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This action research study examined how the consistent implementation of classroom routines, norms, and instructional structures influenced the organization, participation, and facilitation of collaborative learning in a secondary mathematics classroom. Grounded in sociocultural learning theory and reflective practice, this study addressed the gap between the intention to implement collaborative, student-centered learning and the challenge of sustaining it in daily practice. Using a qualitative, teacher-driven action research design, data were collected across six consecutive lessons through video recordings, reflective journals, and lesson transcripts. Analysis revealed three key findings. First, consistent collaborative routines improved classroom organization and instructional flow by creating a predictable environment that reduced uncertainty and allowed greater focus on mathematical thinking. Second, explicitly taught norms and accountability structures increased equitable participation and expanded access to mathematical discourse. Third, as these structures became internalized, the teacher's role shifted from managing behavior to facilitating student thinking and supporting the co-construction of knowledge. These findings suggest that collaborative learning is most effective when supported by intentional, consistently implemented structures. This study highlights the role of instructional design and reflective practice in creating classroom environments where collaboration, equitable participation, and meaningful mathematical discourse can be sustained.

**The Role of Routines, Norms, and Instructional Structures in Supporting Collaborative
Learning in a Secondary Mathematics Classroom**

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DEDICATION PAGE

I dedicate this work to my parents, whose unwavering belief in me has shaped who I am today. From an early age, they instilled in me the value of education and the importance of perseverance. Their constant encouragement and support have given me the confidence to keep going, even when things felt difficult. They continue to inspire me every day to be the best version of myself and to keep pushing forward. This accomplishment is as much theirs as it is mine.

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Chapter 1: Introduction

Introduction

At the start of this school year, my colleagues and I participated in a professional development session focused on implementing collaborative learning structures in our classrooms. The presenter executed the strategies flawlessly. I left the training feeling invigorated and eager to apply these approaches to build community and foster interpersonal skills among my students. However, my enthusiasm quickly diminished when I attempted to implement these strategies in my own classroom. The result was far from what I had envisioned; my classroom became chaotic, marked by unsafe behaviors and off-task conversations. It became evident that I had not successfully implemented the collaborative structures.

This experience prompted me to reflect on the stark contrast between the presenter's success and my own. In conversations with colleagues, a recurring theme emerged: classroom management had been largely overlooked during the training. Asking adults to engage in structured collaboration is fundamentally different from asking ninth-grade students, particularly in a post-pandemic context where students' social skills, attention, and self-regulation have been impacted. From both experience and professional dialogue, I have come to recognize the importance of establishing classroom norms and management structures that support collaborative learning.

Yet, as I reflect on my own teaching practices, I see a disconnect between my pedagogical beliefs and my daily classroom realities. I aspire to build thinking classrooms, as advocated by Peter Liljedahl (2021), and to implement an *Experience First, Formalize Later* approach, as suggested by Math Medic (n.d.). However, a critical piece seems to be missing – specific strategies to facilitate collaboration effectively and consistently. This gap between

intention and implementation has limited my ability to sustain student-centered learning in my classroom.

Research supports the idea that collaborative learning requires intentional planning, structure, and teacher reflection. Even experienced teachers often struggle to sustain active learning when classroom structures are underdeveloped (Metzger, 2015). Similarly, McCoy (2013) emphasizes the importance of balancing active and reflective learning to ensure meaningful student engagement. These perspectives suggest that successful collaborative learning depends on deliberate teacher decisions and ongoing reflection, rather than simply adopting new instructional strategies.

Statement of Problem

Collaborative learning structures are widely recommended as a means of increasing student engagement, mathematical discourse, and deeper conceptual understanding (National Council of Teachers of Mathematics [NCTM], 2014). They are central to reform efforts in mathematics education, encouraging students to communicate their reasoning, explore multiple strategies, and build understanding through peer interaction. However, implementing these structures in real classrooms presents significant challenges. Without intentional classroom structures in place, collaborative learning can quickly become unproductive and difficult to sustain.

Off-task behavior, uneven participation, and social distractions can disrupt learning and frustrate both teachers and students. Collaborative classrooms require teachers to orchestrate multiple layers of activity, balancing instructional goals, social interactions, and logistical demands (Metzger, 2015). When these elements are not managed effectively, teachers may revert to more teacher-centered approaches, limiting opportunities for student discourse and problem solving. Zbiek and Larson (2015) argue that mathematical learning environments are

most effective when teachers use structured strategies that support reasoning and multiple representations. Their work highlights that facilitation and management structures are essential components of meaningful learning, not secondary considerations.

The problem, therefore, is that while collaborative learning is promoted as best practice, it often fails to reach its potential in secondary mathematics classrooms due to a lack of effective structures. As a result, teachers may struggle to implement collaborative learning consistently in ways that are both productive and manageable. This study seeks to address this problem by examining how the consistent implementation of specific instructional structures supports the successful and sustained use of collaborative, student-centered learning in my classroom.

Purpose of the Study

The purpose of this action research case study is to examine the effects of consistently implementing specific classroom routines and instructional structures on collaborative, student-centered learning in a secondary mathematics classroom. These structures include deliberate teacher actions such as routines, norms, grouping strategies, transitions, and accountability measures that support student engagement during collaborative learning. This study focuses on understanding how the consistent use of these structures influences classroom organization, student participation, and the facilitation of collaborative learning. In particular, this research aims to explore how these structures support the development of classroom environments where collaboration can occur more naturally and with fewer disruptions. By focusing on consistency rather than isolated strategies, this study seeks to better understand how structured approaches to instruction can make collaborative learning more effective in daily classroom practice.

Rather than focusing on student achievement outcomes, this study centers on my instructional practices and examines how consistency in implementation impacts the sustainability of collaborative learning. A key focus of this research is understanding how these

structures influence my ability to facilitate student thinking, manage classroom flow, and maintain engagement across a range of learners. This study also considers how the use of intentional routines and structures can reduce the need for reactive management and support proactive, student-centered instruction. Through this process, I aim to better understand how consistent instructional design can support both teaching practice and student participation. Ultimately, this study seeks to identify how structured approaches to collaboration can be implemented in a way that feels manageable and sustainable within the realities of everyday classroom instruction.

Research Question

How does my intentional implementation of classroom routines and norms influence the organization, participation, and facilitation of collaborative learning in my secondary mathematics classroom?

Significance of the Study

This study is significant because it addresses a persistent challenge in mathematics education: not whether collaborative learning should be implemented, but how it can be implemented in a way that is sustainable in daily classroom practice. While collaborative learning is widely promoted as a means of increasing engagement and supporting deeper understanding, many teachers struggle to maintain it consistently due to challenges related to organization, participation, and classroom flow. Without clearly established routines and structures, collaborative learning can become difficult to manage and is often abandoned in favor of more teacher-directed approaches. This creates a gap between instructional ideals and classroom realities, particularly in secondary mathematics settings. By focusing on sustainability, this study contributes to a more practical understanding of how collaborative learning can be effectively maintained over time.

By examining the effects of consistently implemented routines and instructional structures, this study provides insight into how teachers can create classroom environments that support both engagement and organization. It highlights the importance of consistency, suggesting that the effectiveness of collaborative learning depends not only on the strategies used but on how regularly and intentionally they are implemented. This research also emphasizes the role of instructional structures in supporting teacher facilitation, allowing educators to spend less time managing behavior and more time engaging with student thinking. For educators and instructional leaders, this study offers practical insight into how collaborative learning can become a regular and sustainable part of classroom instruction. Additionally, it reinforces the value of reflective practice as a tool for improving teaching and adapting instructional approaches to better meet the needs of students.

Chapter 2: Theoretical and Conceptual Frameworks

Theoretical and Conceptual Frameworks

This study is grounded in sociocultural learning theory, which suggests that learning occurs through social interaction and the co-construction of knowledge. From this perspective, understanding is developed as students engage in dialogue, share ideas, and collaborate with others. Vygotsky's theory emphasizes that learning is shaped through language and interaction, and that students deepen understanding through participation in social learning environments (Vygotsky, 1978). Contemporary research supports this view, highlighting that collaboration and socialization are essential components of learning, particularly in mathematics classrooms where students benefit from explaining their reasoning and engaging with the thinking of others (Cicconi, 2014). Within this framework, peer interaction plays a critical role, as students can act as support for one another's learning, contributing to the development of shared understanding.

In addition to sociocultural theory, this study is informed by reflective practice, which provides a framework for understanding how teaching evolves through ongoing analysis and adaptation. Teaching is not fixed application of strategies but a dynamic process that requires responsiveness to the complexities of the classroom environment. Schön's concept of reflection-in-action emphasizes that educators make instructional decisions in real time, responding to situations of uniqueness and uncertainty that arise during practice (Clandinin & Connelly, 1986). This perspective is complemented by structured models of reflection, such as Gibb's reflective cycle, which support the examination of instructional decisions and their impact on student learning. Through cycles of implementation, reflection, and adjustment, teachers refine their practices to better support student engagement and understanding (Murray, 2015).

Together, these frameworks provide a foundation for this study by explaining both how students learn through collaboration and how instructional practices can be refined to support

that learning. Sociocultural theory highlights the importance of structured social interactions in developing mathematical understanding, while reflective practice supports the ongoing improvement of instructional approaches. This combined framework aligns with the focus of this study on the consistent implementation of collaborative structures and their influence on student participation and engagement in the mathematics classroom.

Collaborative Learning in Mathematics Education

Collaborative learning is a central component of effective mathematics instruction, emphasizing student interaction, discourse, and shared problem solving as key elements of understanding (NCTM, 2014). In mathematics classrooms, collaboration moves beyond simply working together and involves students actively engaging in explaining their reasoning, questioning one another, and constructing meaning collectively (Webb, 2009). These interactions support the development of mathematical understanding by allowing students to make sense of ideas through discussion and shared exploration. When students are given opportunities to engage in discourse, they are positioned as active participant in the learning process rather than passive recipients of information (NCTM, 2014).

Research consistently demonstrates that collaborative learning supports deeper mathematical understanding by encouraging students to articulate their thinking and engage with multiple perspectives (Olsen, 2021; Webb, 2009). When students explain their reasoning and respond to the ideas of others, they are more likely to develop conceptual understanding rather than rely solely on procedural knowledge (Webb, 2009). This type of interaction allows students to clarify misconceptions, refine their thinking, and build connections between ideas. However, effective collaboration depends on the quality of student interaction, including opportunities for explanation, justification, and questioning, rather than simply placing students in groups (Webb, 2009).

In addition to supporting understanding, collaborative learning promotes engagement and participation. When students are actively involved in discussion and problem solving, they are more likely to take ownership of their learning and contribute to the learning community (Olsen, 2021). Structured opportunities for collaboration can also support more equitable participation by encouraging a wider range of students to share their ideas (Olsen, 2021). Establishing classroom norms that support discussion, risk-taking, and shared responsibility is essential for creating an environment where collaboration can be productive (Makar & Fielding-Wells, 2018).

Collaborative learning also aligns with broader educational goals that extend beyond mathematics content. Skills such as communication, critical thinking, and collaboration are essential for student success, and mathematics classrooms provide a meaningful context for developing these competencies (Lemon & Taylor, 2026). Through structured opportunities for interaction, students not only deepen their mathematical understanding but also develop skills necessary for learning and problem solving in real-world contexts (Lemon & Taylor, 2026). These competencies reinforce the importance of designing classroom experiences that prioritize student interactions and engagement. Despite these benefits, implementing collaborative learning effectively in classroom practice can be complex.

Challenges of Implementing Collaborative Learning

Although collaborative learning is widely recognized as beneficial, implementing it effectively in mathematics classrooms presents several challenges. Simply placing students in groups does not ensure meaningful interaction or learning, as the quality of student discourse and participation can vary significantly (Webb, 2009). Without intentional planning and support, group work may result in superficial engagement, where students complete tasks without fully engaging in mathematical reasoning (Webb, 2009). In these situations, students may focus on

completing the task rather than developing understanding, limiting the effectiveness of collaborative learning.

Another significant challenge is uneven participation within groups, where some students dominate discussion while others remain disengaged. Without clear expectations, students may not feel accountable for contributing, resulting in limited opportunities for all group members to engage in meaningful mathematics discourse (Webb, 2009). This imbalance can reduce overall effectiveness of collaboration and prevent students from benefiting equally from the learning experience. Research on collaborative group work highlights that issues such as disengagement and unequal participation can hinder the development of shared understanding and limit student learning opportunities (Rau & Heyl, 1990).

In addition to participation challenges, managing collaborative classroom environments can be complex. Teachers must simultaneously support student interaction, monitor multiple groups, and address behavioral and academic needs (Mundschenk et al., 2011). This level of coordination can be difficult to sustain. Without consistent classroom management practices, including clear expectations and predictable routines, student engagement and productivity may be negatively impacted (Mundschenk et al., 2011). These challenges can make it difficult for teachers to maintain effective collaborative practices, even when they recognize their value.

Instructional Structures that Support Collaboration

Research suggests that effective collaborative learning requires more than simply grouping students together, it depends on intentional structures that support meaningful interaction (Webb, 2009). These structures provide a foundation for student participation by establishing clear expectations for how students engage with tasks and with one another (Mundschenk et al., 2011). NCTM emphasizes the importance of creating classroom environments that promote discourse, problem solving, and active engagement (NCTM, 2014).

Without these supports, opportunities for collaboration may not result in productive mathematical thinking. As a result, instructional structures play a critical role in shaping the quality of student interaction and learning.

One key component of effective collaboration is the establishment of consistent routines that guide student behavior and participation. Routines help students understand what is expected of them during collaborative tasks, reducing uncertainty and increasing engagement (Mundschenk et al., 2011). When collaborative practices are implemented consistently, students become more comfortable participating in discussions and sharing their thinking. Research on classroom environments highlights that predictable structures and routines support student engagement and contribute to a more productive learning environment (Mundschenk et al., 2011). Consistency in these routines is essential for developing sustainable collaborative practices over time.

In addition to routines, clearly defined norms play a significant role in supporting productive collaboration. Norms establish expectations for how students interact, including listening to others, explaining reasoning, and respectfully challenging ideas (Makar & Fielding-Wells, 2018). These expectations help create a classroom culture where students feel safe taking risks and contributing to discussions. Research on inquiry-based mathematics classrooms emphasizes that norms supporting discussion and shared responsibility are critical for meaningful student engagement (Makar & Fielding-Wells, 2018). When norms are consistently reinforced, they support more equitable participation and deeper mathematical discourse.

Instructional structures also include the ways in which tasks are introduced and facilitated within the classroom. The design and delivery of tasks influence how students engage with content and with each other, shaping the depth of their thinking and interaction. Liljedahl's (2021) *Building Thinking Classrooms* provides a model of specific instructional practices, such

as visible random grouping and the use of vertical non-permanent surfaces, that are designed to increase student engagement and participation. These practices emphasize student-centered learning by encouraging active problem solving and collaboration.

Finally, the effectiveness of instructional structures depends on their consistent implementation over time. Research suggests that collaborative practices are most effective when they are embedded into daily instruction rather than used intermittently (Liljedahl, 2021). When structures are applied consistently, they become part of the classroom culture, supporting ongoing student participation and interaction. This consistency allows students to develop habits of collaboration, making it more likely that they will engage meaningfully in mathematical discourse (Liljedahl, 2021; NCTM, 2014).

Teacher Role in Facilitating Student Collaboration

The role of the teacher is critical in supporting effective student collaboration in mathematics classrooms. While instructional structures provide a foundation for interaction, the teacher's actions shape the quality of student engagement and discourse (Webb, 2009). Teachers are responsible for facilitating discussions, monitoring student thinking, and guiding interactions in ways that promote understanding (Webb, 2009). In addition to establishing opportunities for collaboration, teachers must actively support how students engage with one another to ensure that interactions remain focused on mathematical reasoning. This highlights the importance of the teacher's role in shaping productive learning experiences within collaborative settings.

One key aspect of the teacher's role is facilitating mathematical discourse by encouraging students to explain their reasoning and engage with the ideas of others (Webb, 2009). When students are prompted to elaborate on their thinking and respond to peers, they are more likely to develop deeper conceptual understanding. The National Council of Teachers of Mathematics (2014) emphasizes that discourse is essential for students to make sense of mathematical ideas

and build understanding through interaction. By intentionally supporting student talk, teachers help shift the classroom from a teacher-centered environment to one where students actively contribute to the learning process. This facilitation requires purposeful questioning and responsiveness to student contributions.

In addition to facilitating discourse, teachers must attend closely to student thinking during collaborative work. The process of noticing student thinking involves observing, interpreting, and responding to students' ideas as they engage in mathematical tasks. When teachers focus on students' reasoning, they are better able to support learning and create opportunities for deeper understanding (Sherin & van Es, 2026). This attention to student thinking also supports more equitable participation, as it positions students' ideas as valuable contributions to the learning process. By responding to student thinking in real time, teachers can guide learning while maintaining a student-centered approach.

Finally, the teacher plays a key role in fostering a classroom environment that supports collaboration. This includes creating a climate of trust, encouraging participation, and supporting students as they take risks in sharing their ideas. A facilitative approach to teaching emphasizes guiding rather than directing learning, allowing students to take an active role in constructing understanding (Khupavtseva & Kurytsia, 2022). Teachers must continuously monitor group dynamics and adjust their support to maintain productive interactions. Through intentional facilitation and responsiveness, teachers help sustain meaningful collaboration and ensure that student interactions remain focused on learning.

Reflective Practice and Action Research

Reflective practice is an essential component of improving instructional effectiveness and is central to the process of action research. Teaching is a dynamic practice that requires ongoing decision-making in response to student needs and classroom interactions. Schön's concept of

reflection-in-action emphasizes that teachers must respond to “situations of uniqueness and uncertainty” as they occur in the classroom (Clandinin & Connelly, 1986). This perspective highlights the importance of adapting instruction in real time based on student engagement and understanding. In addition to in-the-moment reflection, teachers engage in reflection-on-action, analyzing their instructional practices after lessons to inform future decisions.

Structured approaches to reflection further support the continuous improvement of teaching practices. Gibbs’ (1988) reflective cycle provides a framework for examining instructional experiences, considering both the effectiveness of strategies and their impact on student learning. Through cycles of planning, implementation, reflection, and adjustment, teachers refine their instructional approaches over time (Murray, 2015). This iterative process aligns with the principles of action research, where the goal is to improve practice through systematic inquiry. In this study, reflective practice supports the ongoing refinement of collaborative instructional structures and informs adjustments made throughout the implementation process.

Synthesis and Connection to the Present Study

The literature reviewed highlights the importance of collaborative learning in mathematics classrooms, emphasizing the role of discourse, shared problem solving, and student interaction in developing mathematical understanding. Research consistently demonstrates that collaboration supports deeper learning when students are actively engaged in explaining their reasoning and responding to the ideas of others. However, the literature also reveals that effective collaboration does not occur automatically and is often difficult to implement consistently in classroom settings. Challenges such as uneven participation, superficial engagement, and the complexity of managing collaborative environments can limit the effectiveness of group work. These findings suggest that while collaboration is a valuable

instructional approach, it requires intentional design and sustained implementation to be successful.

In response to these challenges, literature points to the importance of instructional structures and teacher facilitation in supporting meaningful collaboration. Consistent routines, clearly defined norms, and purposeful teacher actions contribute to creating classroom environments where students can engage productively in mathematical discourse. Additionally, reflective practice allows teachers to refine their instructional approaches and respond to the evolving needs of their students. While existing research identifies key elements that support collaboration, there is a need to better understand how the consistent implementation of specific structures influences student participation and engagement over time. This study addresses that need by examining the effects of implementing collaborative instructional structures consistently within a secondary mathematics classroom.

Chapter 3: Methodology

Introduction

The purpose of this action research was to examine how my intentional implementation of classroom routines and norms influenced the organization, participation, and facilitation of collaborative learning in my secondary mathematics classroom. I grounded this in my desire to improve the consistency and effectiveness of collaborative learning by refining the structures, expectations, and facilitation moves used during instruction. While collaborative learning is often identified as a best practice in mathematics education, the routines and norms that make it effective are not always clearly defined or sustained. Through this study, I examined my own instructional decisions, lesson structures, and reflective processes to better understand which practices supported or hindered collaborative learning.

The study was guided by the following research question:

How does my intentional implementation of classroom routines and norms influence the organization, participation, and facilitation of collaborative learning in my secondary mathematics classroom?

This study followed a qualitative, teacher-driven action research design. Action research was uniquely suited to this purpose because it positioned the practitioner as both the researcher and participant, focusing on improvement within a specific classroom context rather than generalizing findings to a broader population (Mertler, 2024). The cyclical process of planning, acting, observing, reflecting, and refining aligned directly with the goals of this study and supported ongoing adjustments to instruction throughout the six lessons analyzed. Importantly, all data was gathered from professional reflection and documentation of teaching practices, and no student data was collected or analyzed.

Context

This study took place in a public high school located in a mid-sized district in the Mountain West region of the United States. The school served a diverse student population within a community that reflects a range of socioeconomic and cultural backgrounds. District-level data indicate that the secondary student population is approximately 65% Caucasian, 25% Hispanic, and 10% representing other racial or ethnic groups, including students identifying as multiracial, Black, Asian, and Indigenous (Local School District, 2025). The district serves over 12,000 students across kindergarten through twelfth grade, with approximately half enrolled at the secondary level (Local School District, 2025). Attendance rates at the secondary level average in the mid-80% range, and graduation rates are consistently near 78%-79% (Local School District, 2025). The district also provides a range of support systems, including services for English language learners, students with disabilities, and students experiencing economic hardship, demonstrating a commitment to equitable access and academic success (Local School District, 2025).

Within this broader instructional context, the study was conducted in an Algebra 1 classroom composed of 18 students of mixed abilities. The class included 15 ninth-grade students and three tenth-grade students, representing a range of academic readiness levels. Among these students four had Individual Education Programs (IEPs), and one student was identified as an English Language Learner (ELL). This diverse composition provided a meaningful context to examine how structured routines, norms, and facilitation strategies influence participation and collaborative learning across students with varying needs and levels of confidence.

Population

Although this action research project was conducted within my own classroom, it applies to a broader professional population of secondary mathematics educators working in public school settings. Teachers in similar environments, particularly those balancing standards-based

curriculum while striving to incorporate student-centered and collaborative instructional practices, may find elements of this study transferable to their own practice. This study was situated within the ongoing professional effort to balance academic rigor with instructional approaches that promote engagement, discourse, and deeper conceptual understanding. While the findings are not intended to be generalized, they contribute to practitioner-based knowledge in the field of mathematics education and classroom management.

Participants

The sole participant in this study was the teacher-researcher. I designed this action research project as a self-study focused on reflective practice, instructional decision-making, and classroom facilitation. No individual student data was collected, recorded, or analyzed. While students were present in the instructional setting, their academic performance, demographic information, and behaviors were not used as data sources. Instead, this study centered on the teacher's actions, reflections, and instructional practices. As the teacher-researcher, I served as planner, facilitator, observer, and analyst. Reflections focused on instructional decisions, facilitation moves, classroom structure, and the extent to which management strategies supported collaborative learning. My dual role provided authentic and practice-based insight, though it required intentional reflexivity to acknowledge potential bias. To support this process, a district mathematics curriculum coordinator documented instructional practices during each lesson through detailed, time-stamped observations that included teacher and student dialogue. These records served as transcripts for data analysis. The coordinator also provided an additional perspective during post-lesson debriefs.

Research Design

This study employed action research grounded in reflective practice, with a specific focus on examining how the intentional implementation of classroom routines, norms, and

accountability structures influenced collaborative learning (Mertler, 2024). I selected action research because it allows educators to systematically investigate and refine their own instructional practices through cycles of planning, implementation, observation, and reflection (Mertler, 2024).

I conducted the action research study across six consecutive lessons within a single instructional unit, at the beginning of the second semester. During this time, a consistent lesson structure was intentionally implemented and refined to support collaborative learning, student participation, and instructional flow. Each lesson followed a predictable sequence designed to reduce variability in classroom organization and allow for focused analysis of instructional routines.

Lessons began with vertical board problems completed in visibly randomized groups. I used an excel spread sheet with built-in coding to assign students into groups of three, which I then displayed on the board for students to see the random grouping and to then locate their groups. These vertical board problems were meant to activate student thinking at the very beginning of class. Initially, these problems were not directly aligned to the curriculum; however, by the third lesson, they became more intentionally connected to the content being taught. These tasks served to activate prior knowledge, engage students in mathematical thinking, and provide a low-stakes entry point into collaboration. Overall, they were designed to reduce barriers to participation and encourage all students to contribute ideas.

Within this routine, the design of the task was also intentional. The vertical board tasks were intentionally designed to support both access and depth of thinking. Each task typically included a closed-ended problem to ensure all students could engage with the mathematics and begin working quickly, followed by an open-ended discussion prompt that required deeper reasoning, explanation, or multiple representations. This structure allowed students who

completed the initial problem more quickly to extend their thinking while still providing an accessible entry point for all learners. Prior to transitioning back to their seats, a brief whole-class debrief was conducted to highlight different strategies and ensure that all students had an opportunity to engage with the more complex aspects of the task. This design supported both initial engagement and development of mathematical discourse within the classroom.

Following the vertical board problems, students engaged in collaborative problems at their table groups. Table groupings were intentionally arranged based on behavioral considerations and a goal of creating mixed-ability groups. For the first five lessons, I used lessons from Math Medic (Math Medic, n.d.), and for the sixth lesson, I developed my own lesson while maintaining the same lesson structure. These lessons were selected because they introduce concepts through contextualized problems and encourage students to engage in problem-solving prior to formalizing their understanding through notes.

During this phase, I began by reading the initial prompt aloud and inviting clarifying questions. Students were then given individual think time before collaborating with their table groups to work through the problems. While students worked, I circulated throughout the room, facilitating conversations and supporting thinking. This facilitation included prompting students to explain their reasoning, justify their approach, and make connections to prior knowledge through questions such as “How do you know?” and “Can you explain your thinking?” Rather than providing answers, I focused on guiding students to clarify or extend their ideas. Specific norms for collaboration were emphasized including talking through reasoning, supporting answers with work, listening to peers, and ensuring all group members were actively participating. I also supported collaboration by encouraging students to engage directly with one another, prompting them to respond to peers’ ideas, ask questions, and build on each other’s thinking. These norms were intentionally reinforced and refined across lessons. I used a visible

timer to communicate expectations for pacing and time management. Additionally, as I circulated, I strategically selected students to share their thinking and record their work on the board. These selections were informed by my observations of student thinking during group work, allowing me to highlight a range of strategies and address common misconceptions during the discussion. These selections were made both to build student confidence and to highlight strategies that would contribute meaningfully to the whole-group discussion that followed.

Lessons then transitioned into whole-group discussion and formalizing thinking, where student ideas were shared, compared, and refined through guided facilitation. During this phase, I facilitated discussion by asking students to explain their reasoning, compare different approaches, and respond to one another's ideas, supporting the co-construction of understanding. I also used questioning to press for deeper thinking and to make key mathematical ideas more explicit. This phase allowed for collective sense-making and provided opportunities for me to highlight key mathematical concepts and student reasoning. Finally, students completed individual checks for understanding, which were used to assess independent comprehension following collaborative work. While I encouraged students to discuss these problems with their peers, I emphasized that they would not be reviewed as a whole group.

In addition to this consistent lesson structure, specific accountability measures were implemented to support equitable participation. These included requiring visible work on vertical boards, using prompts that required contribution from all group members, collecting collaborative work for daily points, and in some cases, the use of different colored markers to make individual contributions visible. Teacher circulation during collaborative work time also served as a key component of both facilitation and accountability, as it allowed for real-time monitoring of engagement and support of student thinking. While some accountability measures

were explicitly introduced, others became internalized by students over time and continued without direct prompt.

The intentional and sustained use of these routines, norms, and accountability structures formed the core intervention of the study. By maintaining a consistent lesson structure while refining these elements, the study examined how these practices influenced classroom organization, student participation, and the teacher’s role in facilitating collaborative learning.

To illustrate how instructional structures, norms, and accountability measures were enacted in practice, Table 1 provides examples of how each lesson component was supported through specific facilitation practices. This table highlights the alignment between instructional design and teacher facilitation across instructional phases.

Table 1

Alignment of Instructional Structures, Norms, Accountability Measures, and Facilitation Practices

Lesson Component	Norm / Expectation	Accountability Measure	Facilitation Example
Vertical Board Work	Explain reasoning Ensure all students participate	Visible work on boards Randomized grouping; shared board space Different colored markers for each group member	“Explain how you approached this problem.” “Let’s hear from someone who has not shared yet.”
Group Work	Justify solutions Ensure all members contribute and respond to peers	Written justification required Collaborative problem-solving tasks Submission of collaborative work for daily points	“How does your work support your answer?” “Do you agree or disagree? Why?”
Whole-Class Discussion	Compare strategies Build on others’ ideas	Selected student work displayed Public recording of responses	“How are these approaches similar or different?” “Can someone extend or refine that idea?”

Data Collection

Data for this study was collected across six consecutive lessons within a single instructional unit. The first lesson focused primarily on establishing classroom norms and introducing instructional routines and structures. The remaining five lessons were curricular and followed the established lesson format.

All six lessons were video recorded to capture instructional practices, classroom interactions, and implementation of routines and norms over time. Following each lesson, I completed a recorded reflective journal using Gibb's (1988) reflective cycle framework, which included description, feelings, evaluation, analysis, conclusion, and action plan. I applied this framework to each component of the lesson structure, including vertical board tasks, collaborative work, whole-group discussion, and individual checks for understanding. These reflections served as the primary data source for examining change in instructional practices and classroom dynamics across the six lessons.

In addition to video recordings and reflective journals, a district mathematics curriculum coordinator observed each lesson and provided written transcripts that included time stamps. These transcripts offered an external record of classroom interactions and instructional flow. This allowed for comparison between observed practices and reflective insights. Together, these data sources provided a comprehensive and triangulated dataset to support analysis of instructional routines, participation, and facilitation over time.

Data Analysis

Data analysis followed a qualitative, inductive approach grounded in open coding and thematic development (Braun & Clarke, 2021; Saldaña, 2021). The analysis process occurred in three stages: open coding, categorization, and theme development. Primary analysis was

conducted using the reflective journals, while lesson transcripts were used to support and validate emerging themes (Miles et al., 2014).

During the initial stage of open coding, I reviewed reflective journals following each lesson and analyzed them line by line to identify key phrases, instructional decisions, and moments that reflected shifts in classroom routines, norms, participation, and facilitation. Rather than coding large sections of text, I focused on highlighting specific standout phrases that captured meaningful changes in my instructional practice and perception (Saldaña, 2021). These initial codes were descriptive and closely aligned with the research focus, including ideas such as establishing routines, clarifying expectations, student participation, activation of prior knowledge, scaffolding into tasks, accountability measures, and facilitation of student thinking.

In the second stage, I organized these open codes into broader categories based on conceptual similarity. This involved grouping related codes and identifying patterns that recurred across multiple lessons (Miles et al., 2014). Categories that emerged included routine development and implementation, norms and accountability structures, participation and engagement, organization and instructional flow, activation and entry into collaboration, and teacher facilitation. This step allowed for patterns to be identified across lessons rather than within isolated reflections (Mertler, 2024).

In the final stage, these categories were synthesized into three overarching themes that represented consistent patterns across the data. The themes were: (1) establishing and sustaining collaborative routines improved classroom organization and flow, (2) explicit norms and accountability structures increased participation and distributed engagement, and (3) as structures stabilized, the teacher role shifted from managing behavior to facilitating collaborative thinking. These themes were developed through repeated review of the reflective journals to

ensure that each theme was supported by multiple instances across the six lessons (Braun & Clarke, 2021).

Lesson transcripts were not formally open coded but were used as a secondary data source to support and provide additional evidence for the themes identified through the reflective journals (Miles et al., 2014). The transcripts, which included time stamps, allowed for examination of specific instructional moments, patterns in participation, and shifts in instructional flow.

Transcript analysis was used to support findings related to how time was allocated between procedural explanations and collaborative engagement across lessons. To support this aspect of analysis, a generative AI tool was used to assist in organizing time-stamped transcript segments into procedural and collaborative categories. This allowed for comparison of how instructional flow evolved from early lessons to later lessons. All categorizations, interpretations, and conclusions were reviewed and finalized by the researcher to ensure alignment with the study's analytic framework.

Analysis was conducted both within individual lessons and across the sequence of lessons to identify changes over time. Within-lesson analysis focused on specific instructional moments, while across-lesson analysis examined how routines, participation, and facilitation evolved as instructional structures became more consistent (Mertler, 2024; Miles et al., 2014)

Limitations

As an action research self-study, this project includes several inherent limitations. Because the study relied primarily on teacher-generated data, including reflective journals, video recordings, and supporting lesson transcripts, the findings are inherently subjective and context-specific. The analysis reflects my interpretation of instructional practices and classroom experiences rather than objective or measurable student outcomes. As a result, the findings are not intended for statistical generalization beyond this specific classroom context.

Additionally, the use of inductive qualitative analysis meant that themes emerged from reflective data rather than being tested against predefined hypotheses. While this approach aligns with the goals of action research and reflective practice, it also introduces the potential for interpretation bias. My dual role as both teacher and researcher further increases this risk. Although structured reflection using Gibbs's (1988) reflective cycle and the inclusion of externally generated lesson transcripts supported consistency and provided additional perspectives, complete objectivity is neither expected nor appropriate within practitioner-based research.

The use of lesson transcripts as a secondary data source also presents limitations. While transcripts provided time-stamped records of classroom interactions and supported analysis of instructional flow, they were not formally coded in the same manner as the reflective journals. Instead, they were used to support and validate emerging themes, which may limit the depth of analysis derived from this data source. Additionally, the exclusion of student-centered data limits the scope of conclusions to teacher practice, instructional structures, and facilitation strategies, rather than direct measures of student learning or achievement. While student interactions were observed and reflected upon, individual student outcomes were not analyzed as independent data.

Finally, the study was conducted across six lessons within a single instructional unit, which limits the ability to examine long-term sustainability of the implemented routines and norms. Changes observed in instructional flow, participation, and facilitation reflect short-term development within a specific context and may not represent sustained or long-term instructional change. Despite these limitations, the methodology provides valuable insight into how intentional classroom routines, norms, and accountability structures can be implemented and refined to support collaborative learning. The depth of reflection supported by iterative analysis

across lessons contributed to meaningful professional learning and a deeper understanding of instructional practice.

Chapter 4: Findings

This chapter presents the findings from this action research study, which examined the following research question: How does my intentional implementation of classroom routines and norms influence the organization and flow of collaborative learning activities? This study focused on my own instructional practice through the analysis of six lessons, using reflection journals and lesson transcripts as primary data sources.

Through inductive coding and analysis, three major themes emerged. First, the establishment of consistent collaborative routines improved classroom organization and instructional flow. Second, the implementation of explicit norms and accountability structures increased equitable participation and access to mathematical discourse. Third, as these routines and norms became established, my instructional role shifted from managing behavior to facilitating student thinking. The following sections describe each theme in detail, supported by evidence from both reflections and transcripts. All quotations in this chapter come from my lesson transcripts and reflections and represent my own teaching and classroom interactions.

Theme 1: Establishing and Sustaining Collaborative Routines Improved Classroom Organization and Flow

The implementation of consistent collaborative routines contributed to improved classroom organization and smoother instructional flow over time. In my reflection from Lesson 1, I described the classroom as “chaotic” and noted that students were hesitant to collaborate. I also reflected that I was spending a significant amount of time redirecting students and clarifying expectations rather than focusing on the mathematical task. This indicates that without established routines, instructional time was largely spent managing procedures instead of supporting learning.

This lack of structure was also evident in the Lesson 1 transcript, where a large portion of instructional time was spent establishing routines, introducing the structure of the class, and engaging in norm-building activities intended to support collaboration. In addition, a significant amount of time was dedicated to accessing digital materials to ensure that all students were able to navigate the required platforms. Throughout the lesson, I frequently had to prompt students to engage in expected behaviors, such as standing, working with their groups, and participating in discussion at their table groups. These interruptions indicate that routines and expectations were still being introduced and required explicit teaching and reinforcement. As a result, the flow of the lesson was heavily dependent on teacher direction, limiting the time that was available for sustained collaborative work.

By Lesson 3, the structure had become more established, incorporating consistent elements such as visible random grouping for vertical board problems at the beginning of each class, group collaboration on problems with context, individual checks for understanding, and built-in accountability measures. In my reflection from Lesson 3, I observed that students were beginning to engage more quickly in collaborative tasks and required fewer reminders to get started. I also observed that the transitions between activities felt smoother, as students were becoming more familiar with the structure of the lesson. These repeated structures created a more predictable sequence for students, allowing them to transition more efficiently between tasks and engage more quickly in collaborative work. As a result, less time was spent clarifying expectations and more time was devoted to collaborative problem solving. This shift was reflected in the transcripts, where the balance of instructional time began to move towards student collaboration rather than procedural explanation. To further examine how routines influenced instructional flow, I analyzed the proportion of instructional time spent on procedural talk compared to collaborative engagement across lessons (see Table 2).

Table 2*Estimated Distribution of Instructional Time Across Lessons*

Lesson	Procedural / Transition Time	Collaborative / Mathematical Talk Time	Key Observation
Lesson 1	High (~60–70%)	Low (~30–40%)	Time dominated by directions, setup, and frequent behavior reminders
Lesson 2	Moderate (~50–60%)	Increasing (~40–50%)	Structured transitions begin but remain teacher-driven
Lesson 3	Balanced (~40–50%)	Balanced (~50–60%)	Routines begin to emerge; resulting in smoother transitions
Lesson 4	Reduced (~25–35%)	High (~65–75%)	Turning point; students begin to sustain routines with less teacher prompting
Lesson 5	Low (~20–30%)	Very High (~70–80%)	Majority of instructional time spent on collaborative work and discussion
Lesson 6	Minimal (~15–25%)	Sustained (~75–85%)	Students begin tasks independently, with minimal teacher prompting

As shown in Table 1, there is a clear progression from early lessons, where most of the instructional time was spent on procedures and transitions, to later lessons, where most of the time was devoted to collaborative problem solving and student discourse.

This progression continued into Lesson 4, which I identified in my reflection as a turning point in how the classroom functioned. I recorded that I was able to spend less time managing procedures and more time observing and supporting student thinking, indicating that routines were becoming internalized. At this stage, students were able to transition into their groups and begin working with minimal prompting, often using established structures such as different colored markers for accountability without being reminded. This reflects a shift in ownership,

where students were beginning to drive the flow of the lesson because they understood what was expected of them. Transcript analysis from Lesson 4 and 5 indicates that a majority of instructional time was spent on collaborative work and mathematical discussion, with significantly fewer interruptions for directions or transitions.

By Lesson 6, routines appeared to be fully internalized, allowing students to engage in tasks with minimal teacher prompting. In my reflection from Lesson 6, I noted that students were able to begin activities independently and that the lesson felt more organized overall. I also reflected that I was no longer needing to stop and clarify expectations, which allowed for a more continuous flow of instruction. This was supported by the transcript, where students immediately engaged in structured tasks such as responding to prompts without requiring additional direction. At this stage, transitions were minimal and instructional time was primarily spent on collaboration and student thinking.

Overall, these findings show that as routines became more consistent, the classroom became more organized and instructional flow improved. Analysis of the transcripts suggests a clear shift from a majority of instructional time being spent on procedures and transitions in early lessons to most time being devoted to collaborative engagement in later lessons. The repeated use of structured routines reduced the need for redirection and clarification, allowing more time to be spent on collaborative problem solving and student thinking. This reflects a shift from teacher-directed organization to student-driven engagement, where the established routines supported smooth transitions and sustained instructional flow throughout the lesson.

Theme 2: Explicit Norms and Accountability Structures Increased Equitable Participation and Access to Mathematical Discourse

The intentional implementation of specific collaborative norms and accountability structures increased student participation and led to more distributed engagement during

collaborative activities. These structures included visible random grouping, vertical board work, collaborative problems with context, activating prior knowledge, and scaffolding to support entry into tasks. In addition, accountability measures such as visible work on vertical boards, prompts requiring all group members to contribute, and collecting collaborative work for daily points were used to support consistent participation.

In my reflection from Lesson 1, I observed that participation was uneven, with some students actively engaging while others were hesitant or not contributing at all. I noted that I needed to frequently prompt students to participate, which disrupted the flow of the lesson and limited the effectiveness of collaboration. At this stage, although students were placed in groups, the norms for collaboration had not yet been clearly established, and accountability structures were not yet consistently implemented. This suggests that simply placing students in groups did not result in equitable participation. This pattern was also evident in the Lesson 1 transcript, where some groups were observed not participating and others were actively working. I also asked questions such as “Who is sharing right now?” to prompt participation, indicating that engagement depended on teacher prompting rather than shared expectations within the group.

As the lessons progressed, I began to more intentionally establish norms for collaboration through structured routines. In my reflection from Lesson 2, I recorded that I was more explicit in communicating expectations for how students should interact, including encouraging them to talk through their thinking, collaborate on problems, and engage with vertical board work. I also incorporated activating prior knowledge and scaffolding to support students in entering the task. I reflected that students were beginning to show less resistance to collaboration, although participation was still not fully consistent across all groups. This shift was reflected in the transcript, where I prompted students to “talk to each other” and describe their thinking, reinforcing expectations for communication and engagement.

A more significant shift in participation occurred as the vertical board routines became more consistent. In my reflections, I recorded that these activities helped students activate their thinking before transitioning into collaborative work, which increased their confidence and willingness to participate. Following this initial engagement, students were more prepared to contribute during table group discussions and whole-class conversations. These findings indicate that the vertical board activities served as an important scaffold, supporting students in entering the task and reducing hesitation to participate, while also increasing access to mathematical discourse during collaborative interactions.

Accountability structures further supported this shift. In Lesson 4, I required students to use different colored markers while working on vertical boards, making individual contributions visible. In my reflection, I noted that this structure reduced passive participation and increased engagement across all group members, supporting more equitable participation within groups. Although this expectation was only explicitly required during Lesson 4, students continued to use different colored markers in subsequent lessons without prompting, indicating that this accountability structure became internalized and helped sustain participation over time without ongoing teacher enforcement.

In addition to individual accountability, I also observed a shift toward shared responsibility within groups. In my reflections from later lessons, I observed that students were beginning to support one another more consistently during collaborative tasks. This was reflected in prompts such as “If your group members don’t have f of ten, help them”, which emphasized that all group members were responsible for understanding the task, not just completing it individually, but contributing to shared understanding within the group.

By Lesson 6, I reflected that participation was more evenly distributed and more equitable across students, with less reliance on my prompting. I also noted that I was hearing

from a wider range of students, including those who would not typically participate during whole-group discussions. This indicates that engagement was no longer concentrated among a small group of students but instead distributed more equitably across the class. Students were contributing more consistently, building on one another's ideas, and engaging more naturally in collaborative discussions. The combination of structured routines, particularly the use of vertical board activities as a scaffold, and internalized accountability measures allowed students to participate more confidently and consistently.

Overall, these findings show that equitable and distributed participation was supported by the interaction between scaffolding and accountability. The use of vertical board activities to activate prior knowledge and support entry into tasks increased student confidence and readiness to engage, while accountability structures ensured that participation was visible and sustained. Together, these supports shifted participation from teacher-directed prompting to more independent and equitable across students, with broader access to mathematical discourse across the classroom.

Theme 3: As Structures Stabilized, the Teacher Role Shifted from Managing Behaviors to Facilitating Collaborative Thinking

As collaborative routines and norms became established, my role shifted from managing student behavior to facilitating and supporting student thinking. In my reflection from Lesson 1, I described feeling “uneasy” and documented that much of my attention was focused on clarifying expectations and managing behavior. I recorded that I was spending more time directing students through procedures than engaging with their thinking. This indicates that during the initial implementation of routines, my role was primarily focused on maintaining structure rather than facilitating learning. As routines became more established, fewer cognitive and managerial

demands were required to maintain structure, allowing greater attention to be directed toward student thinking.

This was also evident in the transcript, where my interactions were largely procedural. For example, I provided step-by-step directions for accessing the class materials, organizing tasks, and frequently redirected student behavior (Lesson 1 Transcript 1.21.26). These interactions demonstrate that my role at this stage was centered on managing the classroom environment rather than supporting deeper student thinking.

As routine and norms became more consistent, I noticed a shift in my role. In my reflection from Lesson 2, I noted that I was starting to focus more on guiding students rather than giving direct answers. I began asking more questions to prompt student thinking and encourage collaboration. This shift is evident in the transcript, where I asked questions such as “How many groups of 2 can I create?” (Lesson 2 Transcript 1.23.26), encouraging students to reason through the problem rather than relying on direct instruction.

In my reflection from Lesson 3, I recorded that I was intentionally working to facilitate conversations within groups and support students in explaining their thinking. I reflected that I was trying to guide students rather than provide answers, which allowed for more student-to-student interaction. This is supported by the transcript, where I prompted students to connect to prior knowledge and build upon previous learning (Lesson 3 Transcript 1.27.26). These interactions reflect a shift from directing instruction to facilitating thinking.

By later lessons, this shift became more consistent and intentional. In my reflection from Lesson 5, I described feeling more confident in my ability to facilitate student thinking and that I was able to better gauge student understanding through listening to their conversations. I noticed that I was hearing more mathematical discourse from a wider range of students, rather than relying on a small group of students to respond. This was reflected in the transcript, where I

asked conceptual questions such as “What operation is this?” and “How many times bigger?” (Lesson 5 Transcript 2.3.26), prompting students to engage in deeper reasoning.

By Lesson 6, I reflected that my role had shifted significantly toward facilitating student thinking. I found that I was able to guide student discussions, ask more open-ended questions, and provide individualized feedback while students were engaged in collaborative tasks. This is supported by the transcript, where I used prompts such as “What do you notice?” and “What do you wonder?” (Lesson 6 Transcript 2.5.26), encouraging students to generate and discuss their own ideas.

Overall, as routines and norms became more consistent, I found myself spending less time managing behavior and more time guiding students’ thinking and supporting their conversations. This shift allowed me to engage more deeply with student understanding and support more meaningful collaborative learning experiences.

Chapter 5: Discussion

The purpose of this study was to examine how the intentional implementation of classroom routines, norms, and accountability structures influenced the organization, participation, and facilitation of collaborative learning in a secondary mathematics classroom. Three themes emerged: a) establishing and sustaining collaborative routines improved classroom organization and flow, b) explicit norms and accountability structures increased equitable participation and access to mathematical discourse, and c) as structures stabilized, the teacher role shifted from managing behavior to facilitating collaborative thinking. These findings both align with and extend existing research in meaningful ways.

Theme 1: Establishing and Sustaining Collaborative Routines Improves Classroom Organization and Flow

The findings strongly align with research that emphasizes the importance of structured and proactive classroom management. Skiba et al. (2016) argue that effective classroom management should be understood as an instructional practice that establishes clear expectations, promotes engagement, and minimizes disruptions rather than relying on reactive discipline. Taken together, these findings suggest that routines help establish a predictable environment that reduces uncertainty for students, enabling them to engage more fully in mathematical thinking. In this study, the consistent use of routines, particularly vertical board work and visible random grouping, created a more predictable and organized learning environment. This reduced the need for redirection and allowed for more efficient use of instructional time.

These findings also align with Liljedahl's (2021) work on *Building Thinking Classrooms*, which demonstrates that structures such as visible random grouping and vertical non-permanent surfaces increase student engagement and willingness to contribute. When these structures are consistently implemented, students become more willing to share ideas and participate in

thinking, even when they are unsure of the correctness of their responses (Liljedahl, 2021). This was reflected in the progression of this study, where students moved from hesitation in early lessons to immediate engagement in later lessons.

These findings further suggest the role of vertical board work specifically as an instructional activator. While existing research emphasizes the importance of structure, these findings suggest that beginning lessons with a consistent, thinking-based routine not only improves organization but also prepares students cognitively for collaboration (Liljedahl, 2021; NCTM 2014). This activation reduced transition time, supported sustained engagement throughout the lesson, and supported smoother instructional flow across lessons.

Theme 2: Explicit Norms and Accountability Structures Increased Equitable Participation and Access to Mathematical Discourse

The findings related to participation align closely with research on collaborative learning. Rau and Heyl (1990) emphasize that collaborative learning environments are most effective when structures are in place to support interaction, accountability, and shared responsibility among group members. Similarly, in this study, participation became more equitable as norms and accountability structures were explicitly taught and consistently reinforced. Taken together, these findings suggest that clearly defined expectations shift responsibility for participation from the teacher to students, creating conditions in which a broader range of students can access and contribute to mathematical discourse.

Additional research supports the idea that simply placing students in groups does not ensure equitable participation. Webb (2009) and Olsen (2021) highlight the importance of clearly defined norms, communication expectations, and accountability structures in promoting balanced engagement among students. This aligns with the findings of this study, where participation shifted from being uneven and teacher-dependent to more evenly distributed as expectations

became internalized. As students developed a clearer understanding of how to participate, dominant participation patterns were disrupted, allowing more students to engage meaningfully in mathematical discourse.

An additional contribution to these findings is the recognition that participation is influenced not only by expectations, but also by students' readiness to engage. The use of vertical board work as a scaffold allowed students to begin thinking in a low-risk environment before engaging in group discussions (Liljedahl, 2021). This initial engagement reduced hesitation and increased students' confidence in contributing. As a result, access to mathematical discourse broadened, particularly for students who were not typically vocal. These findings suggest that activation routines play a critical role in lowering barriers to participation and supporting equitable engagement in collaborative learning environments.

Theme 3: As structures Stabilized, the Teacher Role Shifted from Managing Behaviors to Facilitating Collaborative Thinking

The shift in teacher role observed in this study aligns with research on effective mathematics instruction and facilitation. NCTM (2014) emphasizes that teachers should facilitate meaningful mathematical discourse, pose purposeful questions, and use evidence of student thinking to guide instruction. As routines and norms became internalized, I was able to move away from managing behavior and toward facilitative practices. From a sociocultural perspective, this shift reflects a transition from directing student activity to supporting the co-construction of knowledge through discourse and interaction (Vygotsky, 1978). In this role, the teacher acts as a mediator of learning, guiding students as they engage with and build on one another's mathematical ideas. This shift was made possible because established routines reduced the cognitive and managerial demands of the classroom, allowing greater attention to be directed toward student thinking,

This development is also consistent with Schön's (1986) concept of the reflective practitioner, which suggests that teachers continuously adapt their practices through reflection on their actions and student responses. As instructional structures became more stable, I was able to engage in more responsive and intentional facilitation, adjusting instruction in real time based on student thinking. This responsiveness reflects a deeper engagement with students' ideas, allowing instruction to be shaped by ongoing interaction rather than predetermined responses. This aligns with more recent work that extends Schön's framework, emphasizing the continued relevance of reflective practice in complex professional settings (Tan et al., 2023).

An important extension of the literature is the recognition that facilitation requires significant cognitive and physical effort. While research emphasizes the benefits of student-centered instruction, this study highlights the sustained demand of circulating, listening, and responding to student thinking (NCTM, 2014). This ongoing engagement positioned the teacher as an active participant in the learning process, continuously interpreting and responding to student ideas as they emerged. However, this effort also resulted in a deeper and more immediate understanding of student learning, making the instructional approach both demanding and highly rewarding.

Implications and Recommendations

The findings of this study have several important implications for classroom practice. In this study, the consistent implementation of collaborative routines supported increased student engagement, improved instructional flow, and more equitable participation. Structures such as vertical board work and visible random grouping created opportunities for students to engage in thinking more immediately and with greater confidence. These findings suggest that incorporating consistent, thinking-based routines may support both student participation and the overall organization of collaborative learning environments. An additional insight from this

study is the role of vertical board work as an entry point into collaborative learning. Beginning lessons with opportunities for students to engage with content in a low-risk, visible setting appeared to support readiness to participate in tasks that followed. This initial engagement allowed students to build confidence in their thinking before entering more complex collaborative tasks. These findings highlight how intentional activation structures may support broader participation and more equitable access to mathematical discourse.

The use of explicit norms and accountability structures also played an important role in shaping student participation. In this study, clearly defined expectations for collaboration, combined with structures that made participation visible, supported more consistent and distributed engagement across students. As these expectations became internalized, participation became less dependent on teacher prompting and more sustained over time. These findings suggest that establishing and reinforcing collaborative norms may support not only participation but also shared responsibility for learning within groups. This shift toward shared responsibility contributed to more equitable engagement, as a wider range of students participated more consistently in collaborative discussions.

This work also highlights the importance of persistence and consistency in implementing collaborative practices. Early lessons required significant time and effort to establish routines, reinforce expectations, and support student engagement. This process was at times exhausting, particularly in the early stages when both instructional structures and student expectations were still developing. Over time, however, these structures became more efficient and allowed for a greater focus on student thinking and interaction. This experience was powerful in shaping my understanding of how consistent routines can reduce ambiguity and create space for deeper engagement.

For educators interested in implementing similar approaches, these findings offer one example of how structured routines, norms, and accountability measures can support collaborative learning. While the specific strategies used in this study may not be universally applicable, the underlying principles of consistency, clarity, and intentional design may be useful in a variety of classroom contexts. These findings may serve as a starting point for teachers seeking to create more student-centered and collaborative learning environments. At the same time, this work highlights meaningful shifts in practice develop over time and require ongoing reflection and adjustment. Recognizing the gradual nature of this process may support teachers in sustaining these practices as they refine their implementation.

In addition to classroom-level implications, this study also highlights important considerations for school leadership. Supporting teachers in shifting toward collaborative, student-centered instruction may require opportunities to observe these practices in action. Providing time and access for teachers to visit classrooms where these strategies are being implemented can help make abstract ideas more concrete and allow educators to see the impact on student engagement and participation firsthand. This type of observational learning may support teachers in developing both the confidence and practical understanding needed to implement similar practices in their own classrooms. Creating structures that encourage collaboration among teachers, such as peer observations or instructional rounds, may further support the adoption and sustainability of these approaches.

Conclusion

This study examined how the intentional implementation of classroom routines, norms, and accountability structures influenced the organization and flow of collaborative learning in a secondary mathematics classroom. Across six lessons, the findings demonstrated that consistent routines improved classroom organization and instructional flow. Explicit norms and

accountability structures increased participation and distributed engagement. Stabilization of these structures allowed for a shift in the teacher's role from managing behavior to facilitating student thinking. Together, these findings highlight the interconnected nature of classroom structure, student engagement, and instructional practice.

This study contributes to the growing body of research on collaborative learning by emphasizing the importance of intentional design and sustained implementation of instructional routines. Specifically, the use of vertical board work as an activator and scaffold for participation emerges as a key factor in supporting both engagement and instructional flow. While the process required persistence and willingness to move beyond traditional instructional approaches, the resulting shifts in student participation and teacher facilitation demonstrate the value of these practices. These findings suggest that when teachers commit to structured, student-centered routines, they can create classroom environments that promote meaningful engagement, shared responsibility, and deeper mathematical thinking. As I move forward in my own practice, I am committed to continuing this work. I recognize that while this approach can be demanding, it ultimately leads to more responsive teaching and deeper understanding of my students as mathematical thinkers.

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