A Study of Professional Learning Community Leadership Using A Modified Approach

Makayla Willis Needs

Brigham Young University

Follow this and additional works at: https://scholarsarchive.byu.edu/etd

Part of the Education Commons

BYU ScholarsArchive Citation

https://scholarsarchive.byu.edu/etd/10410

This Thesis is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of BYU ScholarsArchive. For more information, please contact ellen_amatangelo@byu.edu.
A Study of Professional Learning Community Leadership Using a Modified Approach

Makayla Willis Needs

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Arts

Damon L. Bahr, Chair
Brandon G. McMillan
Ryan S. Nixon

Department of Teacher Education
Brigham Young University

Copyright © 2024 Makayla Willis Needs
All Rights Reserved
ABSTRACT

A Study of Professional Learning Community Leadership Using a Modified Approach

Makayla Willis Needs
Department of Teacher Education, BYU
Master of Arts

Professional Learning Communities (PLCs) are an important vehicle for teacher reflection and collaboration. The team leader of the PLC plays a critical role in the effectiveness of a PLC in improving instruction and student learning. However, there is less research around how the team leader facilitates the work of the PLC to improve instruction. This paper reports on a self-study investigation conducted by the team leader who used a modified approach to the PLC process focused on student mathematical thinking. The self-study consisted of analyzing video conversations of three PLC meetings to understand the nature of the leadership and how it changed over time. Based on analysis, there was evidence of the different roles the team leader played across the PLC meetings. Additionally, the roles changed over time as the needs of the team changed. Implications for PLC team leaders include how different roles are utilized to affect teacher discussion on instruction.

*Keywords*: leadership, collaboration, professional learning community, student thinking
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE PAGE</td>
<td>i</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>CHAPTER 1: Introduction</td>
<td>1</td>
</tr>
<tr>
<td>CHAPTER 2: Review of Literature</td>
<td>7</td>
</tr>
<tr>
<td>PLCs—A Potential Vehicle for Promoting Teacher Learning Through Reflection</td>
<td>7</td>
</tr>
<tr>
<td>The Critical Role Student Thinking Plays in Mathematics Teaching</td>
<td>8</td>
</tr>
<tr>
<td>Critical Analysis of the Traditional PLC Process—Ignoring Student Thinking</td>
<td>10</td>
</tr>
<tr>
<td>A Modified Approach to Professional Learning Communities</td>
<td>11</td>
</tr>
<tr>
<td>A Modified PLC Process</td>
<td>12</td>
</tr>
<tr>
<td>Leadership</td>
<td>14</td>
</tr>
<tr>
<td>CHAPTER 3: Methods</td>
<td>17</td>
</tr>
<tr>
<td>Data Collection</td>
<td>18</td>
</tr>
<tr>
<td>Context for Three PLC Meetings</td>
<td>18</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>19</td>
</tr>
<tr>
<td>CHAPTER 4: Results</td>
<td>21</td>
</tr>
<tr>
<td>Broker Role</td>
<td>21</td>
</tr>
<tr>
<td>Mentor Role</td>
<td>26</td>
</tr>
<tr>
<td>Collaborator Role</td>
<td>30</td>
</tr>
<tr>
<td>Facilitator Role</td>
<td>31</td>
</tr>
<tr>
<td>Quantitative Comparison of Roles Across PLC Meetings</td>
<td>33</td>
</tr>
</tbody>
</table>
CHAPTER 5: Discussion.................................................................................................................. 35
Nature of Leadership....................................................................................................................... 35
Leadership Change Over Time ....................................................................................................... 37
Implications for Future Research .................................................................................................. 41
Implications for Educators ........................................................................................................... 42
Limitations..................................................................................................................................... 42
REFERENCES ................................................................................................................................. 44
LIST OF TABLES

Table 1  
Interrelated Leadership Guidelines ............................................................... 15

Table 2  
Relative Number of Segments per Leadership Role Across Professional Learning Community (PLC) Meetings ................................................................. 33
CHAPTER 1

Introduction

Numerous studies over the last 6 decades indicate that the mathematics achievement of U.S. students is less than stellar. National Assessment of Educational Progress (NAEP) scores for 17-year-olds have shown little growth since 1973 (National Center for Education Statistics, 2019). In 2013, only 44% of high school graduates were considered ready for college level mathematics (The College Solution, 2013). Fifteen-year-olds in the United States ranked 26th out of 34 on the 2012 Programme for International Student Assessment (PISA; Organisation for Economic Co-operation and Development, 2013). That same measure revealed that U.S. students only performed well on test items that required lower-level skills (Organisation for Economic Co-operation and Development, 2013). These reports place the responsibility for this lack of achievement on the effectiveness, or lack of effectiveness, on teacher instruction.

In 2014, the National Council of Teachers of Mathematics (NCTM) published Principles to Actions: Ensuring Mathematical Success for All. It articulated “a unified vision of what is needed to realize the potential of educating all students” (p. vii) like previous standards documents. However, unlike those documents, “it describes the actions required” (p. vii) to attain that vision. It says that effective teaching and learning is based on eight general actions: establishing mathematics goals, implementing highly demanding tasks, using and connecting representations, orchestrating discourse, posing questions that assess and advance student thinking, helping students construct interconnected procedural and conceptual understanding, supporting students’ productive struggle, and making “serious use of student thinking” (Ball, 2001). Moscardini (2014) argued that if teachers possess a deep understanding of mathematical content knowledge, utilize inquiry-based teaching practices, and understand how children
understand mathematics, then they can identify the individual needs of their students. These three components support teachers in attending to the needs of most students and the facilitation of students learning from each other. This aligns with previous work that has demonstrated the importance of using student mathematical thinking in practice (Carpenter et al., 2015; Empson & Levi, 2011) as well as how the use of student thinking builds their understanding of mathematical concepts and pedagogical practices which contributes to their generative growth (Franke et al., 1998, 2001).

Generative growth is the process of teachers committing to the “serious use of student thinking” (Ball, 2001, p. 11) and the act of naturally reflecting on their teaching practice as a part of their regular teaching activity. In a study in which teachers engaged in a professional learning community (PLC) with a university mathematics educator and studied the research on student thinking in four mathematical domains, Franke (1998) reported that the teachers learned to apply their knowledge of student thinking in the assessment of students. They applied that knowledge in assessing their own students after presenting them legitimate mathematical tasks that matched the students’ learning trajectories. Over time, the teachers’ knowledge of mathematics and of students’ mathematical thinking increased. Their teacher practice also changed dramatically as they learned to use student thinking in designing and implementing student-centered curriculum (selecting the right task at the right time) and instruction and assessment. Thus, the focus on student thinking led teachers to naturally engaging in instructional improvement without the influence of an outside educator—in this case a university mathematics educator, hence the term, “generative growth” (Franke et al., 2001, p. 653).

There is a need to figure out how to support teachers to build this generative growth as they engage with students’ mathematical thinking because as Moscardini (2014) suggested, there
is a preponderance of practicing teachers that lack the necessary understanding of how children
learn mathematics to successfully provide instruction. Despite herculean efforts among both
providers of teacher preparation and professional development, inquiry and task-based
instruction has yet to become the predominant mode of teacher practice (Jacobs et al., 2006) and
Franke et al. (2001) added that inquiry and task-based instruction in mathematics requires
utilizing consistent formative assessments of student thinking in making decisions during
instruction.

Current practice around PLCs is touted as one means of addressing the problem of poor
student achievement in mathematics and a means to improve teacher instruction (DuFour et al.,
2016). PLCs provide a vehicle for teachers to collaborate on a common unit and lesson design as
well as assessment that is a means for examining the effect of the instruction. PLCs consist of a
group of teachers collaboratively reflecting on their practices to improve individually and as a
group. However, there seem to be incongruities between the interactive PLC instructional
process, and the modern conceptions of mathematics instruction as well as the focus on student
thinking that is needed. First, the pre-instruction PLC does not make serious use of anticipated
student thinking that could surface in lesson implementation while designing units and lessons.
Second, inquiry-based instruction does not characterize the type of instruction promoted in the
PLC literature, neither the Tier-1 instruction that proceeds the common assessment or the leveled
instruction that follows it. Third, traditional forms of assessment that are usually promoted in the
PLC literature are characterized by a limited, narrow view of mathematics, and often utilize
rubrics that ignore the individual student trajectories that research suggests describing how
legitimate mathematical understanding is constructed. Fourth, the grouping of students based on
assessment data stares in the face of decades of research that has demonstrated that ability
grouping in mathematics instruction is ineffective at best and often harmful to students (Boaler & William, 2001; Braddock & Slavin, 1995; Castle et al., 2005; Okano & Tsuchiya, 1999; Schaub & Baker, 1994; Stigler & Hiebert, 1997).

To counter these issues within the PLC, the process must incorporate the use of the research in student thinking and the pedagogical practices around the use of student thinking in instruction. PLCs do offer an opportunity for a team of teachers to collaborate and improve their use of student thinking as a group. However, the role of the leader in guiding the application of student thinking requires further investigation. The success of a PLC seems to be highly dependent on the effectiveness of the leadership. In exploring the importance of this role, Eaker and Keating (2009) stated “the quality of work performed by teams depends on team leaders” and that the success of the team directly relates to the “leadership capacity of team leaders” (para. 1). To support team leads in engaging their teams in the use of student thinking, Kanold et al. (2018) provided protocols for PLCs to have “deeper conversation about student thinking” (p. 76) rather than a discussion around percentage of student proficiency. Furthermore, they also discussed that when teams engage in this conversation, they build a “shared knowledge of effective practices” (p. 78) that supports student learning.

There is little research around the leadership of engaging PLCs in work centered on student mathematical thinking. This paper highlights the work of one team lead for a third-grade team of teachers that applied a modified approach to PLCs to collaborate about their mathematics instruction. The team, consisting of two novice teachers and me, a teacher with 7 years of experience who served as the team lead, gathered to plan lessons by designing mathematical tasks and anticipating the thinking those tasks might elicit. After delivering inquiry-based instruction based on those plans, the team gathered again to compare the thinking
they anticipated they would see to the thinking they observed. Then they worked to design additional tasks based on their observations. This thesis reports on a reflective self-study investigation I conducted of efforts I made to lead my team during three modified PLC meetings.

Since the modified PLC process is a local and recent invention, research around the leadership of traditional PLCs might be informative to some extent, but no doubt wanting with regards to the intricacies associated with leading teachers in discussions around student thinking that are productive and promote teacher reflection and learning. Mujs and Harris (2003) outlined four roles of traditional PLC leadership as: broker, collaborator, mentor, and facilitator. Investigating how a leader uses these roles to center the PLC on student thinking could serve as an example of how to use PLCs to increase student achievement in math. These roles have proven useful in characterizing and guiding effective PLC leaders, and might prove useful for the leader of a modified PLC, but how would they be applied? While traditional PLC meetings incorporate data obtained from the summative assessment of student achievement at the end of a unit, I am not aware of research regarding the use of formative assessment of student thinking to guide teacher planning and inform teacher decision making during instruction, let alone how to guide a PLC that is grounded on student thinking.

The purpose of this study is to investigate the nature of the leadership I provided in directing my grade-level colleagues in the use of the modified approach to PLCs to support my team to take up the serious study of student thinking. In essence, I ask the following research questions:

1. As I used my teammates’ thinking about their students’ thinking to guide them through the modified approach to PLCs, what was the nature of my leadership as viewed through the lenses of broker, mentor, collaborator, and facilitator?
2. In what ways did my leadership moves related to brokering, collaborating, mentoring, and facilitating change over the course of three PLC meetings?
CHAPTER 2

Review of Literature

Because this research focuses on leadership centered on student mathematical thinking within professional learning communities, the literature review begins with background on PLCs and their usefulness in supporting teacher reflection. Then, research is highlighted on the importance of student mathematical thinking within mathematics instruction and the lack of the use of student thinking within the PLC process. Next, a modified approach to PLCs, which focuses student thinking, is presented. Last, research around leadership within the PLC is discussed and the role of the team lead in supporting a team to focus math instruction on student thinking.

PLCs—A Potential Vehicle for Promoting Teacher Learning Through Reflection

Teacher reflection has long been viewed as an important vehicle for encouraging teacher learning (Schon, 1983; Zeichner, 1983). Schon (1983), for example, promoted the stance of viewing teachers as reflective professionals who construct conceptions of their practice through reflection. Similarly, Zeichner (1983) encouraged reflective-based teacher preparation and development as inquiry-oriented teacher education “which prioritizes the development of inquiry about teaching and about the contexts in which teaching is carried out” (p. 5).

PLCs (DuFour et al., 2016) are touted as one means of encouraging teachers to reflect on their practice in a manner that engages them in self-driven improvement. The goal of PLCs is to create a “collaborative culture” with a “focus on learning” and a “results orientation” (DuFour et al., 2016, pp. 11–12). Through cycles of instruction, PLCs can be a vehicle for collaborative unit and lesson design and a means for examining the effect of the resulting instruction. Therefore, the steps within the PLC process allow teachers to examine their teaching and adjust to support
student learning.

The traditional model for PLCs comprises a five-step process (DuFour et al., 2016):

1. Pre-instruction PLC. Teams of teachers plan units of instruction as guided by their core standards; operationalize those standards by developing, finding, and/or adapting a commonly administered end-of-unit summative assessment; then design specific lessons within the unit often aided by the curriculum available.

2. Deliver Tier-1 instruction. Each member of the team teaches the lessons within the unit to their students.

3. Administer common end-of-unit assessment. Following the final lesson within the unit, each member of the team administers and scores the common assessment.

4. Post-instruction PLC. The team discusses the data from the common assessment to determine which students met or exceeded predetermined success criteria and which needed further remedial support. This discussion tends to focus on assessment scores only, although in some cases, teachers engage in diagnostic analysis of student work. Students are then grouped according to the type of instruction they need—extension, practice, medium support (Tier-2), and intensive support (Tier-3).

5. Post-instruction. Deliver the proposed type of instruction to the identified groups.

These five steps in the PLC process can support teachers’ reflection on student learning and instructional design. However, the focus on student learning has traditionally been on assessment results rather than analysis of the details of student thinking and understanding.

The Critical Role Student Thinking Plays in Mathematics Teaching

Student thinking plays a critical role in modern conceptions of mathematics teaching (Ball et al., 2008; Carpenter et al., 2015; Empson & Levi, 2011; NCTM, 2014). Wood et al.
(2001) identified four positions from which teachers learn to take up student mathematical thinking in their practice. Some scholars approach this learning from a disciplinary position, the first of the four positions (Ball, 1988; McDiarmid & Wilson, 1991; Shulman, 1986, 1987). These scholars emphasized the development that occurs as teachers come to better understand the mathematical content as it relates to students’ mathematical thinking. Attention to students’ mathematical thinking is one of the primary drivers of this development (Ball, 2001) and one of the main areas in which teachers develop with teaching experience (McDiarmid & Wilson, 1991).

In the second position, the psychological position, teacher learning focuses on applying the understanding of how students investigate mathematical concepts. Carpenter et al. (2015) investigated student growth in whole number problem sets when the teachers focused on understanding the strategies students developed and then giving students opportunities to build on those strategies. This work was similar to investigations on different mathematical concepts including fractions (Empson & Levi, 2011), number sense (Carpenter et al., 2016), and algebraic reasoning (Carpenter et al., 2003). These studies demonstrate the growth that is possible when teachers focus on how students think about and process the concepts being taught.

The developmental position is third and concerns the investigation of how student thinking changes and develops over time. Teachers begin by trying to gain insight into the initial conceptions of students on a subject and use that as the foundation for future generalization (Fosnot, 2010). Teachers can then help students recognize the generalizations that can be applied to concepts as they continue to investigate more complex operations (Russell et al., 2011; Schifter & Russell, 2022).

The socio-cultural is the fourth and final position and focuses on the collaboration that
occurs within classrooms between teachers and students. Scholars behind the fourth position (Cobb et al., 1991; Wood, 2001) emphasize the learning that takes place as teachers and students make meaning from each other during classroom discussions. Widjaja et al. (2010) stated that “teachers and students need to have a didactical contract … that requires a productive interaction that demands reciprocal obligations” (p. 170). In other words, students listen to their peers and “examine other students’ reasoning” and they must be prepared to “explain, justify, and defend their reasoning” (p. 171).

**Critical Analysis of the Traditional PLC Process—Ignoring Student Thinking**

Given the critical role student thinking plays in mathematics teacher learning, it is problematic that there is a lack of emphasis on student thinking in the traditional PLC process. The pre-instruction PLC meeting, the first step in the process, does not make serious use of anticipated student thinking that could surface in lesson implementation. Planning for effective inquiry-based teaching requires anticipating student thinking (Smith & Stein, 2011). Anticipating student thinking prepares a teacher for thinking that might surface, enables the creation of useful questions in advance of instruction, provides a guide for sequencing of the sharing of student thinking, and provides a useful vehicle for evaluating the posing of mathematical tasks. Such “envisioning how the lesson will unfold and preparing a range of responses to future events” (Eshchar-Netz & Vedder-Weiss, 2020, p. 372) allows teachers to be more responsive to student thinking during the lessons (Jacobs & Empson, 2016). PLCs not incorporating anticipating students’ thinking into their cycles lose out on opportunities for teacher reflection of in-lesson moves to support student understanding.

Another way PLCs fall short in attending to student thinking is the reliance on post-instruction common assessments to determine support for students. These post-instruction
assessments are summative in nature and do little to support a teacher’s instructional decisions while teaching a unit. In the traditional PLC model, instead of using formative assessment to determine how to support students throughout a unit, support comes after Tier-1 instruction is completed (DuFour et al., 2016). Thus, it does not provide opportunities for teachers to reflect amid the course of the unit and adjust planned instruction based on student thinking. Instead, teacher reflection and learning are based on passing or not passing test scores. The monitoring of student thinking provided by consistent formative assessment allows for making on-going adjustments to planned instruction. Thus, incorporating student thinking into PLCs in a manner that allows teachers to reflect and be more responsive to their students within a lesson and unit is key.

**A Modified Approach to Professional Learning Communities**

I propose a modified approach to PLCs that emphasizes teacher learning through reflection centered on student mathematical thinking. This proposal consists of incorporating aspects of lesson study (Hurd & Lewis, 2011) and the Comprehensive Mathematics Instruction (CMI) framework (Hendrickson et al., 2008) into the PLC cycle to support teacher reflection on student thinking.

Lesson study (Hurd & Lewis, 2011) is a widely used model of teacher reflection and collaboration, involving teams of teachers in finding, adapting, or constructing a worthwhile mathematical task, then making use of student thinking by anticipating the thinking the team believes the task will elicit. The team uses that anticipated thinking to design a lesson and then one member of the team delivers the lesson to their students while the rest of the team observes. After the lesson has been taught, the team meets to reflect on the lesson plan during which they compare the observed thinking to the anticipated thinking and adjust the lesson plan accordingly.
for use by the other members of the team.

The CMI framework is used to help collaborative teams make sense of student thinking and to make instructional decisions accordingly. The CMI framework comprises three major components, a teaching cycle, a learning cycle, and a continuum of mathematical understanding (Hendrickson et al., 2008). Of the three framework components, the Learning Cycle is the component most relevant to modified PLCs. The Learning Cycle directly supports this modified approach to PLCs as it places an emphasis on student thinking in the design of unit instruction.

Because the learning cycle guides unit design, it therefore plays a role in the modified PLC process as it allows teachers to reflect on the type of lesson and how it is supporting student thinking. In lessons based on the first phase of the learning cycle, student thinking around a specific purpose is surfaced (develop understanding). That surfaced thinking is examined and extended in subsequent lessons for the purpose of clarification and connections (solidify understanding), then further lessons refine and generalize (practice understanding). To begin a unit, lessons focus on developing the understanding or surfacing students’ thinking. As teachers analyze student thinking, this framework helps them decide what type of lessons their students will need for them to solidify or practice their understanding.

A Modified PLC Process

Using the above literature review as conceptual grounding, the following steps outline a modified PLC process for the purposes of promoting meaningful teacher reflection in service of supporting teacher development. Instead of the five steps involved in the traditional approach, this modified PLC process comprises these five steps:

1. Pre-instruction PLC, design a task. A team of teachers design a task together in a PLC meeting that will surface thinking about the whole unit of instruction.
2. Pre-instruction PLC, anticipate student thinking. In the same meeting, anticipate student thinking that will surface from the task then use the thinking to design the rest of the lesson, i.e. a lesson for students in the develop phase of the learning cycle.

3. Deliver Tier-1 instruction, they teach the lesson in their own classrooms.

4. Post-instruction PLC, analyze student thinking. In a post-instruction PLC meeting, they categorize observed student thinking based on a progression of student understanding, then compare it to the thinking they anticipated they would see.

5. Post-instruction PLC, plan future lessons. In the same meeting, they use the observed thinking to plan subsequent tasks and lessons to build on student thinking and move them forward to the solidify and practice phases of the learning cycle.

This modified PLC process differs from the traditional process in significant ways. Rather than a formal, summative assessment at the end of instruction (unit), the common assessment consists of a task and accompanying questioning, that have both instructional and assessment purposes (i.e., formative assessment). Note that this approach focuses on current instruction rather than instruction that has just been completed. Because it involves anticipating student thinking about a task that is about to be launched, it provides an environment for the improvement of the instruction around that task as teachers reflect on their own practice—the presentation of a task, the quality of the questions they intend to pose, and orchestrating discussion during which students engage in each other’s thinking. It also paves the way for higher quality subsequent lessons because the PLC plans subsequent tasks that begin the process of examining and extending, then refining and generalizing student thinking that first surfaces at the beginning of a unit.

The use of traditional approaches to PLCs can entail “personal exposure and might,
therefore, be highly face threatening” (Eshchar-Netz & Vedder-Weiss, 2020, p. 372). The modified PLC process aligns with the work of Eschar-Netz and Velder-Weiss because it involves “pre-teaching collaborative activities for instructional preparation, such as discussing mathematical problems … or pre-lesson discussions [that] have been shown to be less threatening and may therefore better support collaborative reflective inquiry” (p. 372). The modified PLC process is non-threatening in that team members are invited to engage in collective reflection and learning.

**Leadership**

In the modified approach to PLCs, the purpose of the team lead is to support their team in collaborative teacher reflection and analyzing student thinking. Because team leads are expected to have a “demonstrated record of effectiveness in their own teaching” as well as “earned the recognition and respect of their peers” (Eaker & Keating, 2009, para. 12) they can use their expertise in guiding the PLC. Ultimately, the goal of the team lead in PLCs is to raise the collective practices of the team by focusing on student thinking.

Researchers have defined the nature of effective leadership in schools in multiple ways. For instance, York-Barr and Duke (2004) defined team leadership as “the process by which teachers, individually or collectively, influence their colleagues, principals, and other members of school communities to improve teaching and learning practices with the aim of increased student learning and achievement” (p. 287–288). Charner-Laird et al. (2016) viewed the role of the team lead as one of “reculturing schools by focusing on collaboration as a lever for improvement” (p. 979). More specifically, a team lead in a traditional PLC has been defined as someone who “serves as the key communication link between the administration and the faculty” and has the responsibility to “enhance the capacity of their team to work interdependently to
achieve common goals” (Eaker & Keating, 2009, para. 10–11). Team leads in PLCs are tasked with improving the effectiveness of their teams by “ensuring that the team focuses on the critical questions and practices associated with improving student learning” (Eaker & Keating, 2009, para. 11). With the various definitions that these scholars have used to describe leadership, it seems that one thing they have in common is an emphasis on improving practice. Within the modified approach to PLCs, the main role of the team lead is to help improve practice through teacher reflection while supporting the team in understanding student thinking. For this study, although the team lead was designated to facilitate grade-level PLC meetings, leadership is being defined as the practices and strategies that were used to support teacher collaboration.

Team leads can draw upon the work of Kanold et al. (2018) to support their leadership in the modified approach to PLCs. Kanold et al. (2018) outlined two interrelated lists of leadership guidelines as shown in Table 1. Their “leadership practices” are used to support “effective mathematics collaboration” (p. 15), and their “leadership strategies” are designed to “establish a common purpose and create clarity for team expectations, outcomes, actions, and behaviors” (p. 25). As the team lead engages in the appropriate leadership practices and utilizes specific leadership strategies, they can support their team in improving their mathematics instruction.

Table 1

Interrelated Leadership Guidelines

<table>
<thead>
<tr>
<th>Leadership Practices</th>
<th>Leadership Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trusting environment</td>
<td>Common purpose</td>
</tr>
<tr>
<td>Relational intelligence</td>
<td>Collective commitments that focus on collaboration</td>
</tr>
<tr>
<td>Effective communication</td>
<td>Evidence of success</td>
</tr>
<tr>
<td>Passion and persistence</td>
<td>Continuous reflection and refinement</td>
</tr>
<tr>
<td>Commitment to the PLC process</td>
<td>Mutual accountability to the professional work of the team</td>
</tr>
</tbody>
</table>
The use of these practices and strategies is evident in the different roles that a team lead might take up to support their team. For example, Muijs and Harris (2003) outlined four roles that comprise PLC leadership:

- **broker**: ensuring that connections are made within the school to help maximize teaching and learning
- **collaborator**: working collegially with other teachers to encourage the examination of instructional practices
- **mentor**: serving as a source of instructional expertise and information
- **facilitator**: forging close relationships with individual teachers through mutual learning

How and in what way these roles are taken up by the team lead can influence the strategies and practices implemented to support positive teacher reflection and collaboration. Ultimately the success of the PLC process hinges on the role of the team lead (Eaker & Keating, 2009). They must understand the purpose of the PLC in guiding the collaborative effort of teacher reflection. Furthermore, it is their responsibility to focus the reflection on student thinking, especially when dealing with mathematics instruction. Evidence has been shown that traditional PLCs fall short in this area, as evidenced in using post-instruction summative assessments (DuFour et al., 2016). In light of this, I used the modified PLC process. Due to the novelty of this approach, this work is focused on examining the leadership role within modified PLCs to improve mathematics instruction by understanding student thinking.
CHAPTER 3

Methods

A self-study methodology was used to analyze data obtained from three PLC meetings that I conducted, as team lead, using the modified PLC process outlined in Chapter 2. The PLC included me and two other teachers. I chose a self-study approach because I sought to better understand my practice as the leader of a team of teachers who wanted to improve their mathematics instruction. Self-study is a form of practitioner research that typically employs qualitative methodology and has emerged as a viable means through which teacher educators learn from their own professional practice (Berry & Hamilton, 2013). Alluding to the potential of self-study as a process for enacting change, they discussed how researchers develop, that the outcomes of a self-study are both personal, focusing on self-understanding, as well as public, adding to public knowledge and literature around teacher education.

At the time of this study, I had been teaching for 7 years. I had taken several post-graduate mathematics education courses and earned an elementary mathematics license endorsement. I had also conducted professional development and served on a school district mathematics committee of school-based leaders. Our school district was highly focused on literacy development and achievement. However, I did not want my team to lose sight of the importance of mathematics instruction. Working with novice teachers, I felt like I could positively influence them in a couple of ways. The first, setting up a good routine for our PLC meetings. The second, allowing for them to see that there is a space to discuss literacy instruction and mathematics as well. Third, I wanted to empower them through my own leadership. Even though I was the team lead I still wanted them to see me as a collaborator and trusted coworker with whom they could feel safe when they had questions.
**Data Collection**

Over the 2021–2022 school year PLC meetings were held weekly. From these weekly meetings, five were video recorded to capture the discussions. Of these five, three were transcribed and selected for analysis. Of the three selected for analysis, two PLC meetings were conducted in the Fall of 2021. The first meeting consisted of working on steps one and two from the modified PLC process. The second recorded meeting in the fall consisted of working on steps four and five. These meetings were selected because they captured the planning and debriefing aspects of a full cycle from an addition and subtraction unit. The third PLC meeting was conducted in the Winter of 2022 and consisted of steps four and five of the modified PLC process; both post-instruction PLC steps that focus on analyzing student thinking and planning future instruction. It was selected because it covered a different content domain, in this case fractions, and there seemed to be a qualitative change in our discussion at this stage.

As the team lead, my main job was to create agendas and facilitate discussions with my team members based on my observations. Even though I planned certain discussion points, the conversation was flexible and based on the opinions and input from my teammates to better serve their needs.

**Context for Three PLC Meetings**

To provide context, the mathematical content and process are explained for each of the three meetings. The first meeting focused on planning Tier-1 instruction for our addition and subtraction unit. As a team, we began by looking at our Common Core State Standard (CCSS; The Council of Chief State School Officers, 2015), our instructional materials, and other resources to help us launch the first task in the unit. The task we created comprised of three problems:
1. Problem 1. 163 + 26. Loni had 163 sea animal stickers. His mother gave him 26 more sea animal stickers. How many sea animal stickers does he have in all?

2. Problem 2. Loni now has 189 stickers. If his grandma gives him 13 more for his birthday, how many does he have now?

3. Problem 3. Loni can compare his sticker collection to his friend Jazlyn’s collection. If he has 202 stickers and she has 220 stickers, who has the bigger collection? How many more stickers does the bigger collection contain?

After creating this task, we anticipated the thinking we thought we would see from our students as they engaged in one or more of the problems. From there, we delivered the tasks to our students. During instruction, we collected artifacts of the various thinking we saw from the students through pictures, anecdotal notes, and models drawn on the board by students.

After engaging students in the planned task, we used our next PLC meeting to compare the anticipated student thinking from our first PLC meeting with the actual student thinking we collected from the lesson. We also used the observed student thinking to help us design subsequent tasks to help students’ thinking move through the phases of the learning cycle.

The third PLC meeting was held in the winter, focused on our fraction standard, and was a post-Tier-1 instruction meeting, like the second meeting. Prior to the third meeting, we had met to plan the task and anticipate student thinking (like the first meeting). During this third meeting we compared the thinking we had previously anticipated we would see from a task that invited students to place fractions on a number line. As in the second PLC, we also worked to design subsequent tasks to support students.

**Data Analysis**

The analysis focused on coding “segments” of the meeting. I use the term “segment” to
describe each portion of the transcript in which I am speaking before or after a teammate’s comment or question. The first analytical pass through the data was guided by a priori codes. In the first pass, I coded for the four roles that comprise teacher leadership—broker, collaborator, mentor, and facilitator. During the second pass through the data, I used emergent coding to identify the characteristics of the four roles in relation to leadership around student thinking. The third pass through the data consisted of interpreting the meaning of each segment concerning the codes assigned. During the fourth pass, I compiled a research text that organized segments and constructed text to connect ideas from all three transcripts (Saldaña, 2016). The fifth and final pass conducted was to create an analytic memo that organized the codes into emerging themes across all collaborations to investigate the nature and change of leadership over the three modified PLCs.

My thesis chair served in a collaborative role as I analyzed the data. Collaboration served to provide “transparency, validity, rigor and trustworthiness in conducting self-study” (Butler & Bullock, 2022, pp. v–vi). My committee chair and I worked together to establish a consistent and credible analysis. During the initial portion of each phase of analysis, we mutually created observation notes as we watched each recording and began coding, categorizing, and creating meaning which served to establish coding consistency. To provide credibility (Williams, 2018), we conducted our analyses separately for the remainder of each phase, then compared analyses, and reconciled differences through negotiation.

Additionally, a quantitative analysis of segments was also conducted to calculate how much I spoke, how much I spoke over time across PLC meetings, and the number of segments devoted to each role. This analysis provided insight into the change of discussions which reflected the nature of my leadership over time.
CHAPTER 4

Results

Through this analysis, I attempted to answer the following research questions:

1. As I used my teammates’ thinking about their students’ thinking to guide them through the modified approach to PLCs, what was the nature of my leadership as viewed through the lenses of broker, mentor, collaborator, and facilitator?
2. In what ways did my leadership moves related to brokering, collaborating, mentoring, and facilitating change over the course of three PLC meetings?

I will address the findings related to each research question by leadership role. That is, first I will discuss the nature of my leadership in the PLC meetings as I functioned as a broker, then discuss how my leadership moves related to brokering changed over time. I will then follow that same pattern for the mentoring, collaborating, and facilitating roles. Inasmuch as this is a self-study, all the segments that appear below represent my contribution to the PLC meetings.

Broker Role

In all three PLC meetings, the role of broker manifested itself in my efforts to help my team make connections with other educators in our school. For example, in the first PLC meeting, we were designing an addition and subtraction lesson focused on place value understanding. To help support students in the lesson we wanted manipulatives such as linking blocks, place value blocks, and graph paper. However, we did not have enough of these supplies for all three of our classrooms. After realizing we did not have these supplies, I told my team, “I can borrow some too if we need to and we can ask first grade if we can borrow some of their place value blocks. I’m sure they’ve got some.” My team did not have the necessary resources for this instructional unit for our students and I felt that as the team leader, it was my job to
advocate for my teammates in getting the proper resources to successfully launch this lesson. In this case, I acted as a broker between my team and other teams on campus to get the necessary materials we needed for our lesson.

My brokering differed across meetings according to whom I was connecting with and for what purpose. I also encouraged connections with other educators to obtain needed materials in the second PLC meeting, this time with our administration. As this was our school’s first year, we did not have all the materials that teachers acquire throughout their years of service. Because of this, our principal met with each team leader and requested that we make a list of items we felt would benefit the learning in our classrooms. After my meeting with my principal, I discussed with my team at our PLC meeting the materials we needed. This highlights part of the conversation I had with my team:

Kaylene (pseudonym, principal) wanted us, if we needed more stuff, to send our list, I’ve just been forgetting to get a list going. We want place-value blocks. Probably some of those guys [linking blocks].

This quote is an example of me brokering the conversation I had with my principal to my teammates so that they could be included in creating a list of items to best serve our students.

In addition to connecting my team to others for materials, I worked to encourage working relationships with teachers who also shared responsibility with us for our students, specifically the special education teacher, Hazel (pseudonym). In the second PLC meeting, I was discussing my desire to talk with the special education teacher as we were working in our addition and subtraction unit about strategies that students with Individualized Education Plans (IEPs) had displayed in our Tier-1 lesson so that she could utilize those students’ thinking in her own classroom. At that point I stated:
This is when I wish Hazel was in here because I would love for her to launch a task like this with the kids she works with. She’s gone all week though, right? I know she was telling me one of my kids has the goal of regrouping and in my brain, I was just thinking, are you just making him do the standard algorithm? Because he could probably expand a number, put a number in expanded form and add it that way.

This example was brokering the connection between the special education teacher and the rest of our team to collaborate on our mathematics instruction. The need for this brokering stemmed from our desire to align student IEP goals with Tier-1 classroom instruction to better serve the special education students we jointly served. By this point in my career, I had learned of the importance of collaborating with the special education teacher and the increased potential for success it could provide for students who have specific learning disabilities. I also promoted a similar connection with Hazel in the second PLC meeting based on my diagnosis of our special education students’ difficulties with multi-digit addition and subtraction. As we were looking at their observed thinking on addition and subtraction, I told my team that I needed to talk to Hazel about the underlying problem our students were having with addition and subtraction. I said, “I got to talk to Hazel and say, ‘There’s a bigger issue going on here. This is not a problem with adding and subtracting. This is a problem of place value.’ I felt the responsibility of demonstrating to my team the importance of continually working with the special education teacher in working to best serve the students that we share. This comment was made knowing that it would benefit all the students in our grade level who receive special education services. Therefore, connecting with our special education teacher about some of our students’ observed thinking, I thought, would then help her as she delivered her small group instruction. If the
special education teacher could support this thinking in a small group, then I thought the students might be more successful on this standard in the regular education classroom.

A brokering connection that exemplifies a change from the first PLC meeting to the second PLC meeting involved Maggie (pseudonym), the instructional coach, to encourage better vertical alignment across multiple grade levels. As a team, we noticed some of our students had a hard time on assessments that posed word problems because of their difficulties with reading. As the team lead, I had shared my ideas on supporting students with reading difficulties, which we tried, but they were ineffective. My goal was to discuss the significance of this with the instructional coach so that she could then help us vertically align with the second-grade team to discuss how we can support reading comprehension in math. At this point in our meeting, I was discussing how difficult it can be to give students a state standardized math assessment that requires them to read without teacher support.

I have no idea what to do. We have a data dive tomorrow with Maggie … on literacy. So probably the focus would be our phonics and Acadience data [a benchmark assessment required by the Utah State Board]. And then I plan on telling her the biggest problem we’re seeing too, is that the kids don’t get to practice reading. And because they don’t get to practice reading, it’s really hard to give them assessments on comprehension. That’s almost like we’re setting them up for failure.

While this comment seems to relate to literacy and not mathematics, the purpose here was to discuss that when given word problems on a math assessment, our students could not access the word problems because of their reading skills at that point in time.

Brokering in the third PLC meeting looked similar to the second in that I was connecting to our instructional coach so that she could continue to provide instructional support to our team.
Our coach worked to meet with my team once a week. When she was unable to attend a previous meeting in which we discussed using number lines with fractions, I took it upon myself to catch her up on that discussion. The coach and I had a few conversations before this point on the strategies we were seeing from students and the questions we had that related to this mathematical topic, so this connection was just to cue her as to where we were at in our conversation.

So today, just to catch you up, the conversation was going on with the number line. So I think I have a couple [of students] that were really comfortable with eight fourths, identifying it as eight fourths [on a number line], but [also labeling that point on the number line as] two over one, some of them were like, “I don’t really understand what’s happening.”

Having cued the coach, I felt as though she would be better able to give us support now that she knew where we were at in our conversation. She was then able to participate in our discussion and shared a few problem examples to use with our students to support their thinking. This brokering of a connection with the instructional coach allowed for my team to learn different ways to introduce number lines to address the different needs in our classes.

These examples demonstrate the nature of my leadership in the broker role as it consisted of getting access to materials needed for the lessons that we designed from other grade-level teams and administration. My broker role also consisted of connecting our team to collaborate with educators who could give us additional support, in particular, the special education teacher and instructional coach. This aspect of leadership highlighted how I connected my team to available resources and supported critical conversations across stakeholders at our school.
Mentor Role

The mentor role was the most prominent in all three PLC meetings and manifested itself in the form of modeling a number of good teaching practices. I did not simply talk about those practices, but rather modeled them to ensure my teammates understood how to utilize them. Those good teaching practices included the use of our grade-level curriculum map, aligning the curriculum with the CCSS, and selecting strategies for students to share.

Although the mentoring role consistently manifested itself in the form of modeling teaching practices, the practices I modeled varied from meeting to meeting, an issue related to the second research question. During the first PLC meeting, I modeled the use of our curriculum map. In this excerpt I was comparing the amount of time we had allotted in our curriculum map for the addition and subtraction unit to the amount of time our curriculum materials suggested we would need to teach it in order to determine if there would be enough time to conclude that unit before the Christmas break.

Roughly, it would be maybe 20 lessons. So it would take us realistically, we would have 5, 10, 15 [instructional] days [before] Thanksgiving. Then, the week after [Thanksgiving] would be 20 [instructional days]. So it could take us into the second week of December. Okay. And then we are out in December. I mean, I think we could kind of get through this by the first week of December.

Another way modeling occurred in the first meeting was in the modeling of strategies we might have children share during the discussion portion of our Tier-1 lesson. At this point in our meeting, I was trying to model how I would determine the order for the sharing of student thinking in a whole class discussion.

I think we’ll definitely see [the] standard algorithm. I think we’ll see this one too because
my kids have done that one. And I think we’ll see the number line one you brought up.
All kids that’ll like switch, manipulate those numbers around [might use the number line strategy to represent their thinking]. I also think kids will do the second one, this one you did, Heather (teammate pseudonym). Okay. I don’t know about you guys, but I could see my kids doing it [like that], but I think they would write it a little bit differently.
As a team, we knew some students would choose the standard algorithm as a strategy, which is why it was voiced as the first strategy, not because it should be the first when students shared their thinking. From there, I numbered our papers with the various strategies, not including the standard algorithm, to demonstrate which strategies to share first. While I was mentoring the ordering of sharing of strategies, I also used an experience I had in teaching this topic to bring up an alternate way students might represent a strategy that Heather shared so that they could be aware of alternate representations of similar student thinking.
I also modeled a process for ensuring that the curriculum materials we used aligned with the CCSS. In this excerpt I compared the numerical complexity of the problems we intended to use with the numerical complexity specified in the Standards. This would ensure that the rigor level of the problems we posed would facilitate a productive struggle among our students as they solved problems involving regrouping.
I’m going to check our addition standard real quick to see how many numbers they have to add up to. We have to fluently add and subtract within a thousand. So I’m thinking I like starting with a hundreds number and then maybe our next task would be to do something bigger.
In the second PLC meeting, I modeled how to focus on student thinking by comparing the thinking we observed to the thinking we anticipated. My intent was to help my team
members more fully understand and interpret student thinking and to use that thinking to adapt
their instructional moves while teaching. In the beginning of this quote, I was analyzing how a
student was adding, noticing a partial conception in his regrouping process. Then I moved to
addressing an instructional move I wanted to make by using place value blocks since this
student’s preferred method for adding involved the use of place value.

One kid got 179 instead of 180. Cuz he was like adding by tens. Well, then, I guess I will
just have to take my friend aside. I’m going to just pull blocks and just start with
manipulatives and then see if he can represent that with numbers.

In the same meeting, we discussed the thinking of another student who was also dealing
with the interaction of place value knowledge and multi-digit addition. I observed that a student
knew that his drawing of 16 tens was the same as 100 plus 6 tens, so I wondered if posing a
problem with larger numbers would cause him to represent his thinking more abstractly with
expanded notation.

I wonder if next time we could get him to draw the hundreds separate. But this is a good
strategy. He knows that there’s like 10 that he had to draw there, like 16 tens … I would
love to get them to this one. Okay. Really expanded form but I think we still need just a
minute to play with addition still. Okay. With I think we need to use larger numbers. I
think we need to push ‘em a little bit.

In the third PLC meeting, we had moved on to a different standard, fraction number
sense, but I still saw myself modeling teaching practices that involved making instructional
moves based on observed student thinking. However, my leadership moves were different
because I was responding to explicit questions my team members posed about what to do with
certain students’ thinking. In other words, I was not just modeling teaching practices based on
inferences I made about my team members’ needs, but now I was using modeling to answer their explicit questions and also asking them questions to elicit more participation from them.

In this segment, I was responding to Kate’s (teammate pseudonym) question regarding a student who was trying to determine if 2 wholes and 8/4 were equivalent. Heather had shared a move she made with her class to support their thinking about a similar situation, so I shared an adaptation of Heather’s move with Kate.

And then you could ask them, “Well, what’s the size of the piece? How many pieces are in the whole?” And hopefully they would get to like, “Well, we didn’t cut anything. It’s just the one whole thing.”

Kate continued posing questions about equivalency with fraction. Rather than giving her and my other teammates the direct answer, I thought posing a question to them about a task would help them generate more thoughts on how their students might think about this topic which would then support their own instructional moves. This segment deals with helping students recognize that one whole can be represented with fractions that have the same numerator and denominator.

I don’t know if it’s too far to go into … like if your wholes are cut into halves. We kind of did this with the equivalent fractions. Right? Talking kind of about what you said or even, I mean, we could even just do it with just one of these just one whole splitting it in half and just saying like, “How much of the brownie do I have?”

In summary, the mentor role involved quite a bit of modeling for my teammates. This modeling looked different over the three PLC meetings. In the first and second PLC meetings, my mentoring focused on instructional practice. In the third PLC meeting, my mentoring
changed because they had specific questions about the mathematical content being taught, therefore, I adapted the modeling I used based on their needs.

**Collaborator Role**

Leadership in the collaborator role focuses on sharing ideas with teammates as if the leader were simply participating as the other team members do. Collaborating in this way appears similar to mentoring but differs as to intent. In mentoring, my intent was to teach something to my novice team members that I did not think they knew, i.e., to model an unfamiliar teaching practice. In collaborating, I was sharing my ideas as part of the normal sharing all team members are expected to do.

An example of collaborative sharing occurred in the first PLC, when I anticipated how some students might additively compare 202 and 220.

I did three [strategies]. Okay. So I did counting up with fingers like 200, 2, 3, 4, 5, 6, 7, whatever. Then I guess and check, like I thought, okay, they’ll start with 202 and like add 10 more. Get to 212 and then add … 8 more and see that that would be 220 or something.

This was just part of our PLC process, coming up with anticipated student thinking and then sharing it. Here, I was sharing how I thought a student would solve a comparison math problem as a collaborator, not intending to model or teach. It might seem difficult to distinguish this collaborative comment from a mentoring one but in my mind, it was clear that I was not trying to teach my team members something new.

In the second meeting, I was talking about the same task as above, in which we were comparing 202 and 220.

Yeah, I had standard just like you did and number line for the second one. For the second one, I also had counting up or for the comparison, I should say they started at 202 and
then counted up to 220.

Again, this segment is no different from what my teammates could have said.

In the third PLC meeting, the mathematical content changed to fractions. However, I was still focused on sharing the observed thinking of my students as they were representing various fractions on a number line with no intent to teach something new. In this case, I was discussing the placement of 8/4 and 2/1.

I think I have a couple [students] that were really comfortable with 8/4, identifying it as 8/4 [on a number line], but that 2 over 1, some of them were like, “I don’t really understand what’s happening.” And I think part of the problem was visually there were like all the tick marks on the number line [which made them confused].

This sharing of ideas that compared the thinking we observed to the thinking we anticipated seeing was something each of my teammates did along with me.

Returning to the second research question, I did not notice a significant change in the collaborator role across the three PLC meetings. Each time I acted as a collaborator, it was to share my students’ thinking or to participate in a way that any teammate could, like reading the task out loud or providing a page number.

Facilitator Role

The role of a facilitator is to promote positive working relationships. I decided that keeping our team focused on the PLC agenda would be an important way to promote such relationships. I believed this would promote positive relations because it honors everyone’s time and allows us to continue our collective commitments to our students through PLC discussion. I was explicit about our goals for each PLC meeting. If we were running out of time, I would tell my teammates that we could make note that we could finish the conversation in our next PLC
meeting. If anyone made a significant number of off-topic comments, I would gently bring the discussion back to the agenda.

In the first PLC meeting, I introduced our goal to design a task to launch our addition and subtraction unit. That also meant we were to work through the problems ourselves and then anticipate thinking from students. “The first step that we take is going to be to create a task, try solving it on our own and then sharing those ideas and then anticipate strategies we’d see from our students.”

In the second PLC meeting, keeping to the agenda looked like diverting my team back to designing a task after discussing some of the materials we would need for instruction. In the following example, I was trying to transition my team from discussing in-depth the materials we need in our classroom. While the idea is important, it was not what was listed on our agenda at that time, so I wanted to put our focus back on the student thinking we saw, summarize our next steps, and move forward with our meeting.

Let’s start with a problem with bigger numbers that might help them as they do. If we’re trying to push them away from some of these little direct modeling pictures, um, and push them towards expanded form. Maybe that’ll help because it might get hard to draw a lot of pictures.

Lastly, in the third PLC meeting, keeping to the agenda involved making a note that we needed to continue talking about equivalent fractions on another day as we were running out of time in our meeting.

I think Monday we will finish up 2.2 and the number lines and then the rest of the week is just comparing fractions, which I think we should talk about Monday if you guys are okay with it.
I did this because, as facilitator of the meeting, it is my job to keep the meeting on topic and honor everyone’s time, which means ending at the appropriate time and making note of what we will talk about in the following meeting.

The nature of my leadership in the facilitator role looked like helping my team follow our agenda by referring back to it during the meetings so that our meetings could be focused. This facilitation supported accomplishing all that we had planned out and as the team leader, I felt like it was my responsibility to provide this kind of leadership to work in a timely manner.

**Quantitative Comparison of Roles Across PLC Meetings**

The number of segments related to each role was tabulated and relative percentages computed for each PLC meeting and is portrayed in Table 2. These data were used to address both research questions.

**Table 2**

*Relative Number of Segments per Leadership Role Across Professional Learning Community (PLC) Meetings*

<table>
<thead>
<tr>
<th>PLC Meetings</th>
<th>Broker</th>
<th>Mentor</th>
<th>Collaborator</th>
<th>Facilitator</th>
<th>Total Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Meeting 1</td>
<td>3 (4%)</td>
<td>41 (52%)</td>
<td>17 (22%)</td>
<td>17 (22%)</td>
<td>78</td>
</tr>
<tr>
<td>PLC Meeting 2</td>
<td>4 (15%)</td>
<td>15 (58%)</td>
<td>2 (8%)</td>
<td>5 (19%)</td>
<td>26</td>
</tr>
<tr>
<td>PLC Meeting 3</td>
<td>1 (6%)</td>
<td>9 (53%)</td>
<td>3 (18%)</td>
<td>4 (24%)</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>8 (6%)</td>
<td>65 (53%)</td>
<td>22 (18%)</td>
<td>26 (21%)</td>
<td>121</td>
</tr>
</tbody>
</table>
In addressing the first research question related to the nature of my leadership, the table clearly shows that mentoring was the most frequent role in which I engaged, comprising a little more than half of all segments. About a fifth of my moves involved the collaborator role while about a fourth of my moves involved being a facilitator. The role of broker appeared the least frequently.

The change of roles over time is also exhibited in Table 2. The percentage of segments for each of the roles were relatively the same over the three PLC meetings. However, the number of segments changed over time. In the first PLC meeting, I had a total of 78 segments. This is understandable because this was our first meeting using the modified approach, so more leadership moves were needed to guide my team through the process. By the second PLC meeting, my segments had decreased to 26 and the third saw another decrease to 17. Over the course of the three PLC meetings, the total number of leadership segments decreased. Changes also occurred within the specific roles. The role of broker saw an increase in the second PLC in relation to all the other segments. From the first PLC meeting to the third PLC meeting, there was not as big of a need to broker connections because we had acquired the necessary classroom materials and had a communication procedure in place by the third PLC meeting that allowed for opportunities outside of the meeting to communicate with other stakeholders in the building (special education teacher, administration, and instructional coach). The mentor role consisted of the most segments but decreased over the three PLC meetings. The collaborator role saw a decrease over the three PLC meetings. The facilitator role remained consistent between all three PLC meetings, accounting for between a fourth and a fifth of all segments. This table demonstrates the change within the roles between each PLC meeting, particularly in the roles as mentor, collaborator, and facilitator.
Current practice around PLCs (DuFour et al., 2016) is touted as one means of encouraging teachers to reflect on their practice. The role of the team lead in PLCs, in guiding teacher reflection, directly impacts the success of the team in improving practices to increase student learning (Eaker & Keating, 2009). One of the flaws with the current PLC process is teachers can engage in the process without attending to student thinking and its connection to practice. Because of the importance of applying student thinking in instructional design, leaving that out of the PLC process hinders the potential opportunities for teacher collaboration and reflection. This self-study on my leadership within the modified PLC adds insight into the manner of supporting my team to bring student thinking into the process and in turn their practice. Examining my leadership through the lens of the four roles outlined by Muijs and Harris (2003) adds nuance to the literature on leadership within the PLC by explaining how I learned to engage my team in utilizing student thinking in their practice. Through this research, I was able to understand my work as the team lead and identify the nature of and change in leadership over the three PLC meetings.

Nature of Leadership

The first research question focused on the nature of my leadership in my team’s PLC meetings. I will address the nature of leadership by discussing each of the roles in service of student thinking.

The nature of the broker role focused on making connections to other educators on our school campus. The broker role helped me see that being a team lead meant connecting my team to accessing necessary resources we would need to support our students’ thinking. I operated as a
broker between my own PLC and others to meet the needs of my teams’ students. This brokering aligns with the discussion York-Barr and Duke (2004), connecting multiple PLCs across the work, but my efforts were in the service of student thinking. Additionally, I needed to broker a connection with our principal, special education teacher, and instructional coach to gather materials and communicate about our students’ thinking to better design instruction. The role of broker created a bridge of communication externally to our PLC to help my team ensure that we would have the necessary tools and resources to support our students’ thinking.

The nature of leadership through the mentor role consisted of modeling specific practices around student thinking. Modeling in this role included the way I pushed my teammates to look at multiple student strategies and how we discussed the sequencing of student thinking for a share out of strategies. Additionally, I modeled potential questions to ask students during instruction and how to use student thinking from a lesson to create subsequent tasks to pose to students. I felt the need to mentor because I was working with two novice teachers who were not yet experienced in applying student thinking in their instructional design. The role of mentor focused so much on demonstrating how to attend to student thinking because I felt like my team saw me as a “critical friend” as described by Eshchar-Netz and Vedder-Weiss (2020). The purpose of a “critical friend” (2020) is to support the team in engaging in meaningful inquiry about practice. While I felt like my team saw me as the more experienced teacher on our team, I did not want to tell them how to teach but wanted to engage them in their own inquiry on best practices which I think I did through the mentor role with modeling and questioning about student thinking. I tried to lead in this manner to support my team as they learned to take up the practice of inquiry-based teaching.

The nature of leadership through the facilitator role was in holding tight to our PLC
agenda to honor our discussion around student thinking. My goal as the leader was to establish the focus on student thinking as the common purpose of our meetings. I felt strongly about this because my novice teammates were participating in a PLC for the first time. This idea of establishing a common purpose was discussed by DuFour et al. (2016) in reference to the importance of leaders helping their teams create a clear vision for their work together. Therefore, this form of leadership allowed our team to keep our goals centered on student thinking.

The nature of leadership through the collaborator role was in discussing student thinking and keeping that perspective as the focus of our discussion points. When I was in the role of collaborator, I shared insights from my own students and the strategies I saw them employing in their mathematical understanding. This demonstrated to the team that I was equally accountable to them in focusing on my own students to improve my practices. This aligns with what was discussed by Kanold et al. (2018) when they outlined leadership strategies that emphasized a common purpose and mutual accountability.

These learnings about the nature of my leadership from the four roles show that my leadership consisted of adjusting my support depending on what was needed in order to help them take up student thinking. Leadership then in a PLC needs to be able to move flexibly between the roles and to be able to adjust according to team needs. It is also critical for the team lead to be able to recognize what is needed by the team to engage in student thinking in their teaching practice and what discussions within the PLC process will support that learning.

**Leadership Change Over Time**

While leading the PLC meetings, I attempted to use my team members’ thinking about their student’s thinking to guide my leadership of our PLC work with the hope that they would learn to use their students’ thinking to guide their instruction. Each of the four roles manifested
themselves in varying ways, however they changed over time as my team began to take up student thinking in their practice. The nature of the specific moves I made as a leader changed across the three meetings as I discerned the needs of my team members.

In the first two collaborations, my mentor role seemed to focus on best practices relating to providing appropriate tasks such as selection of tasks, what number selections to use, how to structure a whole class discussion, and what questions to ask during student work time and the whole class discussion. Whereas the mentoring in the third PLC really came from questions my teammates had asked specifically about their own students’ thinking in relation to the mathematical content. Instead of modeling what I thought my team needed, I modeled based on their questions about the mathematical content being taught. This adds to the research of Eaker and Keating (2009) who found that team leads who demonstrate strong pedagogical knowledge develop trusting relationships with their team members. After working through good teaching practices in the earlier two PLC meetings, I shifted to focusing on mathematical content because that was what my team specifically asked for which showed that they were trusting me to support them in discussing their own content knowledge in relation to student thinking. PLCs need a team lead who is both strong in pedagogical understanding and mathematical content knowledge to be successful in supporting teachers to attend to student thinking in their practice (Ball, 2001; Carpenter et al., 2015).

This change in mentoring is also evident in the quantitative analysis. The relative similarity in the number of segments represented by the mentoring role in each PLC meeting is probably due to the fact that my teammates were novices who were in need of the consistent benefit my experience could provide. After the first two PLCs my teammates had gained enough experience in engaging in this process that the modeling I exhibited shifted from modeling how
to engage in student thinking, to modeling how to engage with mathematical content. My team did not need as much leadership in mentoring from me as we worked through the modified approach throughout the year. It seems like my teammates needed more mentoring in the beginning as they were learning this process. This supports the strategy discussed by Kanold et al. (2018) that leaders need to foster a trusting environment to increase collaboration. I surmise that the change in my mentoring role may have been because my teammates felt comfortable to share their thoughts and therefore required less mentoring. Another component of this shift was likely due to the nature of the change in mathematical content being taught, going from addition and subtraction to fractions. My teammates were less comfortable with fraction content and how kids think about fractions and asked for more learning in that unit. On the other hand, I surmise the decrease in the use of the collaborating role resulted from my recognition that my teammates did not seem to need someone to collegially collaborate with them in order for them to share their views independently. They were learning to collaborate themselves. As a collaborator, I focused on sharing ideas any teammate could in all three PLC meetings but reverted more to that mentor role to interpret what we were collaborating about. The role of broker saw an increase in the second PLC in relation to all the other segments because of the need to consistently collaborate with the special education teacher who shared instructional responsibility with us for a handful of our students. The number of segments devoted to the facilitator role remained pretty consistent between all three PLC meetings no doubt due to the need to have someone provide the leading of the team through each meeting’s agenda.

Each time I acted as a collaborator, it was to share my students’ thinking or to participate in a way that any teammate could, like reading the task out loud or providing a page number. This makes sense because the role of the collaborator is to engage in conversation, collegially. I
would not expect the nature of my collaboration to differ across PLC meetings because when engaging in the collaborator role I temporarily did not function in any real leadership way; I was not mentoring, facilitating, or brokering. I was just doing what the rest of the team did. Therefore, I would not see any real change except for the fact that the purposes of the meeting changed. Because of my moves as a collaborator, consistently sharing the observed and anticipated student thinking in my classroom, my teammates also shared their student thinking. This strategically informed their instructional decisions. This finding harmonizes with the work of Eaker and Keating (2009) who suggested that the degree of success experienced by members of a PLC in terms of promoting student learning is directly related to the moves made by the team lead. The first PLC meeting focused on anticipating thinking, so my collaborative moves were about anticipating. The second PLC meeting focused on comparing observed thinking to anticipated so my collaborative moves were about that. The third PLC meeting also focused on observed thinking, but the topic was fraction number sense so, of course, my collaborative comments were about fractions. But in all three meetings, my collaborative comments were no different than the comments of my team members, thus keeping the focus on student thinking.

While analyzing the three PLC meetings, something I found interesting was how much more my teammates were communicating in the third PLC and the nature of their communication. For example, I was really impressed with the quality of questions from one of my teammates in the third PLC. The vulnerability she displayed is something I did not have as a first-year teacher. In that third PLC, she sought to really understand the mathematics and how to support her students’ thinking in our meeting and kept asking questions to clarify her own understanding and to get instructional ideas. Likewise, my other teammate shared more comments that felt like a mentor. This teammate seemed to grow in her self-confidence in our
PLC meetings and both teammates felt valued enough to share their instructional strategies with our team in hopes that it would positively impact our students. This leads me to believe that the modified approach to the PLC process created an environment in which my teammates believed they were in a safe place. Additionally, the four roles that I engaged in as a team leader helped our team learn to trust one another and forge the positive relationships that created this safe space.

**Implications for Future Research**

Additional insights regarding the leadership of PLCs, and particularly the modified PLC process is needed to support the effectiveness and implementation. This includes researching the nature of the modified approach to PLC over the course of multiple years and how that might support the development of generative growth of each of the team members. Additionally, more research is needed on how PLCs change over time as they engage in this modified PLC process and how the roles within the different members of the PLC potentially change over time. It would be interesting to see how the team leader’s role adapts and changes as the team grows together in their collective inquiry and professional learning. Additionally, the conversations with the instructional coach, special education teacher, and principal bring up the question about research into team makeup. Instead of a team consisting of just grade-level teachers, research is needed on how including the special education teacher, instructional coach, and/or principal in the PLC process supports the work.

One key aspect of this self-study was my experience with both the research in student thinking and pedagogical moves in inquiry-based instruction. More research is needed to uncover how much and what type of experience is needed in these areas for a team lead to successfully lead a team to improve instruction and learning.
Implications for Educators

PLCs are a popular method to support collaborative work amongst teachers in many school districts. Continued work is needed to improve the learning and opportunities for teachers within their PLCs. As a leader, I learned the purpose behind the leadership moves I made and better understood how to support my team in their application of student thinking. This work on the leadership role in the modified approach to PLCs is a positive step toward understanding how to help lead teachers to make a more specific use of student thinking in their instructional practice. This work gives insight into how schools and school districts that seek to implement the PLC model can use the modified PLC process to engage their teachers around student thinking to improve mathematics instruction. Since two of the teachers were in their first year of teaching, this study also indicates roles a leader may play to support new teachers to engage in mathematics instruction in this manner. PLCs in this manner provide coaching and mentorship to improve pedagogical and content knowledge as a team, especially for new teachers.

My experience in seeking greater math pedagogy, through a math endorsement and math coaching endorsement, gave me a strong foundation in student thinking. I was able to apply this foundation in my role as team lead in my PLC. School districts can provide training and support for team leads to increase their foundation in math pedagogy and increasing understanding in student thinking. This could be supplemented with training on how to effectively lead a modified PLC. This will result in stronger team leads that can guide PLCs to greater teacher reflection through applying student thinking.

Limitations

This work is limited to the experience of one team lead in applying a modified PLC approach. More research needs to be done to evaluate the role of the team lead and the use of the
four leadership roles in effectively focusing PLCs on student thinking. It is possible that the four leadership roles could be used in more effective ways to improve teacher practices in applying student thinking. However, this work does add to the existing literature by providing a meaningful example of analyzing leadership in applying student thinking through the modified PLC process. This can serve as a guide for team leads who want to improve the practices of their teaching through greater reflection and application of student thinking.
REFERENCES


https://doi.org/10.1177/0013124504270787

https://doi.org/10.1177/105268461602600604

https://doi.org/10.1007/0-306-47201-5_8

https://thecollegesolution.com/act-test-results-for-the-class-of-2013/


Solution Tree, Inc. https://allthingsplc.info/team-leaders-in-a-professional-learning-community/#:~:text=Team%20leaders%20must%20have%20excellent,by%20skill%20and%20relentlessly%20and%20continually!


http://dx.doi.org/10.1016/j.tate.2014.06.003


https://doi.org/10.1177/0263211X030314007


https://qualitativeinquirydailylife.wordpress.com/about/


https://doi.org/10.3102/00346543074003255