

Collaborative Learning in Math Classes: Teachers' Perspectives on Group Work and Peer Teaching

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Abstract: This qualitative study explored the challenges and coping mechanisms of elementary intermediate Mathematics teachers in employing collaborative learning strategies in their classrooms. Conducted in selected schools within the Mati Central District, Division of Mati City, the study aimed to understand teachers' perspectives on group work, peer teaching, and the integration of collaborative methods in mathematics instruction. Using in-depth interviews and focus group discussions with purposively selected teacher participants, data were analyzed thematically using framework analysis. Findings revealed three major challenges faced by teachers: passive student participation and group dynamics, misalignment with curriculum pacing and assessment, and lack of preparedness and professional development. In response to these difficulties, teachers adopted coping mechanisms such as strategic group formation, assigning roles and accountability within groups, and designing tasks that foster mathematical discourse and engagement. Furthermore, participants emphasized the need for ongoing professional development, supportive assessment systems, and recognition of collaborative learning's positive outcomes. The study highlights the importance of equipping teachers with relevant training and institutional support to sustain collaborative practices in math education. Insights from this research can inform policy and program development aimed at improving classroom collaboration, instructional effectiveness, and learner engagement in mathematics.

Keywords: Collaborative Learning , Math Classes, Group Work And Peer Teaching.

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I. INTRODUCTION

➤ Background of the Study

Collaborative learning in mathematics, particularly through group work and peer teaching, is an effective student-centered approach that can strengthen understanding, critical thinking, and engagement. This study examines the experiences and perspectives of mathematics teachers regarding the use of these strategies, focusing on their benefits, challenges, and effective practices. The study also aims to determine how collaborative learning contributes to improved student learning and provides useful insights for teachers, school administrators, and learners.

Internationally, teachers encounter difficulties in managing group activities and ensuring equal participation. In the United States and Australia, differences in student engagement may result in some learners dominating discussions while others remain passive (Gillies & Hattie, 2020). Similarly, teachers in Canada and the United Kingdom find it challenging to address diverse learning needs within groups, particularly when providing appropriate

activities for both advanced and struggling learners (Boaler, 2020).

Assessment is another concern in collaborative learning. Educators in Finland and Singapore experience difficulty in measuring individual contributions and maintaining accountability during group tasks (Black & Wiliam, 2021). Traditional assessment practices may not fully reflect students' individual learning and collaborative processes, highlighting the need for assessment approaches that can evaluate both group performance and individual participation.

In the Philippines, collaborative learning is increasingly used to promote peer interaction, shared problem-solving, and deeper mathematical understanding. However, teachers often face challenges in managing large classes and maintaining active participation among learners. Ensuring that every student contributes while preventing a few students from dominating group discussions requires careful planning, classroom management, and monitoring (Baclay, 2020).

The implementation of collaborative learning is also affected by limited resources and insufficient teacher preparation. Some Philippine schools lack adequate classroom space, instructional materials, and technological resources needed to support effective group activities (Ogena & Brawner, 2019). Moreover, teachers may have limited opportunities for professional development on collaborative learning strategies, making continuous training essential for improving their skills in facilitating group dynamics and designing meaningful collaborative tasks (Bernardo, 2018).

In Mati City, similar concerns include inadequate instructional materials, limited technology, insufficient classroom space, and a lack of training in collaborative learning practices (Perez, 2019; Garcia, 2020). These challenges emphasize the need to understand teachers' actual experiences and resource requirements. Therefore, this study seeks to provide valuable insights into the benefits, challenges, and effective practices of collaborative learning in mathematics, with the goal of promoting greater student engagement, improved achievement, and a more inclusive learning environment.

➤ Research Questions

In line with the purpose of exploring the strategies of teachers in collaborative math classes on group work and peer teaching including the coping mechanisms with the challenges that they encountered, this study specifically sought answers to the following research questions:

- What are the challenges of teachers employing collaborative learning in math classes?
- How do teachers cope with the challenges encountered in collaborative learning in math classes?
- What insights can be drawn on collaborative learning in math classes?

➤ Theoretical Lens

This study on collaborative learning in mathematics focuses on teachers' perspectives regarding group work and peer teaching. It is primarily anchored on Cognitive Load Theory (CLT) by Sweller (1988), which explains how learners process information and how cognitive demands influence learning. The theory identifies three types of cognitive load: intrinsic load, which refers to the complexity of the learning task; extraneous load, which results from ineffective instructional design and should be minimized; and germane load, which involves the mental effort used to develop understanding and meaningful knowledge. In collaborative mathematics learning, teachers can manage cognitive load by providing clear explanations, scaffolding, appropriate practice, and activities that encourage problem-solving, reflection, and deeper understanding. CLT therefore provides a useful foundation for organizing lessons, activities, and assessments that promote effective learning.

The study is also anchored on Social Constructivism (Vygotsky, 1978), which emphasizes that knowledge develops through social interaction, dialogue, shared experiences, and negotiation of meaning. This is closely connected to the Zone of Proximal Development (ZPD),

where learners accomplish tasks with the assistance and scaffolding of peers or teachers that they may not complete independently. It is further supported by Piaget's Constructivism (1972), which views learning as an active process in which learners construct knowledge through experiences, reflection, peer interaction, and resolution of cognitive conflicts. Finally, the study draws from Johnson and Johnson's Cooperative Learning Theory (1989), which emphasizes learning through shared goals and identifies five essential elements of effective cooperation: positive interdependence, individual accountability, promotive interaction, social skills, and group processing. Together, these theories provide a strong foundation for examining how group work and peer teaching can promote active participation, knowledge construction, cognitive development, and meaningful learning in mathematics.

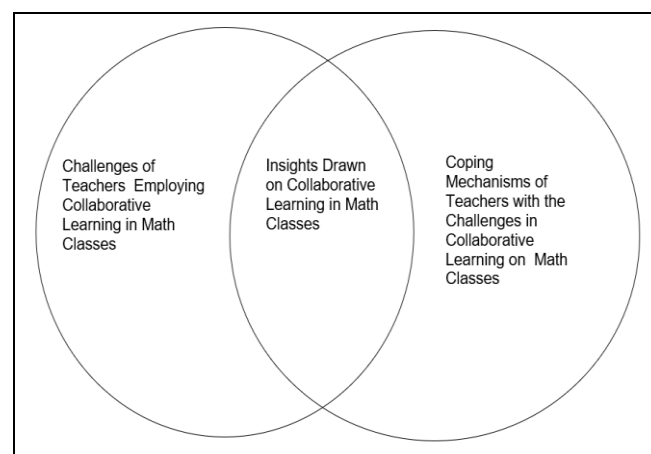


Fig 1 Conceptual Framework of the Study

II. METHODOLOGY

➤ Design and Procedure

This study employed a qualitative research approach using a phenomenological design to examine the lived experiences of elementary intermediate Mathematics teachers in implementing collaborative learning through group work and peer teaching. Phenomenology focuses on understanding individuals' experiences from their own perspectives by setting aside preconceived assumptions to achieve a deeper and more authentic interpretation (Lester, 1999, as cited in Bhandari, 2020). It is particularly appropriate for examining teachers' personal experiences, challenges, and coping strategies in collaborative classroom settings. Qutoshi (2021) further explains that phenomenological research involves the simultaneous collection and analysis of data, allowing researchers to closely examine participants' experiences and identify significant aspects of the phenomenon as they emerge.

To obtain rich and comprehensive data, the study used semi-structured in-depth interviews, focus group discussions (FGDs), and open-ended questionnaires. Individual interviews provided teachers with opportunities to describe their experiences, challenges, and coping strategies through flexible and open-ended discussions. FGDs complemented these accounts by capturing shared experiences, differing

perspectives, group interactions, and collective meaning-making among teachers. Meanwhile, open-ended questionnaires were used to include participants who were difficult to reach because of time or distance constraints. These questionnaires allowed respondents to provide detailed and reflective answers, broadening the range of perspectives gathered. As noted by Delve and Limpaecher (2022), open-ended questionnaires are useful for obtaining detailed responses from participants with different schedules while providing valuable insights that can complement interview and FGD findings.

➤ *Research Participants*

The study included ten (10) purposively selected intermediate Mathematics teachers from Mati Central District, Division of Mati City, who provided in-depth insights into their experiences, challenges, and coping strategies in implementing collaborative learning. Five teachers participated in individual in-depth interviews (IDI), while the other five joined a focus group discussion (FGD). All participants held plantilla positions from Teacher I to Teacher III (T1–T3), had at least three years of teaching experience, and obtained a Very Satisfactory Performance Rating for three consecutive years. Both male and female teachers were represented to provide balanced perspectives. Purposive or judgmental sampling was employed to select participants with relevant experience and sufficient knowledge of collaborative learning, ensuring the collection of credible and meaningful accounts.

➤ *Research Instrument*

To establish the credibility, transferability, and dependability of the study, multiple data collection techniques were utilized, including audiotaped one-on-one interviews, peer debriefing, field notes, and close and participant observations. Ten intermediate Mathematics teachers shared their lived experiences, challenges, and coping strategies in implementing collaborative learning. Each interview lasted approximately one hour and fifteen minutes and was conducted within a scheduled four-day period, allowing participants to freely express their views while enabling the researcher to document relevant verbal and non-verbal responses. An interview guide containing open-ended questions was used to ensure that the discussions remained aligned with the study objectives while allowing participants to provide detailed personal accounts. Guided by Fuster-Guillén (2019), the interviews focused on participants' personal histories, interpretations, and reflections regarding their experiences with collaborative learning. The use of conversational interviews and observation further provided a deeper understanding of teachers' classroom practices, interactions, and contextual experiences, resulting in authentic and comprehensive data for analysis.

➤ *Data Analysis*

The data from the in-depth interviews and focus group discussions were analyzed through thematic analysis, following Creswell's qualitative data analysis model,

particularly the identification of themes. This approach was used to systematically recognize and interpret meaningful patterns in the participants' experiences. As explained by Creswell (2012, as cited in Chali, Eshete, & Debela, 2022), themes are groups of related codes that express significant meanings within qualitative data. The analysis involved familiarizing with the transcripts, generating initial codes, grouping related codes into potential themes, reviewing and refining the themes, defining and naming each theme, and developing the final narrative. Relevant participant quotations were incorporated to support the identified themes and accurately represent their lived experiences.

The thematic analysis was conducted systematically to ensure that the findings were grounded in the participants' actual accounts and aligned with the research questions. Redundant or overlapping themes were combined or revised to establish clear and distinct interpretations of the teachers' experiences, challenges, and coping strategies in implementing collaborative learning. Fuchs (2023) emphasized that thematic analysis involves an iterative process of coding, thematizing, and reflection that enables researchers to develop meaningful interpretations and theoretical insights. Through careful and transparent manual coding, the study produced a credible and comprehensive understanding of the experiences of intermediate Mathematics teachers in Mati Central District.

➤ *Framework Analysis*

The study employed Framework Analysis to systematically examine the experiences of elementary intermediate Mathematics teachers in implementing collaborative learning strategies. This approach is appropriate for applied qualitative research because it provides a structured yet flexible process for investigating real-world educational concerns. Guided by Fuchs (2023), Goldsmith (2021), and the framework of Ritchie and Spencer (1994), the analysis involved organizing interview and focus group transcripts, identifying and coding significant ideas and recurring concepts, grouping related codes into categories, and developing overarching themes that reflected the teachers' challenges and coping strategies.

To ensure the trustworthiness and credibility of the findings, the study used data triangulation through interview transcripts, field notes, and member checking. The researcher also ensured that interpretations remained grounded in participants' narratives and supported by relevant literature. After refining the themes, the findings were presented through an analytical narrative supported by participant quotations, tables, and thematic illustrations. As Goldsmith (2021) emphasized, Framework Analysis requires continuous and careful engagement with the data rather than a simple linear process. Through this systematic approach, the study generated a comprehensive understanding of how intermediate Mathematics teachers in Mati Central District manage the challenges of collaborative learning and develop strategies to support its effective implementation.

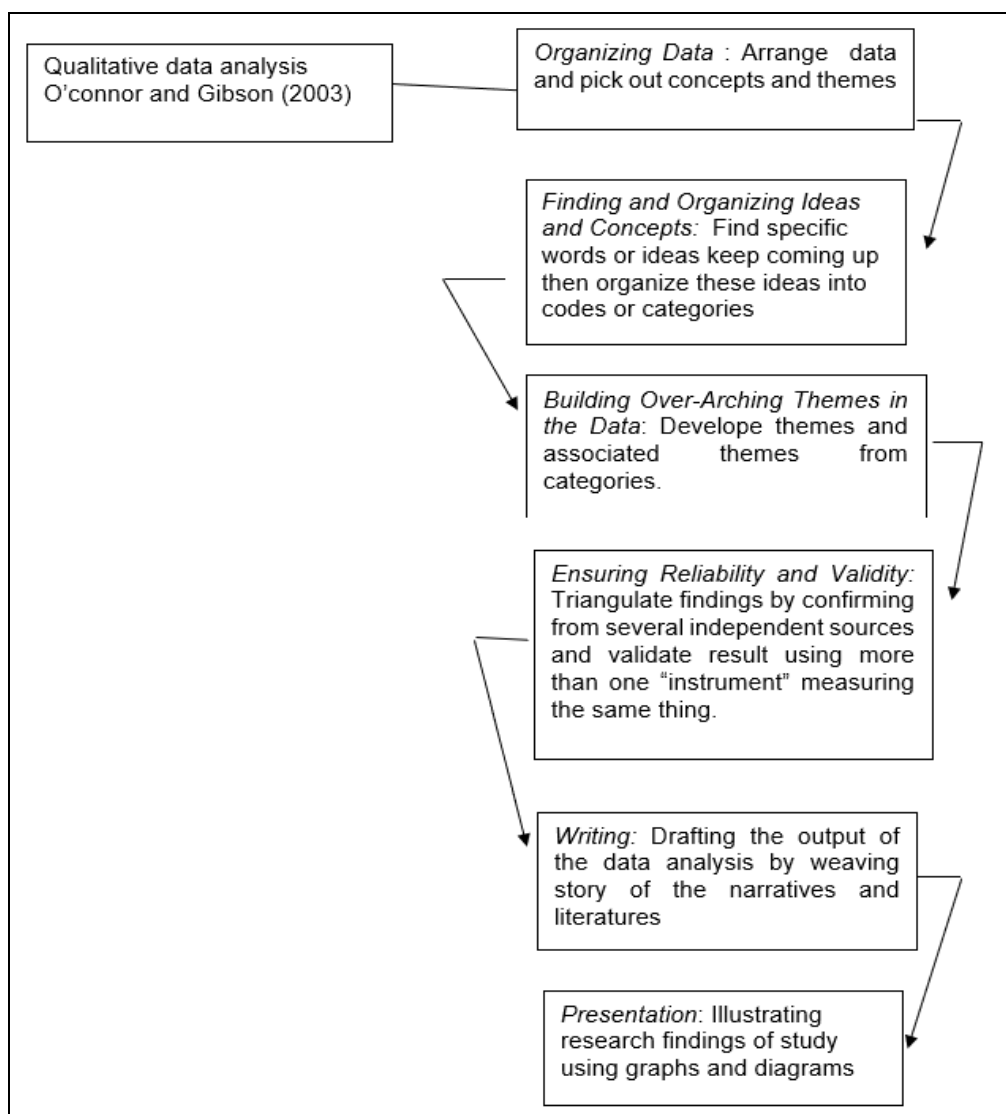


Fig 2 Analytical Framework of the Study

III. RESULTS AND DISCUSSIONS

➤ Challenges in Employing Collaborative Learning on Math Classes

Collaborative learning is widely recognized in mathematics education for its ability to strengthen problem-solving, conceptual understanding, and student engagement. However, its effective implementation can be affected by several challenges, including unequal student participation, curriculum demands, limited teacher training, and logistical and technological constraints. Lin and Tan (2022) emphasized that recognizing these challenges is important in improving teaching strategies and ensuring that collaborative learning is meaningfully integrated into mathematics instruction.

Technology-related and classroom conditions can further limit collaborative learning, particularly in developing and rural areas where internet connectivity, access to devices, and digital skills may be inadequate. Pérez and Rivera (2024) noted that technology-supported collaborative mathematics learning in Latin America is often hindered by unreliable access, limited technical support, and insufficient teacher

preparation in digital pedagogy. Moreover, face-to-face group activities may be constrained by large class sizes, limited classroom space, and fixed seating arrangements, making effective collaboration more difficult.

• Passive Student Participation and Group Dynamics

A major challenge in implementing collaborative learning in mathematics is managing student participation and group dynamics. Although group work aims to promote shared responsibility and peer learning, participation is often uneven, with some students taking dominant roles while others remain passive or disengaged. Differences in confidence, prior knowledge, and communication skills may create power imbalances that weaken collaboration and limit meaningful mathematical discussions (Veenman & Denessen, 2021). Similarly, some learners may experience anxiety or intimidation when working with peers, particularly when solving difficult mathematical problems, which can further reduce their participation (Saito & Yamaguchi, 2023). These challenges were evident in the teachers' narratives regarding student participation and group dynamics, as reflected in the following statements:

"Sinusigurado kong lahat ay nabibigyan ng pagkakataong magsalita sa collaborative learning, minsan sa pagtawag ng isa-isa o pagbibigay ng roles. Nakakatulong ito para magbahagi ng insights kahit ang tahimik na estudyante. Bagaman may ilan pa ring naghihintay lang ng sagot, nakikita kong mas nagiging responsable sila. Nakikilahok sila dahil alam nilang kailangan nilang tumulong sa grupo." ("I ensure everyone gets a chance to speak in collaborative learning, sometimes by calling on individuals or assigning roles. This helps even quiet students share insights. Although some still wait for answers, I see them becoming more responsible, participating because they know they need to contribute to the group.") (P1)

"May dalawang estudyante na halos lahat ang gumagawa, kaya kinausap ko silang lahat tungkol sa pagtutulongan. Pagkatapos, mas sinubukan na ng iba na magbahagi ng opinyon at tumulong. Mayroon pa ring "free-rider" minsan, ngunit natututo pa rin ang iba sa pakikinig at pag-obserba. Kahit may problema, may pagkatuto pa rin ang nangyayari." ("Two students were doing most of the work, so I spoke to everyone about collaboration. Afterward, others tried harder to share opinions and help. There are still occasional "free-riders," but others still learn by listening and observing. Despite the issues, learning still occurs.") (P4)

The teachers' narratives revealed that they used different strategies to promote equitable participation during collaborative learning. P1 addressed passive participation by directly calling on quieter students and assigning specific group roles, which encouraged greater involvement and responsibility. However, some learners still tended to rely on their classmates for answers. Similarly, P4 emphasized the importance of teamwork and communicated clear expectations to students, resulting in improved participation in subsequent activities, although the issue of "free-riders" remained. Despite this challenge, P4 observed that even less active students could still gain knowledge by observing their peers. These experiences were further supported by the participants' responses during the discussion, as reflected in the following statements:

"Para maging epektibo ang collaborative learning, mahalaga ang respeto at open communication. Bago magsimula, pinag-uusapan namin kung paano kami magtutulongan. Nagiging positibo ang environment sa grupo; nagtatanungan at nagbibigay ng constructive feedback. May personal na hindi pagkakasundo minsan, pero sinusubukan naming pag-usapan nang mahinahon. Malaki ang tulong nito sa kanilang performance dahil mas kumpiyansa silang magbahagi." ("For effective collaborative learning, respect and open communication are vital. Before starting, we discuss how we'll help each other. The group environment becomes positive; they ask questions and give constructive feedback. There are occasional personal disagreements, but we try to discuss them calmly. This greatly aids their performance as they're more confident sharing.") (P6)

"May mga estudyante sa klase na komportable sa Tagalog, iba sa ibang diyalekto o Ingles, na nagiging hamon

sa komunikasyon. Hinihikayat ko silang gumamit ng Tagalog, pero pinapayagan ko rin silang magpaliwanag sa paraang komportable sila. Nakikita ko ang kanilang pagtitiyaga na magkaintindihan kahit may language barrier. Minsan bumabagal ang diskusyon dahil sa pagsasalin, pero nakakatulong pa rin ito sa pag-unawa." ("Some students in class are comfortable with Tagalog, others with different dialects or English, which challenges communication. I encourage them to use Tagalog but also allow explanations in their comfortable language. I see their perseverance to understand each other despite the language barrier. Discussions sometimes slow down due to translation, but it still aids understanding.") (P7)

The teachers' reflections showed that establishing clear group norms and addressing communication barriers were important in promoting effective collaboration. P6 emphasized setting expectations centered on respect and open communication before group activities, which helped create a supportive environment, encourage constructive feedback, and build students' confidence. Although personal conflicts sometimes affected group dynamics, these were managed through calm and open discussions. Meanwhile, P7 addressed linguistic diversity by encouraging the use of Tagalog while allowing students to communicate in their preferred language to ensure understanding. However, this approach sometimes slowed discussions because of the need for translation.

These findings support Saito and Yamaguchi (2023), who noted that without careful planning and clearly defined group roles, collaborative learning may reinforce existing inequalities rather than promote inclusion. Similarly, Veenman and Denessen (2021) explained that differences in students' confidence, prior knowledge, and communication abilities can create group-based imbalances that affect engagement and mathematical problem-solving. Thus, effective group formation, meaningful role assignment, and a supportive classroom environment are essential, although teachers may face limitations in time and training when implementing these strategies consistently.

• *Misalignment with Curriculum Pacing and Assessment*

Collaboration among teachers, students, and the wider school community plays an important role in effective classroom management. It promotes a supportive learning environment where learners are engaged, motivated, and cooperative, emphasizing that classroom management is a shared responsibility grounded in teamwork, communication, and mutual respect. However, teachers face challenges in aligning collaborative learning activities with curriculum pacing guides and assessment requirements. Since group work and peer teaching often require more time to develop deeper conceptual understanding than traditional instruction, teachers may struggle to complete the prescribed curriculum within the allotted period (Hmelo-Silver et al., 2020).

Moreover, teachers may experience pressure to prioritize content coverage, particularly when standardized assessments focus on procedural skills and extensive curriculum content (Au, 2019). This tension can limit

opportunities for meaningful collaborative exploration despite its potential benefits to student learning. These concerns highlight the need for effective planning and coordination to balance curriculum requirements with collaborative learning practices, as reflected in the following statements from the participants:

"Mahirap isingit ang collaborative learning sa dami ng ituturo sa math, kaya pumipili lang ako ng ilang paksa. Sa mga paksang ito, mas lumalim ang pag-unawa at tumagal ang natutunan ng mga estudyante. Dahil limitado ang oras, hindi ito magamit sa lahat ng aralin. Nakatulong ito sa performance sa piling paksa, ngunit hindi sa buong kurikulum." ("It's hard to fit collaborative learning into the extensive math curriculum, so I select only a few topics. For these topics, students gain deeper understanding and retain what they learn longer. Due to limited time, it can't be used for all lessons. It helped performance in specific topics, but not across the entire curriculum.") (P2)

"Nahihirapan akong sukatin ang individual learning sa collaborative activities, kaya nagbibigay ako ng group tasks at individual quizzes. Nakikita ko ang pagtutulungan at pagpapaliwanag ng konsepto ng mga estudyante. Minsan, ang group grade ay hindi sumasalamain sa individual understanding, at may mga nakikinabang sa iba. Nakakatulong ito sa group problem-solving, ngunit kailangan pa ng ibang paraan para masiguro ang individual learning." ("I struggle to measure individual learning in collaborative activities, so I give group tasks and individual quizzes. I see students helping each other and explaining concepts. Sometimes, group grades don't reflect individual understanding, and some benefit from others' efforts. It helps with group problem-solving, but I still need other ways to ensure individual learning.") (P5)

The teachers' narratives revealed that time constraints and assessment difficulties significantly affect the implementation of collaborative learning in Mathematics. P2 explained that the extensive curriculum limits the time available for group activities, leading to the selective use of collaborative learning on topics where it can provide the greatest benefit. Although this approach promotes deeper and more lasting understanding, limited instructional time restricts its use across other lessons. Meanwhile, P5 addressed the challenge of measuring individual learning by supplementing group activities with individual quizzes and other assessments. While group work promotes peer support and explanation, the teacher recognized that group grades may not accurately represent each learner's actual understanding or contribution.

These experiences are consistent with Webb (2020), who noted that traditional assessments such as quizzes and examinations may not fully capture learning gained through group interaction and peer support. Similarly, Barron and Darling-Hammond (2020) emphasized the need for varied assessment strategies, including teacher observation, peer evaluation, and individual reflection, to measure both individual accountability and collaborative skills. Thus, balancing curriculum demands with meaningful collaborative

activities and appropriate assessment practices remains essential for effective implementation.

"Minsan, ang collaborative activities ay lumalayo sa layunin ng aralin, kaya sinusubukan kong i-modify ang mga ito. Dahil dito, naiuugnay ng mga estudyante ang kanilang pagtutulungan sa kanilang dapat matutunan. Ang pag-adjust ay minsan nakakabawas sa 'fun' factor, kaya hindi sila gaanong engaged. Nakakatulong ito sa pag-unawa sa aralin, pero kailangan ko pang balansehin ang pag-aaral at engagement." ("Sometimes, collaborative activities stray from the lesson's objective, so I try to modify them. This helps students connect their collaboration to what they need to learn. Adjusting activities sometimes reduces the 'fun' factor, making students less engaged. It helps with lesson understanding, but I still need to balance learning and engagement.") (P8)

Participant 8 (P8) experienced difficulty in aligning engaging collaborative learning activities with specific Mathematics learning objectives. To address this, the teacher adapted activities to ensure that they remained relevant to the intended outcomes. Although this strategy helped students connect their group experiences with the lesson objectives, excessive modification sometimes reduced the enjoyment and engagement naturally associated with collaborative learning, highlighting the need to balance instructional alignment with student motivation.

This concern is also related to assessment, as traditional methods such as quizzes and examinations may not fully capture learning developed through group interaction and peer support (Webb, 2020). Teachers may also find it difficult to determine individual contributions and understanding during collaborative tasks. Therefore, varied assessment approaches, including teacher observation, peer assessment, and individual reflection, are necessary to evaluate both individual accountability and collaborative skills (Barron & Darling-Hammond, 2019).

• Lack of Preparedness and Professional Development

Elementary teachers recognize that effective classroom management and positive student behavior require consistent, proactive, and supportive strategies. These practices help maintain academic engagement while creating a safe, respectful, and productive learning environment. Similarly, teachers' perspectives on collaborative learning in Mathematics highlight the importance of adequate preparation and professional development. Many teachers feel that their pre-service training did not sufficiently develop the knowledge and skills needed to effectively facilitate group work and peer teaching, which may result in uncertainty and continued reliance on traditional teacher-centered methods.

The findings further emphasize the need for continuous and targeted professional development focused specifically on collaborative learning in Mathematics. While general training programs may provide useful information, they may not adequately address the practical demands of managing group dynamics, facilitating peer teaching, and designing

effective collaborative activities. This supports the findings of Opfer and Pedder (2021), who emphasized the importance of sustained professional development in strengthening teachers' instructional knowledge and practices. The participants' responses from the in-depth interviews further supported this theme, as reflected in the following statements:

"Nahirapan akong i-manage ang dynamics ng grupo, kaya nag-research ako at kinausap ang ibang guro para sa strategies. Ang natutunan ko ay nakatulong sa pagpapangkat at pagbibigay ng tasks. Hindi lahat ng strategies applicable sa bawat klase, dahil magkakaiba ang sitwasyon. Pero ang pagiging open sa pag-aaral at pagpapalitan ng ideya ay nakatulong upang maging mas epektibo ako." ("I struggled to manage group dynamics, so I researched and talked to other teachers for strategies. What I learned helped with grouping and assigning tasks. Not all strategies are applicable to every class due to varying situations. However, being open to learning and exchanging ideas helped me become more effective.") (P3)

The teachers' narratives revealed that limited training and difficulties in managing collaborative learning influenced their classroom practices. P3 initially struggled with group dynamics but improved implementation by researching effective strategies and consulting experienced colleagues, resulting in better group formation and task distribution. However, the teacher recognized that strategies may not work equally in all classroom contexts, highlighting the importance of continuous learning and professional collaboration. Similarly, P9 had no formal training when first implementing collaborative learning and relied on online resources and personal experience. Although these efforts increased student engagement and enthusiasm, the teacher continued to experience difficulties in managing groups, providing clear instructions, and determining the extent of students' learning and appropriate assessment.

These experiences emphasize teachers' need for practical professional development on forming effective groups, scaffolding activities, managing conflicts, and promoting meaningful mathematical discussions (Gillies, 2020). Professional development can be more effective when teachers experience collaborative learning themselves, observe exemplary practices, and work with colleagues in collaborative lesson planning (Darling-Hammond et al., 2019). Thus, sustained training and peer collaboration are essential in strengthening teachers' confidence and competence in implementing collaborative learning.

"Noong una kong sinubukan ang collaborative learning, kulang ako sa pormal na training, kaya nagbasa lang ako online at sinubukan ang sa tingin ko'y gagana. Ang enthusiasm ng mga bata na magtulungan ay nakakahawa at nakita kong naging mas aktibo sila. Dahil sa kakulangan sa kaalaman, nahirapan akong i-manage ang grupo o i-assess ang natutunan nila. May mga pagkakataong nagkagulo ang mga grupo dahil sa hindi malinaw na instructions." ("When I first tried collaborative learning, I lacked formal training, so I just read online and experimented. The children's

enthusiasm to collaborate was contagious, and I saw them become more active. Due to my lack of knowledge, I struggled to manage groups or assess their learning. There were times groups became chaotic due to unclear instructions.") (P9)

"Naniniwala ako sa benepisyo ng collaborative learning, ngunit kulang ang training ko sa pagpapatupad nito sa math. Umaasa ako sa workshops, ngunit hindi pa rin ito sapat. Nakatulong ang ilang techniques sa workshop para mas maging organized ang mga grupo. Madalas kulang sa materials at structured activities na para sa collaborative learning sa math." ("I believe in collaborative learning's benefits but lack sufficient training to implement it in math. I rely on workshops, but it's still not enough. Some workshop techniques helped organize groups. We often lack materials and structured activities designed for collaborative learning in math.") (P10)

P10 recognized the value of collaborative learning but expressed concerns about limited preparation for its effective use in Mathematics. The teacher relied mainly on occasional workshops, which provided some useful strategies for organizing groups but did not fully address the need for appropriate materials and structured collaborative activities. This highlights the importance of sustained professional development, as one-time training is often insufficient to create lasting changes in teaching practice (Desimone, 2019). Continuous support and opportunities for reflection can help teachers apply new strategies and respond to classroom challenges more effectively (Opfer & Pedder, 2021).

Three major themes emerged from the participants' responses: passive student participation and group dynamics, misalignment with curriculum pacing and assessment, and lack of preparedness and professional development. The first theme shows that although group work can promote peer interaction, deeper understanding, and problem-solving skills (Johnson et al., 2018), passive learners, unequal participation, and group conflicts can limit these benefits and make effective collaboration difficult.

The second theme, misalignment with curriculum pacing and assessment, reflects the difficulty of balancing collaborative learning with curriculum requirements. While group work and peer teaching can address diverse learning needs and support both struggling and advanced learners (Chiu et al., 2020), collaborative activities often require more time than traditional instruction. In addition, assessing individual learning and contributions within group tasks remains challenging, raising concerns about fairness and assessment validity (Jones & Smith, 2022).

Finally, the theme of lack of preparedness and professional development emphasizes the need for teachers to receive adequate training, resources, and continuous support. Teachers require practical skills in forming balanced groups, managing diverse learners, encouraging equal participation, facilitating collaboration, and designing appropriate assessments. Without sufficient preparation, teachers may feel uncertain or discouraged from fully

implementing collaborative learning despite its recognized benefits, underscoring the importance of sustained and targeted professional development.

➤ *Coping Mechanism with the Challenges Encountered in Collaborative Learning in Math Classes*

To effectively cope with the challenges of implementing collaborative learning in math classes, educators can adopt a multifaceted approach. This includes strategically structuring group activities with defined roles and tasks that necessitate teamwork, explicitly teaching students essential collaboration skills, and employing varied grouping methods. Simultaneously, aligning collaborative work with curriculum demands involves selecting appropriate learning objectives, managing time effectively, and utilizing formative assessment techniques during group work alongside diverse assessment methods that value both process and product.

• *Creating Strategic Group Formation*

To address unequal participation and group-management challenges, teachers use intentional and strategic group formation rather than relying solely on random grouping. Heterogeneous groups are created by considering students' skill levels, learning styles, and interpersonal characteristics, allowing learners with different strengths to support one another. According to Lin and Tan (2022), strategic grouping can prevent high-achieving students from dominating activities while promoting peer scaffolding and meaningful participation. Teachers may also rotate group members to expose students to different classmates and develop their adaptability and cooperation.

Similarly, Gillies (2020) emphasized that carefully structured groups can strengthen cooperation, minimize social loafing, and promote mutual respect. Teachers may use diagnostic assessments, previous performance, and classroom observations to determine appropriate group compositions for collaborative mathematical tasks. The participants' responses further highlighted the importance of strategic group formation in promoting effective collaboration and equitable participation in Mathematics classes, as reflected in the following statements:

"Noong una, hinayaan kong magkagrupong ang mga magkakaibigan, pero napansin kong iilan lang ang gumagawa. Ngayon, mas pinag-iisipan ko ang pagbuo ng grupo, tinitignan ang kasanayan at estilo ng pagkatuto. Sinisigurado kong may "stronger" na estudyante sa bawat grupo upang tumulong, at nag-eksperimento ako sa iba't ibang paraan ng pagpapangkat. Kailangan ko pa ng mas maraming aktibidad na nangangailangan ng kontribusyon ng bawat miyembro upang maiwasan ang "free-riding." ("Initially, I let friends form groups, but I noticed only a few would work. Now, I put more thought into grouping, considering skills and learning styles. I ensure each group has "stronger" students to assist, and I've experimented with various grouping methods. I still need more activities that truly require every member's contribution to prevent "free-riding.") (P1)

"Ang uneven participation ay isang hamon; minsan isang estudyante lang ang dominante. Nagbibigay ako ng individual preparation time bago ang collaborative task, at nag-a-assign ng specific roles sa grupo. Sa ganitong paraan, mas nagiging accountable ang bawat isa. Kailangan ko pa ng mas matibay na rubrics na hindi lang final answer ang tinitignan kundi pati na rin ang individual contribution." ("Uneven participation is a challenge; sometimes one student dominates. I give individual preparation time before collaborative tasks and assign specific group roles. This way, everyone becomes more accountable. I still need more robust rubrics that assess not just the final answer but also individual contributions.") (P8)

Teacher P1 learned from previous experiences that friendship-based grouping could result in passive participation and therefore shifted to forming groups based on students' skills and learning styles. The teacher also experimented with different grouping strategies and recognized the need for more inclusive activities to minimize "free-riding." Similarly, P8 promoted equal participation by providing individual preparation time and assigning specific group roles to strengthen accountability. The teacher also identified the need for comprehensive rubrics that evaluate individual contributions rather than focusing only on the group's final output.

These practices are supported by Lynch (2024), who noted that rotating group members encourages adaptability, prevents cliques, and allows teachers to better understand students' social development and individual support needs. Likewise, Alzahrani and Woollard (2021) emphasized that clearly defined roles improve task management and develop students' metacognitive skills, particularly in multi-step mathematical problem-solving. Rotating these roles also gives learners opportunities to develop confidence and competence in different responsibilities. These insights are evident in the following remarks:

"Kahit maayos ang initial grouping, minsan hindi gumagana ang dynamics ng grupo. Nagiging flexible ako sa pagpapalit ng grupo kung hindi na produktibo ang set-up. Pinapayagan ko silang magpalit o ako mismo ang nag-reorganize. Kailangan ko pa ng mas maraming estratehiya para matulungan ang mga bata na mag-manage ng conflict at maging mas epektibo sa komunikasyon." ("Even with good initial grouping, sometimes group dynamics don't work. I'm flexible about changing groups if a setup becomes unproductive, allowing them to switch or reorganizing myself. I still need more strategies to help students manage conflict within groups and improve their communication.") (P9)

P9 addressed unproductive group dynamics by allowing group changes when necessary and recognizing the need to further develop students' conflict-management and communication skills. This approach highlights the importance of flexible and responsive classroom management in sustaining productive collaboration. Nguyen and Walker (2023) emphasized that understanding students' individual characteristics and intentionally forming groups

can improve collaboration and engagement in Mathematics. Thus, strategic grouping serves not only as a management strategy but also as a pedagogical practice that promotes equity, inclusion, and student-centered learning.

Assigning specific roles also helps ensure active participation and shared responsibility. Common roles such as facilitator, recorder, timekeeper, and presenter provide students with clear responsibilities and opportunities to contribute throughout collaborative tasks. According to Alzahrani and Woollard (2021), structured roles improve student engagement and task efficiency, particularly during complex and multi-step mathematical activities, while also developing learners' leadership and communication skills.

- *Adapting Role Assignment and Accountability Structures*

Teachers use clear role assignments to promote equal participation, accountability, and active involvement in collaborative Mathematics activities. Roles such as facilitator, recorder, checker, and reporter give each learner a specific responsibility, helping minimize social loafing and ensuring that students contribute meaningfully. The findings are consistent with Veenman and Denessen (2021), who emphasized that structured roles strengthen students' sense of responsibility and encourage productive collaborative dialogue. Peer evaluation and self-assessment may also be used to monitor participation and encourage learners to reflect on their collaborative behaviors.

Similarly, Han and Kim (2021) found that assigning clear and regularly rotated roles in middle school Mathematics classes improved group dynamics and increased student engagement. Rotating responsibilities allows learners to develop leadership, accountability, and confidence while experiencing different aspects of group work. These practices demonstrate the value of structured accountability in creating more balanced and effective collaborative learning environments, as reflected in the participants' interview responses:

"Dati, iilan lang ang gumagawa sa group work, kaya nag-assign ako ng specific roles sa bawat miyembro. May taga-sulat, taga-salita, taga-check, at taga-manage ng oras. Ipinaliwanag ko rin ang kahalagahan ng kontribusyon ng bawat isa para sa tagumpay ng grupo. Kailangan ko pa ng mas maraming halimbawa ng epektibong paglalarawan ng role na pwede kong i-adapt sa iba't ibang paksa sa math." ("Previously, only a few would work in group tasks, so I started assigning specific roles to each member: writer, speaker, checker, and time manager. I also explained the importance of everyone's contribution for group success. I still need more examples of effective role descriptions that I can adapt to various math topics.") (P2)

"Para malaman kung talagang nag-contribute ang bawat isa, nag-implement ako ng 'contribution tracker'. Bawat miyembro ay kailangan mag-note ng kanilang ginawa sa bawat hakbang ng aktibidad. Mayroon ding peer evaluation kung saan nagbibigay sila ng feedback sa isa't isa. Kailangan ko pa ng mas user-friendly na paraan para ma-manage ang pagsubaybay at pagtatasa na ito, marahil

isang simpleng digital tool." ("To track individual contributions, I implemented a 'contribution tracker.' Each member notes their work at every step of the activity. There's also peer evaluation where they give each other feedback. I still need a more user-friendly way to manage this tracking and evaluation, perhaps a simple digital tool.") (P4)

The participants emphasized the importance of role assignment and accountability in addressing unequal participation. P2 assigned specific responsibilities to each group member and emphasized that individual contributions were essential to group success, while recognizing the need for flexible role descriptions applicable to different Mathematics topics. Similarly, P4 used a contribution tracker and peer evaluation to monitor individual participation, although the teacher identified the need for a simpler and possibly digital system to manage these records efficiently.

These practices are supported by Slavin (2020), who emphasized that individual accountability is essential in cooperative learning models such as Student Teams-Achievement Divisions (STAD), where both group performance and individual achievement contribute to success. Likewise, Toma and Garcia (2022) found that peer evaluation in group-based Mathematics activities increased students' awareness of their responsibilities, improved collaboration, and reduced off-task behavior. Therefore, flexible role assignments and effective accountability mechanisms can promote equitable participation and strengthen both social and academic responsibility in collaborative learning.

"Para masiguro ang involvement at accountability, sinubukan ko ang 'tiered responsibility'. Bawat miyembro ay may tiyak na responsibilidad depende sa pagiging kumplikado ng gawain. Iniaayon ko ang mga role sa kalakasan ng mga bata hangga't maaari. Kailangan ko pa ng mas malinaw na guidelines kung paano i-differentiate ang mga role base sa iba't ibang layunin ng pag-aaral." ("To ensure involvement and accountability, I tried 'tiered responsibility,' where each member has specific duties based on task complexity. I align roles with student strengths whenever possible. I still need clearer guidelines on differentiating roles based on various learning objectives.") (P5)

"Minsan, ang problema ay ang mga expectations sa loob ng grupo dahil may mga miyembrong hindi committed. Sinubukan kong gumawa ng 'group contracts' kung saan sama-samang nagdedesisyon ang grupo sa mga role, inaasahang kontribusyon, at konsekwensya. Pinangunahan ko ang diskusyon para masigurong nagkakasundo ang lahat. Kailangan ko pa ng mas maraming structured activities para matulungan silang pag-usapan at pagkasunduan ang kanilang mga responsibilidad." ("Sometimes, the problem is group expectations due to uncommitted members. I tried 'group contracts' where the group collectively decides on roles, expected contributions, and consequences. I led the discussion to ensure everyone agreed. I still need more structured activities to help them discuss and agree on their responsibilities.") (P10)

P5 implemented tiered responsibilities by assigning roles according to task complexity and students' strengths, which encouraged participation and accountability. However, the teacher noted the need for clearer guidelines on matching roles with different learning objectives. Similarly, P10 used "group contracts" in which students collaboratively established roles, expected contributions, and consequences. While this approach strengthened commitment and shared responsibility, the teacher recognized the need for more structured activities to guide students in developing these agreements.

These practices are particularly relevant in Mathematics, where accuracy and step-by-step reasoning are essential. Structured accountability within group work encourages meaningful mathematical dialogue and strengthens students' conceptual understanding by allowing them to explain their reasoning and learn from peer explanations (Lou et al., 2022). Likewise, individual tasks, peer assessment, and self-assessment can reinforce students' responsibility for their own learning while maintaining group cooperation (Pang & Leung, 2021). Thus, combining differentiated roles with individual and group accountability can promote active participation and deeper mathematical learning.

- *Creating Task Design for Mathematical Discourse*

Task design plays a crucial role in promoting mathematical discourse within collaborative learning. Teachers recognize that the structure and nature of mathematical activities significantly influence the quality of student interaction during group work and peer teaching. Well-designed tasks encourage learners to explain their reasoning, exchange ideas, and engage in meaningful mathematical discussions (Anderson, 2021). In particular, rich and open-ended problems that allow multiple solution strategies and require students to provide explanations and justifications are effective in stimulating deeper mathematical conversations (Boaler, 2021).

The findings highlight that carefully designed mathematical tasks not only support collaboration but also encourage students to communicate their thinking and learn from different perspectives. By providing opportunities for reasoning, discussion, and multiple approaches to problem-solving, teachers can create more engaging and productive collaborative learning experiences. The participants' perspectives on task design and mathematical discourse are reflected in the following statements:

"Napansin kong walang diskusyon sa standard na tanong sa math. Para mahimok silang magbahagi ng ideya, gumamit ako ng open-ended na tanong. Binibigyan ko sila ng problema at tinatanong kung paano ito sosolusyunan o iba-ibang paraan. Mas naging engaged sila dahil kailangan nilang ipaliwanag ang kanilang pag-iisip. Kailangan ko pa ng mas maraming halimbawa ng ganitong uri ng tanong na akma sa iba't ibang paksa sa math." ("I noticed a lack of discussion with standard math questions. To encourage sharing ideas, I started using open-ended questions. I give them a problem and ask how they'd solve it or for different

approaches. They became more engaged because they had to explain their thinking. I still need more examples of this type of question that fit various math topics.")(P3)

"Minsan, tama ang sagot ng grupo pero hindi nila maipaliwanag kung bakit. Para masanay silang mag-reason out, nagdisenyo ako ng tasks na mahalaga ang proseso, hindi lang ang sagot. Halimbawa, 'Ipaliwanag kung bakit gumagana ang formula na ito.' Mas naging aktibo sila sa pag-uusap para i-justify ang kanilang pag-iisip. Kailangan ko pa ng mas maraming estratehiya kung paano i-scaffold ang ganitong uri ng tasks." ("Sometimes, groups get the right answer but can't explain why. To foster reasoning, I designed tasks where the process, not just the answer, is crucial. For example, 'Explain why this formula works.' They became more active in discussing to justify their thinking. I still need more strategies to scaffold this type of task.") (P6)

P3 addressed limited mathematical discussion by using open-ended questions that encouraged students to present different solution strategies and explain their reasoning. The teacher also expressed the need for additional examples of open-ended questions across various Mathematics topics. Similarly, P6 designed activities that emphasized the solution process and justification rather than simply obtaining the correct answer, while recognizing the need for additional scaffolding strategies to support students who struggle to explain their thinking.

From the teachers' perspectives, mathematical tasks should be challenging yet accessible to accommodate learners with varying abilities and promote equitable participation (Choppin et al., 2022). They also emphasized the value of contextualized and authentic tasks, as students tend to participate more actively in discussions when mathematical problems are connected to real-life situations or their personal experiences (Wickstrom et al., 2021). Thus, well-designed and relevant tasks can strengthen motivation, reasoning, and meaningful mathematical discourse.

"Para mas lumalim ang mathematical discourse, sinubukan ko ang mga aktibidad na parang debate. Nagbibigay ako ng dalawang paraan ng pagso-solve at tinatanong kung alin ang mas epektibo, kailangan nilang magpresenta ng argumento. Tinuruan ko rin silang makinig at mag-respond nang maayos sa iba. Kailangan ko pa ng mas maraming structured na paraan para ipakilala ang ganitong uri ng aktibidad sa iba't ibang antas ng math." ("To deepen mathematical discourse, I tried debate-like activities. I present two ways to solve a problem and ask which is more effective, requiring them to present arguments. I also taught them to listen and respond respectfully. I still need more structured ways to introduce this type of activity across different math levels.") (P7)

Participants also promoted deeper mathematical discourse through debate and argument-based activities, where students examined and defended different solution methods using mathematical evidence. They also taught students effective listening and response skills, although they

recognized the need for more structured approaches to apply these activities across different Mathematics levels. Effective task design also supports peer teaching, particularly through multi-step or phased problems that encourage students to depend on one another to understand different parts of a task (Zolkower & Crespo, 2020). Providing scaffolds such as prompts, sentence starters, and guiding questions can further help students explain, evaluate, and extend their peers' ideas (Staples & Bartlo, 2021).

Overall, three major coping mechanisms emerged: strategic group formation, adapted role assignment and accountability structures, and task design that promotes mathematical discourse. Strategic grouping addresses passive participation and poor group dynamics by creating balanced groups that encourage peer support and active interaction. This is consistent with Van de Pol et al. (2019), who found that peer teaching strategies can benefit both tutors and learners in understanding mathematical concepts. Role assignment and accountability, meanwhile, help reduce free-riding by ensuring that every student has a meaningful responsibility, supporting ownership, interdependence, and learning through explanation and collaborative problem-solving (Topping, 2018).

Finally, designing tasks that promote mathematical discourse enables teachers to move beyond simple group work toward deeper communication, reasoning, and conceptual understanding. Activities requiring explanation, argumentation, and collaborative problem-solving encourage students to express their ideas, evaluate different perspectives, and construct knowledge together. Roscoe and Chi (2020) emphasized that such approaches can support leadership development, individualized peer assistance, and improved academic outcomes. Thus, carefully designed mathematical tasks can strengthen communication and ensure that collaborative activities result in meaningful and lasting learning.

➤ *Educational Management Insights Drawn from the Findings of the Study on Collaborative Learning in Math Classes*

The findings of studies on collaborative learning in mathematics classrooms offer several valuable insights for educational management. Educational leaders should recognize that transitioning to a collaborative teaching approach requires more than just encouraging group work; it demands equipping teachers with the pedagogical knowledge and practical skills to design engaging tasks, facilitate productive group interactions, implement strategic group formation, and develop appropriate assessment methods that account for both individual and collective learning.

- *Providing Adequate Professional Development and Ongoing Support for Teachers*

Teachers emphasize that adequate professional development (PD) and continuous support are essential for effectively implementing collaborative learning in Mathematics classrooms. Since collaborative learning requires teachers to manage group dynamics, facilitate student interaction, and design meaningful tasks that

encourage mathematical discourse and peer learning, many educators may feel unprepared, particularly when shifting from traditional teacher-centered instruction to student-centered approaches (Goos & Bennison, 2021). Targeted professional development can provide teachers with both the theoretical knowledge and practical strategies needed to facilitate effective group work and peer teaching.

Effective PD should be continuous, practical, and integrated into teachers' regular professional activities. Borko et al. (2020) emphasized that quality professional development should include collaboration among teachers, modeling of effective practices, and opportunities to examine student work. Teachers can benefit from active learning experiences such as collaborative lesson planning, peer observation, and reflection sessions focused on improving collaborative Mathematics instruction. The participants likewise highlighted the importance of providing relevant and sustained professional development, as reflected in their statements:

"Dati, nag-aalangan ako sa collaborative learning sa math, iniisip na dagdag trabaho lang. Pero dahil sa seminars, mas naintindihan ko ang layunin at paraan nito. Natuto ako ng mga estratehiya sa pagbuo ng grupo at pagdisenyo ng tasks. Dahil sa pagtaas ng kumpiyansa, mas epektibo ko itong naipatupad. Mas naging aktibo ang mga bata, at tumaas pa ang kanilang performance sa mga pagsusulit." ("Initially, I was hesitant about collaborative learning in math, thinking it was just extra work. But seminars helped me understand its purpose and methods. I learned strategies for group formation and task design. With increased confidence, I implemented it more effectively, leading to more active students and improved quiz and exam performance.") (P1)

"Hindi perpekto agad ang collaborative activities, lalo na sa simula. Malaking tulong ang suporta mula sa aming paaralan, tulad ng LAC sessions at mentor teachers. Dahil dito, hindi ako natatakot subukan ang iba't ibang approach at mag-adjust. Mas nagiging engaged ang mga bata sa mapaghamong tasks na kayang gawin nang sama-sama, at makikita ang kanilang pagtutulungan sa mas magandang scores." ("Collaborative activities aren't immediately perfect, especially at first. School support, like LAC sessions and mentor teachers, is a big help. This allows me to try different approaches and adjust without fear. Students become more engaged with challenging but achievable group tasks, and their teamwork is reflected in better scores.") (P6)

The experiences of P1 and P6 highlight the importance of teacher preparedness and continuous professional development in implementing collaborative learning in Mathematics. P1 initially felt hesitant but developed greater confidence after participating in seminars and workshops that provided clear explanations and practical strategies, resulting in increased student engagement and improved performance. Similarly, P6 emphasized the value of sustained school support through Learning Action Cells (LACs) and mentoring, which encouraged the teacher to experiment with

and adapt collaborative approaches, leading to better student engagement and academic outcomes.

Access to research-based resources and authentic classroom examples can further strengthen teachers' confidence and skills. Professional development that includes classroom videos, sample collaborative tasks, and analysis of student discourse provides practical models that teachers can adapt to their own contexts (Roesken-Winter et al., 2022). Moreover, teachers benefit from PD that directly addresses common challenges such as unequal participation, accountability, and differentiation in group activities (Wenger-Trayner et al., 2020). These findings underscore the need for relevant, continuous, and context-responsive professional development and support for teachers, as reflected in the following remarks:

"Minsan, mahirap mag-implement ng collaborative learning kung kulang sa resources. Ngunit sa aming paaralan, binibigyan kami ng mga materyales at training. May access din kami sa online platforms na nakakatulong sa group work. Dahil dito, nakapag-design ako ng mas engaging activities na humihikayat sa pagtutulungan. Mas ganado silang mag-participate at nagresulta ito sa mas malalim na pag-unawa sa mga konsepto." ("Sometimes, implementing collaborative learning is hard with limited resources. But our school provides materials and training, plus access to online platforms for group work. This helps me design engaging activities that encourage collaboration. Students are more eager to participate, leading to a deeper understanding of concepts.") (P7)

The participant emphasized that adequate resources and school-provided training are essential for the effective implementation of collaborative learning in Mathematics. Access to instructional materials, online platforms, and guidance in designing engaging activities increased student participation, created a more enjoyable learning environment, and supported deeper conceptual understanding. These findings highlight that teacher preparation must be complemented by sufficient resources and practical institutional support.

Administrative support and policy alignment are also necessary to sustain collaborative learning practices. Without adequate time for lesson planning, teacher collaboration, mentoring, and access to necessary resources, teachers may find it difficult to maintain newly acquired practices (DeLuca et al., 2023). Similarly, Sullivan et al. (2023) emphasized that school leaders play an important role in developing a culture that encourages teacher collaboration, innovation, and experimentation. When professional development is supported by consistent administrative encouragement and follow-through, schools are better positioned to sustain improvements in collaborative teaching and learning.

• *Developing Assessment and Accountability System*

The study highlights the need for educational management to broaden assessment practices beyond individual tests when evaluating students' mathematical learning. Incorporating group assessments, peer evaluations,

and observations of collaborative processes can provide a more comprehensive understanding of both individual learning and the effectiveness of collaborative instruction. This is particularly important because Mathematics teachers often find it difficult to fairly assess individual performance and group contributions in collaborative learning environments (Van der Vleuten et al., 2020).

Teachers also emphasize that assessment should consider not only the final mathematical output but also the process of collaboration, including students' communication, reasoning, participation, and problem-solving. In this regard, Black and Wiliam (2021) stressed the value of formative assessment through continuous observation, questioning, and feedback. Developing appropriate assessment and accountability systems can therefore promote fairness, strengthen student responsibility, and provide teachers with better evidence of learning during collaborative activities, as reflected in the participants' statements:

"Dati, puro individual tests lang ang assessment ko. Ngayon, nag-develop ako ng rubrics na tinitignan ang partisipasyon at pagtulong sa grupo. Mas naging engaged ang mga bata dahil alam nilang importante ang kanilang pagsisikap sa group work. Naging mas accountable sila dahil may impact ito sa kanilang grado." ("Previously, I only used individual tests for assessment. Now, I've developed rubrics that assess participation and peer support within groups. Students became more engaged, knowing their effort in group work was important. They also became more accountable as their participation impacted their grades.") (P2)

"Sa collaborative learning, mas madalas ang feedback, hindi lang mula sa akin kundi pati sa kapwa mag-aaral. Nag-develop ako ng estratehiya para sa epektibong peer feedback, nagturo kung paano magbigay at tumanggap ng constructive criticism. Dahil dito, mas naging aware sila sa kanilang kalakasan at kahinaan. Tumaas ang kanilang performance dahil sa madalas na pagtanggap ng feedback." ("In collaborative learning, feedback is more frequent, not just from me but also from peers. I developed strategies for effective peer feedback, teaching how to give and receive constructive criticism. This made them more aware of their strengths and weaknesses, leading to improved performance due to more frequent feedback.") (P3)

Moreover, Teacher P2 recognized the need to align assessment with the collaborative learning approach by developing rubrics that evaluated not only the final answer but also student participation, idea sharing, and peer support, leading to increased engagement and accountability. Teacher P3 emphasized the importance of frequent feedback in collaborative learning and implemented strategies to facilitate effective peer feedback through explicit instruction, sentence starters, and templates, resulting in increased self-awareness, motivation for improvement, and ultimately, enhanced student performance. One shared:

"Hindi lang ako nag-focus sa traditional tests sa collaborative learning. Nag-incorporate din ako ng

performance-based assessments. Halimbawa, nagpapagawa ako ng group presentations o projects na nangangailangan ng aplikasyon ng konsepto sa totooong problema. Nasusukat ko ang tunay nilang pag-unawa, hindi lang memorya. Mas naging engaged sila dahil mas challenging at makabuluhan ang mga tasks." ("I didn't solely rely on traditional tests for collaborative learning; I also incorporated performance-based assessments. For instance, I assigned group presentations or projects requiring real-world application of concepts. This allowed me to measure their true understanding, not just memorization. Students became more engaged due to the challenging and meaningful tasks.") (P8)

The participant expanded assessment practices in collaborative learning by using performance-based tasks, such as group presentations and real-world application projects. These approaches allowed teachers to evaluate students' mathematical understanding beyond memorization while promoting deeper engagement through meaningful and challenging activities. In Mathematics classrooms, assessment can focus on learners' ability to explain concepts, justify solution strategies, and respond to or build upon their peers' ideas. Using rubrics that include these collaborative competencies can clarify expectations and strengthen student accountability (Gillies, 2020).

The use of self- and peer-assessment also provides valuable opportunities for students to reflect on their individual contributions and evaluate group interactions. These assessment strategies encourage learners to become more aware of their strengths, areas for improvement, and responsibilities within the group. According to Panadero and Brown (2022), self- and peer-assessment promote metacognitive awareness and personal accountability, making them useful tools for strengthening both individual learning and effective collaboration.

• Valuing Collaborative Learning Outcomes

School-wide accountability systems should recognize and reward teachers who effectively implement collaborative learning, reinforcing its value as an important instructional approach. Teachers increasingly appreciate that collaborative learning in Mathematics produces outcomes that extend beyond procedural skills, including deeper conceptual understanding, problem-solving abilities, and interpersonal competencies. According to Webb and Franke (2021), collaborative environments encourage students to explain their thinking, challenge peers' reasoning, and construct mathematical ideas together, all of which contribute to mathematical proficiency.

Teachers also recognize that group work and peer teaching develop communication, leadership, and critical-thinking skills that may receive less attention in traditional instruction. Through peer explanations, discussions, and justification of answers, students actively process mathematical concepts and learn to consider different perspectives. This interaction strengthens understanding, retention, and connections between mathematical ideas (Boaler, 2020). Thus, recognizing these broader learning

outcomes can encourage teachers to sustain collaborative practices in Mathematics classrooms.

"Bilang guro, napansin kong tumataas ang engagement ng mga estudyante sa collaborative activities sa math. Hindi lang sila nakikinig sa akin; nagtatanungan sila at mas aktibong tumutuklas ng solusyon. Nababawasan ang takot na magkamali dahil sama-sama silang nag-iisip. Ang malaking kontribusyon nito sa kanilang performance ay ang mas matibay na pag-unawa sa konsepto dahil sila mismo ang nagtuturuan." ("As a teacher, I've noticed increased student engagement in collaborative math activities. They aren't just listening to me; they ask each other questions and actively discover solutions. The fear of making mistakes lessens because they're thinking together. Its significant contribution to their performance is a stronger understanding of concepts through peer teaching.") (P4)

"Ang collaborative learning ay nagbibigay ng iba't ibang paraan para ma-engage ang mga estudyante. Ang mga mahiyain ay mas komportableng magtanong sa grupo. Ang mga mabilis matuto ay nagkakaroon ng pagkakataong magturo, na nagpapatibay pa ng kanilang kaalaman. Sa performance, malaki ang tulong nito dahil natututo sila mula sa iba't ibang perspektibo." ("Collaborative learning offers diverse ways to engage students. Shy students feel more comfortable asking questions within their groups. Fast learners get to teach others, reinforcing their own knowledge. In terms of performance, it's very helpful as they learn concepts from various perspectives.") (P5)

The participants' responses highlighted the positive effects of collaborative learning on student engagement and understanding. P4 observed increased participation during group Mathematics activities, which the teacher attributed to peer interaction, sharing of ideas, and active problem-solving. These experiences created a less intimidating learning environment and strengthened conceptual understanding through peer teaching and explanation. Similarly, P5 noted that collaborative learning provides shy learners with a comfortable space to ask questions while allowing faster learners to reinforce their knowledge by teaching others, resulting in deeper understanding and improved performance.

These findings are consistent with Schoenfeld (2022), who emphasized that collaborative learning provides opportunities for struggling learners to participate and benefit from peer support, thereby promoting equity and engagement. Reinholz and Shah (2020) further explained that when collaborative learning outcomes are explicitly recognized and assessed, students are more likely to value these activities and take greater ownership of their learning. Thus, incorporating group performance, shared problem-solving, and reflection into assessment can strengthen participation and maximize the benefits of collaborative Mathematics learning.

"Ang collaborative learning ay nagpapalakas ng pakiramdam ng komunidad sa klase. Mas nagiging involved ang mga estudyante dahil parte sila ng isang team na may

iisang layunin. Ang pagtutulungan nila ang nagpapa-engage sa kanila. Sa performance, napansin kong tumataas ang kanilang problem-solving skills. Natututo silang makinig, mag-analyze ng iba't ibang approach, at magtulungan.” (“Collaborative learning strengthens classroom community. Students become more involved, being part of a team with a shared goal. Their cooperation to reach that goal engages them. In terms of performance, I’ve noticed their problem-solving skills increase. They learn to listen, analyze different approaches, and collaborate.”) (P9)

"Para sa akin, ang collaborative learning ay nagbibigay ng mas makatotohanang karanasan sa pag-aaral ng math. Sa totooong buhay, madalas tayong nagtutulungan para masolusyunan ang mga problema. Kaya ang pag-engage nila sa collaborative tasks ay paghahanda rin sa kanila para sa hinaharap. Ang malaking kontribusyon nito sa performance ay ang pag-develop ng kanilang communication at teamwork skills.” (“For me, collaborative learning offers a more realistic math learning experience. In real life, we often collaborate to solve problems, so engaging in collaborative tasks prepares them for the future. Its significant contribution to performance is the development of their communication and teamwork skills.”) (P10)

The study highlights teachers’ recognition of collaborative learning as an approach that strengthens classroom community, student engagement, and mathematical problem-solving. P9 emphasized that shared goals and teamwork encourage active listening, consideration of different solution strategies, and cooperative problem-solving. Similarly, P10 viewed collaborative learning as a more authentic approach to Mathematics that reflects real-world problem-solving while developing communication and teamwork skills essential for students’ future success. Teachers also noted that positive peer interactions can reduce students’ fear of making mistakes and encourage a growth mindset, where challenges are viewed as opportunities for improvement (Dweck, 2020). Such supportive environments can further promote confidence, risk-taking, and resilience in mathematical learning (Ramos & Santos, 2024).

Three major themes emerged from the participants’ responses: providing adequate professional development and ongoing support for teachers, developing assessment and accountability systems, and valuing collaborative learning outcomes. The first theme emphasizes the need to equip teachers with appropriate knowledge and strategies to manage unequal participation, group dynamics, assessment challenges, and technology integration. Comprehensive training, combined with continuous mentoring and support, can help teachers improve their collaborative practices and respond effectively to emerging classroom challenges (Brown & Miller, 2023).

The second theme focuses on establishing effective assessment and accountability systems for collaborative learning. Teachers often face time limitations when integrating meaningful group activities within curriculum requirements, while assessing individual contributions within group tasks remains challenging (Brown & Miller, 2022).

Educational management should therefore provide clear assessment guidelines and practical tools that fairly evaluate both individual learning and group performance. Such systems can strengthen accountability, provide meaningful feedback, and ensure that the time devoted to collaborative learning contributes to measurable learning outcomes.

Finally, the study emphasizes the importance of valuing collaborative learning outcomes beyond traditional measures of academic achievement. Collaborative activities develop communication, teamwork, problem-solving, and other skills essential for 21st-century learning, although maintaining discipline and productive group dynamics remains a challenge (Johnson et al., 2018). Educational leaders should recognize these competencies by incorporating them into curriculum goals, assessment practices, and teacher performance frameworks. By formally valuing both academic and collaborative outcomes, schools can encourage teachers to sustain effective group work and peer teaching, ultimately enriching the quality of Mathematics education.

IV. IMPLICATIONS AND FUTURE DIRECTION

➤ Implications

The findings of this study on collaborative learning in Mathematics, particularly teachers’ perspectives on group work and peer teaching, provide practical insights that support and extend the study’s theoretical foundations. Regarding the challenges encountered, three major themes emerged: passive student participation and group dynamics, misalignment with curriculum pacing and assessment, and lack of preparedness and professional development. These findings demonstrate that while collaborative learning offers important benefits, its effectiveness depends on how teachers manage classroom interactions, curriculum demands, assessment requirements, and their own preparedness to facilitate student-centered learning.

The first challenge, passive participation and group dynamics, can be explained through John Sweller’s Cognitive Load Theory. Although collaborative learning is intended to increase engagement, unequal participation, conflicts, and disorganized group interactions may increase students’ extraneous cognitive load. Instead of focusing their mental resources on mathematical concepts, students may become distracted by social difficulties, unclear responsibilities, or dependence on more active classmates. The second challenge, misalignment with curriculum pacing and assessment, is closely related to Vygotsky’s Social Constructivism, which views learning as a socially constructed process. Rigid curriculum schedules and individual-focused assessments may limit the time needed for meaningful interaction, discussion, and collaborative problem-solving, creating tension between social learning and traditional instructional demands.

The third challenge, lack of teacher preparedness and professional development, is strongly connected to Vygotsky’s Zone of Proximal Development (ZPD). Effective collaborative learning requires teachers to provide

appropriate guidance and scaffolding so that students can accomplish tasks beyond what they could achieve independently. Without sufficient training, teachers may lack the skills necessary to manage group interactions, provide effective scaffolding, and facilitate productive peer learning. To address these challenges, the study identified three coping mechanisms: strategic group formation, adapted role assignment and accountability structures, and task design that promotes mathematical discourse. Strategic grouping and clearly defined roles can reduce confusion, passive participation, and unnecessary cognitive demands, thereby supporting Sweller's principle of managing extraneous cognitive load.

Task design that promotes mathematical discourse is particularly aligned with Social Constructivism and the ZPD, as it encourages students to explain their reasoning, exchange perspectives, challenge ideas, and collaboratively construct mathematical knowledge. Well-designed tasks provide opportunities for peer support and scaffolding, enabling learners to work within their ZPD. These strategies demonstrate that collaborative learning becomes more effective when teachers intentionally structure group composition, responsibilities, accountability, and mathematical tasks to maximize meaningful interaction and learning.

From an educational management perspective, three key insights emerged: providing adequate professional development and continuous support, developing effective assessment and accountability systems, and valuing collaborative learning outcomes. These insights are closely related to both Cognitive Load Theory and Vygotsky's Social Constructivism. Appropriate training and practical support can reduce the cognitive demands placed on teachers when managing collaborative classrooms, while clear assessment and accountability systems provide students with a better understanding of their responsibilities and learning expectations. At the same time, recognizing outcomes such as communication, teamwork, critical thinking, and peer learning reflects Vygotsky's view that knowledge develops through social interaction. Thus, educational management should provide structures and support that enable teachers and students to fully benefit from collaborative learning in Mathematics.

➤ *Future Direction*

To strengthen collaborative learning in Mathematics, all stakeholders should work together to create a supportive and effective learning environment. Learners should develop teamwork, communication, peer-teaching, and reflection skills, while providing feedback on their collaborative experiences. Teachers should receive continuous professional development on collaborative strategies, assessment, classroom management, and technology integration, while sharing practices through professional learning communities. Parents should be informed about the benefits of collaborative learning and encouraged to support Mathematics discussions and activities at home while maintaining communication with teachers. School administrators should provide resources, training, curriculum

flexibility, and fair assessment systems that recognize both individual and group contributions. The Department of Education should establish adaptable guidelines, address resource and technology gaps, and support research and pilot programs suited to local contexts such as Mati City. Finally, future researchers should conduct mixed-methods and longitudinal studies and develop culturally relevant assessment tools to examine the long-term academic and socio-emotional effects of collaborative learning among Filipino learners.

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