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Exploration of the Use of Computer-Mediated Communications to Support the Face-toFace Collaborative Efforts of a Sixth-Grade Professional Learning Community

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DEDICATION

For my sons, Michael and Matthew, the very heart and soul of my existence. Always remember that NOTHING is out of your reach. Don't you EVER doubt who you are and what you can become. Words cannot express my love for you both.

To my mother, more than any other person, you have always believed in me, even when I found it hard to believe in myself. You taught me how to handle all of life's ups and downs like a beast! Know that I will always LOVE YOU BIGGER!

To my husband, Tad, my forever Soulmate. I stumble to find the words to describe all that you mean to me. You once gave me a locket engraved with "*Draw strength from your accomplishments. From me, draw strength for those accomplishments not yet achieved*". Little did you know how much strength I would need from you! You have never let me down. Thank you for making us amazing.

Grandpa, I'll never forget the old typewriter and the encouragement that came with it. I did it! But you never had a doubt, did you!? I love and miss you tremendously.

And lastly, This is to all those things throughout my life that have ever tried to get in my way:

I'm not gonna run from the scars from within, burning my skin
They wanna lay me to rest, but I won't go, no I won't go
I wanna stand up, a hundred feet tall
'cause fear will never lead my way
I'm ready to run, a hundred miles strong
I will never be the same
Waking the lions in me
I'm waking the lions in me
~ Pop Evil

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ABSTRACT

Noting the lack of resources to meet face-to-face, most notably time, a significant body of research has investigated the use of computer-mediated communication (CMC) to replace face-to-face interactions of teacher professional learning communities (PLCs). Equally noted is the research on social constructivist theory that supports social interaction as the foundation of learning (Vygotsky, 1978). The purpose of this qualitative case study was to determine how a successful sixth-grade PLC leveraged available technologies in support of their face-to-face collaborative efforts by answering the following research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts? The case study investigated a sixth-grade PLC whose authenticity was solidified in 2016 as part of their earning the nation's first ever Learning Forward School designation. This required the sixth-grade team to undergo a rigorous, on-site external review of their professional learning practices by the school improvement-focused Advanc-ED® organization. Data for the case study was collected through a semi-structured group interview, participant-observations of face-to-face interactions, and the collection of artifacts from the online platforms utilized by the PLC. Using a thematic analysis approach, several themes emerged related to participation, access, structure, leadership, time and participant preferences.

Based on the findings, a district plan of action was created that included participation from all levels of leadership in providing adequate resources, including time, training and technology, to formulate successful teacher learning environments.

The resources, as well as ongoing leadership involvement, form the basis of the action plan that aims to implement well-structured PLCs that utilize CMC in the most effective ways to support necessary face-to-face collaborative activities.

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LIST OF ABBREVIATIONS

ALN ..... Asynchronous Learning Network

CMC..... Computer-mediated Communication

MKO ..... More Knowledgeable Other

MS365..... Microsoft Office365

oCoP..... online Community of Practice

oPLC ..... online Professional Learning Community

PD ..... Professional Development

PDSA ..... Plan, Do, Study, Act

PLC ..... Professional Learning Community

RMS ..... Ruku Middle School

SELMS..... Schoology Enterprise Learning Management System

SLO ..... Student Learning Outcome

TIS..... Technology Integration Specialist

vCoP..... virtual Community of Practice

vPLC ..... virtual Professional Learning Community

ZPD ..... Zone of Proximal Development

CHAPTER 1

INTRODUCTION

Chapter one serves to provide an overview of the action research conducted as part of the dissertation process. The study investigated how Riku Middle School's (pseudonym) (RMS) sixth-grade professional learning community (PLC) utilized available computer-mediated communication (CMC) resources to support their face-to-face collaborative efforts by investigating the following research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts?

Within a mere couple of decades, people have seen the capacity to move from passive, read-only interface (Web 1.0) to the ability to be actively involved, collaborate and synchronously communicate (Web 2.0). Web 2.0 tools allow opportunities for interaction that support social constructivists theories of learning through CMC, where participants can interact using digital resources such as emails, discussion forums and collaborative documents as ways to both support each other's learning and forge personal relationships (Silvers, O'Connell & Fewell, 2007). The ability to communicate and collaborate via CMC has certain advantages that allow this type of interaction, including being both time and place independent and affording teachers opportunities to participate anywhere at any time, to overcome issues faced by co-located communities (Hawkes & Romiszowski, 2001). However, computer-mediated interactions have drawbacks including the impersonal nature of online interactions, feelings of isolation and inconducive structures for collaboration that allude to the negative aspects of creating

completely digital interactions (Hutchinson & Colwell, 2011; Huang, 2001). The idea that CMC can support, rather than completely replace, face-to-face interactions could address issues encountered in both online and face-to-face environments.

The direct observation of RMS's successful teacher learning environment in contrast to what has been directly observed at other district schools, feedback from the school's technology integration specialist (TIS) and curriculum coordinator at RMS, and RMS's recognition by national organizations as an exemplary teacher learning school formed the basis for the problem of practice (PoP) of this study. Further, in conjunction with these observations in a middle school within Bakingu (pseudonym) School District, recognition and feedback, in-district survey feedback suggest that schools within the district face the challenge of having available time within scheduled meetings to carry out collaborative activities. This mirrors data from a Bill and Melinda Gates Foundation (2014) national survey of educators who report that time, as well as time management, are problematic to success.

Overview of the Topic

The common thread that weaves its way through evidence-based best practices for professional learning is collaborative efforts among participants. Promoted by their Standards for Professional Learning, the Learning Forward (2011) organization outlines effective PLCs as those that develop collective responsibility, have leadership that implement structures and systems that support teacher learning, engage teachers in active learning, and work towards a shared vision. It also defines essential tasks within a PLC as those that incorporate shared decision making, group task work, data analysis, peer feedback and in-depth discussion (Learning Forward, 2011). In support of these tasks, face-to-face collaboration is known to promote essential social interactions that foster

relationships in which teachers feel comfortable engaging in honest and open dialogue, promote risk-taking, and support celebration of successes as well collectively work to overcome failures (Peterson, 1994; Kim and Kim, 2008), all of which contribute to successful teacher learning environments (Stoll, Bolam, McMahon, Wallace & Thomas, 2006). It is also increasingly becoming a preferable method of teacher learning with 67% of teachers responding on MetLife's 2009 Teacher Survey that they feel collaboration is essential to their and their students' success (Markow & Pieteres, 2009).

These crucial interactions among team members requires an effective PLC structure to exist that must attend to several factors that fall under the umbrellas of leadership, resources and outcomes. Leaders ensure that a strong emphasis on professional learning is valued and ongoing, ensuring that adequate resources are provided to achieve success (Learning Forward, 2011). Adequate resources that include human, fiscal, technology and well-organized time, must be prioritized and outcomes of professional learning constantly measured (Berry, Daughtrey & Wieder, 2009; Killion & Roy, 2009; Learning Forward, 2011; von Frank, 2008). However, barriers exist that thwart success of learning communities including lack of time, poor structure, and failure of involvement by leadership (Carpenter, 2015; Levine & Marcus, 2010; Markow & Pieteres, 2009; Ohlsson, 2013; Plauborg, 2009; *Primary Sources*, 2012; Sims & Penny, 2015; Tallerico, 2014). The lack of time for PLCs to meet and poor time management among PLC participants are reported as major roadblocks in carrying out PLC activities that increase success (Bill and Melinda Gates Foundation, 2014; von Frank, 2008; Wei, Darling-Hammond & Adamson, 2010). Additionally, responses from open-ended questions on a 2014 assessment survey of the district's 1:1 digital initiative included statements addressing time constraints and, most telling, that teachers feel strongly that

time to collaborate with peers is the most beneficial aspect of their professional learning experiences (reference omitted to ensure confidentiality of participants).

With rapidly advancing technology's ability to support collaboration in virtual arenas, moving PLC activities to online venues, either in part or in whole, has become a viable solution for teacher professional learning, especially for those teachers who struggle with finding adequate time to participate in face-to-face meetings (King, 2002). Research has indicated that there are many benefits in utilizing CMC resources, many of which parallel or are even more beneficial than carrying out some activities face-to-face, including an increase in learning time, a broader exchange of information, and more meaningful critical reflection (Blitz, 2013; Huang, 2002; Liu, 2015; Schlager & Fusco, 2003).

Conversely, online collaborative environments are not without negatives, including lesser cohesion among participants, decreased satisfaction with learning and a lack of motivation to engage with peers compared to face-to-face collaborative activities (Blitz, 2013; Huang, 2002; Schlager & Fusco, 2003). In addition to the many benefits of traditional PLCs and the preference of teachers for the personal and cohesive nature of face-to-face interactions, the fact that teachers spend most of their workday in isolation from peers makes it essential that teachers have time to meet with their colleagues for collaborative activities (Blitz, 2013; Huang 2002). However, with districts struggling to provide adequate time during the workday for teachers to meet and to use that limited time effectively, investigating how CMC is used in conjunction with traditional PLC time was a worthwhile investigation and the completed action research assisted in understanding how CMC was utilized by the PLC to address known issues by using CMC as a means of extending and supporting their collaboration and learning efforts.

Statement of the Problem

Several traits must exist for a PLC to be effective. These include shared values and vision, collective responsibility, collaboration, critical reflection and individual and group learning (Killion & Roy, 2009; Learning Forward, 2011; Stoll et al, 2006). The lack of available time for teachers to meet in their communities creates significant roadblocks for team members to effectively participate in these essential collaborative activities (Feger & Arruda, 2008; Stoll et al, 2006; von Frank, 2008). Additionally, the inability of school leadership to attend face-to-face meetings contributes to their disengagement from PLC activities, creating a negative impact on the resources and goals of the community (Carpenter, 2015; Sims & Penny, 2015; Tallerico, 2014).

Bakingu is no exception to these issues. As observed by the researcher, average time for teacher collaboration across district schools averages one to two forty-minute periods per week. During these limited meeting times the researcher often noted the time management issues leading to the lack of critical, structured activities including participatory learning and collaborative undertakings.

RMS experiences similar issues where, although they have twice the meeting time of other schools in the district, time for teacher learning falls below the fifteen percent of a teacher's work week recognized by Learning Forward (2011) professional learning organization's minimal time for maximum impact on teacher learning. In addition, related arts teachers, special education teachers and counselors, who have a stake in student behavior and growth, have schedules that preclude them from becoming involved in face-to-face meetings. Further, RMS leadership, that is tasked with oversight of the sixth grade teacher team as well as student behavior and growth, rarely have time to attend PLC meetings due to scheduling and duties that conflict with meeting times.

Educators in schools where concerted efforts have been made to carve out sufficient time for well-planned collaborative professional development (PD) have remarked that the time to work with peers made a significant impact on their teacher practice and on student achievement (Berry et al, 2009; Roy, 2008). Recognizing the importance of this critical learning time, RMS's principal ensured that the school's learning communities were given sufficient time to meet each week. This was done by scheduling entire grade levels to attend related arts classes simultaneously, freeing up the content area teachers to attend meetings together.

Time that is currently dedicated to teacher learning are considered by both Learning Forward (2011) and teachers within the district as inadequate to carry out necessary collaboration. During visits to district schools, both teachers and instructional coaches commented on the limited amount of time available for PLC activities. The current focus within the district for PLCs was completing the State required Read to Succeed courses that left very little time to conduct activities related to successful PLCs, including collaborative tasks. Therefore, the focus of this study was to understand how the use of CMC resources by an established PLC provided a means of extending and supporting collaboration that addressed issues faced by PLCs.

Purpose of the Study

The purpose of this qualitative case study was to explore and understand how CMC played a role in providing support for the collaborative efforts of the sixth-grade PLC at RMS by targeting the following research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts? The justification for choosing this specific community is based on a triangulation of information; direct, informal observation by the intended researcher,

feedback from an established PLC member, and the school's recognition as a Learning Forward Learning School for the school's commitment to an effective and continuous cycle of teacher learning (Learning Forward, 2016).

Frequent visits to each school in the district are part of a regular routine as the director of instructional technology for the district, including RMS. Informal observations of PLC activities have shown that RMS has a noticeable use of technology resources that outpaces other schools' PLCs regularly visited by the observer. Further, regular coaching meeting discussions with RMS's technology integration specialist (TIS), who is a member of the sixth-grade PLC, have shed light on how current district provided technology resources are utilized by the school's PLCs. Lastly, national recognition as the Learning School designation, is only awarded after a rigorous accreditation process devised by Learning Forward and Advanc-Ed®, two national organizations deeply committed to effective teacher and student learning.

Ubiquitous access to technology resources has the potential to extend collaborative efforts beyond the limited time available for face-to-face interactions, resolving issues faced by districts in finding available time to carry out PLC efforts effectively (Tallerico, 2013; Veerman & Veldhuis-Diermanse, 2001). Using CMC for asynchronous and synchronous work efforts can allow time and shared access to materials outside of structured PLCs to complete individual or small group targeted tasks, thereby easing demands of face-to-face meetings (Jonassen & Kwon, 2001). In turn, the use of CMC can allow limited face-to-face meeting time to be focused on collaborative teaching and learning activities and efforts that require critical face-to-face interactions (Jonassen & Kwon, 2001).

The study of RMS's successful PLC provided a good model to investigate and duplicate for those district PLCs struggling with known issues. The researcher intends to work with other administrators in the district to incorporate the successful strategies used by the RMS PLC into the overall professional learning plan of the district.

Rationale for the Study

Research on collaborative models of professional learning show that they increase teacher effectiveness more than any other form of PD as well as provide opportunities for teachers to participate in the much-preferred active learning environments with peers (Berry et al, 2009; Bill and Melinda Gates, 2014; Markow & Pieteres, 2009; National Staff Development Council, 2010). However, lack of time that leads to additional issues of time management, lack of involved leadership and unorganized meetings, is reported as a major roadblock in providing collaborative learning opportunities for teachers. A 2014 survey by the Bill and Melinda Gates Foundation noted lack of time and poor time management as major issues among PLC participants (Bill and Melinda Gates, 2014) In addition, a 2012 Scholastic research study of approximately 10,000 teachers nationwide reported that the average time for teachers to collaborate during the required school day is a mere fifteen minutes (*Primary Sources*, 2012). This is despite school and district leadership recognizing the need for more professional learning time as well as higher teacher job dissatisfaction in schools where professional learning time is minimal (National Staff Development Council, 2010).

The lack of time for teachers to collaborate in PLCs as well leadership's limited time to be involved in both structuring and participating in PLC meetings, makes the attempt to understand how to extend time for effective collaboration and leadership involvement a logical endeavor. With previous research that has spanned over a century

solidifying the idea that learning is constructed socially coupled with more recent research on the positive aspects of the use of technology for professional learning (Vaughan, 2004) the idea that CMC can and should, support rather than replace, face-to-face learning and how this can be accomplished effectively needed attention. Even the United States Department of Education (2014), in their promotion of online communities of practice (oCoPs), notes that participation in online social activities should be integrated with face-to-face interactions as criteria for quality practice.

Because the chosen district has implemented a 1:1 device initiative where every teacher has 24/7 access to a device, an abundance of digital resources, at-school access to a robust Internet connection and job-embedded instructional technology coaching, the use of digital and web-based resources are viable solutions in providing a means of collaboration and communication both during and outside of scheduled meetings that can maximize the limited resources available to create successful teacher learning environments.

The implementation of this study provided important insight on how teacher communities can use CMC resources as a vehicle to support their essential face-to-face collaborative efforts. The use of qualitative research methods allowed an in-depth analysis of face-to-face interactions as well as determined the effectiveness of using digital resources in an established, natural setting.

Theoretical Framework

The main theoretical framework that guided this research is the theory of social constructivism. Constructivist theory can be applied to both face-to-face and computer-mediated interactions, driving research methodology and associated actions on how CMC can support face-to-face efforts.

Social constructivism. Vygotsky's (1978) theory on socially constructed knowledge asserts that social interaction is the foundation of learning. Vygotsky (1978) believed that learning took place on two levels, the first through social interaction that leads to a second, a higher level of individual cognitive understanding. This can be further defined through Vygotsky's (1978) integrally related principles of More Knowledgeable Other (MKO) and Zone of Proximal Development (ZPD). Vygotsky's (1978) MKO principle states the obvious; that a more knowledgeable person can engage another in the learning process and, through social interaction, can guide that knowledge. The MKO is an integral part of Vygotsky's (1978) second principle, ZPD, whereas the learner goes through stages of socially interactive learning until the individual has enough mastery of the knowledge to function independently at the task.

The ZPD encompasses two stages and is defined by Vygotsky (1978) as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (p. 86).

Communities of practice to support social constructivist principles. Although there are many definitions that have arisen on the theory, Jean Lave and Etienne Wegner (2015), who have done extensive research on the constructs of CoP, best define CoP as 'groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly (para 4). Collective responsibility, a direct link between learning, implementation and practice, and the fostering of the creation and sharing of knowledge are the main characteristics of communities of practice (Wenger-Trayner & Wenger-Trayner, 2015).

CoPs take social constructivist theories to another level because it is not merely based on social interaction to increase personal knowledge, but it extends interactions to problem-solving and innovative thinking as they "invent new practices, create new knowledge, define new territory, and develop a collective and strategic voice" (Wenger-Trayner, 2015, p. 6). To distinguish itself as a community from an ordinary group of people or a gathering of like-minded individuals with a common interest, CoP encompass three critical elements: the domain, the community, and the practice (Wenger-Trayner, 2015):

- The domain: encapsulates a deep interest in common knowledge, problem or situation necessary to authentic CoP. There cannot be a sharing of knowledge and collective problem-solving activity if there is no domain focus.
- The community: with social connectivity at the core of learning in CoP, a sense of community is necessary to foster the collaborative effort of the group. A sense of collectiveness in risk taking, accountability and problem solving make authentic learning communities.
- The practice: a focus is essential in carrying out the important, collective tasks of CoP. The interest in a collective goal/outcome keeps members grounded in tasks that will result in the successful outcomes of the group.

Collaborative learning is a noticeable foundational aspect of CoPs. Although definitions of collaborative learning vary across interested disciplines, most interpret it as "a situation in which two or more people learn or attempt to learn something together" (Dillenbourg, 1999, p.1). As directly applied to educational PLC settings, collaborative learning is best defined as "an instructional method in which

students at various performance levels work together in small groups toward a common goal" (Gokhale, 1995, p. 22).

Based upon Vygotsky's (1978) social constructivism, and more specifically ZPD, collaborative learning environments allow the necessary social events that provide the interactions for learning to occur (Dillenbourg, 1999). In collaborative environments, learners build upon what they can already complete independently, allowing an increase in cognitive development based upon interactions with more knowledgeable peers (Dillenbourg, 1999).

Methodology

The goal of educational action research is to bring about change in the classroom, school or district in which the research is being conducted. The cyclical nature of action research, that includes identifying a problem within one's own practice, collecting and analyzing data and then applying the findings that lead to new inquiry, make it a sound approach in educational settings where classroom environments change regularly (Mertler, 2014). Further, because action research is driven by a problem identified and systemically analyzed by the educator within his/her own setting it allows for change to be driven by the educator rather than a 'top-down' administrative approach (Efron & Ravid, 2013).

A case study design was utilized to carry out this action research. Case studies focus inquiry on a specific individual, group or program within real-life context, allowing for deep, authentic data collection (Merriam, 2001). Identifying the case establishes boundaries around a specific phenomenon as well as sample that creates a conducive environment to exam the particular actions of the case (Merriam, 2001). This qualitative case study focused on the experiences of an established sixth-grade middle school PLC

that has been nationally recognized as an exemplary teacher learning model. Specifically, the case study explored the role that CMC played in supporting the PLC's face-to-face collaborative efforts.

A case study does not require specific methods of data collection or analysis, however, qualitative methods are often preferred due to their interpretive versus hypothetical nature (Merriam, 2001). Because of this subjective nature of qualitative research, triangulation is necessary to ensure credibility, therefore, a multi-modal method of data collection was used that included a pre-observation group interview, participant observations in face-to-face environment, and the collection of digital artifacts through unobtrusive measures.

RMS has PLCs for each grade level that meet regularly during the week. Their work focuses on ongoing teacher effectiveness efforts that include collaboration on common lesson plans, assessments, data analysis and the sharing of and reflection on best instructional practices. The team consists of eight teachers, two from each core content area (English, mathematics, science and social studies), one teacher that teachers both science and social studies, the school's technology integration specialist (TIS) and the school's curriculum coordinator who serves as the PLC lead. This specific PLC was chosen for the study due to its noted recognition by both Advanc-Ed® and the Learning Forward organization as an outstanding exemplar of teacher learning practice (Learning Forward, 2016). This qualitative study commenced in November of the 2017-2018 school year with the pre-interview focused on gaining initial insight into this specific community, including its use of CMC. Observations of the PLC meetings focused on participant activities and how CMC resources were utilized both during face-to-face meetings. Unobtrusive measures in the form of artifacts collected from the PLCs online

platform were used to collect information on how CMC was used outside and during meeting times that had an influence on face-to-face activities.

From scrutinized and condensed coded data, a thematic approach to data analysis was used to categorize the data and create an inter-laced, web-like representation of the information (Attride-Stirling, 2001). This categorization and representation allowed patterns and relationships between CMC and face-to-face activities to emerge.

Chapter Summary

Considering issues facing teacher learning communities in carrying out face-to-face activities, the investigation of how an effective PLC uses CMC to extend and support these activities was a worthwhile investigation. The idea that CMC can support, not completely replace, face-to-face activities is based upon the underlying, theoretical framework of constructivist learning principles that can be applied to both face-to-face and CMC interactions. Conducting the investigation using a single case study design, that focused on a specific RMS PLC recognized as an exemplary teacher learning model, allowed for authentic data to be collected in real-life context. My interest in understanding how CMC can support collaboration in a successful PLC will contribute greatly to our school district, and the education community, as we seek to implement the most effective learning communities to support district and state initiatives. The cumulative research analysis will serve to assist in the development of future district teacher learning plans and goals that will include the sharing of best PLC in support of collaborative efforts. An extensive review of the literature was conducted to formulate a solid basis for the study. Laid out in Chapter 2, the review encompasses the theoretical framework of social constructivism, its impact on professional learning, and the use of CMC to support constructivist learning for teachers in their PLCs. Chapter 3 describes,

in detail, the data collection and analysis methods as well as explains the limitations of the study and how rigor, trustworthiness and confidentiality were achieved. Chapter 4 discusses the outcomes of the analysis, connecting it to the review of the literature and theoretical framework. Chapter 5 provides the implications and outlines an action plan based on the data. It also provides suggestions for future research.

GLOSSARY OF TERMS

Asynchronous Learning Network	A structured online environment that allows for communication that is not limited by time or place (Hiltz & Turoff, 2002)
Communities of Practice	A group of people who work collectively on topics of common interest (Wenger-Trayner & Wenger-Trayner, 2015)
Computer-mediated communication	The use of computers to mediate communication between individuals or groups of people who are not co-located (Luppicini, 2007)
Professional learning community	Collaborative group of educators that works towards the common goal of improving student achievement (Dufour, Dufour & Ecker, 2008)
Social constructivism	A learning theory that asserts the basis of all learning is socially constructed and takes place through social interactions (Phye, 1997)
Web 2.0	Web-based resources and tools that allow for user interactivity and connectivity (Anderson, 2012)

CHAPTER 2

LITERATURE REVIEW

Prior to conducting research, a literature review provides a solid knowledge foundation for many aspects of research including theory development, methodology choice and conceptual model creation (Webster & Watson, 2002). During and following research, a literature review can show a depth of knowledge of related subject matter, helping justify research findings and demonstrate preparedness and expertise in having conducted the research (Kumar, 2011). It also assists with selecting research methodologies by understanding methods previously used and determining what works best for future research (Kumar, 2011).

This literature review focused on gathering information on the problem of practice where time and time management were identified as known issues in carrying out effective PLCs. It supports the rationale for the study where CMC was investigated as a viable solution in resolving the known problems in the researcher's district, thereby providing a foundation for conducting a qualitative case study to support the collaborative efforts of teachers in a sixth-grade PLC. It explored how CMC has traditionally been used for teacher learning efforts and, more specifically, to support collaboration among participants to enhance and extend the known benefits of teacher learning. This review of the literature begins by discussing the importance of a literature review as it relates to qualitative case study design and introduces the theories in which the research is grounded, including social constructivism and how the theory relates to

CoPs. Within this framework, the thorough exploration of collaborative activities within teacher professional learning communities supported by CMC assisted in understanding the framework of the conducted research, supported the study design, and assisted in identify gaps in existing bodies of knowledge (Kumar, 2011).

Both theoretical and empirical research is reviewed and presented that support the reader's understanding of the focus of the issues under examination, and the need to further explore the concepts related to the investigation. These included social constructivist and collaborative learning theories, PLCs as effective teacher collaborative learning models, and the use of CMC to support collaborative learning, all of which are examined in support of the research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts? This literature review was conducted between February, 2014 and November, 2017 by using the United States Department of Education's ERIC database, Google Scholar search engine, the University of South Carolina online library collections and the University of South Carolina – Columbia Campus library. The original research was limited to materials from 2010 onward, however, an expansion was necessary due to both the social constructivist framework based upon scholarly work that has spanned seventy-five years, as well as from necessity due to the need to expand on historical and empirical data on collaborative learning to support educator learning.

Professional Learning Communities Defined

Collective responsibility, a direct link between learning, implementation and practice, and the fostering of the creation and sharing of knowledge are the main characteristics of communities of practice in which PLCs are the adopted model within the education community (Dufour & Eaker, 2009; Wenger-Trayner & Wenger-Trayner,

2015). Leading CoP theorist Etienne Wenger (2002), in his book, *Cultivating Communities of Practice: A Guide to Managing Knowledge,* defines CoPs as "groups of people who share a concern, a set of problems or a passion about a topic and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (p. 4). Per Wenger (1998), early social constructivists learning theories formed the basis for conceptualization of CoP theory that assumes that:

> [E]ngagement in social practice is the foundational process by which we learn and so become who we are. The primary unit of analysis is neither the individual or the social institution but rather the informal 'communities of practice' that people form as they pursue shared enterprises over time. (p. 5)

CoP structure rests in the integration of three components of socialization for the purposes of learning that include meaning, practice and community that are "deeply connected and mutually defined" (Wenger, 1998, p. 266). Steeped in constructivist theory, this socialization for learning creates collaborative interactions to increase personal knowledge, promote problem-solving, and generate innovative thinking as communities "invent new practices, create new knowledge, define new territory, and develop a collective and strategic voice" (Wenger-Trayner & Wenger-Trayner, 2015, p. 6).

Although all CoPs share a basic structure, further community design varies within it, meaning, they can reside within a corporation, business or school and the foci of each community is targeted to that specific community's needs (Wenger et al, 2002). This holds true for CoPs within the education community where they are commonly referred to as PLCs. A review of what are considered effective PLCs are based upon CoP

principles including common interests, vision, and goals, a sense of community that fosters collaboration, and participation in collective tasks/activities, are the foundations of both CoP and PLCs (Blankenship, 2007; Dufour & Eaker, 2008; Learning Forward, 2011; Stoll et al, 2006;). Dufour and Eaker (2008), whom are well-regarded authorities on PLCs, define PLCs as "educators committed to working collaboratively in ongoing processes of collective inquiry and action research to achieve better results for the students they serve" (p.14), an explanation that parallels CoP concepts.

The terms are often found to be used interchangeably in the literature with the term professional learning community rarely used outside of the educational setting while the term community of practice, though most notably used in the business world, frequently appears in the literature as related to education (Blankenship & Ruona, 2007).

Social Constructivism as a Theoretical Foundation

To understand the necessary characteristics and structures for authentic and sustainable learning communities, whether face-to-face, online or a combination is to understand the popular, proven learning theory of social constructivism that asserts social interactions are the foundation of learning (Schoen, 2011; Tam, 2009; Vygotsky, 1978). Most notably, Vygotsky (1978) believed learning was both social and personal where cognitive understanding came from social interactions. Vygotsky's integrally related principles of MKO and ZPD assert that a more knowledgeable person can engage another in the learning process and, through social interaction, can guide that knowledge (Vygotsky, 1978). This integrates with Vygotsky's (1978) MKO whereas the learner goes through stages of socially interactive learning until he has enough mastery of the knowledge that he can function independently at the learned task (Vygotsky, 1978).

The ZPD encompasses two of the four stages of learning and is defined by Vygotsky as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Known as scaffolding, the incremental assistance given to a student in the building of his knowledge within the ZPD allows for him to grasp the concept.

Vygotsky's emerging theory of social constructivism was founded on earlier constructivist theories of John Dewey (1897), whose philosophy centered on the idea that education should not be passive. Dewey's (1897) now infamous *My Pedagogic Creed*, first published in The School Journal in 1897, declared in part that:

[T]rue education comes through the stimulation of the child's powers by the demands of the social situations in which he finds himself. Through these demands he is stimulated to act as a member of a unity, to emerge from his original narrowness of action and feeling, and to conceive of himself from the standpoint of the welfare of the group to which he belongs. (p. 77)

Social learning theorists believed not only that learning is a social process, but that the environment in which it occurs influences the breadth and depth of the knowledge gained and the transformation from learning to knowing (Jordan, Carlile & Stack, 2008; Tam, 2009; Vygotsky, 1978). Thus, learners not only require the MKO and the scaffolding of knowledge within their ZPD, they also require a "complex interplay among learners' existing knowledge, the social context, and the problem to be solved" (Tam, 2009, p. 64). Essentially, learners need a collaborative environment in which to construct knowledge and using collaborative PD models creates conducive environments

for scaffolding that "acts as a strong motivator for teacher's ZPD progression" (Shabani, 2012, p. 116).

Although not explicitly stated in the earlier literature by social learning theorists because it is a more recent concept in the education community, PLCs can be a favorable environment for teachers to engage in social constructivist principles of learning that leads to the acquisition of knowledge through knowledge scaffolding, collaboration, shared experiences, and cooperative task completion (Eun; 2008; Lave & Wenger, 1991). This includes the idea that social constructivist principles support the same principles outlined for effective PLCs that include promoting active learning/engagement, peer-to-peer learning, and working toward a common goal (Jordan et al, 2008; Lave & Wenger, 1991; Learning Forward, 2011; Tam, 2009). This is in direct relation to Vygotsky's (1978) assertion that learning, as a social process, requires more than interaction itself, requiring clear goals and collaborative activities (Minick, 1978; Vygotsky, 1978).

The social constructivist framework is outlined to provide a solid foundation for the necessity of face-to-face interactions in teacher learning and the preclusion of moving collaborative learning activities to completely virtual/online environments. Instead, it sets the context for the use of CMC as a means of providing communications that support critical, face-to-face interactions and, more specifically, collaborative activities.

Face-to-Face PLCs as a Social Constructivist Approach to Teacher Learning

An investigation by the National Center on Time and Learning of seventeen schools on the cutting edge of professional learning for teachers, most notably the provision of time for teacher learning, notes that "at its best, teacher PD is organized to engage teachers in deep collaboration and to stimulate peer-to-peer learning. Teachers are more invested when they have an opportunity to reflect, interact with their peers, and

collaboratively problem-solve" (Kaplan, 2015, p. 28). This statement is in conclusion to their research on the schools' professional teacher learning practices, noting that collaboration, reflection and active learning were those most noticeable attributes of the schools' effective teacher learning environments (Kaplan, 2015).

The Learning Forward (2011) organization's sole focus is researching and developing resources to increase teacher knowledge and skills through their development of their *Standards for Professional Learning.* The standards were developed in conjunction with, and is supported by, more than forty professional education organizations, who all identify collaboration, that includes knowledge sharing, active learning, and reflection, as key components of effective teacher professional learning (Learning Forward, 2011), which are in direct relation to principles of social constructivist learning theories (Minick, 1978; Vygotsky, 1978). Numerous other studies have also concluded that these attributes create the most effective teacher learning environments, all of which are notable undertakings of effective PLCs (Brooks & Gibson, 2012; Garet et al, 2001; Hord, 2004; Stoll et al, 2006).

Collaboration. Collaborative learning is steeped in Vygotsky's (1978) social constructivist theory of learning and the idea that learning takes place during social interactions with more knowledgeable others, creating opportunities for collective scaffolding of knowledge (Eun, 2008; Lin, 2015; Vygotsky, 1978). In their systematic review that focused specifically on teacher collaboration, Vangrieken, Dochy, Raes and Kynt (2015) found varying terms for collaboration and subsequently settled on a definition that they believe best defines collaboration in teacher learning environments, that is a "joint interaction in the group in all activities that are needed to perform a shared task" (p. 23). They also found many descriptive terms of collaborative learning in which

they encapsulated into “task-related focus, including working and reflecting together for job-related purposes” (Vangrieken et al, 2015, p. 23).

Although time is the reigning focus when discussing effective PLCs, it is not only the quantity of time afforded for professional learning, but also how the time is utilized, especially in terms of the essential component of collaboration. During his participation in a series of workshops on collaborative learning that included experts from a variety of disciplines such as cognitive psychology, educational science and artificial intelligence, Dillenbourg (1999) reviewed the different approaches to collaborative learning undertaken by the group and determined that “collaborative learning is not one single mechanism” (p. 4). He argues that simply setting two or more people to work collaboratively does not guarantee that additional cognitive operations beyond what could take place during individual learning will be triggered (Dillenbourg, 1999). Conditions must be set into place to “increase the probability that some types of interaction occur” (p. 5), including methods and types of interactions, oversight and guidance by leadership, common goals and the division of labor (Dillenbourg, 1999). Dillenbourg’s (1999) assessment of the necessity of these activities and conditions parallel those encouraged by experts of professional learning in communities of practice including such conditions as engaged leadership, a shared vision, and structural considerations as well as activities that include active participation and knowledge sharing (DuFour, DuFour & Eaker, 2008; Learning Forward, 2011).

As recent research discovers the benefits and impact of collaborative learning, it has become a central theme in the research specific to teacher learning where it has been shown to have a positive effect on teacher practice, motivation and commitment, and increases student achievement (Berry et al, 2009; Cordingley, Bell, Rundell & Evans,

2003; Goddard, Goddard & Tschannen-Moran, 2007; Hord, 2014; Vangrieken et al, 2015). A positive aspect of teacher collaboration is that it can communicate a teacher's individual knowledge and experiences to benefit the good of the group that, in turn, encourages teachers to implement new pedagogical strategies in the classroom (Cordingley et al, 2003; Goddard et al, 2007; Killion & Williams, 2009). The change in teacher practice informed by peers who have implemented successful pedagogical strategies is known to have a positive effect on student achievement, a conclusion of several studies specifically related to a direct correlation between teacher collaboration and student achievement (Goddard et al, 2007; Graham, 2007).

For example, a 2007 study that surveyed 452 fourth-grade teachers across 47 elementary schools found a strong, positive relationship (by one standard deviation) between teacher collaboration and increased student scores on state mathematics and reading assessments (Goddard et al, 2007). The conclusion of the study suggests that students had higher rates of achievement when they attended schools where teachers had increased opportunities to participate in collaborative PD activities focused on curriculum development and instructional practices (Goddard et al, 2007). A 2009 national survey of 1,210 teachers drew a similar conclusion that showed evidence that collaboration among teachers spreads effective teaching practices related to improved student outcomes (Barnett, Daughtrey & Wieder, 2009). This same study showed that 90% of teachers feel that their teaching practice had improved as a direct result of collaborative efforts in their schools and that 79% of teachers reported their commitment to continuing in the teaching practice as a direct result of participating in teacher networking (Barnett, Daughtrey & Wieder, 2009). This same conclusion was drawn from Metlife's Survey of American Teachers (2009). It was further concurred in Barnet et al's (2009) research that

concluded new teachers who had less experience deeply benefited from collaboration with veteran teachers, especially those veteran teachers who were highly satisfied in their careers.

Cordingley et al's (2003) cumulative review of the research on the impact of collaborative PD concluded that characteristics of effective collaborative learning include "processes to encourage, extend and structure professional dialogue that encourages teachers to consider new approaches to teaching practices" and "engage in professional conversations that had them explore their own beliefs" (p. 1). Further, Hord's (2004) research in 22 schools identified five themes that characterized effective teacher team collaboration that included shared values and vision, collective learning and application of that learning, supportive conditions, shared practice including feedback and reflection, and supportive and shared leadership.

These characteristics parallel those that define PLCs, in which collaboration is a key factor to their effectiveness (Graham, 2007; Kaplan, Chan, Farbman & Novoryta, 2015). Therefore, participation in PLCs is a viable method in implementing collaborative activities amongst teachers to inform, implement and reflect on best teaching practices.

Active participation/collective inquiry. As part of his theory on the social nature of learning, Vygotsky (1978) believed that students must participate in active learning environments with peers to gain knowledge (Eun, 2008; Kinnucan-Welsh, 2007; Minick, 1987; Vygotsky, 1978). This idea has been heavily applied to PLCs, where evidence points to the need for teachers to participate collaboratively in engaging, targeted activities and that the "activity becomes the context in which teachers socially construct emerging understanding about teaching and learning" (Kinnucan-Welsh, 2007, p. 279). Active learning, where teachers participate in their own learning in conjunction

with peers, is shown to be more effective than teachers who learn and teach in isolation and have little opportunity to be engaged in learning with their colleagues (Garet et al, 1999).

In a comprehensive and telling study conducted by Jackson and Bruegmann (2009) that used eleven years' worth of data that matched teacher peer learning to student achievement found that small group teacher community of learners were a strong predictor of student achievement. The focus of the comprehensive study targeted how changes in a teacher's peers in their respective learning communities could positively or negatively affect their students' learning. The subsequent data from the study showed a "statistically significant and positive effect" on student mathematics and reading test scores when teachers learned from their knowledgeable and experienced peers in small communities (Jackson & Bruegmann, 2009, p. 13).

Garet, Porter, Desimone, Briman and Yoon (2001) conducted a study to explore the relationship between features of specific forms of professional development and the teacher-reported change in classroom practice. Garet et al (2001) surveyed over a 1,000 teachers who had participated in various forms of professional development carried out over a six month period by the Eisenhower National Professional Development Program. The large-scale, federally funded program was implemented solely for the purpose of increasing pedagogical knowledge and skills of teachers, primarily in mathematics and science. According to Garet et al (2001), the program did not require a specific approach to professional development, thereby allowing a variety of teacher learning approaches in which to draw and compare data including workshops, conferences, peer coaching and collaborative work groups. Garet et al's (2001) research compared features identified in their review of literature as effective with the forms of professional development offered

by the Eisenhower program, measuring participation in specific forms of PD with teacher self-reported changes in classroom practice. The very telling outcome of Garet et al's (2001) research solidifies a larger body of research on the effectiveness of collaborative group effort on positive changes in teacher practice. These included opportunities for active learning and collective participation as part of what Garet et al (2001) refers to as "coherent" in which teacher learning is "integrated into the daily life of the school" (p. 935).

The summary of Garet et al's (2001) study overwhelming stresses the importance of collective participation types of PD for teachers from the same school, grade and/or subject area where the PD "focuses on academic subject matter (content), gives teachers opportunities for "hands-on" work (active learning), and is integrated into the daily life of the school (coherence)" (p. 935). Garet et al (2001) relates the specific PD attributes of active learning, professional communication and collective participation to teacher self-reported improvements in knowledge and skills that positively change classroom practice.

Kinnucan (2007), through her experiences of facilitating and observing teacher learning communities from a constructivist perspective, notes that "We must first acknowledge teachers are learners, and provide ample and meaningful experiences through which they can construct their own understanding of the content of the PD" (p. 280). Hord (2004), a Learning Forward scholar laureate, who has conducted extensive research on effective professional learning and is a strong advocate of the PLC model, is in concurrence with Kinnucan's viewpoint. Hord's (2004) extensive research, including an in-depth study of 22 schools' PLCs, identified active and collective learning as major themes of effective teacher learning.

Kinnucan's (2007) and Hord's (2004) insights are backed by additional research, including one conducted in a *Professional Learning Communities at Work*™ PLC model developed by Robert DuFour (2008) and colleagues. DuFour's (2008) model is promoted as an effective PLC model by AdvancED®, a non-profit school accreditation agency and is based on CoP principles targeted toward educator learning where the structure is defined by DuFour as "educators committed to working in ongoing processes of collective inquiry and action research to achieve better results for the students they serve" (DuFour, DuFour & Eaker, 2008). The outcome of research by Graham (2007), who undertook a mixed methods case study that included surveys and interviews of participants, indicated a strong correlation between a well-structured PLC and teacher improvement including establishing a sense of community and participation in active learning. DuFour's (2008) PLC model is steeped in collective inquiry and shared knowledge that DuFour (2008) asserts allows teachers "to make more informed (and therefore better) decisions" and that "educators in a PLC have an acute sense of curiosity and openness to new possibilities" (p. 16).

Knowledge sharing. Wenger et al (2002), the leading authority on CoP, views CoPs as the necessary vehicle for successful knowledge sharing, believing that "the knowledge of experts is an accumulation of experiences - a kind of 'residue' of their actions, thinking, and conversations - that remains a dynamic part of their ongoing experiences" (pg. 9). Wenger et al (2002) further adds that the sharing of this knowledge "requires interaction and informal learning processes such as storytelling, conversation, coaching, and apprenticeship of the kind that communities of practice provide" (p. 9). Through well-structured collaborative activities that are the basis for effective PLCs, knowledge sharing can enhance individual learning and bring about more effective

teaching practices (Darling-Hammond, Hyler & Gardner, 2017; Hyler & Gardner, 2017; Kumar, 2011).

Despite a wide array of research on knowledge sharing in learning communities, most have focused on CoPs in the corporate world. Attention given to knowledge sharing specifically related to PLCs mainly focuses on knowledge sharing in online groups. Because PLCs are based upon CoP principles, the research focused on private institutions and business CoP is relatable to educational PLCs.

One longitudinal qualitative case study that was conducted in the education community investigated the partnership between a school district and a university's Collaboration Centers Project and the connection between collaborative activities and increased knowledge in teacher practice (Mustanti, 2010). The project entailed training certified English as a Second Language teachers as collaboration co-facilitators who served in six schools where collaboration centers were created in order for teachers to actively participation in learning, exchange ideas, and purposefully build trust in order to facilitate collaboration (Mustanti, 2010). Through field notes and interviews the research concluded that participants perceived their collaboration as an invaluable knowledge building process and, in addition, a way to "exchange experiences, maintain interesting conversations, and build relationships with peers" (p. 79).

Conclusion of research done by Kumaraswamy (2012) of five staff development programs, implemented to improve teacher quality, concurred with Mustanti's (2010) research where participants recognized an increase in personal knowledge due to collaboration that included knowledge sharing among participants. In his conclusion, Kumaraswamy (2012) stated "The only way to enable sharing of knowledge is by bringing people together through collaboration. Therefore developing individual and

team competency through collaboration is the key to effective knowledge sharing" (p. 310).

Reflection. Dewey (1933) defines reflection as "an active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds supporting it and future conclusions to which it tends" (p. 6). This requires teachers to be open-minded and challenge their assumptions on how and why they teach and this process in which analyzing, questioning and critiquing are undertakings allows for discussion and feedback that supports knowledge sharing, collective inquiry and team interactivity to promote effective teaching practice (Fullan, 2001; Liu, 2015). Critical reflection allows a teacher to not only gain a variety of perspectives from peers, but to also undergo a process of self-examination/evaluation, both of which can challenge teachers to improve practice and make the learning transformative (Brookfield, 2003; Shandomo, 2010; Loughran (2002).

Reflection is recognized as an important practice in PLCs as members work within a cycle of continuous improvement within their community (Kaplan, et al, 2015; Ohlsson; 2013; Carroll, Fulton & Doerr, 2010). This was noted in an investigation into successful PLCs that included an in-depth look at the literature as well as several case studies noted a leading principle of effectiveness in learning communities is self-directed reflection that creates a cycle of "goal-setting, planning, standards, and evaluation driven by the needs of both teachers and students" (Carroll et al, 2010, p. 10).

Further, a survey of teachers in 17 schools considered as exemplary models of effective teacher learning noted that 94% of teachers surveyed in these schools indicated that reflection was a critical aspect of their learning and that they were encouraged to reflect often on their teaching practice (Kaplan et al, 2015). Additionally, a multi-case

study using interviews and observations of three teacher teams by Ohlsson (2013) indicate that, of the three teams investigated, the successful teacher team encouraged its members to engage in deep and critical reflection while the other two teams. Those who criticized the team experience as being ineffective, avoided activities that engaged team members in reflective dialogue (Ohlsson, 2013). Further, the study indicated that the interruption of reflective discussion between team members led to strong, negative emotions within the teams that avoided reflection while the highly reflective teams could cohesively conceptualize the resolution of challenges and problems (Ohlsson, 2013).

As Hord (2009) states, "the professional learning community encourages constructivism by providing the setting and the working relationships demanded of constructivist learning" (p. 41). The learner-centered environment that encourages peer-to-peer learning activities that include active participation, collective inquiry, reflection, feedback and collaboration (in-depth discussion on collaborative learning follows) allow individual learners to work within a framework of socially constructed learning.

Issues Facing Professional Learning Community Efforts

Although insufficient time for teachers to meet is the most reported roadblock to effective PLCs, other issues exist that hinder PLC efforts including poor time management, lack of structure and organization, and disengaged leadership (Barnett et al, 2009; Bill and Melinda Gates, 2014; Blitz, 2013; Graham, 2007; Leonard, 2003; Ohlsson, 2013; Sims and Penny, 2015).

Time. Research, as well as data from national surveys of teachers, indicate that the recommended fifteen percent of work time that should be dedicated to PLC activity for maximum impact on teacher learning is hardly common practice (Bill and Melinda Gates Foundation, 2014; Feger & Arruda, 2008; Johnston & Tsai, 2018; *Primary*

Sources, 2012; Stoll et al, 2006; von Frank, 2008; TALIS, 2009; "*The state of teacher professional learning*", 2016; Vangrieken, 2015).

Less than half (40%) of the teacher respondents on MetLife's 2009 Survey of the American Teacher reported that they were given structured time to work together with only a mere 7% of these teachers believing the time spent was within a strong collaborative model of PD (Markow & Pieteres, 2009). This supports a later study by Scholastic (2012) that polled approximately 10,000 teachers nationwide who reported that the average time for teachers to collaborate during the required school day is fifteen minutes (*Primary Sources*, 2012). More recent surveys that include one of 6500 teachers nationwide, conducted as a joint effort of Corwin, Learning Forward and the National Education Institute, further solidifies the time deficiency trend as more than half of survey respondents indicated most of their professional learning took place during in-service days and over the summer and twenty-five percent reported spending less than an hour a week in job-embedded professional learning ("The state of teacher professional learning", 2016)

Another recent survey of 1825 respondents from the National Teacher Panel, with representation of K-12 teachers from across the country, further concluded the dismal amount of teachers (only 31%) that report having sufficient amount of time to collaborate with peers with only 12% indicating that they are able to participate in discussions related to instructional practices three or more times a week (Johnston and Tsai, 2018). Overall, the conclusion of Johnston and Tsai's (2018) survey indicated that "the vast majority of educators felt that time constraints prohibit them from collaborating with colleagues at their school" (p. 11).

Structure. Teachers interviewed say their learning increased when PLCs were structured compared to unstructured meetings where conversations tended to "focus on solving practical problems in their everyday classroom practice and expanding their repertoire of actions rather than challenging and taking a critical and reflective approach to one another's practice" (Plauborg, 2009, p. 31). In their respective studies, Plauborg (2009), Ohlsson (2013) and Levine and Marcus (2010) concluded that team meetings that were unstructured tended to restrict the practices, including reflection, that lead to the necessary depth of knowledge for teachers to change practice. This conclusion was also noted in a survey of over one thousand teachers who responded that their participation in highly structured collaborative efforts resulted in greater PLC task focus on strategies that they were more likely to implement in their classrooms (Barnett, 2009).

This same sentiment was further brought to light with a survey of 542 teachers across ten Netherlands schools that showed a conflict between teacher perceptions of workplace learning and actual practice whereby lack of attention and focus on actual implementation of effective learning activities were in conflict with theory (Kwakman, 2003). The research, that solicited feedback on both task factors and environmental factors, concluded that certain conditions such as reflective practice, depth of knowledge/knowledge sharing, and opportunities to participate in what is perceived as effective collaborative activities was lacking in actual practice (Kwakman, 2003).

Leadership. The impact of leadership cannot go without notice as a defining factor in either overcoming issues or precipitating them. The disengagement of leadership is a noted factor when leadership fails to provide adequate resources that support successful PLCs (Carpenter, 2015; Sims and Penny, 2015; Tallerico, 2014). Three separate studies of middle school PLCs noted that leadership had an impact on

PLC efforts where teams with involved leadership who provided guidance, goals and structures were more successful and teachers more satisfied with participation than those who had leaders who were more detached from the team, especially during the early stages of implementation of a team (Carpenter, 2015; LeClerc, Moreau, Dumouchel and Sallafranque-St-Louis, 2012; Sims and Penny, 2015). Leadership that merely puts processes in place without participating, including providing modeling and/or training and continuous overview and insight of team efforts contributes to the failure of the team (Sims and Penny, 2015: Carpenter, 2015, LeClerc et al, 2012).

Culture. Any major change in school systems, including a change in professional learning structures, also significantly changes school culture that, in turn, may solicit resistance (Richard, 2004; Patterson, 2006).

In 2009, Nehring and Fitzsimons (2011) conducted a focus group study with eleven high school teachers in a school that was at the one year mark of implementing PLCs, garnering the thoughts and feelings of the staff on the PLC environment. During interviews and focus group conversations the participants relayed a high level of negative feelings towards the implementation including ambivalence, uncertainty, skepticism and resistance (Nehring & Fitzsimons, 2011). The study further concluded that, although, as the implementation progressed throughout the year, "teacher thoughts and feelings evolved from a somewhat tentative mixture of skepticism, uncertainty and interest to a more committed mixture of opposition, ambivalence and support" (Nehring & Fitzsimons, 2011, p. 523). The researchers attributed the negativity to a failure to convey a clear purpose of the project, a lack of commitment to allowable time for collaboration, absence of training for PLC facilitators and the lack of progress monitoring (Nehring & Fitzsimons, 2011).

The researcher deduced that these were all necessary components of a PLC that require deep and critical attention because resistance stems from the idea that

Shared practice runs *counter* to isolated, private practice. Long-term growth runs *counter* to quick solutions. . . Singly and collectively, the traits of a PLC. . . threaten to de-stabilize an existing culture of conventional traits. (Nehring &Fitzsimons, 2011, p. 526)

Initial and follow up research by Leonard (2002) and Leonard and Leonard (2003) showed cultural conflict between what is expected in collaborative teacher efforts and the perceptions of teachers who were expected to participate. The initial questionnaire research showed that "teacher work continues to be characterized by competition and individualism and lacks the type of trusting, caring environment that is more conducive to collaborative practice" (Leonard, 2002, p. 3). Further, teachers did not perceive that school culture exhibited the support or expectations necessary for collaborative activities to be successful (Leonard, 2002).

The follow-up research that solicited responses to open-ended questions specific to collaborative practices at their schools and within the district was further testimonial to the cultural conflict between teachers and the system's desire for more shared teacher work and learning activities (Leonard, 2003). Responses to open-ended questions showed teachers perceived their peers as having a lack of commitment, a resistance to change and a preference to work independently (Leonard, 2003).

In his article, *Learning Communities in 6–8 Middle Schools: Natural Complements or Another Bandwagon in the Parade*? Patterson (2006) draws from his focus groups at two different middle schools to spotlight the difficulty in changing school culture focused on teacher learning. Patterson (2006) argues that teachers felt conflicted and disenchanted by the establishment of PLCs due to the differing ideals on what

constituted a learning community, inconsistency on activities that should be carried out in the PLC, and teachers' lack of input in the decision-making process.

Computer-Mediated Communication for Teacher Collaboration

The progression of technology, and specifically Internet and World Wide Web (Web) resources that have forged new paths on how humans interact has had a profound impact on the education community (Hutchison & Colwell, 2011; Albion, 2008). Within a mere couple of decades, we have seen the capacity to move from passive, read-only interface (Web 1.0) to the ability to be actively involved, collaborate and synchronously communicate (Web 2.0) (Albion, 2008).

In addition to Web 2.0 resources such as blogs, wikis, synchronous/asynchronous file sharing and social media websites, the use of digital resources that allow other connectivity options such as Bluetooth, local server file sharing and the use of applications on mobile devices, allow collaboration in ways many veteran teachers had never thought possible (Hutchison & Colwell, 2011; Silvers, O'Connell & Fewell, 2007; Albion, 2008). This connectivity allows flexibility in teacher learning, communication and collaboration with no time, space and pacing constraints that make rapid sharing of, and immediate access to, information for comprehensive knowledge acquisition something repeatedly reported by educators as the most advantageous aspect of utilizing CMC (National Research Council, 2007; Blitz, 2013; Huang, 2002; Hutchison & Colwell, 2011; Borko, Whitcomb & Liston, 2008; Chesbro & Boxler, 2010, Jonassen & Kwon, 2001).

After a cumulative review of literature of CMC that included both scholarly definitions and amassed topics of research and discussion over the past two decades, Thurow, Lengel and Tomic (2004) determined that CMC "refers to any human

communication achieved through, or with the help of, computer technology" (p. 30). The communication may be synchronous or asynchronous and include communication that flows one-to-one (1:1), one-to-many (1:n), or many-to-many(n:n) and utilizes a variety of computer resources including electronic mail (email), electronic mailing distribution lists (email listservs), discussion forums, chat rooms, document/video repositories, databases and collective file sharing (Thurow et al, 2004; Herring, Stein & Virtanen, 2013; Bannan-Ritland, 2002; December, 1996; Berge and Collins, 1995).

The use of CMC allows opportunities for interaction that support social constructivists theories of learning that support each other's learning and have the potential to forge personal relationships (Silvers, O'Connell & Fewell, 2007; Moller, 1998; Hutchison & Colwell, 2011; Blitz, 2013; Veerman & Veldhuis-Diermanse, 2001; Cooper & Hirtle, 2000; Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007). This type of communication and collaboration has been promoted heavily by The United States Department of Education' Office of Technology National Education Technology Plan, that encourages the creation of school and district online learning communities (Office of Educational Technology, 2014).

The idea that technology can support the necessary constructivist components of PLCs was concluded by Hung and Der-Thanq (2002) in their study on the implications of considerations of Vygotsky's theory when creating online communities. As concluded by their study, well-designed online learning communities can support Vygotsky's ZPD theory, allowing and supporting interactions that take learners from mere social interactions to learner interdependency, content personalization and scaffolding of knowledge (Hung & Der-Thanq, 2002).

Further, a thorough review of the literature by Blitz (2013) published by the National Center for the Education Evaluation and Regional Assistance concluded that these well-designed online environments allowed for collaborative activities to be carried out that support teacher engagement, knowledge acquisition, and a sense of community to develop a change in teacher practice, which are all attributes of successful PLCs (Blitz, 2013).

CMC for active participation/collective inquiry. Hiltz's (2002) own research as well as her extensive review of the literature including research of nineteen studies that compared ALNs (Asynchronous Learning Networks) to face-to-face courses taught on the same campuses concluded that "ALNs tend to be as effective or more effective than traditional modes of course delivery at the university level" (p. 57). However, the conclusion overwhelming pointed to the necessity that students are active learners in an environment where the instructor uses collaborative pedagogical strategies (Hiltz, 2002).

Using a questionnaire to assess perceptions as well as analysis of both face-to-face communication and CMC patterns to determine the quality of each process in group problem solving, Jonassen (2001) determined that participants were more satisfied in the group problem-solving process when using CMC than when engaged in face-to-face conversations. This was due to the conferencing using CMC was more task-related and, thereby, participants perceived it to be of better quality (Jonassen, 2001).

CMC for knowledge sharing. The very nature of CMC, where students can reach a collective audience easily and quickly, promotes knowledge sharing by providing a means of idea exchange, concept construction, clarification of materials and an accumulation of multiple perspectives (Stacey, 1999; Littlejohn, 2010). Whether

working individually or as a group, CMC is used as a means of providing and digesting additional knowledge beyond that of the individual and those who use CMC to participate, either as producers or consumers, in knowledge sharing find the variety of processes in CMC-facilitated collaboration and communication as satisfying (Stacey, 1999; Booth, 2012).

An analysis of data from a mixed methods study of knowledge sharing behaviors identified several distinct learning practices that included learning through formal coursework, discussions, experience, indirect and the teaching of others that proved to be a positive experience (Littlejohn, 2011). The study of 462 novice, mid-level and expert employees that participated in global knowledge sharing networks showed that, although the majority of respondents preferred face-to-face interactions, the ability to utilize CMC to share knowledge was a viable option that produced positive results (Littlejohn, 2010). Most interesting about the study is that it revealed that the variety of learning practices were valued not just from a knowledge perspective, but also from a social aspect (Littlejohn, 2010). Many survey respondents noted that conversations, both one-to-one and group, with colleagues at all levels (peer, coach, manager) as well as discussions "provided them with a support mechanism for coping with work" as well as participation in formal, structured courses providing opportunities to collaborate with the group proving "to be major motivators for participation in these traditional forms of learning" (Littlejohn, 2010, p. 28).

Although research has noted the positive aspects of online collaborative opportunities, it is important to understand that successful results do not take place simply by utilizing CMC as a tool. Attention to structure as well as opportunities to engage and interact are important elements of success. As an example, in her 2012

multiple case study that focused on knowledge sharing and trust in two nationwide online learning communities involving K12 educators, Booth (2012) discovered that knowledge sharing was cultivated through a variety of methods including structured conversations, collaborative activities, member-generated blogs and articles, and community book clubs.

This sustained knowledge sharing over time was attributed to moderator oversight that ensured a high level of engagement, targeted discussions and monitored membership so that members felt comfortable taking risks and openly communicating (Booth, 2012). Hoban (1999) came to a similar conclusion when investigating knowledge sharing of 22 college students in an initial education certification course that used CMC to support face-to-face knowledge building. Likening to face-to-face interactions, Hoban (1999) noted that students participated in knowledge sharing in creative and engaging ways in online interactions that included the use of emails and asynchronous discussion boards, however, it required intervention and input from moderators to ensure participants maintained focus on intended topics.

Hoban (1999) noted that "without direction, very little 'deep' knowledge building happens through these modes of communication" (p. 8). In addition, as is necessitated in face-to-face communities, online communications for the purpose of knowledge sharing requires a significant amount of trust among community members (Booth, 2012; Chen and Hung, 2010). Trust allows an open exchange of favorable 'knowledge contributing and knowledge collecting behaviors' that creates relationships that increase overall knowledge and improved performance of the group (Chen and Hung, 2010, p. 233).

CMC for critical reflection and feedback. The most notable benefit of online collaboration found in the literature is the critical reflections and feedback that are part of the important collaborative efforts of PLCs (King, 2002; Hawkes & Romiszowski, 2001;

An, Kim & Kim, 2008; Dede & Kremer, 1999; Thomas, 2001). Two critical elements of reflection, content (what is being reflected upon) and process (how reflection is taking place), that are essential to change teacher practice can be supported using CMC (Liu, 2015). This was part of the conclusion of a two-year comparative analysis of discourse in both asynchronous CMC and face-to-face communications of 28 teachers participating in a project-based learning initiative (Hawkes, 2001). Hawke's (2001) study found that, although the CMC was less interactive, it was more reflective than face-to-face discourse in that the flexibility afforded by CMC allowed a deeper reflective process that included the 'what' and the 'why'. The study further revealed that the use of CMC for team discourse significantly increased and improved overall teacher professional knowledge (Hawkes, 2001).

The deeper reflection can be connected to the process that takes place in online interactions where it is easier to review resources because discussions are compiled, saved and are retrievable by all participants. Participants are able to review, reflect and broaden upon previous ideas as well as compile information from multiple perspectives more easily than those in face-to-face teams that allows for an improved learning process and greater change in positive teaching practice (Benbunan-Fich, Hiltz & Turoff, 2001).

The use of CMC such as sharing of video content, participation in discussions, and collective interactivity on community issues are shown to be helpful in stimulating reflective practices and making reflection more in-depth (Borko et al, 2008; Brooks & Gibson, 2012; Huang, 2002; Hutchison & Colwell, 2011). The sharing of resources in this way promotes active engagement as participants make connections and form relationships with others through processes based on collective content.

Another benefit of online asynchronous communication is that feedback from participants is quick and can be specific (Hutchison & Colwell, 2011). This type of feedback can impact reflective practices by providing wider access to content and more in-depth learning processes (Hutchison & Colwell, 2011). Some studies have further revealed that reflection in CMC environments is perceived by participants, and is shown to be more beneficial than, reflection in face-to-face environments. Jonassen and Kwon's (2001) comparative study of CMC versus face-to-face group problem solving found that those groups utilizing CMC perceived their communications as of higher quality and more satisfying than the participants in face-to-face environments, citing that the communication was more focused and task-oriented. The study confirmed that the exchange of ideas and perspectives in the groups utilizing CMC outpaced that of the face-to-face groups (Jonassen & Kwon, 2001).

Further, in problem-solving scenarios utilizing CMC, participants acknowledged that the flexibility afforded by utilizing CMC allowed for deeper, more reflective thinking as well as more time for consideration before making decisions (Jonassen & Kwon, 2001).

Issues with Computer-Mediated Communication for Teacher Learning

In an effort to find time for teacher learning that is unavailable during the school day, CMC is often seen as a useful means of teacher learning, communication and collaboration after contractual work hours (Hawkes, 2000). However, time constraints remain persistent when expecting teachers to use CMC in place of face-to-face. This issue was spotlighted in a study by Hawkes (2000) of 28 middle school teachers who participated in a project on the use of technology to collaborate on curriculum development where teachers did not perceive the use of CMC as a shortcut. Eighty-two

percent of the teachers noted that they faced time constraints, feeling that the effort to participate took too much time (Hawkes, 2000). Further, a major theme drawn from a five year discussion and research project focused on online teacher professional development run by the National Research Council's (2007) National Teacher Advisory Committee vocalized teacher's resentment at being asked to complete tasks outside of contractual time.

The consensus for online professional development was seen "like any other work-related expectation to be completed outside of contractual time, this expectation is unfair and counterproductive" (National Research Council, 2007, p. 19). Further, these time constraints can lead to residual issues where those having less personal time to devote to participating in the online activities being perceived as less knowledgeable and their expertise and ideas being marginalized merely due to lack of presence and not truly lack of knowledge (Barnett, 2002).

The impersonal nature of online interactions, especially when considering social interactions as part of learning processes, has been noted in some studies as an issue in computer-mediated environments (Jonassen and Kwon, 2001; Hawkes, 2000; Blitz; 2013 Andres, 2010). Jonassen and Kwon's (2001) comparative study noted that the lack of nonverbal cues while utilizing CMC was an issue when attempting to carry out problem-solving activities. The study also recognized that face-to-face communications were more cohesive and personal compared to those interactions using CMC (Jonassen & Kwon, 2001). Andre's (2010) experimental, comparative study of a co-located collaborative team and a dispersed collaborative team also determined that the lack of participant's ability to focus on some nonverbal gestures impaired their ability to understand others. Further, in addition to the inability to focus on nonverbal gestures, the

lack of attending to verbal queues also challenged effective interaction because it "generated more sarcastic reactions to challenged ideas posed, skeptical evaluations of others, and skepticism regarding accuracy of interpretation" (Andres, 2010, p. 483). Andre's (2010) final conclusion determined that, although personal learning experiences took place, they were of a lower quality and less satisfactory among the participants using CMC versus those who were face-to-face.

Blitz's (2013) study also recognized the impersonal nature of online interactions as the study noted less motivation in teachers to interact online than face-to-face, possibly due to poor course structure that lacks interactivity, contributing to the feeling of isolation that many teachers express as an issue in the teaching profession in general (Blitz, 2013; Hutchison and Colwell, 2011).

Huang (2002) also argues that a focus on the use of technology rather than its application to creating engaging and enriching environments ends up having participants in social isolation, something Huang, and others, agrees that many teachers already experience in their day to day classroom environments (Hutchinson and Cowell, 2011; Nehring and Fitzsimons, 2011; Blitz 2013). Recurring themes in the data of a case study by Hutchinson and Colwell (2011) of twenty-six inductee and mentor teachers using a wiki as a collaborative tool suggests that the feelings of isolation can be perpetuated using CMC as many teachers failed to contribute to the wiki because they preferred to talk to their group members in person. The data also suggests that the preference is due to face-to-face interactions being more personal than interactions utilizing CMC (Hutchinson & Colwell, 2011).

A similar investigation through the TeL Project, a two year PD project in Canada that focused on middle school mathematics and science/technology, noted that teachers

placed more value on face-to-face interactions than those online, and while participation in online tasks waned over the course of the one-year project, teachers heavily responded that they looked forward to the face-to-face sessions (Sinclair & Owston, 2006). One of the goals of the TeL hybrid teacher learning project was to "improve teacher attitudes, knowledge, and classroom practice" (p. 47). The program expectations were to have teachers gain knowledge through reading and discussing theoretical articles, engage in hands-on activities, reflect and share knowledge and experiences. The designers of the program believed that both face-to-face and online components could satisfy these expectations and designed the project in three modules, each beginning with a daylong face-to-face session followed by eight weeks of online sessions and finishing with another face-to-face session.

During the online component of Sinclair and Owston's (2006) research teachers participated in moderated, synchronous discussions, reflection, accessing professional materials and sharing their own work. Face-to-face sessions included participation in hands-on activities, sharing of ideas and experiences and discussion on specific topics. Questionnaires and surveys provided to the 6, 7, and 8th grade teacher participants noted an overall positive response to the program as well as an increase in teacher knowledge, however, the majority of participants placed much more value and satisfaction with the face-to-face component than the online sessions (Sinclair & Owston, 2006).

Participation in the online activities waned over the course of the one-year project despite teachers being provided a half day each week to attend to online activities, that included a significant decrease from 89% participation to 56% between the first and last modules in journal submissions (Sinclair and Owston, 2006). It is important to note that the study did not mention whether the online tasks were directly related to the activities

taking place in the face-to-face components where learning that is meaningful and ongoing is important to teacher engagement and participation (Kinnucan, 2007; DuFour and Eaker, 2008; Learning Forward, 2011).

Another important observation by Sinclair and Owston (2006) noted that the lack of online task completion was not due to an issue of time as teachers were given weekly half-day early release where classes were covered by substitute teachers specifically to focus on project tasks, but was most likely attributed to time management. This collaborates other studies and teacher surveys that noted time management as problematic (Bill and Melinda Gates Foundation, 2014; von Frank, 2008; Wei, Darling-Hammond & Adamson, 2010).

Collaborative efforts in online environments may be hindered by issues previously mentioned as well as group members' inadequacies in working collaboratively, not something unique to online environments, yet one that needs attention in both face-to-face and virtual settings (An, Kim & Kim, 2008). In their research on teacher perceptions of online collaborative efforts, An, Kim and Kim (2008) noted similar complaints when groups of educators attempted collaborative/collective efforts as those in face-to-face groups. Working online tends to exacerbate collaborative efforts because most facilitators/instructors tend to focus on tasks and assume that the social dynamics of the group will fall nicely into place, thus neglecting the need to focus on a sense of community that builds critical elements such as trust and a sense of belonging (An et al, 2008).

CMC in Support of Face-to-Face PLCs

Early on in the investigation of using CMC for teacher learning the focus rested on moving learning to completely online environments that served to alleviate time

constraints of meeting face-to-face as well as connect teachers across distance. However, with the emergence of an emphasis on constructivist principles applied to teacher learning, the overwhelming preference of teachers for face-to-face interactions, and noted limitations of online interactions, more recent conclusions in investigations of CMC are noting its use in support of, rather than a complete replacement to, face-to-face learning as more effective and better received by teachers (Blitz, 2013; Hawkes and Romiszowski, 2001; Hoban, 2008; Hutchinson and Colwell, 2011; Sinclair & Owston, 2006; Vaughan, 2004).

For example, two separate one-year studies found positive effects on teacher knowledge and willingness to modify teacher practice after their participation in hybrid learning opportunities (Sinclair & Owston, 2006). Blitz (2013) and Hutchinson and Colwell (2011) attribute this success to the advantageous components of online learning including flexibility, absence of time constraints and the structure in which participants can share information that can complement face-to-face interactions.

In Hawkes and Romiszowski (2001) research, cited previously on the benefits of the use of CMC, it also concluded that some aspects of face-to-face were more conducive to collaborative efforts of PLCs including more interactive discourse that led them to recommend that CMC be used to supplement, not replace, face-to-face discourse. Part of the recommendation rested upon follow up interviews conducted as part of the research where more than half of the interviewees firmly believed that CMC could not replace face-to-face conversation (Hawkes & Romiszowski, 2001).

A supporting study by Cooper and Hirtle (2000) of twelve teachers using a discussion thread as well as Microsoft Office tools showed that the communication and collaboration between the teacher and students as well as peer-to-peer increased due to

the availability of these tools, however, follow-up interviews indicated that teachers disliked the use of the wiki because of its impersonal nature. This gives indication that the positives associated with the use of online tools coupled with the positive social aspects of face-to-face interactions bring the greatest benefit to teacher learning (Cooper & Hirtle, 2001). Data from Vaughan's (2004) pilot study gave a similar indication where face-to-face collaborative sessions created a sense of community and the online components, including dialogue and reflective activities, 'created an opportunity to extend and sustain' the sense of community (p. 105).

Chapter Summary

With both challenges and benefits of face-to-face and online communication and collaboration, the idea to merge the best of what online resources can offer with benefits offered by face-to-face communities of learners is a worthwhile investigation. Chapter 3 outlines the data collection and analysis methods used to investigate the benefits and challenges that were explored during the review of the literature in Chapter 2.

CHAPTER 3

METHODOLOGY

The research targets issues recognized in both observed and historical research where the known problem of practice is the limited resources, namely time, to carry out PLC activities. The issue of time is known to lead to roadblocks in leadership participation and engagement, ineffective time management, and disorganized learning environments. As director of instructional technology, the researcher had an in-depth look at each of the district schools' professional learning practices. This led to the purpose of the study in investigating how CMC could be utilized to support PLC efforts.

The research process, that involved the collection of qualitative data from an interview, observations and collection of digital artifacts, led to the action research focused on how an established PLC within the researcher's district utilized CMC resources as a means of extending and supporting their collaborative efforts. The single case study design served to examine how the well-established PLC used CMC resources as a means of extending and supporting communication and collaboration in answering the following research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts?

Research Design

Using a qualitative case study design allowed for a close-up examination of the processes and procedures of how the group under examination was successful in its use of CMC to support their ongoing PLC efforts (Putney, 2010; Yin, 2016). Although case

studies can be both qualitative and quantitative, information gathered in a qualitative case study design can provide true-to-life details that are both individual and holistic in nature (Merriam, 2001; Putney, 2010). It allows the researcher to become up-close and personal with participants, enabling the gathering of highly relevant and intricately specific details about the group and its individuals that are often overlooked with the statistical nature of quantitative research methods (Merriam, 2001; Putney, 2010). Understanding the real-life context of the PLC that was observed in this case study was imperative in understanding how CMC supported their efforts, including how the team conducted face-to-face communication and collaborative activities.

In *Qualitative Research and Case Study Applications in Education,* Merriam (2001) describes a case study design as one of ongoing inquiry in stating that it "is employed to gain an in-depth understanding of the situation and outcomes, in context rather than a specific variable, in discovery rather than confirmation" (p. 19). The ongoing focus on a single program, group and/or situation in real-life context through a case study design allows a deeper perspective of both the individual and the group, an asset that Merriam asserts is well-suited for action research within the education community where the goal is to improve practice (Merriam, 2001).

Unlike quantitative methods, qualitative case studies are not bound by any specific data collection methods, however, triangulation to ensure validity and credibility, are essential (Merriam, 2001; Putney, 2010). Therefore, a range of data collection methods were included in the study design including participant interviews, observations and the collection of artifacts through unobtrusive measures.

Although only a small amount of previous research using case study design has surfaced that targets using CMC specifically to support face-to-face teacher PLCs, using

a case study design fits into the purpose of the research conducted as it seeks to discover, not confirm, the role that CMC played in RMS's Learning School designation through an understanding of the processes of using CMC (Merriam, 2001). The collection and subsequent outcome of the inquiry allowed a district-wide action research plan to be developed to increase the effectiveness of PLCs across all district schools.

Setting

RMS is one of three middle schools in a small urban school district in upstate South Carolina where 544 students are served by forty-eight teachers (thirty-six female and twelve male), 66% of whom have advanced degrees and 85% are on extended, continuous contracts (South Carolina Department of Education, 2016). The school consists of grades sixth, seventh and eighth with each grade level having their own PLC that all function in the same manner. The PLC lead and the technology integration specialist for the sample under investigation also serve in the same capacity for all of the PLCs at the school.

Selection of the Sample

Because of the nonprobability nature of qualitative research, purposeful sampling is a justifiable method of data collection, especially in a case study design where the researcher's goal is to learn as much as possible from a single sample (Merriam, 2001). Criteria for purposeful sampling must be justified by establishing the relevance of the sample to the research outcome (Merriam, 2001). In this case study, the RMS sixth grade PLC was chosen due to the authenticity of their professional learning community. An authentic learning community is defined by the Learning Forward professional learning organization as one whose characteristics include supportive relationships, intentional collective learning, and conducive structural conditions (Hord, 2004). RMS's PLC

authenticity was solidified in 2016 as part of RMS earning the nation's first ever Learning Forward School designation. This required RMS, including the sixth-grade team, to undergo a rigorous, on-site external review of their professional learning practices by the school improvement-focused Advanc-ED® organization.

The Learning Forward School designation was developed as a collaborative effort between the Learning Forward and AdvancED® organizations. Learning Forward (2011) is an international, non-profit organization that focuses on researching, developing and supporting teacher professional learning to increase teacher knowledge and skills with an emphasize on implementation of their *Standards for Professional Learning.* AdvancED®, is a non-profit, non-partisan accreditation agency that "conducts rigorous, on-site external reviews of Pre-K-12 schools and school systems to ensure that all learners realize their full potential" (https://www.advanc-ed.org/about-us).

As part of RMS's March 2016 review process, the AdvancED® team conducted a three day, in-depth examination of RMS's teacher learning practices aligned with Learning Forward's (2011) *Standards for Professional Learning and* the AdvancED® accreditation success indicators for teacher learning. The subsequent Learning Forward Executive Summary indicated that at RMS the "authentic teams foster a sense of belonging; promote ownership of professional learning through inquiry and problem solving" and that "various collaborative teams work together to promote schoolwide determination by sharing a clear vision and the united focus to constantly improve student learning" (p. 2).

Further, as part of the review process, a Standards Assessment Inventory (SAI), developed and distributed to RMS staff by AdvancED® and Learning Forward (2016) shed positive light on RMS's PLC use of technology resources. On a five-point scale, the

faculty at RMS rated access to technology resources at 4.7 and the use of technology for professional learning as a 4.8 (Learning Forward, 2016).

The sixth-grade team was specifically chosen due to the longevity of the team (eight of the eleven members have participated since the PLCs inception five years prior) and the leadership team who have been a continuous part of the PLC for five years. This includes being part of the team during the rigorous Learning School designation process. Further, the team has an array of both teaching experience (induction to thirty-eight years) as well as teacher age (twenty-three to fifty-two years). These participants have an ongoing professional relationship with the participant-observer that is directly related to the use of technology for teaching and learning, with the participant-observer having frequent interactions with the team, thereby creating a strong level of trust and respect that will allow acceptance of participant observation within the team setting.

Participant profiles. RMS has PLCs for each grade level that meet regularly four times per week for forty minutes each meeting. The chosen sample for this research is the RMS sixth grade team that consists of nine teachers, two from each core content area (English, mathematics, science and social studies), and one that teaches both science and social studies. The school's curriculum coordinator and technology integration specialist (TIS) comprise the PLC's leadership team. The technology integration specialist serves as gatekeeper.

Kory (pseudonym). Kory is a fifty-two year old female with twenty-eight years teaching experience and has been teaching both sixth-grade honors and college preparation (CP) ELA at RMS for nine years. She has been a member of the PLC since its inception five years ago. She holds a master's degree in both Early Childhood and Elementary Education. Kory plans to retire within the next three years. She admits that

she struggles with technology use and is vocal about her preference in working with her peers face-to-face. She has a light sense of humor and initiates many of the non-teaching related social interactions that take place during face-to-face meetings. It is evident others in the group appreciate her minor diversions and follow her lead with getting back on track with the PLC structured activities.

Shiba (pseudonym). Shiba is a thirty-eight year veteran teacher who has been at RMS for sixteen years teaching ELA. She has been a participant in the PLC for five years. She is fifty-nine years old and holds a master's degree in Education. Shiba will retire after the 2017-18 school year. Although looking forward to retirement following the 2017-18 school year, her dedication to wanting her students to succeed has not waivered and she continues to work very hard. She is a quiet person and her interactions with the team are very poised and no-nonsense. She is well-respected among her peers.

Kinnaras (pseudonym). Kinnaras is a fifty-two year old male teacher and has been teaching for ten years, eight of those at RMS teaching sixth-grade science. He holds a master's in STEM Curriculum and Instruction and previously taught fifth grade math. He has been the only male member of the PLC for the five years it has existed. His peers have nicknamed him 'the kid whisperer' because of his ability to connect with difficult students. He is extremely well-respected by his peers and is very patient and helpful to the new science teacher that he has become a mentor.

Amy (pseudonym). 2017-18 is Amy's second year of teaching and her first at RMS. She is twenty-seven years old and holds a master's degree in Education. She teaches sixth-grade honors science and has previously taught fourth grade ELA and social studies. With only one year of teaching experience and being her first year as a middle school science teacher, Amy seeks plenty of guidance from her peers, especially

Kinnaras, as well as PLC leadership. Her enthusiasm is boundless and she enjoys creating engaging lessons for her students. Her gratefulness in having Kinnaras as a mentor is apparent and she greatly respects his input and values their face-to-face time tremendously.

Kaze (pseudonym). Kaze is a forty-six year old female who has been teaching sixth grade mathematics at RMS for nine of her eighteen years of teaching. She holds a master's degree in Education and has been a member of the PLC for its five years of existence. A great sense of humor, the team looks to her to lighten the mood when things get stressful. She is also looked upon as a leader because she is very vocal in difficult situations as well as readily providing praise.

Giselle (pseudonym). Giselle has been teaching for eighteen years, six at RMS and has been with the PLC for five years. She has a master's degree in Education. Although she does not speak much during meetings, she also has a good sense of humor and that benefits the interactions with Kaze who has a similar personality.

Megan (pseudonym). Megan is a forty-nine year old female teacher with eighteen years teaching experience, nine of them at RMS, and has been a PLC member since its inception. She holds a bachelor's, plus eighteen credits, in Education and teaches both sixth-grade honors social studies and a CP inclusion class. She admits she struggles at times with using technology and has stated often how she appreciates Omed's technology skills and has Omed utilize the technology while they are planning lessons together.

Omed (pseudonym). Omed is an induction year teacher. She is 23 years old and has a degree in Elementary Education plus her South Carolina Gifted and Talented endorsement. She teaches sixth grade social studies. She is extremely comfortable with

all types of technology and often volunteers to take care of items that need to be done digitally.

Carolina (pseudonym). A fifty-two year old induction year teacher, Carolina teaches both sixth-grade science and social studies. She holds a master's in Elementary Education and previously worked at a private school.

Laverne (pseudonym). A fifty year-old female, education became Laverne's second career at 35. She has been in education for sixteen years and holds a bachelor's degree in English and an additional thirty credits in Education. Laverne became an educator through the Program of Alternative Certification for Educators program and taught English for five years before becoming RMS's technology integration specialist. Naomi and she have a solid working relationship that began when Laverne was an induction teacher at another school. Together, Naomi and she launched the current PLCs at RMS.

Naomi (pseudonym). Naomi is a fifty-year old female with twenty-one years of teaching experience, ten of those at RMS. She holds two master's degrees, one in Elementary Education and another in Administration and Supervision. She previously served as an ELA instructional coach and master teacher at both the state and school level. She has, and currently, serves as RMS's curriculum coordinator for five years. With the support of school and district level administration, Naomi developed and implemented the current PLC structure using the Learning Forward (2011) Standards for Professional Learning as a framework. She and Laverne have a ten year history, where Naomi served as the instructional coach at the previous school in which they were both assigned.

Data Collection Methods

This case study utilized a single pre-observation group interview, participant-observation of face-to-face activities, and unobtrusive measures in the form of artifacts. Using a multi-modal method gives the researcher an in-depth analysis that weeds out any bias that can become problematic as an observer conducting a case study and can also provide credibility to the qualitative research (Merriam, 2001).

Collection during the interview and observations included evidence on activities of the group as well as their experiences, feelings and opinions that the interviewer felt had an impact on the research problem and outcome (Butin, 2013; Merriam, 2001). Further, because the research question aimed to understand how online activities impact offline interactions and practices, it was important to collect information from both online and offline interfaces to clearly understand the connections between the two (Baym, 1995). Therefore, the collection of artifacts from online environments, including asynchronous discussion threads as well as course files and folders, was used.

Change to the collection method. Activities in online communities can parallel those in traditional, face-to-face groups where members of both participate in similar activities and behaviors. Therefore, the use of participant observation is a common method of qualitative research for online interactions where researchers of online activities "are by definition participants to some extent, since they employ computer mediation to observe and interact with their research subjects" (Fielding, 2008, p. 261; Kawulich, 2005).

However, early in the observation of face-to-face interactions and the attempted observations of online interactions, the researcher noted that there was limited online interactions that were comparable to face-to-face interactions to warrant participant-

observation. Therefore, the researcher determined that observations of online interactions was not a necessary means of collecting data and the method was replaced with unobtrusive measures, specifically, the collection of artifacts from CMC platforms.

Interview. A semi-structured group interview, that took place in the PLC room, was conducted with all team members present. As defined by Roller (2015), the scope and purpose of focus groups, also known as group interviews, as a qualitative research method "involves interviewing two or more people simultaneously with the goal of fostering interaction among participants, resulting in an exchange of experiences and ideas" (p. 105). Although interviews can be conducted via telephone or through CMC, such as emails or online discussion forums, face-to-face questioning was chosen for this research to take advantage of the natural setting that allowed for spontaneous group interaction and insight into group dynamics by providing rich participant interactions (Blaxter, 2010; Roller, 2015).

Interview protocol. With permission previously secured from both the district (Appendix A) and the school (Appendix B), research began on November 28, 2017 with the semi-structured group interview. Just prior to the interview being conducted, each community member reviewed and signed an informed consent (Appendix C) and established an identity that included a pseudonym to protect their privacy.

The face-to-face group interview took place during the team's regularly scheduled technology infusion meeting time in their meeting room where all participants sat at the same table with the interviewer. The semi-structured interview lasted forty-minutes, the normal span of their meeting time. QuickTime audio recorder was used to record the interview to the interviewer's district-issued MacBook for transcription into a Microsoft

Word document on the same MacBook. The interviewer also jotted down observation notes to accompany the transcription that noted physical interactions of group members.

An interview protocol was utilized in conducting the interview (see Table 3.1) that provided a loose direction and did not contain all the questions that were asked, rather, the allowance for open-ended questioning allowed for the respondents to go beyond "yes" and "no" responses to tell their story from their own points of view and, by doing so in a group setting, allowed for multiple perspectives to converge as well as be challenged (Blaxter; 2010; Butin, 2013; Merriam, 2001; Roller, 2015; Yin, 2016). The interview protocol (see Table 3.1) contained questions that directly aligned with the research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts?

Table 3.1.

Interview Protocol

Interview Protocol	
Name of interviewer:	
Names of interviewees:	
Place of interview:	Date of interview:
Note: Introduce self and role during research period. Describe purpose of the study aligned to the research question. Allow for clarification and questions	
Research Question	Interview questions targeting the research question
How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts?	1. Describe activities and tasks that take place during your PLC meetings 2. What types of technologies do you use during your PLC meetings to carry out the activities and tasks that take place during meetings? 3. Provide an example of a way in which you used technology during a PLC meeting. 4. Do you use any technologies to complete PLC tasks or carry out PLC activities when you are not at your PLC meetings? 5. Provide an example of a way in which you used technology to complete PLC tasks when not in a PLC meeting.

Although the members of the PLC were familiar with the researcher, the interview began with the researcher introducing herself, reminding the participants of the informed consent they had each previously signed (see Appendix C) and conveying to them the purpose of the research. As a district office administrator, the researcher felt it necessary to initiate a rapport during the pre-observation interview that would allow the participant-observer to be immersed in group activities during her role as participant-observer in their face-to-face PLCs (Merriam, 2001; Yin, 2016).

Pilot interview. Roller (2015) states that "More than any other qualitative method, the ultimate usefulness of group discussions relies on the complexity of skills honed by the person who interfaces with the participants and "guides" the discussion—that is, the moderator" (p. 110). Therefore, a test pilot was conducted to determine if questions elicited adequate feedback, to test the credibility of the questions being asked, and to allow the interviewer to practice good interviewing techniques (Josselson, 2013; Roller, 2015).

Two participants were chosen from the seventh grade PLC at RMS that has a similar structure and conducts similar processes as the sixth grade team under investigation. The pilot interview was conducted under what would be similar circumstances to the interview with the sample where they were in the room where their regular PLC meetings are conducted.

Changes to the interview guide. During the recording of interview question responses, the interviewer noted that question one: *Describe your day-to-day activities in your PLC*, required clarification for one participant due to the broad nature of the question and the interviewer reworded for the participants as: *describe activities and*

tasks that take place during your PLC meetings. This will be used as the new first question on the study interview.

Question four: *What types of technologies do you use outside of scheduled PLC time that directly relate to PLC activities?*, also needed clarification for both participants and solicited more targeted feedback when asked as: *Do you use any technologies to complete PLC tasks or carry out PLC activities when you are not at your PLC meetings?* This replaced question four in the study.

With clarification of the noted questions, taking into consideration the feedback provided by pilot participants as well as the initial questioning that led to additional inquiries valid to the topic under investigation, it is concluded that the results of the pilot interview are satisfactory in targeting the responses that support the research being conducted.

Observations. As a tool, observation is described as "directly observing and recording the actions, events, and conversations that occur in the field" (Yin, 2016, p.130). Per Fielding (2008), "observational research aims to answer questions about specific populations, from which other researchers can make inferences about the behavior" (p. 1114). These observations include recording people's social interactions, physical actions/reactions, group dynamics and the environment in which the participants interact (Fielding, 2008; Yin, 2016).

Observation protocol. With permission previously secured by both the district (Appendix A) and the school (Appendix B), participant observations for the study took place between November 30, 2017 and March 28, 2018. Observations took place two to four times a week depending upon the observer's work obligations and the school

schedule. PLC meetings were held Tuesday through Fridays from 10:58 AM to 11:38 AM.

The five-month time span was necessary to allow the researcher to observe activities in each of the meeting types. For collaborative content lesson planning meetings, individual content area groups that included mathematics, social studies, science and English language arts, were each observed twice. Technology infusion and student data-driven RTI data meetings were each observed three times, and participatory teacher learning meetings were observed six times (see Table 3.2 for specific observation dates).

Table 3.2

Observation Dates

MEETING FOCUS	OBSERVATIONS
Technology infusion (Tech Tuesday)	December 12, February 6 and February 20
Teacher participatory learning	December 13, January 24, February 14, March 7 and March 14, March 22 (switch with collaborative content planning)
Collaborative content lesson planning (Thursdays)	November 30 and January 25 (science) February 8 (math), February 15 (social studies), February 22 (ELA), March 8 (ELA), March 15 (social studies)
Student data-drive RTI (Fridays)	January 26, December 1 and February 9

Observations were audio-recorded using QuickTime audio recorder on the MacBook and later transcribed and saved as Microsoft Word documents. The audio files and transcriptions were stored in the observer's district-provided Microsoft Office OneDrive cloud storage and the transcriptions were imported into NVIVO for data analysis. The researcher has, and will continue to maintain, sole possession of the

password-secured computer as well as maintain sole access to the research information stored in OneDrive.

The researcher used Microsoft Word on the MacBook to record field notes during the observations that included the date, time, physical setting and participants present. Recordings of interactions, activities and conversations, especially those that related specifically to the use of, or reference to, CMC were recorded. Immediately following each observation the notes were expanded upon and included additional thoughts, questions and clarifications to ensure accuracy (Merriam, 2001; Yin, 2016). The field notes were stored in the researcher's password protected OneDrive cloud storage.

Unobtrusive measures. Yin (2016) describes unobtrusive measures as those that "record aspects of the social and physical environment that are already in place, not manipulated by researchers or affected by their presence" (p. 153). Several decades ago, Webb et al (1966) described the use of unobtrusive measures to collect personal and professional communications by accessing archived written records. Today, these same measures can be applied to communications that are computer-mediated where files, as well as asynchronous discussions, can be printed and/or 'screen captured' by the researcher (Knight, 2018). Because unobtrusive measures collect non-reactive sources of data, it becomes an integral part of triangulating qualitative data in regards to validity (Webb, et al, 1966; Yin, 2016).

The sixth-grade PLC, in conjunction with the seventh and eighth grade PLCs at RMS, utilized the Courses features of Schoology to store, share and retrieve information. The Schoology course also offered a discussion forum that allowed the community to post reflections and feedback associated with their PLC activities. Unobtrusive measures, in the form of retrieving this archival information, was used to collect this data

by using the 'screen capture' feature on the researcher's MacBook. This feature allowed the researcher to take a picture of file systems and discussions that were saved as a picture file to the researcher's computer. This process allowed the researcher to expand the scope of data collection, allowing the collection of data that showed the connection between computer-mediated activities with those taking place face-to-face.

Data Analysis

Thematic network analysis, that offered a systemic and representational means of going from raw data to interpretation, was used to analyze the interview, observations and artifacts (Attride-Stirling, 2001). Thematic analysis begins with the coding of relevant words, phrases and sentences that are categorized into basic themes, forming the foundation of the thematic network (Attride-Stirling, 2001; Marks, 2004; Yin, 2016). Being recursive and iterative in nature, the assembly, disassembly and reworking of the basic themes allows for codes to be added, connected, disconnected and reconnected in order to continually investigate and re-evaluate both the original coding and the basic themes (Yin, 2016). The repetitive exploration of the codes and basic themes is essential as it requires the researcher to examine and reexamine the data through a variety of lenses, lending validity to the analysis (Yin, 2016).

A constructed network is used as a guide to systemically revisit the compiled data to gain a deeper analysis in support of the research question through summarization and the interpretation of patterns found in the themes (Attride-Stirling, 2011; Merriam, 2001). The final thematic network is graphically represented similar to the representation in Figure 3.1.

Before analysis began, an initial coding catalog was created, a priori, based upon the underlying theoretical framework as well as the investigation through the literature

Figure 3.1. Sample of thematic network analysis represented visually.

review (Ryan & Bernard, 2003). As analysis of data progressed, additional codes materialized and these emergent codes were added to the catalog (Taylor, Bogdan & DeVault, 2015). The complete coding catalog is attached as Appendix D.

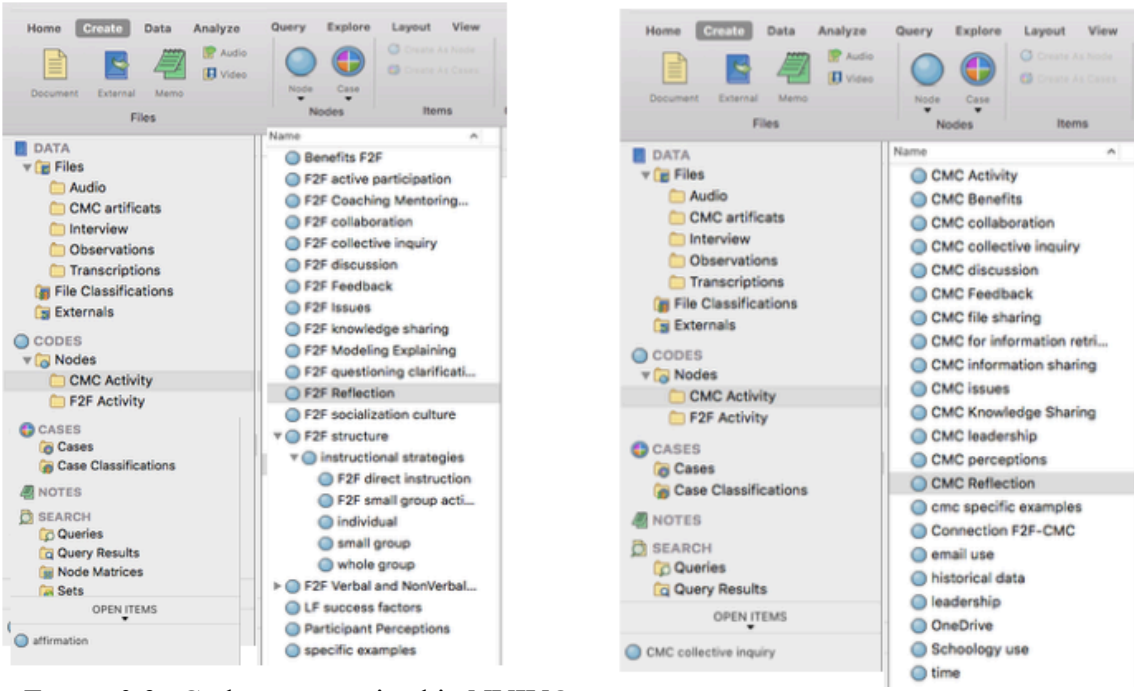


Figure 3.2. Codes as organized in NVIVO.

NVIVO 12 data analysis software was used to code all data where folders, known as nodes in NVIVO, were created based upon the two areas of investigation: CMC activity, and face-to-face activity. The a priori codes were added to each of these nodes (see Figure 3.2) and coding began with the transcribed interview where, line by line, key words and phrases were highlighted according to related codes and added to the respective node folders (see Figure 3.2).

Three passthrough reads of the interview were made to ensure intimate familiarity with the data. The process of coding continued with each of the transcribed observations until all transcribed data was coded using NVIVO.

In all, 1,987 segments of text were coded into fifty-four a priori and emergent codes. As codes were being narrowed, categorized and reworked into basic themes, it was the researchers preference to export the data from NVIVO into a Microsoft Excel workbook as the researcher felt it was easier to organize and manipulate the data (see Figure 3.3).

E	F	G	H	I	J	K
back using CMC	Reflection using CMC	General collaboration using CMC	Productivity using CMC	misc (where?)		abbreviations
i) After discussion (RTI plc) one of the teachers email the principal back (because there is a nt involved). The same information will be d to the RTI folder in Schoology	(CG) (E) (FS) (S) They finish their respective plans then email them to each other for feedback and then they post them to the Schoology lesson plan course when completely done.	(H) (AG) (O) (FS) Petty searches her OneDrive to locate the lesson and her and McCArter discuss the parts of the lesson that they integrated their content last year and how they will again this year. McCarter asks her to share last years lesson (Petty shares via OneDrive)	(wg) She asks them to jot down some reminders so that they can do their reflection. Manigo, Dena, Lockemy, Dawkins and Petty are using notebook. Medlin, Bridges, Martin, McCarter are typing on their MBs	(I asked how do you share content using the macs?) She responds that she will email her something she wants or use OneDrive to share a file.		WGI - whole group instruction WG - whole group DI - direct instruction CG - Content groups SY - Synchronous S - Schoology MS - Microsoft Word use LP - Lesson planning
R) Brock: okay so we need to complete the two rent surveys and I posted the links in Schoology	(S) Others are quietly adding to the post in Schoology	(CG) (FS) (E) Bridges: this is our template. She fills it out while we work on it here and then she'll send it to me email	(H) (E) (CG) (FS) She is copying and pasting into her lesson plans from last year's Petty lesson plan that Petty shared with her via email	(H) (S) (IR) Bridges is looking up past lessons on her mb in Schoology folders, but stops intermittently and looks at mccarter and nods her head in agreement		
(S) Mr Brothers: if you look what I did was d a couple of things to the folder, um Bridges, t some of that stuff in your folder. Everyone in the folder (macbooks)	(S) (WG) Jill opens with having teacher go to do a post on Schoology she says 'we are trying to problem solve' and they are going to respond to her question in a discussion forum on the use of paper	(FS) (E) (CG) Petty is telling Medlin to add some items to her Friday lesson and then email her the template.	(CG) (E) (FS) Bridges: this is our template. She fills it out while we work on it here and then she'll send it to me email	One teacher has shared a Nearpod with another via the Nearpod website		
NG) She added a post for immediate response eachers are all using their Macs to respond to ost but they are also discussing face to face	Tech Tuesday course she added a post for immediate response and teachers are all using their Macs to respond to the post but they are also discussing f2f.	(SY) They can each contribute digitally using their MBs because the worksheet is in Schoology from her OneDrive	(CG) Sometime they share email or files from OneDrive right on the spot	(M) Olivia is using her mb to take notes on what Petty is telling her		
		(CG) (FS) (O) Med: Let me send you the PPT that I use (shares via OneDrive)	(CG) Before closing her Macbook martin told bridges she emailed her the lesson template.	(observation) Rarely do they use technology outside of the PLC to complete assignments or additional tasks for their PLCs. The majority of activity going on in Schoology takes		

Figure 3.3. Example of coded data in Excel spreadsheet.

The Excel workbook was then printed, by code, where different colored markers were used to highlight potential basic themes surmised initially by the researcher (see Figure 3.4). The researcher felt this process allowed a better visualization of where codes intersected and overlapped in order to best consolidate codes into these potential themes.

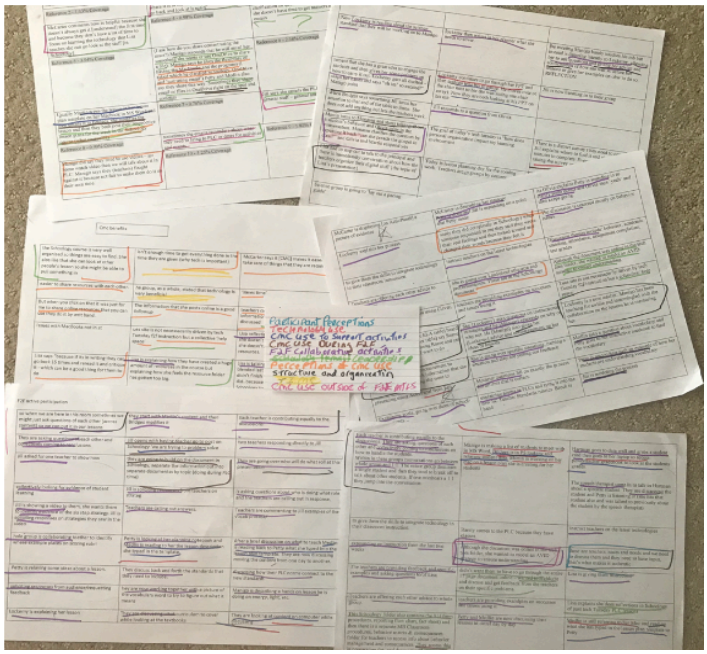


Figure 3.4. Sample of process used to identify overlapping patterns.

As an example of how the coding process took place would be where the participant's comment:

> For example in that basket there's a RAN chart and she introduced that RAN chart to us on Wednesday. We actually went through the RAN chart and saw how it worked and then we were expected to take that ran chart and do it with our students in the classroom

was highlighted with several different codes in the NVIVO data analysis platform: *face-to-face active participation, modeling, whole group, lesson planning and instructional practices.* As overlaps were being recognized and basic themes emerged, data with multiple codes, such as the one noted, were placed with the most relevant

theme. For this particular piece of coded data, it was found to be most relevant to, and subsequently categorized within, the *participant activities for a continuous cycle of learning* theme.

The same process as noted above continued, where patterns emerged, similarities and overlaps recognized, and consolidation of codes taking place until the fifty codes were deduced into thirteen basic themes. Although no requirement exists for a minimum or maximum number of basic themes, the recommendation is to target between four and fifteen, where less than four is too little to validate the data and more than fifteen cannot effectively be summarized in later steps of analysis (Attride-Stirling, 2001). To complete the thematic analysis, the basic themes were further rearranged and consolidated into organizing themes where they will then recognized as supporting the overarching global theme that is the "core, principal metaphor that encapsulates the main point in the text" (Attride-Stirling, 2001, p. 393).

Peer debriefings. To ensure the validity of the analysis process, three peer debriefings with the PLC's technology integration specialist (TIS) were conducted. In the first debrief the coding catalog was shared and the coding procedure was discussed. The discussion further targeted the emergence of themes where the TIS provided feedback to how the data was being construed. The second debriefing took place after the final thematic analysis was completed, where the researcher shared the graphically represented thematic network with the TIS and discussed how the data was synthesized in creating the network. During the last debriefing session the TIS and the researcher read through a draft of Chapter IV where, together, they analyzed the researcher's final interpretation, discussing not only the themes, but also the lens in which it was analyzed.

This was done to ensure all themes were meaningfully represented and trustworthiness in representation of the data was met.

Triangulation. It is imperative to the legitimacy of the research outcome that a variety of methods are used to ensure confirmability, dependability and credibility of collected data during qualitative research. This was especially important as this was a single case study method (Merriam, 2001), therefore, both methodological and investigator triangulation was used to validate the research. The use of a variety of data collection methods in the form of an open-ended interview, observations and the collection of artifacts were used to triangulate collection. Further, the use of thematic analysis, that is a constant recursive and reflective process, and that required several passthroughs of the data to deduce from a large amount of codes to a single, global theme (Attride-Stirling, 2001), was used to ensure the trustworthiness of the conclusions drawn from all sources. The process was triangulated where the researcher coded the material using NVIVO, then exported the data to a Microsoft EXCEL spreadsheet to approach the data more holistically. Finally all data was printed and highlighted so that overlapping themes could more readily apparent.

Limitations of the Study

Limitations were noted within this qualitative case study. First, the inability to access specific user data from the Schoology Learning Management System hindered the investigation of usage of the platform specific to both the sixth grade team and RMS's related arts teachers. As noted in the study, completed weekly lesson plans from all of RMS's PLCs are collectively housed in a single Schoology course that is available for access by all certified staff members in the building. The desire to investigate access by specific populations, including related arts teachers and particularly the sixth grade team,

was not an option due to the participants all being added as administrators to the course. Individualistic data on course administrators is not an option in Schoology, limiting the investigation of whom exactly was accessing the lesson plans and how often.

Second, RMS has a PLC for each grade level (6-8). The designation as an effective learning school system by Learning Forward and Advanc-Ed® of RMS was awarded to the entire school, not just the sixth grade that was investigated. The decision to conduct a single case study limited to the sixth-grade PLC could have led to limitations of the findings. However, the sixth-grade PLC was chosen because of the variability of its participants that ranged in age from twenty-three to fifty-two, as well as a range in teaching experience from induction to thirty-eight years.

Third, there are inherent limitations when conducting qualitative research where, during observations, participants could change their behaviors to be more acceptable to the observer. This requires the researcher to acknowledge and further investigate rather than allow bias and assumptions to lead the researcher toward specific, desired data (Merriam, 2001). Further, to minimize what could be an overwhelming amount of data available for collection during observations as well as the researcher's desire for data that reinforces the district's reputation as a leader in innovative technology use, the researcher may omit relevant data (either intentionally or unintentionally) (Fielding, 2008).

Lastly, because of the nature of single qualitative case study design, where research is specific to the phenomenon of a small sample, it is difficult to apply generalizability to the entire population of interest (Leung, 2015). Therefore, although validity was attended to through triangulation of data methods and investigation, the ability to generalize the outcome of the research across larger populations remains an inherent limitation of qualitative methods.

Rigor and Trustworthiness

To ensure the rigor and trustworthiness of collected data, the technology integration specialist (TIS), who is a PLC member, participated in three debriefing sessions, one at the beginning of the data analysis, a second where the thematic network was shared, and third where together the TIS and the researcher did a read-through of Chapter 4. During all sessions input was solicited from the TIS and her feedback on the analysis and interpretation of the data were considered during all phases of the collection and analysis process. In addition, the audio recording of both the interview and all observations, that were later transcribed by the researcher, ensured that direct quotes of the participants were not misconstrued.

Positionality

My role as the district's director of instructional technology, responsible for the adoption, integration and use of technology resources to support both classroom and teacher learning, as well as my ongoing training and investigation of effective teacher professional education, is the basis for my research. However, by choosing to conduct research as a participant-observer rather than include myself as a collaborative partner allowed me to observe an already effective PLC that does not require my input, strategies or ideas. Rather, the research was strictly for learning purposes to understand how the group successfully puts into practice the tools that are provided them. My desire was to understand, not implement, successful strategies for the use of CMC to support PLC collaboration.

I expertly observed the group's face-to-face interactions, recognizing the capabilities of the CMC resources being utilized by the group and learning from the structure of the PLC. My participation in the group remained focused on observing and

recording how adopted CMC resources were being utilized by the community to further their communicative and collaborative efforts with conduct reflecting only that of an observer and not of advisor nor district administrator. I conducted myself appropriately as to not sway decisions on which resources should be utilized, the use of the resources or acted in a capacity that would sway the outcome of the research being conducted. These decisions remained at the discretion of the PLC leadership and, as they found appropriate, delegated to the team.

Professional Integrity and Bias

Because the participant-researcher is the sole source of collection and analysis of the data, a common concern with case study design is the ability of the researcher to become biased and subjective, either consciously or unconsciously and exclude data that may be counterproductive to anticipated research outcomes (Merriam, 2001). As Merriam (2001) suggests in her detailed writing on case study design entitled, *Qualitative Research and Case Study Applications in Education*, because the subjects and situation are oftentimes more personal than clinical, the researcher may exhibit bias and subjectivity. The possibility for bias could arise due to a personal desire to have the research question positively addressed.

As the director of instructional technology that serves the school where the research is being conducted, it is only natural that I would want a positive outcome that shows exceptional use of technology, not just by students, but by staff as well. The district heavily advertises the national recognitions received due to its innovative use of technology including RMS's Learning Forward Learning School designation, the district's recognition by Apple, Incorporated as a distinguished technology program and the district's induction into the Digital Promise League of Innovative Schools. These

biases could come in the form of leading interview questions, interpersonal mannerisms and the desire of the participants to agree with someone in an administrative position (Sloan & Quan-Haase, 2017).

The remedy in ensuring unbiased and objective research methods cannot be found in manuals or journals, but instead, lies within the researcher. It is imperative that the researcher address any perceived bias and assumptions prior to the research as well as throughout the collection and analysis process by both ongoing documentation of such conflict as well as by discussing with participants, peers and advisors (Merriam, 2001). Further, as outlined in Sloan and Quan-Haase (2017), three procedures were followed during the reassembling process of data analysis that assisted in addressing bias: constant comparisons of data across coded themes was made, avoidance of discarding negative evidence was adhered, and engagement in rival thinking that challenged data outcomes was practiced. The recursive nature of thematic analysis as well as the researcher's integrity, allowed the implementation of these procedures.

Additionally, a useful guideline is AERA's (2011) Code of Conduct that addresses behavior specific to conducting educational research. The researcher engaged in reading the code's information that included advised her on dealing with personal animosities, differences in implementation (in this case, the choice and use of technology resources), and ensuring all those who were participants were well aware of the ethical considerations of the researcher and the study ("AERA Code of Ethics: American Educational Research Association Approved by the AERA Council February 2011", 2011).

Ultimately, ensuring validity and reliability of the data, through triangulation, proper collection procedures and documentation was ensured by the integrity of both the

researcher and the outcome of the research (Merriam, 2001). Understanding that bias is a consistent threat when conducting qualitative research requires the researcher to accept that predisposition for favorable outcomes are possible and to constantly address this prior to data collection as well as throughout the entire research process

Ethical Considerations

There is no research protocol established within the district where the research was conducted beyond critical review of the research proposal and permission from the assistant deputy superintendent of the area in which the research will be conducted. However, no explicit district guidelines to adhere to does not mean that considerations do not exist and that are essential to any study. I found the recommendations and requirements outlined in the American Psychological Association (2017) Ethical Principles of Psychologists and Code of Conduct, as well as the Code of Conduct of the American Educational Research Association relevant and applicable.

Informed consent. To avoid ethical dilemma and deception in research, the APA's (2017) code of ethics requires informed consent from institutions and individuals to conduct research and collect data; however, the code allows researchers to "dispense with informed consent . . . where research would not reasonably be assumed to create distress or harm and involves (a) the study of normal educational practices, curricula, or classroom management methods conducted in educational settings the study of factors related to job . . . (c) or organization effectiveness conducted in organizational settings for which there is no risk to participants' employability" (APA, 2010).

Although the research topic and methodology were discussed in detail with the school principal and the PLC lead and were also thoroughly outlined for each participant in the study, I chose to have participants complete informed consent (see Appendix C).

This afforded courtesy to each participant as well as assisted them with thoroughly understanding the scope of the research and their role in advancing research in the field of technology to support PLCS

Confidentiality. Confidentiality is important to qualitative research, especially with the use of observations and interviews where trust is necessary to maintain open communication (AERA, 2011). To protect the identities of the participants, each chose a pseudonym to be used in the publication of the research. Further, the informed consent relayed the scope and sequence of the research and laid out the possible benefits and risks of the study. With no known risks to the possibility of exposure of identity coupled with the precautionary measures to protect the identities of the participants, the researcher ensured that all participants felt comfortable with the measures taken to ensure confidentiality.

Chapter Summary

Chapter 3 described, in detail, the data collection and analysis methods that were used in conducting the qualitative research related to the study of how a sixth grade PLC utilized CMC to support their community efforts. It included a description of how the researcher utilized an interview, observations and the collection of artifacts to gather data as well as the use of thematic analysis to interpret the data. Rigor, trustworthiness, ethical considerations, positionality and triangulation were also discussed so that a foundation was laid for the validity of the research. The outcome of these methods and the subsequent analysis of the data is discussed in Chapter 4.

CHAPTER 4

FINDINGS

The purpose of the research was to examine how an established sixth-grade professional learning community utilized CMC to support their face-to-face collaborative efforts. The problem of practice was the limited resources that hinder PLCs from carrying out their activities including lack of time and time management. The problem of practice was formulated from the researcher's direct observations from district schools as well as feedback from the district's school-level instructional technology coaches where the problem of practice was noted as common issues that hampered PLC efforts in the schools. The sample was chosen due to its recently having received national recognition as a Learning Forward School, a distinction given by the Learning Forward and Advanc-Ed® organizations based upon RMS's commitment to teacher learning. The single case study was carried out to investigate the following research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts?

Study Design

The researcher utilized a single case study design where the data was collected using three methods: a single semi-structured group interview, eighteen participant observations spanning from November 30, 2017 to April 28, 2018, and unobtrusive measures in the form of gathering artifacts from CMC platforms utilized by the PLC. During the interview, participants shared their feelings, perceptions and experience

related to their professional learning community and how they used CMC resources. Observations done by the researcher captured the community's activities, their use of CMC during meetings, the community's social interactions/reactions, group dynamics and the environment in which the participants interacted. Collected artifacts, in the form of screen captures of online activities, showed how CMC platforms were utilized by the community.

Collected data was transcribed and imported into NVIVO 12 data analysis software where it was coded and categorized and then reworked, disassembled and reassembled for emergence of basic themes. The basic themes formed the basis of a thematic network where organizing themes emerged, finally being deduced into a single global theme that encompassed the main point of the data.

Background

Participants of this study comprised a sixth-grade professional learning community at an urban middle school in a mid-size South Carolina city. Participants included nine teachers, two from each content area (social studies, science, English language arts and mathematics), and one who taught both social studies and science. The school's curriculum coordinator and the school's technology integration specialist (TIS) comprised the leadership team of the PLC that facilitated the day-to-day activities of the community. Six of the teachers, as well as the curriculum coordinator and TIS, have been part of the PLC since its inception five years prior, three of the teachers were new to the school and the PLC and one of them to the teaching practice. Ages of participants ranged from twenty-three to fifty-nine years old and their teaching experience ranged from first year induction to thirty-eight years. In addition, the curriculum coordinator has twelve prior years' experience as a state and school level instructional coach.

At the time of the case study the PLC had been in practice for five years and was originally established by the PLC lead with authority and careful inspection of the school district's assistant superintendent for curriculum and instruction. It is the only school in the district that carries out a continuous cycle of teacher learning that specifically uses the Learning Forward Standards of Professional Learning (2011) as its framework.

Overview of PLC Structure

The PLC follows a cycle of learning for continuous improvement carried out during meetings over four days and include activities as follows:

- **Wednesday teacher participatory learning:** teacher learning opportunities including active participation in learning activities, reflection, feedback and collective inquiry
- **Thursday collaborative content lesson planning:** content group collaboration on the coming week's lesson plans that incorporate the learned strategies from Wednesday as well as other meetings explained next
- **Friday student data-driven RTI:** collective inquiry on student behavior and summative/formative assessment data retrieved from PowerSchool, the district's student information system, and the teachers' own behavior and assessment information
- **Tuesday technology infusion:** teachers' engagement in learning technologies for use in the classroom, to support their administrative and/or PLC activities and/or for the completion of technology related tasks in direct support of the school's 1:1 technology initiative

This brief understanding of PLC activities and the cycle of learning it implements is illustrated in Figure 1 and is expounded upon in this chapter's coming sections.

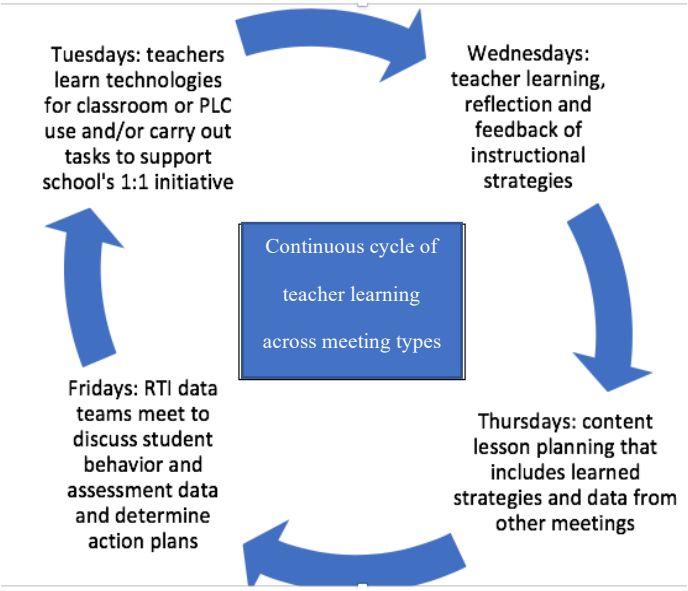


Figure 4.1. Continuous cycle of teacher learning across meeting types.

Study Findings

The study revealed that computer-mediated communication resources for collaboration are used most often during face-to-face PLC meetings, with the majority of usage outside of face-to-face meetings for individual responsibilities, brief communications and sporadic feedback. Outlook email as a communicative platform was used for quick, informal communications, to share information with those not in attendance at face-to-face meetings, and for PLC members to share their lesson plan templates with each other. Schoology, the district-adopted cloud-based learning management system, was used as a collaborative platform to share files and to store and retrieve information with usage, albeit limited, for discussion, reflection, collective inquiry and synchronous or asynchronous collaborative activities. The practices noted

above were regardless of whether the usage was during or outside of face-to-face meetings.

Noted by participant feedback, the structure of both CMC platforms and face-to-face meetings were key in the utilization of CMC resources. Relevancy, organization, PLC leadership support, and time management all contributed to the use of CMC by PLC members. However, regardless of age or teaching experience, participants repeatedly specified that they preferred to engage in face-to-face collaborative interactions despite CMC being readily available and capable of facilitating the interactions. The community emphasized that they valued having CMC resources to support their face-to-face activities.

Data Analysis

Through a thematic analysis approach, where the interview and observations were recorded and transcribed using QuickTime audio recorder on the researcher's MacBook, and then coded using NVIVO 11 software, the data recognized the fluidity of the meetings. This was noted where the activities and content of each meeting throughout the week continued and supported the activities of other meetings (see Figure 1). Further, the data revealed that CMC supported this cycle during and outside of face-to-face meetings by providing a means of extending learning opportunities and allowing connections beyond participants who were present at meetings. The Learning Forward (2011) organization recognizes that knowledge sharing, development of skills through active participation, and collaborative activities as essential to effective teacher learning. Further, the organization also promotes a continuous cycle of teacher practice, reflection and feedback as a part of teacher learning that are supported by effective leadership

(Learning Forward, 2011). The recognition of these attributes, and how CMC supports them, became the basis of organizing and presenting the data in five main themes:

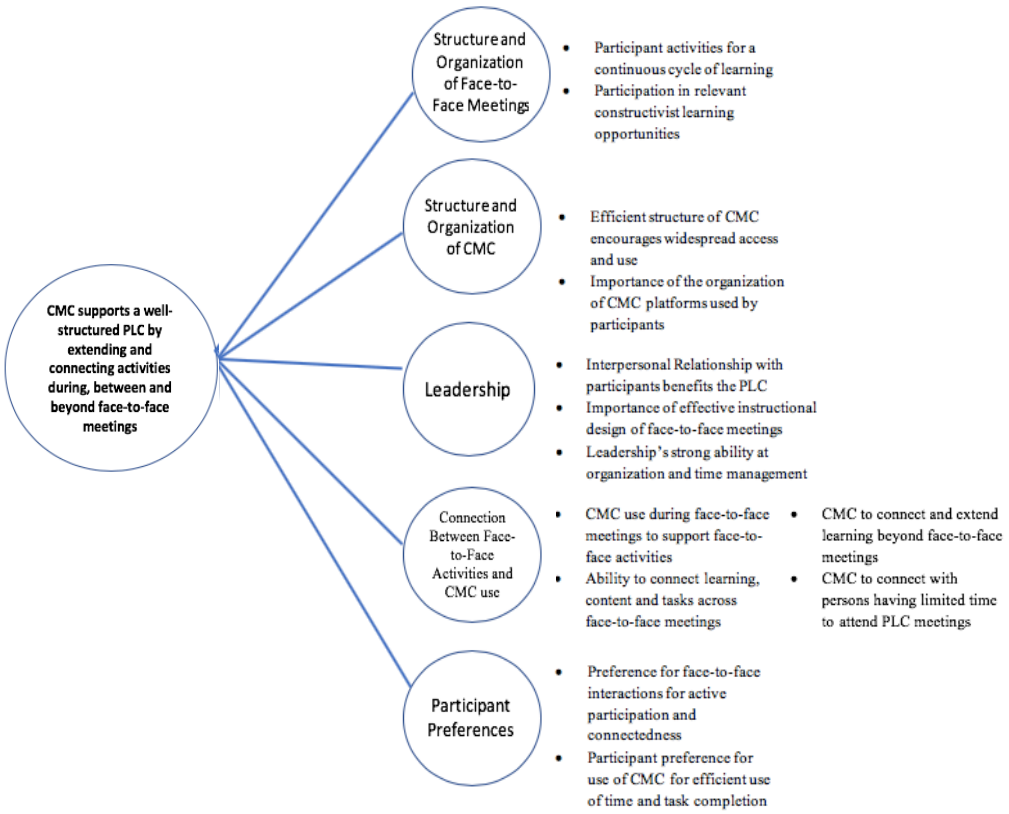


Figure 4.2. Visual representation of thematic data.

- Section #1: Structure and Organization of Face-to-Face Meetings
- Section #2: Structure and Organization of CMC
- Section #3: Leadership
- Section #4: Connection Between Face-to-Face and CMC
- Section #5: Participant Preferences

These sections, which are visually represented as organizing themes in the thematic network (see Figure 4.2.), encompass the network's basic themes that emerged from the data. Although the data appears to be linear in its presentation due to the

dissertation writing process requirements, the themes have overlap due to the investigation of face-to-face activities, CMC use, and the connection between them. Therefore, the researcher felt it important to note that the extracted data is presented in the section where it rendered the most support to a specific theme.

Section #1: Structure and Organization of Face-to-Face Meetings

Teachers meet together in their PLC four times in a five-day work week for forty minutes per meeting. Each meeting has a different scope and purpose, however, they are all inter-related as noted previously. During these meetings the team carries out well-organized, relevant and measured activities and interactions that include active participation, collective inquiry, feedback and knowledge sharing. Research has shown that these activities are the basis of effective PLCs (Graham, 2007; Kumar, Darling-Hammond, Hyler & Gardner, 2017).

Theme: Participant activities for a continuous cycle of learning. Collectively, meetings are married together across meeting days where learning from one focused meeting flows to the next to create a continuous cycle of learning, practice, feedback and reflection (as shown in Figure 4.3).

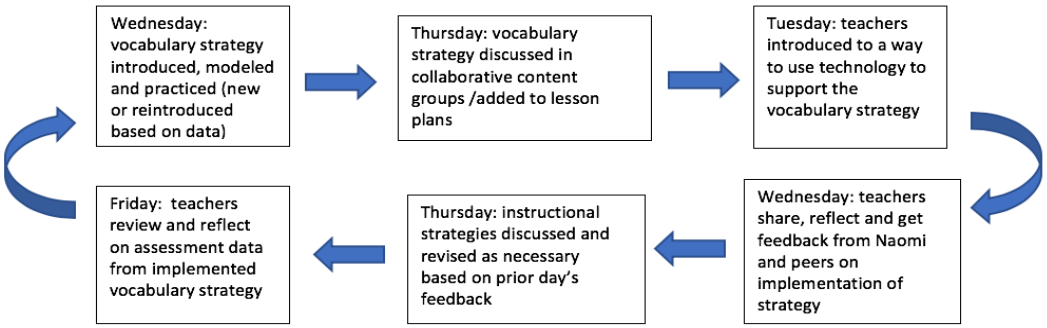


Figure 4.3. Flow of content and activities between PLC meetings.

Naomi refers to this cycle as *plan, do, study, act* (PDSA), somethings she says "I kept seeing over and over when trying to plan for the PLC" however, she says she is only vaguely familiar with any one specific method. An Internet search by the researcher showed that PDSA is an improvement framework developed by the Associates in Process Improvement (API) (2018) company to help businesses improve their practice. It has become the adopted model of the United States Department of Health and Human Services Agency for Healthcare Research and Quality. Reference to the cycle can be found on their website as well as pages of other United States healthcare organizations, such as the Centers for Medicare and Medicaid Services and the Institute for Healthcare Improvement. The learning process implemented by Naomi, although not exact, shows a similar structure to the PDSA cycle where a plan to resolve an issue is developed, the plan is carried out, the effects are studied, and then the plan is modified accordingly (Associates in Process Improvement, 2018).

The implementation of the cycle was noted during the pre-observation interview where participants explained:

Kory: We have a strategy, a uh, kind of a walkthrough of something that she [Naomi] is wanting us to push out into our classrooms. And so we go through that, walk through that so we know how it is supposed to work and then we take it out, do it in our classrooms and then we bring back data from that.

Carolina: For example in that basket there's a RAN [reading and analyzing non-fiction] chart and she introduced that RAN chart to us on Wednesday. We actually went through the RAN chart and saw how it worked and then we were expected to take that chart and do it with our students in the classroom.

Activities that support the cycle are implemented during PLC meetings throughout the week. During teacher participatory learning days, Naomi engages the

team in hands-on learning, discussion, reflection and feedback on the implementation of learned strategies and relates them to the cycle:

> Today we will start discussing what would you consider acceptable evidence in your room for student learning as it relates to vocabulary. That is going to bring us up to the continuous improvement cycle

and:

> If you look at the cycle we have, we went through the planning stage, you've implemented in your classroom, you've been carrying out the plan and you've got data. So in here today we are on the study component, we are gonna look at and analyze your data and examine the data

Data gathered from the learned instructional strategies are discussed during student data-driven RTI meetings as a part of a more elaborate student data analysis geared towards the district's RTI efforts. During these meetings, the team is divided into three groups with each group retrieving, from their Schoology platform, their previously submitted individual classroom assessment and behavior data. They also access state and teacher assessment data and behavior referral information from PowerSchool, the district's student information system. As explained by Kinnaras during the interview: In other words that's where we look at the information, the data that we gather, then we implement it and come up with different, um, strategies or different things we can do to help our students.

The collective inquiry and discussions focus on the retrieved assessment data as well as the teachers' individual observations of student behaviors that have been exhibited by the students in their respective classroom. This data is used by Naomi and Laverne to determine what instructional strategies will be introduced to the team at subsequent teacher participatory learning meetings.

Hands-on teacher learning during technology infusion PLC meetings is oftentimes incorporated as part of the cycle as well. This was expressed during the interview by Shiba:

> So Tuesday it's all technology related so we're looking at maybe a new way to do things with technology in the classroom. Like going over something with Schoology perhaps. Using the technology in the classroom. Ways to incorporate it into our lessons.

An observed example of this started during a teacher participatory learning meeting where teachers learned a vocabulary strategy involving folding a piece of paper a certain way to use as a vocabulary learning activity with students. After learning the model, the teachers actively participated in practicing the strategy. The following technology infusion meeting Laverne showed them a computer program that could carry out the same strategy digitally. As a continuation of the cycle, teachers discussed how to utilize the strategy with their students and then incorporated it in their lesson plans during their next collaborative lesson planning meeting. Reflection on the process, including student assessment data from classroom implementation of the strategy, was carried out in subsequent teacher participatory meetings.

Theme: Participation in relevant constructivist learning opportunities. The activities that the community engages in promote active participation in the form of discussion, collaboration, collective inquiry and knowledge sharing. The Learning Forward (2011) organization promotes these activities as highly relevant teacher learning practices and are noted as key PLC activities in their Standards for Professional *Learning (2011).*

Emerged pattern: Knowledge sharing across groups and content areas. Although each content group could potentially meet in separate rooms or through

available CMC, the principal and Naomi decided that all meetings would take place for all groups together in their PLC room. This structure allowed for knowledge sharing and collective inquiry across groups. With underpinnings from Vygotsky's (1978) social constructivist theory of learning through more knowledgeable others (MKO), knowledge sharing during PLCs, both formally and informally, is known to enhance teacher learning and increase individual knowledge (Wenger et al, 2002; (Kumar, Darling-Hammond, Hyler and Gardner, 2017). This is reflected in RMS's sixth-grade PLC where the structure of face-to-face meetings allows time for collaboration within and across groups, increasing discussion and knowledge sharing for the entire team. During the interview, an example was shared by Giselle as she explained, "Like last week we had to, um, give presentations as a team on what we're doing with our data and um, and what strategies are we implementing to get our students where they need to be."

Depending on the activities that will take place during the teacher participatory learning meetings, Naomi will oftentimes place teachers in either content groups, randomized groups or pairs, or specific groups or pairs. Despite being in small groups, discussion and interactions tend to go beyond these assigned groupings so that knowledge and feedback become more widespread. Kory noted this during the group interview:

> Well when we're thinking we are just gonna have to figure something out, then someone else will say, *well in my class I tried this,* and then oh well we're gonna try that! And we can piece this and piece this and if they were trying this over in that group and our group would be like *do you think we could try that or what*?

In a specific teacher participatory meeting example, a paired teacher discussions quickly became whole group knowledge sharing and reflection as participants could overhear other paired group conversations, and finding them relevant, would participate:

Kinnaras: We could make connections between classroom or [pair A]
Omed: across content [pair A]
Megan: across content or anything. I've noticed an increase in word walls [pair B]
Shiba: Exactly. They are starting to use those words and strategies without being prompted [pair C]
Amy: I notice they are self-correcting. For example a student was asking me a question and asked if the animal was warm-blooded or cold-blooded and then I made them use the vocabulary [pair C]
Omed : So this fall under how we planned it [pair A]
Kinnaras: But it really wasn't a plan, it was just things that we observed that was a plus [pair A]
Megan: Us too. It wasn't part of a plan, just us observing like you did [pair B]

In lesson planning meetings, where teachers work in content groups, the teachers hear something that is relevant to them from another content group or ask questions of each other and engage in a conversation about that topic across their content groups. The following discussion took place between three different content planning groups, ELA, social studies and science from a collaborative content lesson planning meeting:

Amy: They've learned about Aristotle? [science teacher]
Megan: Yes. [social studies teacher]
Amy: Okay and they've learned about Linnaeus?
Kinnaras: But we definitely need to know about him because he comes up in that first taxonomy [science teacher]
Megan: And Aristotle. Naming plants, naming animals [social studies teacher]
Kinnaras: And hierarchy. They would have learned that in social studies [science teacher]
Megan: they know it cuz of social hierarchy [social studies]
Kory: They know that word from my class too [ELA teacher]
Amy: Okay so let's apply that to science [science teacher]
Megan: They should make that connection [social studies]

Collectively, team members feel these interactions with each other across their content groups are valuable resources to their task completion as Kory stated during the interview, "Just like when we teach, like in the classroom we bring in other subjects so we need to be here in this room to talk about it".

Emerged pattern: Active participation and collective inquiry. Naomi facilitates teacher participatory learning meetings using a variety of instructional methods including

whole and small group collaborative discussion and reflection, hands-on participation and collective inquiry. The following are observed examples of Naomi carrying out these strategies:

> Thinking about the six steps, normally you do together the restate and show steps one, two three. But what about steps four, five and six? I want you to discuss that now with your partner.
>
> What I want you to do, we are gonna watch a quick video, and I want to see if you can capture some evidence from this video of any of those steps. So you are looking for evidence from the steps and sharing it.
>
> You are bringing back student samples every week and we will collectively continue looking for student evidence each week and actually what you did in the classroom. So some of you I will ask in a few minutes to stand up and ask you what you did in the classroom. Share what it looked like.

Kaze: Are we going to share?
Naomi: We are all at one time, but right now we are just reflecting on your own. But I am going to be giving you an opportunity to collaborate on that reflection together cuz we plan that way so it just makes sense to give you the opportunity to do it this way

Hands-on activities during Tech Tuesday are meant to support the integration of technology in the classroom, including targeting the integration of technology with the newly learned instructional strategies, noted previously as part of the cycle of continuous learning. In addition, these meetings have included the collective discussion and resolution of technology issues that affect the classroom environment and support the school's 1:1 program (every student and teacher has a MacBook Air laptop computer) as well as peer-to-peer learning of technology for classroom use. The types of focused activities were relayed by participants during the interview:

Megan: She introduces new things. Stuff that we might not have integrated into the classroom yet. We're all at different levels. I've had a MacBook since they came out and we have teachers who've never worked on a MacBook so she helps us and we help each other learn things.

Kory: And we may spend that time, um, uploading MacBook data and we cross-check the MacBooks to make sure everybody still has the same one. Um check the chargers and those things and we upload the data into the Schoology platform and that's what we would do together during that time as well.

Emerged pattern: Collaborative lesson planning. An abundance of research shows that, when teachers are given collaborative learning opportunities, their motivation and commitment to learning increases, resulting in a positive impact on student achievement (Vangrieken et al, 2015; Cordingley, Bell, Rundell and Evans, 2003; Hord, 2014; Goddard, Goddard and Tschannen-Moran, 2007; Berry et al, 2009). Once a week the PLC meeting time is set aside solely for the purpose of teachers working collaboratively, by content area, on lesson plans for the upcoming week. They discuss strategies, share ideas and provide feedback as they complete a basic outline of the coming week's lessons that each teacher will access outside of their PLC time to complete their individual plans. This structure was shared by participants during the interview:

Kinnaris: We have teachers who want to bounce ideas off each other. Basically, this time is for collaboration not writing plans. Plans is an individual responsibility.

Megan: Omed types everything now and I just go back and put in accommodations later, we don't need to be together to do that

Kaze: We have a template. She fills some of it out on Thursdays [collaborative lesson planning meeting day]. She teaches honors and I teacher CP [college preparation]. Same standards but her classes are at a faster pace. So our template has the standards and then we discuss what we will do that week. She'll send it to me and I'll do mine on my prep.

The following are specific examples from observations of collaborative lesson planning meetings that show the collaboration of the groups:

Kinnaras: So let me stop you for just a second, can I hit backspace? Once we get here we have talked about classification. Then, that's when we get into actual animals
Amy: So I will take two weeks to do this?
Kinnaras: Really do you think you need two weeks? We only need one week. I think we can do this simultaneously with the other content

and:

Megan: They could do a geographic sculpture station. Last year I got some pretty good stuff with that.
Omed: Okay. So then for closure we're gonna talk about review geographical features
Megan: Yea. We could talk about comparisons, Greece and Rome. I think I'll have a poster, you know keep a poster for each day and they can just add things, what do you think about that?
Omed: For Rome and Greece?
Megan: Cuz its time they go back and think about, you know, be comparing the civilizations. It's about time we start going back and doing that
Omed: Okay. So what's your data going to look like? I'm going to do data bingo

A continuous cycle of learning takes place that span across all of the PLC's meetings, allowing for meaningful connections to be made in the learning. This is done with relevant participatory activities including knowledge sharing, discussion, collective inquiry and collaboration, all of which are shown to be powerful and effective means of teacher learning (Wenger et al, 2002; Darling-Hammond, Hyler and Gardner, 2017; Hord, 2014).

Section #2: Structure and Organization of CMC

The Schoology Learning Management System is utilized by the PLC for file storage, sharing and retrieval as follows:

- Wednesday 2017-18: contains presentations and support documents from teacher participatory learning meetings, student assessment, behavior and growth

data, RTI student tier charts and behavior management and consequence policies and procedural documents.

- Lesson Plans and Agendas 2017-18: Contains all lesson plans created for grades six, seven and eight, Student Learning Outcomes (SLO) documents, instructional action plans, agendas and for PLC meetings and submissions from face-to-face tasks
- Tech Tuesday: houses tutorials and procedural documents related to technology integration, technology issue resolution and support documents related to the district's 1:1 technology program

These courses serve as the foundation for information and filing sharing for the PLC. Members of all school PLCs, PLC leadership and school administrators can access all courses in the platform at any time from any Internet or data-connected device.

Theme: Efficient structure of CMC encourages widespread access and use. Lesson plan submission to the Lesson Plans and Agendas course every Monday morning is a required PLC norm. All posted lesson plans, from all sixth through eighth grade teachers can be viewed by all teachers sixth through eighth grade and all certified staff including related arts teachers, special education teachers, assistant principals, guidance counselors and the principal. The ability for all teachers to see all lesson plans was done purposefully to encourage cross-curricular integration, an easy means of access, and inclusive lesson planning by special education teachers. In addition, this structure allows the principal to monitor upcoming classroom activity at anytime from anywhere as well as allow assistant principals, who oversee curriculum and instruction for the entire school, to review lessons plans and provide feedback.

Theme: Importance of the organization of CMC platforms used by the PLC members. The attention to file upkeep, organization and structure of these Schoology courses is an important element of participants utilizing the platform to assist with their learning needs, mainly as an extension of their learning and to implement instructional strategies and procedures in their classrooms that are presented during face-to-face meetings. During the interview all participants mentioned the use of Schoology as their file sharing platform and many indicated the importance of having it easily accessible and well organized. Amy and Carolina summed up the collective sentiments of the group:

Amy: I think, um, in my opinion my first year here Schoology is amazing. Having everything organized and all in one place and knowing if I don't know where something is chances are it's going to be on Schoology and so that helps immensely, just the organization and the structure

Carolina: The Schoology course is very well organized so things are easy to find. I like that I can look at other people's lesson and might be able to pull something into mine

Because the team stores most of its materials in Schoology and accesses it often in support of PLC activities, Laverne and Naomi work to ensure that files and folders are organized and easily accessible to participants. The Schoology Lesson Plans and Agendas course has a specific hierarchical folder structure as outlined in Figure 4.4.

It is important to note that teacher participatory learning, collaborative content lesson planning and student data-driven RTI meetings are held sacred with none being cancelled or used for other activities during the observation period, however, there were four occasions in which the technology infusion meetings were either cancelled or used for other than their intended purpose. Because of this limited and disrupted schedule to work with teachers, Laverne relies on the use of her Tech Tuesday Schoology course to share resources with the team. She pays attention to the organization of the information

(see Figure 4.5) and encourages teacher use of resources placed in course during her technology infusion meetings:

> So this is a build from last week and the week before, cuz last week, you now, we had to cut it short but you guys actually ended up helping me a whole lot telling me a bunch of stuff so now we've got it all in this document

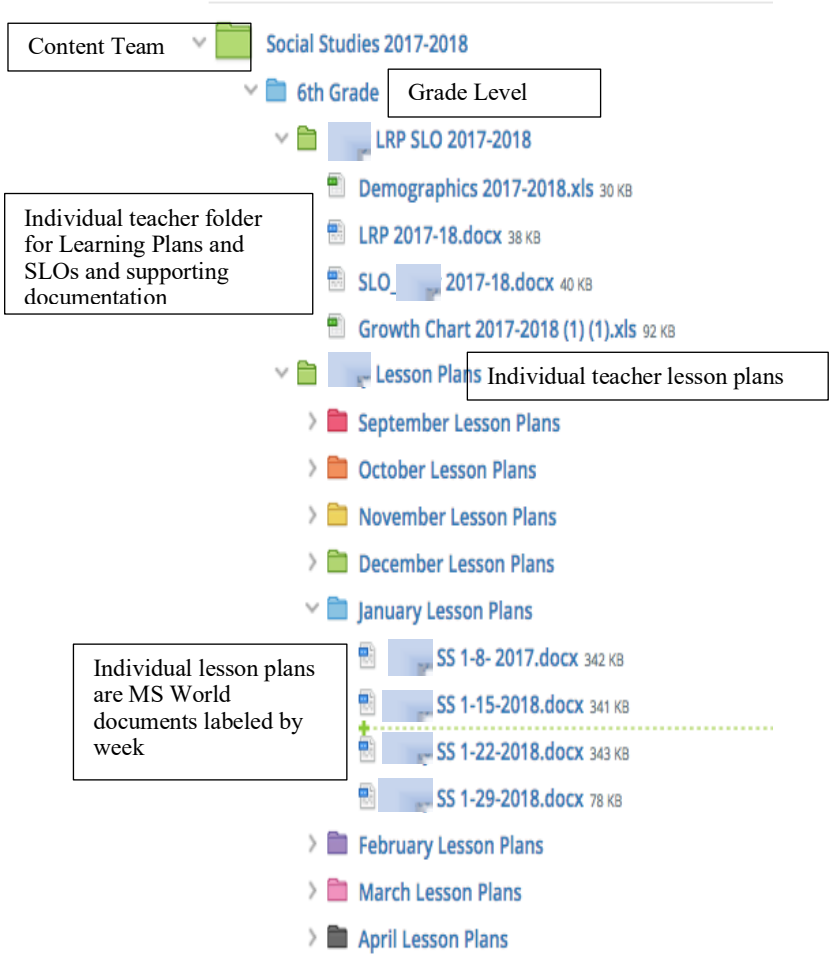


Figure 4.4. Annotated screenshot of Lesson Plans and Agenda 2017-18 Schoology course folder structure.

> Once it gets into Schoology it needs to be separated into what you are used to, so you're still not having to go through stuff. So last week the seventeen page document has now been separated into its respective places. so if you go to the IT action board, it now has all of the categories. Its listed as a category and tells you where it is.

> So we look over these several times and you've got lots of resources that you've been using that are always there in Schoology and I organized them all for you.

The structure and ease of use of online environments is an important aspect in encouraging their use (Booth, 2012). The maintenance of resources stored in Schoology as well as continuous referral to their relevance by PLC leadership ensures teachers utilization of CMC platforms for their learning.

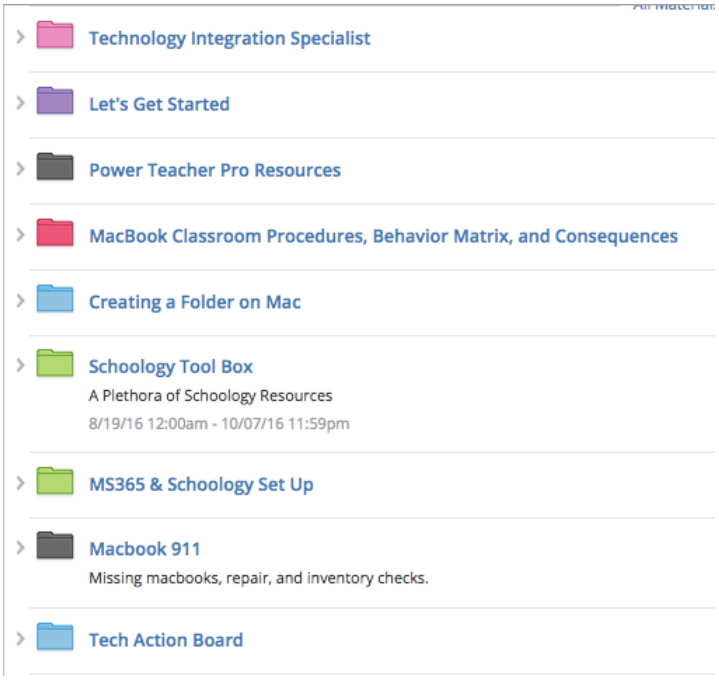


Figure 4.5. Annotated screenshot of Tech Tuesday folder structure

Section #3: PLC Leadership

Engaged leadership that ensures the effective use of resources, including time and technology, is essential to the success of teacher learning (Carpenter, 2015; LeClerc, Moreau, Dumouchel & Sallafranque-St-Louis, 2012; Sims & Penny, 2015). RMS's Leadership uses the Learning Forward Standards (2011) as a framework for the PLC that emphasizes the development and sharing of knowledge and skills directed towards a

common goal of increasing student achievement. Each of RMS's PLCs (for sixth, seventh and eighth grade teachers) are facilitated by the school's curriculum coordinator, Naomi, who has been in the educational community for twenty-one years, twelve of those as an instructional coach at both the school and state level. She is responsible for the day-to-day learning activities and content of each PLC meeting.

Theme: Interpersonal relationship with participants benefits the PLC. Naomi and Laverne, the school's technology integration specialist, work closely together to assess student data and monitor teacher progress related to implementation of PLC activities. Their decade-long relationship began at a prior school where Naomi was Laverne's instructional coach for five years. Together, they brought the current PLC to fruition and their close working relationship has benefited the PLC greatly as Naomi guides Laverne in facilitating and structuring PLC activities. A conversation with Laverne directly following a PLC meeting included her emphasizing that:

[Naomi] is my everything! Coach and mentor, she assessed my lessons, helped me with planning, and she still coaches me every day. It's still endless! We work through everything that needs to be done with the PLC to make sure we get it right.

Naomi's relationship with the teachers on her team are also indicative of her many years of coaching experience. Oftentimes teachers will stay after the meeting to confer with Naomi, sometimes about school matters, other times on a personal level. Comments by participants about Naomi, such as Kory's "we can't help it, we love each other!" and Amy stating that she likes "getting feedback from [Naomi] because she's more personal about it" are telling of their relationships. Naomi herself appreciates the relationships as, when asked about moving her PLC activities online, she stated, "if it were all digital we wouldn't be connected like a family like we are!" Naomi does not

hesitate to express this connection during meetings as shown by her behavior at the completion of one particular teacher participatory learning meeting:

Like I said have candy for y'all to thank you. Also under someone's chair there is a sticker that says "you're amazing". If you have that sticker under your chair you can come get a Valentine [entire group claps and cheers].

Theme: Importance of effective instructional design of face-to-face meetings.

As stated previously, Naomi implements a variety of instructional strategies as she works with teachers across PLC meetings. During the interview Kinnaras stressed how effective Naomi was at designing what he believes is a successful learning environment:

> I think one thing important is that our professional learning is designed to support our instruction. It's not a class by itself, its integrated, it's part of what we do so it's designed to support our instruction. And she designs it, she chunks it so that it's not too much you know it's just enough for us to handle and implement with fidelity and then bring back and we may find out this did or didn't work for sixth grade

To ensure that the content of PLC meetings supports their instruction, Naomi and Laverne rely heavily on student data compiled from both state summative assessments and teacher formative and summative assessments, as well as teacher reflection and feedback during their PLC meetings. During a reflective conversation between Naomi and Laverne following a PLC meeting, they discussed with me their use of data and its overall importance in what they and the PLC members accomplish, where Naomi stated that:

> Without data all anyone really has is an opinion. Cuz if we are all just saying *I think it works; well no it doesn't, well we think core extension works, I think the vocabulary works* but we don't know. If we are just throwing out opinions without the data to support it then really were not going to get the growth were looking for so we really need to use the data and make it work for us

Naomi understands the importance of peer-to-peer learning and collaboration as she is often present during the collaborative lesson planning meetings, however, does not disrupt the collaboration unless she is specifically asked to participate as stated by Megan during the interview that, "Sometimes [Naomi] is here and we can ask her questions but mostly we are allowed to just collaborate the whole time on the coming week's lessons." Kory also spoke about Naomi's leadership during the interview, noting the same is true when the teachers are engaged in groupwork during teacher participatory learning meetings:

> And we can piece this and piece this and [Naomi] is there to fill in the gaps if we need that to offer another suggestion, a way, and then she will work between the two teams as well. So if she hears something with this team. She makes it a huge collaborative thing.

Theme: Leadership's strong ability at organization and time management. During the interview, the team members spoke highly of Naomi's leadership, explaining that they appreciate their professional learning time because of her decisions that emphasize the way that she organizes the meetings where Amy shared, "Just the organization and the structure and I think [Naomi] as curriculum coach, compared to where I came from before, she is on it. She uses our time very wisely".

Emerged pattern: Time management of face-to-face meetings. Both Naomi and Laverne work closely together to analyze a variety of data to prepare for PLC meetings and drive their instruction, ensuring relevant and timely delivery of content to the team and to ensure PLC time is well-managed. However, despite the efforts at timeliness, preparedness and participation, and the fact that the PLC has more time than the average PLCs in schools across the district and nation (Markow & Pieteres, 2009), participants still note lack of time as an issue. Kory stated that "We don't get time to visit each

other's classrooms much during the course of the day and PLC time is so limited". Amy also said that there was a lack of time outside of face-to-face meetings to collaborate:

> When [Kinnaras] is not here I really feel the difference. I'll still spend the time doing my lessons and then try to find a time to discuss them with him and get some feedback, but I really don't get an opportunity to find time to do that.

During the interview, members of the PLC noted Naomi's ability to organize PLC activities in order to maximize the limited time they have during, and outside of, PLC meetings as Kaze shared that Naomi is "very efficient and prepared and since she was a classroom teacher she understands that our time is limited". Amy, during the interview, also noted that:

> Naomi is very, very supportive with giving us ample time. We are given time throughout the week to get things done so there is not, there is very little extra work I have to do outside of what happens here, on my own time.

Emerged pattern: Leadership use of CMC to assist with time management. The PLC expectation is that every teacher come prepared and on time to PLC meetings. Naomi uses the Lesson Plans and Agendas Schoology course as well as Outlook email to provide them with necessary information prior to meetings to ensure preparedness (see Figure 4.6). Further, because Naomi uses the Schoology platform to house important documents and website links, she is able to keep 'housekeeping items' such as sharing school event information or reviewing dates of state assessments, from taking up more than the first few minutes of very few of their meetings.

Even in her absence, Naomi ensures that PLC time is managed efficiently and that she utilizes available technology resources to support her leadership role. As an example,

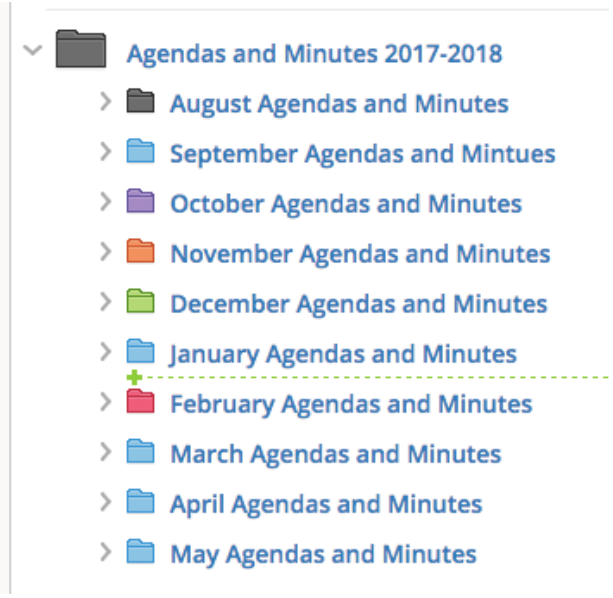


Figure 4.6. Screenshot of Agendas folder structure in Schoology.

on one occasion during the observation period, she was unable to be in attendance at a teacher participatory learning meeting. Prior to the meeting she emailed the PLC members what was expected of them during the meeting and shared the items needed to complete the task in the Schoology course. During Naomi's absence the teachers were able to retrieve the necessary items, complete the task, and upload them to Schoology for Naomi's retrieval and review. Because of the CMC structure put into place by Naomi, where PLC materials can be accessed anytime from anywhere, the team was able to carry out their tasks and Naomi was able to facilitate, to an extent, the meeting despite her absence.

It is important for leadership to attend to the structure and organization of PLCs so that effective learning can take place (Carpenter, 2015; Sims & Penny, 2015; Tallerico, 2014). Naomi, as an effective leader, utilizes available resources including the

use of technology and the management of available time, so that she can carry out meaningful learning with her team.

Section #4: Connection Between Face-to-Face Activities and CMC Use

The utilization of CMC has been shown to be an effective means of supporting face-to-face PLC efforts, especially for communities with limited available resources, and most specifically, time (Blitz, 2013; Hawkes & Romiszowski, 2001; Hutchinson & Colwell, 2011; Sinclair & Owston, 2006; Vaughan, 2004; Hoban, 2008). As part of their effective PLC structure, the sixth grade PLC at RMS utilized Schoology as their main CMC platform, as well as Outlook mail, in support of face-to-face activities as well as individual task completion related to the team's collective goal of teacher learning to increase student success.

Theme: CMC use during face-to-face meetings to support face-to-face activities. PLC members utilized Schoology and Outlook mail during face-to-face meetings for instructional purposes, collaborative activities and task completion. During face-to-face meetings Naomi and Laverne continually pointed out where to find information in Schoology and/or asked participants to access documents and Internet links in Schoology courses to support their meeting activities. Laverne says, "I show them something and then explain where it is in the Schoology course so they can go back and look at it again."

During direct instruction the documents would be displayed on the Promethean ActivPanel as well as participants being able to call them up on their MacBooks to view. Once modeled, the information would then be used by the team during their learning activities. The following examples merged data from transcribed observations as well as

the researcher's observational notes that showed Naomi's use of CMC during her facilitation of face-to-face meetings:

> I'm going to show you the resource now that we are going to use in our session in her today and that is the PDSA worksheet vocabulary [She is using the panel to display the worksheet from Schoology]
>
> So I'm gonna bring that up real quick to show you how to complete it [Her sample document is in Schoology and they will fill in the blanks together]
>
> I'm going to give you some time to go through it since they asked us to go through it [She put a link in Schoology to a survey, something given by district office. She is going to explain how to complete it]

During student data-driven RTI meetings, as part of the district's RTI efforts, the team worked in groups of three, dividing students among the groups, focusing on students who need the most assistance and intervention. The groups were structured so that one person used their MacBooks to access student data contained in folders in the Wednesday Schoology 2017-18 course as well as PowerSchool, the district's student information system as noted during the interview by Giselle:

> On Fridays we use the RTI [meetings] to put all of our data into the learning. We got our SLOs [student learning outcomes] in Schoology that we pull up. All of our data charts that we refer to, and our test scores, are all in Schoology

The Schoology course folders contain information on intervention strategies, RTI student tier charts, and behavior management and consequence policies. PowerSchool contains student academic, attendance and behavior data.

The consensus among PLC participants is that the use of Outlook email is an integral part of the lesson planning process that participants acknowledge makes

collaborative lesson planning easier and, specifically, that it helps save time. This was noted by Megan during the interview:

> So I guess what we have is a skeleton lesson plan and then I just go back in my first period I add what my paraprofessional will be doing with her groups. Whereas she'll be working and she doesn't need all that in her lesson plans. So they are individualist, but not [laughs]. They don't start out that way. They start out general. She types it all up and then emails it to me. I put my accommodations in.

The above mentioned method, where one content group person enters information into the Microsoft Word lesson plan template using their MacBook, was used by all of the content groups during their face-to-face lesson planning collaboration.

File sharing via email that supported face-to-face collaboration was noted several times during the observation period to share lesson plans as well as teaching materials to avoid duplication of efforts as noted by the observed dialogues such as the one below:

Omed: I don't have that PowerPoint
Megan: I think I did it. Yea. I did it over the weekend. I'm going to send it to you right now. [sends via email attachment]

The ability to provide resources immediately to other group members was noted during an observation of content lesson planning where Megan and Kory were having a discussion on an integrated lesson that was taught the previous year. Kory was unsure of where to find the lesson and Megan pulled up the plan from her Schoology resources and quickly emailed it to Kory. Kory had access to the plan immediately and was able to extract the desired information within minutes of her first inquiry for it.

This also was the case for work being done in student data-driven RTI meetings where data is retrieved from PowerSchool and Schoology by one or more group members and used by the group to actively participate in discussion of student behaviors and

academics. As they collectively discuss and come to consensus on intervention one person will type the plans in a Microsoft Word document:

Kinnaras: One person can start typing
[Megan and Amy are discussing who will type]

Omed: I've already started typing [she takes a seat between Carolina and Kinnaras] and shows them the document]

Once complete the document will be emailed to all group members to ensure each has a copy of the plan for future reference in carrying it out. The plan is also sent to the assistant principal assigned to the grade level team as well as the principal.

Naomi also takes advantage of Outlook mail for face-to-face time management prior to face-to-face meetings, she will post agenda items to Schoology (see Figure 4.6) for team member to review as well as send email reminders so they come prepared to the meetings.

In addition to retrieval and viewing of documents, participants were also able to individually and synchronously interact in digital documents with other PLC members present during meetings, giving them the ability to collaborate through CMC. As an example, during a meeting the team was collaborating on how they were to collect their evidence of student learning and a digital document housed in Schoology was used for them to synchronously collaborate:

Naomi: So okay we are in the middle of the cycle and we brought evidence last week and you started to analyze your student learning so now it's time to document that evidence. So if you just click on it and bring mine up from here, you're going to notice and I'm going to have it on the screen but you can bring it up on your computer. I'm gonna walk you through the worksheet, then I'm going to have you work on it as a team.

After Naomi finished modeling and explaining the task the teachers discussed, reflected and provided feedback to each other verbally while collectively and synchronously working on adding information to the document in Schoology.

The use of digital resources during face-to-face meetings supports critical interactions of participants. During one such meeting, Naomi had them access links through Schoology to complete a survey during the meeting to ensure the teachers had sufficient time and clarification. The discussions that ensued face-to-face while completing the survey digitally shows the support that CMC resources can lend to important face-to-face interactions:

Naomi:	I had to think about some of those questions and some there was more than one possible answer.
Kaze:	Yea some of these questions are very convoluted
Amy:	So do I need to check that box?
Naomi:	So how did you do your SLO? That would be considered
Amy:	Sorry, don't mean to over analyze
Naomi:	Oh no worries! It took me a long time to complete the survey.
Omed:	How do you ensure the assessment is aligned with the skills and the goals? Can we say use USA test prep?
Naomi:	You could or you could say that it is a nationally recognized test
Omed:	Okay , yeah

Theme: Ability to connect learning, content and tasks across face-to-face meetings. The use of Schoology assisted the team in carrying out the continuous cycle of learning, planning, implementation and reflection. Naomi does not directly participate in collaborative lesson planning during the meeting set aside specifically for that purpose. However, Naomi accesses and is able to review lesson plans because teachers are required to post them to the Lesson Plans and Agendas Schoology course. She is then able to connect PLC content and activities between the teachers' collaborative lesson planning and upcoming teacher participatory learning sessions. A transcribed

observation captured the following noted instance where, after teaching a vocabulary strategy during a prior Wednesday meeting, Naomi reviewed the submitted lesson plans in preparation for the next Wednesday teacher learning meeting:

> As a part of us collecting data one piece of our data is are we implementing vocabulary with fidelity? When I went through the plans only seven out of the thirteen actually noted anything for vocabulary this week. Which is only fifty-four percent so what would that tell you in regards to our goal?
>
> What I'm saying is if we're saying that one way that we're implementing it is by looking at lesson plans if we just pull up a random plan and there is no mention of vocabulary . . . I just wanted to share this because with the PDSA cycle what we want to do is evaluate if a strategy works and a way for us to evaluate if it works is that the first part would be if we are all doing it with fidelity and I'm not saying we're not doing it with fidelity there could be many reasons why this number looks this way.

Further, during the observation period Naomi created a Schoology folder for teachers to submit evidence of implementation of the learning strategy as part of their continuous cycle of improvement. After implementation of strategies in their continuous cycle of improvement. After implementation of strategies in their classrooms, teachers were required to add their evidence of the learning to a folder in Schoology (PDSA Vocabulary Evidence 2017-2018) (shown in Figure 4.7) prior to attending the upcoming teacher participatory learning meeting. Teachers were able to add evidence in different ways including uploading PDF files, picture files (PNG, JPG) and Microsoft Word documents. The evidence was accessed during subsequent participatory teacher learning meetings in order to share, discuss, reflect and give feedback on the effectiveness of the strategies based upon student outcomes. After the face-to-face discussion, feedback and reflection the teachers revised their instructional plans and submitted them to the evidence folder.

Laverne also utilizes Schoology to cross the face-to-face meeting boundaries that allows for her to connect activities from one meeting to another with ease:

> Here's the reflections from the last two tech Tuesdays, so here it is here's what we talked about. Dissertation, that's what I've been calling it cuz it just keeps growing and it's the stuff that you guys had questions about and I had more from 8th grade from today and so we're just gonna keep building this document and then I'm gonna separate inside Schoology under the particular topics.

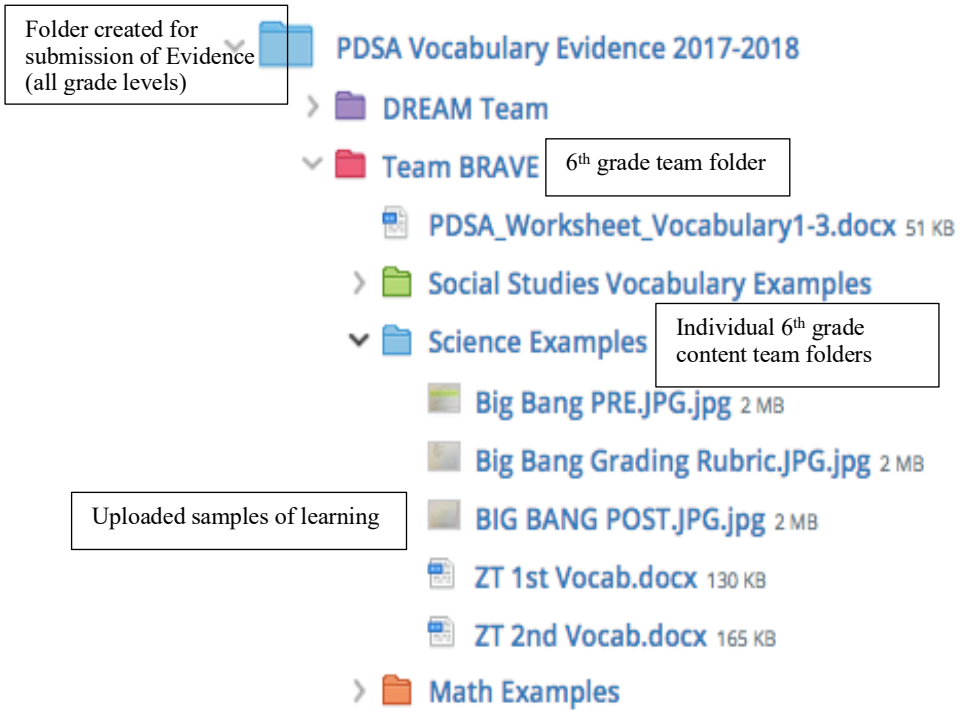


Figure 4.7. Screenshot of Schoology folders to examine file sharing using CMC.

Theme: CMC to connect and extend learning beyond face-to-face meetings.

The use of Schoology to support and extend the face-to-face learning instead of completely replacing it was alluded to by Laverne as she mentioned that "posting a procedural document online isn't really coaching". However, Laverne felt that the ability

to post supporting documents to Schoology allowed her to utilize her face-to-face time effectively as she stated, “I didn’t want them to have to go through the entire seventeen page document online. Wanted to highlight and discuss and get feedback from the teachers on their specific problems first.”

Naomi and Laverne use the Schoology platform to share resources used during face-to-face meetings as well as supplement face-to-face instruction. They post resources that include presentations, research-based documents, sample lesson plans, and examples of student activities and refer to them often:

Naomi: I’m gonna put an article in there [Laverne’s] gonna put another one in there cuz I want you to know that everything we do is coming from research. I’m not just creating what I think we should do. Everything I do is coming from research. You are welcome to read them. One article is like fifty pages, you know like a novelette. The other one is like thirty and is a good article but we aren’t comin in here to read articles. If you wanna read them you can read them on your own.

Laverne: I put it in Schoology because we don’t come in here to read fifty-page articles, but it is in the folder if you want to read it

Laverne: So now we’ve created a place for you to go to problem solve before you say it’s not working. So always go, it’s good practice

Laverne, who collaborates heavily with the building’s technology support person who is not a PLC member, uses Schoology and Outlook mail to relay information from their collaborative efforts. For example, if the tech support person notices a recurring issue with technology use or procedures he emails solutions to the entire staff. Laverne takes these emails and consolidates them and posts them as files to specific folders in the Tech Tuesday Schoology course. The stored files are then called up during technology infusion PLC meetings and used as discussion points for teacher instruction as noted in the following example where Laverne relayed:

> If you go to the Schoology folder, the IT action board, it now has all of the categories. Its listed as a category and tells you where it is. And then it has the posts separately of his board that you requested. So now you can go in and see a list of kids who need a case 2/20/18. Kids who are off campus getting their MacBooks fixed, etcetera.

Teachers agreed that the ability to access materials at any time made it easier to go back and look at everything that took place during meetings as Kinnaris stated, "I like the flexibility of having those resources to use". Kory commented on how helpful it was to be able to access the documents outside of the meeting, "I don't always get it the first time and because we don't have a lot of time to focus on learning the technology that [Laverne] teaches us I can go look at the stuff." Accessing these documents, either during or beyond face-to-face meetings, was not mandatory but the documents were made available to provide an extension to their face-to-face learning.

Emerged pattern: Infrequency of required CMC use outside of face-to-face meetings. It is important to note that the required use of CMC outside of face-to-face meetings, aside from file upload, is extremely infrequent and was only noted as an obligation once during the eighteen observations conducted. During the interview, when asked about the use of CMC outside of PLCs, all participants agreed that they rarely used it for required PLC activities beyond revising and uploading supporting documents such as lesson plans, evidence of learning or action plans. On the infrequent occasions where they are asked to reflect or provide feedback using Schoology's online discussion forum, they are usually given time do so before the end of the PLC meeting in which the reflection coincides. This was described by participants during the interview:

Megan: So whenever we're done with the PLC we'll go and have an exit slip. We'll respond to, or have a comment about, or whatever would be in Schoology.

Shiba: Maybe about what we did that day could be a question or a could be a survey or a poll or vote

Giselle: It's usually not a day later. Like, an exit ticket would be something on the computer before we ever leave. And so before we left for that day we would do our exit ticket.

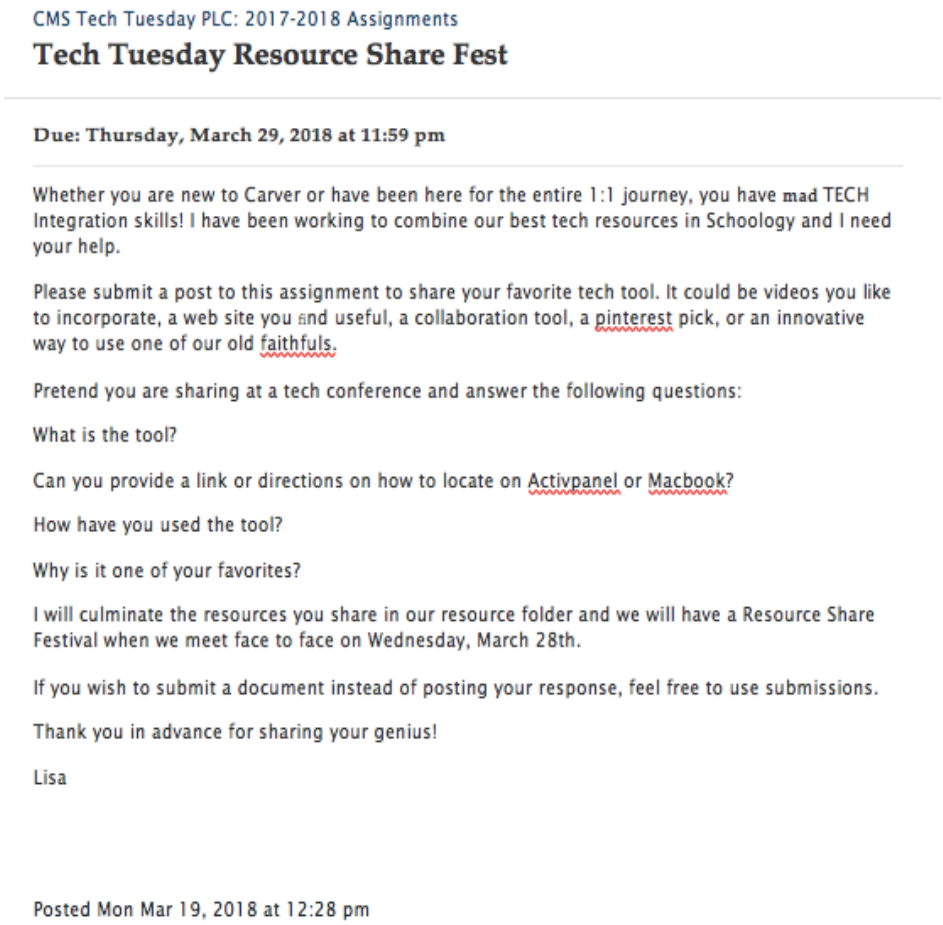
The participants agreed that any outside meeting-time use of CMC was not time-consuming and consisted of uploading lesson plans and data or accessing forms and documents for administrative tasks. Further, the teachers agreed that they would, as Megan stated during the interview, be "resentful if I were made to work outside of the PLC just because I had technology to do it." Carolina concurred, saying that having the technology is essential but "not so that we can do homework."

Equally as important to note is that, on one of the rare occasions that teachers were required to reflect using Schoology outside of face-to-face PLC time, the participants actually completed the activity during what would have been their regularly scheduled technology infusion face-to-face time. In this example, shown in Figure 4.8, Laverne posted an assignment to the Schoology Tech Tuesday course (for all teachers across grade levels) asking for participant feedback that would subsequently be discussed during a future face-to-face Tech Tuesday meeting.

Figure 4.9 shows sample responses to the posted assignment. Noting the time and sequence of the postings, the participants completed their posts at the very start of what would have been a face-to-face Tech Tuesday meeting. During this time the teachers were not required to attend a face-to-face meeting but chose to meet in one of their classrooms to discuss and complete the postings together.

For clarification the interviewer asked the interviewees to estimate the amount of time CMC was used outside of the PLC face-to-face meetings for PLC tasks. Omed

replied, “Very rare. Under ten percent unless it was something we learned to do and it was part of a lesson that when you were teaching you would be utilizing.” Kinnaras added, “Or like going back to the data. We might pull up something [Naomi] wants us to see before PLC but it’s short and she doesn’t do it often.”



CMS Tech Tuesday PLC: 2017-2018 Assignments

Tech Tuesday Resource Share Fest

Due: Thursday, March 29, 2018 at 11:59 pm

Whether you are new to Carver or have been here for the entire 1:1 journey, you have mad TECH Integration skills! I have been working to combine our best tech resources in Schoology and I need your help.

Please submit a post to this assignment to share your favorite tech tool. It could be videos you like to incorporate, a web site you find useful, a collaboration tool, a pinterest pick, or an innovative way to use one of our old faithfuls.

Pretend you are sharing at a tech conference and answer the following questions:

What is the tool?

Can you provide a link or directions on how to locate on Activpanel or Macbook?

How have you used the tool?

Why is it one of your favorites?

I will culminate the resources you share in our resource folder and we will have a Resource Share Festival when we meet face to face on Wednesday, March 28th.

If you wish to submit a document instead of posting your response, feel free to use submissions.

Thank you in advance for sharing your genius!

Lisa

Posted Mon Mar 19, 2018 at 12:28 pm

Figure 4.8. Laverne’s Tech Tuesday Schoology post for participant feedback.

Theme: CMC to connect with persons having limited time to attend PLC meetings. The use of CMC also assists with connecting to staff members who face time constraints and schedules that disallow them to participate in face-to-face meetings. For

example, email extends lesson planning collaboration to members of content teams that cannot be present during planning time as mentioned by Megan during the interview:

Figure 4.9. Participant responses to Laverne's Tech Tuesday post.

> We have another person that has to plan with science. So basically she [Omed] types it up and we basically just send her the lesson plan for the week and she just might come to us and say 'just explain this to me'. But she's got the links to the things we're doing. So she might not be sitting here planning with us but she's got everything at her fingertips.

In addition, the sample school tasks assistant principals with PLC oversight that includes the review of lesson plans and of student academic and behavioral growth.

However, due to scheduling, assistant principals most often are not present during face-to-face meetings where lesson planning and student assessment and behavior data analysis, and intervention planning take place. Because there is a requirement for each teacher to upload their weekly lesson plans to the Lesson Plans and Agenda Schoology course, the assistant principal is able to remotely review the plans. If necessary, the assistant principal can download plans and, using Microsoft Word, add comments and annotations and then attach the annotated document in an email to the respective teacher. Outlook mail is also utilized to share information from collaborative discussions during student data-driven RTI meetings. The collective inquiry and subsequent action plans that are developed during these meetings combined into a single action plan captured in a Microsoft Word document and then emailed to the assistant principal using Outlook mail.

Related arts teachers' schedules also disallow their attendance at face-to-face meetings or the ability to participate in their own PLCs. As noted during the pre-observation interview, prior to the use of current CMC platforms, there was a struggle with incorporating related arts content into core curriculum. Although participants believe that face-to-face meetings would maximize collaboration with the related arts teachers, they mention that CMC has provided some assistance in integration:

Kaze: That's something we've been struggling with. It's the planning period, we don't have a common planning period.

Carolina: That's some of our frustrations.

Kory: I think this was the format that maybe they can go in and look and see if, say, okay if sixth grade is working on China, so if there is something I could, you know, incorporate in my art class or my music class to enhance that, that would be a platform for that because a couple of years ago we put it up on a board in the other room and just kind of wrote what sixth grade was doing at any given time. What book sixth grade was reading, what novel we were studying and then when the related arts could come in they could see, or anybody else could come in and see what we were working on, just an overview of what we were working on so I think maybe this has replaced that maybe.

Kinnaras: It's a lot more sensible so for teachers who cannot make it down to that room they can just pull them up on their computer.

Interviewer: And do you think they do?

Kinnaras: I think some of them do. Particularly the art classes. My students are always coming in and talking about how science is related to art or something so I know that the art teachers are.

Carolina: I would think that they almost have to since they don't actually have meeting time that they would almost be held to checking that out.

Because of the way the course is structured, Schoology analytics cannot provide number of views/downloads on each individual lesson plan or whom specifically accessed the documents. The only analytics accessible is total number of page views for the entire school year, which consisted of 11,237 from the beginning of the school year to the end of the observation period on April 28, 2018. This included views by all teachers and administrators grades six through eight.

CMC is also used to provide needed information to special education teachers and school counselors who, due to scheduling, are unable to participate in RTI data meetings. RTI data is housed, updated and retrieved from the Wednesday Schoology course. This data is accessible by the special education teachers and school counselors at any time from any data or Internet connected device. Required forms are also housed in the same Schoology course, however, it was noted that teachers often forgot to do retrieval,

completion and submission of these forms. Therefore, a system that utilized Outlook email was implemented to ensure forms were submitted:

> Kory: So every afternoon she sends a link to the form. It is a behavior form she has what his IEP and what is the outcome. . . she sends the link every day . . . it's the same questions every day we just hit the response and do what we need to do and just send it to her. . . before we had a paper form. I like this better because the student couldn't never remember to give it to us. I could never remember to go and get it so once he had this set up it was much easier than the paper form.

The RMS PLC utilized CMC to support their face-to-face efforts by giving participants the ability to readily access necessary information and share it easily. It also allowed an extension of their face-to-face communication and collaborative efforts including allowing the inclusion, to a certain extent, of those unable to participate in face-to-face meetings.

Section #5: Participant Preferences

In consideration of social constructivists theories of learning and the ability for the use of CMC to provide a means for discussion, learner interdependency and personalization of knowledge as well as social interactions, studies show that teachers continue to prefer face-to-face interactions (Blitz, 2013; Huang 2002; Hutchinson & Colwell, 2011). Prior research has noted that the preferences were due to the more personal nature of face-to-face interactions (Hutchinson & Colwell, 2011), as well as the necessity to remove feelings of isolation often felt by teachers (Blitz, 2013; Huang 2002).

Theme: Preference for face-to-face interactions for active participation and connectedness. The participants overwhelmingly stated their preference for face-to-face meetings over using CMC for their learning activities. The consensus was that face-to-

face provided opportunities for more meaningful learning as well much needed social interactions.

Emerged pattern: Preference for face-to-face participatory learning activities.

Naomi, as the person responsible for the structure and organization of the PLC, felt that the cycle of continuous improvement was best served by carrying out activities face-to-face as she stated during an informal discussion that:

> I want it to be they've completed it so let's look at it and figure out what we need to do next. I don't want it to be forced. I want it to be natural, to become so natural to them that it wasn't just that [Naomi] said go and type something online. Because in order for PDSA to work they will actually have to get to a point that if [Naomi's] not here I can follow a cycle of continual improvement without guidance from anyone else.

This was also the sentiment of Kinnaris, who stated during the interview:

> But that's just like if you take a graduate class online you wait 'til the last minute to submit your paper. You know you've gone through what you've read, those 50 comments and from those comments you took a sentence from this, this, this and you get a reply back that says '*wonderful thoughts*!' Yea when all I did was look at those fifty before me and just typed it up.

This was reiterated by Kory who stated:

> I think that is a lot to be said for that. Because there was a big move toward the virtual classroom. To flipping that classroom. While there are things that I think are wonderful about that, I think that too says the same thing. There's an extension. Could be used as an extension instead of the whole class thing you know you can't take away from. That student looking you in the eye and finishing that work. Or looking you in the eye and saying I just don't know. Instead of them looking at that computer and just clicking anything because nobody's there for that accountability. Does that make sense? I think that's kinda the same thing as we feel about [Naomi's] virtual classrooms. We feel the same with our learning as teachers.

According to feedback from the team, when comparing using CMC to face-to face interactions collectively they feel face-to-face provides more depth and meaning to

collaboration:

Omed: I could email, but I don't think that it isn't as good because details are missing. In face-to-face if details are missing I can ask more questions right away.

Amy: If someone wrote plans and just shared it in Schoology without discussing it they wouldn't be able to really know and understand what each is thinking, we wouldn't be able to clarify anything.

Megan: Here I can talk about things that happened in the past. I look at things from past years and we can talk about it that we can't in email. Like, you can't have a real conversation in email.

Kory: There are things that I can do on my own but there are things that I need help with that only watching someone go through it, talking me through it can get me to the next step.

The strong desire towards face-to-face active participation in their learning as well as face-to-face collaborative lesson planning was relayed by new teachers, described during the interview by two of the first year teachers, Amy, age 27, and Carolina, age 52:

Amy: I think being in person having that conversation, having a verbal explanation of what is going through his [Kinnaris] mind. He could have sent me that PowerPoint in an email but for me to sit here while he went through it and explained his thought process is invaluable. Remember this is my first year so that kind of stuff is helpful.

I come up with questions while we are talking that I might not think about if I'm looking at it online.

Carolina: I think what drives us is that this is the only time we get to sit down with each other. Even if its worktime. There's so many other things going on Monday, Tuesday, Wednesday and Friday that we are dealing with so there's never really any time to sit down and plan together and its better face to face.

This was reiterated by Omed, age 24, who is also a first year teacher:

Omed: It hasn't been as difficult as I thought planning. Number one, [Megan] for sure, but this has been really helpful for me cuz she sends me her plan and I read over them then we get to come here and talk about them and it works really well.

> I am so comfortable here. Even when I'm just typing. She's telling me and I'm typing and processing it and it's giving me more, it filters through my brain and I understand it more.
>
> I haven't had a trial and error year, I'm new, [Megan] has all of those, so the face-to-face is a dream to me so our conversations flow so well when we collaborate.

Emerged pattern: Preference for face-to-face reflection and feedback.

Participants, including Naomi, felt that reflection and feedback are best completed during face-to-face meetings versus CMC. During an informal discussion Naomi stated that, "Online they can just go and type anything and it might not necessarily show the true learning" and "I want it to be a natural, to become so natural to them that it wasn't just that [Naomi] said go online and type something up". She finishes her thoughts with her idea that, "It's not like a multiple choice quiz but about what is really going on, real situations. Having them go online feels that way, they could just go online and post whatever they felt we wanted to hear".

Laverne, because of her technology infusion meeting times often being used for other purposes, relies heavily on CMC to communicate with the team. However, her preference remains with reflection and feedback being face-to-face as she reiterates Naomi's point of wanting true reflection and feedback that they feel face-to-face provides over using CMC:

> Sometimes when they do things online outside, and they are just responding all online, then they, it's not their true reflection. Sometimes they can say things, kinda like kids do, hiding behind the device. They say things that aren't' necessarily true. They say things they think you want to hear.

Omed, a first year teacher, shares her preference for face-to-face feedback over using Outlook mail as she stated during the interview:

> But for me, if I don't understand something on the email it could be a quick fix. . . Email confuses me sometimes cuz its not detailed. Sometimes it is but like, here I'm like [Megan] I'm confused and she just says two words and I'm [snaps her fingers].

Giselle concurred, stating, "Sometimes we disagree on how things should go. Not in a bad way, just different. We need to discuss those because it can get misunderstood pretty quickly if we just email". Amy added to the conversation that "I really need this time, I'm new so to be able to get feedback from him [Kinnaras], I know it makes my lessons better".

Emerged pattern: Preference for face-to-face social interactions. During the interview Kaze stated, and all other team members nodded in agreement, that "We need this [points to everyone in the room sitting around the table]. We need to talk to each other, to see each other". Carolina, a first year teacher, added, "I'm new and I get frustrated sometimes and I just need to see people and to talk to people for real". The idea that face-to-face interactions are an important element of their community was a sentiment expressed by every team member that crossed age boundaries as Amy, a new teacher age 27, stated, "I feel so overwhelmed all the time with what teaching entails. I need to have this PLC time, I need the help of my peers", feelings echoed by veteran teachers who range in age from forty-eight to fifty-three years old:

Kinnaras: We don't like to discuss on computers because we like to see each other face-to-face and we want to vent and share experiences.

Kory Face-to-face is still what we want. We have to be able to really talk to each other.

Megan: We can talk about things that we can't in email, like, you can't have a real conversation in email. Cuz its personal, you know, that little personalization.

Laverne: You can see teachers getting passionate about stuff, whether it's good or bad, that's something you can't get online.

Additional examples given during the interview showcases the team's preference for face-to-face interaction:

Megan: Like when you're, you're being held accountable face-to-face. I think that's what makes it work cuz we could've very easily since we've had the MacBooks, done away with PLCs and say hey let's just hold all this on the MacBook. And sometimes, [Laverne], for the Tech Tuesday might just put up a video and instead of us just watching the video on our computers and respond about the video, so we all might gather in a room together regardless and watch the video together.

Omed: We won't ever want to sit in separate rooms and use technology to collaborate like we do. We would use technology for minor things but would never want to lose our face-to-face time.

As an example from an observed collaborative lesson planning meeting, Kory was making a personal announcement about the birth of her grandchild that solicited joyous response from the team. After the announcement took place, Kaze commented to the observer as she pointed to the others in the room, "this you can't get in an email. This you cannot get through technology". She goes on to add "we don't goof off, but just, I don't know, talk about ourselves sometimes. Just about stuff".

This sentiment was driven home during the interview as the following exchange occurred:

Interviewer:	Do you feel your PLC would be as strong if it were completely in a virtual environment?
Collective response:	No!
Interviewer:	Why not?
Kory:	I think that's why we have a good group that works together is cuz we feel comfortable to say this isn't working, or I tried that and it's not gonna work for me
Megan:	Like when you're being held accountable face to face. I think that's what makes it work
Carolina:	There is just something to be said for human interaction
Collective response:	Yes. Agreed.
Kory:	There is just something to be said when I have to look you in the eye and say I need you to help me, I'm struggling
Amy:	We wouldn't have this awesome bond

Megan: The comradery.

Theme: Participant preference for use of CMC for efficient use of time and task completion. Although the overwhelming preference among the group is to meet face-to-face, they also value the use of CMC, especially as a means of efficiency in completing their required tasks during PLC time, as well as assisting with managing their limited time. This was noted by Kory during the interview as she stated that "We [her and Shiba] teach most the same material and its good we get to share a lot of resources online". Shiba added that, "We need to have face-to-face time and then that backup so if I didn't absorb all of it I can refer back to it". Participants mentioned during the interview the use of CMC in assisting specifically with collaborative lesson planning:

Kinnaris: We do as much as we can in PLC then the last few minutes we discuss who will do what before the plans are due, she'll email me what we worked on then we'll finish our plans and email them to each other for a little feedback before they are due.

Megan: Our lesson plan collaboration and sharing are easier too. I have to make accommodations to mine. So we plan together, she types it all up and then emails it to me. I put my accommodations in, it might take me 15-20 minutes after lunch to do that, then put them in Schoology.

Megan's statement was reiterated during an observation of a collaborative lesson planning meeting, where her and Omed shared the following conversation with the observer:

Megan: Just like the lesson plan thing. She's like send me the lesson plan, you know, cuz were doing an identical lesson just with different vocabulary words so
Omed: Send it
Megan: Send it to her, copy and paste. You see what I'm saying?
Omed: Half the time
Megan: We were just like totally multi-tasking

The overwhelming preference of participants for face-to-face interactions was due to the positive experiences they shared while participating in knowledge sharing, feedback and reflection. The time spent together, that allowed for social interactions dispersed within their learning time, was beneficial to their team effort, allowing them to build a family-like relationship. They appreciated the benefits that CMC brought in the form of easier task completion and assistance in easing time constraints and CMC was utilized in effective ways such as allowing those absent to be connected and a way to be more efficient in task completion.

Triangulation

Observations of the face-to-face interactions of the PLC members as well as analysis of CMC artifacts showed how computer resources were leveraged to support their face-to-face collaborative efforts. Schoology was used as a means of file sharing, storage and retrieval. Files shared and stored were well organized and directly related to the goals of the community. Outlook mail was used to share files and quick bits of information and knowledge as well offer a means of asking and answering questions. CMC allowed a means of knowledge sharing with non-PLC members that could not be present at face-to-face meetings a means of access to PLC knowledge.

Leadership and administration used CMC as means of oversight as well as participation when meeting attendance was not possible. Naomi was able to have oversight of, and prepare for, face-to-face activities and connect activities across meetings due to anytime, anywhere access to information stored in Schoology. Assistant principals were able to access lesson plans on Schoology and provide feedback via email.

Although members of the community were provided ample resources to conduct their interactions via CMC, the majority was conducted face-to-face with CMC as a

support mechanism. The PLC structure, where face-to-face interactions were prevalent despite available CMC resources, was based upon leadership's dedication to providing resources and structure to both the face-to face meetings and CMC resources. The interview and subsequent observations showed that all the members of the community had a strong desire to engage in face-to-face interactions, preferring them over the use of CMC for collaborative activities.

In addition to a solid structure and leadership support, the preference to collaborate face-to-face rested on the depth of knowledge that participants believed these interactions could bring over those that took place mediated by technology. Also, the strong desire for social interactions that participants felt created a positive, supportive learning environment propelled participants into preferring them over CMC interactions.

It was not necessary to conduct collaborative activities in online environments to have an effect on time constraints and time management. The use of CMC during face-to-face meetings assisted in addressing issues of time by providing a means of easy communication and knowledge sharing as well as a means of extending learning.

A solid conclusion drawn from the research is that, although the capability of CMC to replace face-to-face interactions exists, teacher preference remains with face-to-face collaboration with the use of CMC to support it. A well-structured, well-supported community can effectively utilize CMC, both during and as an extension of, meetings to assist with carrying out and supporting preferred face-to-face PLC tasks.

Chapter Summary

Chapter 4 contains the results of analysis of a qualitative case study where an interview, observations and analysis of artifacts connected the data to the research question: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts? Nine teachers, two ELA, two science, two social studies, two mathematics and one that taught both science and social studies, the school's technology integration specialist and the school's curriculum coordinator made up the sample under investigation. The nine teachers were interviewed prior to eighteen observations of their face-to-face PLCs conducted over a five month period. In direct relation to the research question, participant-observations served to understand the interactions and activities of the community. The observations, that allowed the researcher to become intimate with the activities, interactions and culture of the community, served as the foundation of data collection (Hatch, 2002). The interview served to uncover perceptions, ideas and perspectives that were not readily apparent during observations (Hatch, 2002). The interview also gave participants an opportunity to share their points of view that are not often recognizable in observations (Butin, 2013; Hatch, 2002). Lastly, data collected from the teams' Schoology courses through unobtrusive measures was done by capturing screenshots of organizational structures and interactions. The collection of these artifacts allowed further insight into participant interactions where that extended beyond observations.

The interview and observations were recorded using QuickTime audio recorder on the MacBook into Microsoft Word documents. The transcriptions were put into NVIVO data analysis software where they were coded following a coding catalog that included both a priori and emergent codes. These codes were reworked, merged and deduced into the basic themes that formed the basis of the thematic network that was

developed from the analysis. The thematic network consisted of thirteen basic themes that emerged from the codes. These basic themes were then consolidated into the five organizing themes that designed the structure of Chapter 4. Together, these themes created an overarching global theme that encapsulated how the sample under investigation utilized CMC to support their PLC efforts. A summary of this analysis as well as discussion of a plan of action are provided in Chapter 5.

CHAPTER 5

IMPLICATIONS AND RECOMMENDATIONS

Chapter 5 opens with providing a brief overview of the purpose of the research and the methods used in implementing the action design. The chapter then discusses the themes that emerged from the data and connects them to the existing body of knowledge on the use of CMC by PLCs. It also describes the data in the context of theories on social constructivism and CoPs. Next, the role of the researcher in developing and implementing an action plan is provided, followed by a detailed articulation of the plan. Chapter V concludes with a discussion on suggestions for future research.

Overview of the Research

This qualitative case study investigated a sixth-grade PLC in a mid-size urban area in Upstate South Carolina. The sixth-grade PLC consisted of nine teachers, two for each content area (ELA, mathematics, science, social studies) and one who taught both science and social studies. In addition, the school's curriculum coordinator and the school's technology integration specialist (TIS) made up the PLC's leadership team. The sample was chosen due to its designation by the Learning Forward organization, working in conjunction with Advanc-ED®, as a Learning School dedicated to exceptional teacher learning practices (Learning Forward, 2016). Of the three PLCs at RMS, the sixth-grade was specifically chosen because of its variability in the age of its members (from twenty-three to fifty-eight), teaching experience (induction to thirty-eight years) and the recommendation of the PLC leadership.

The problem of practice was developed through the researcher's district-wide involvement in teacher professional development related to the district's 1:1 program as well as knowledge and experience garnered from the study of Learning Forward's (2011) Standards of Professional Learning. The Learning Standards promote both collaborative activities and the effective use of resources as foundations for PLC success (Learning Forward, 2011). However, as part of the researcher's responsibilities visiting district schools, limitations including lack of time and ineffective use of resources, were noted as major issues in implementing effective teacher learning environments. A noticeable difference in the practices of RMS's PLCs, especially in their use of technology resources, allowed the researcher to have a purpose in conducting the action research with the specific aim of determining how the PLC utilized CMC resources as part of their successful learning environment.

The following research question guided the study: How do participants in an established PLC use CMC as a means of supporting and extending their face-to-face collaborative efforts? A qualitative case study design was used to answer the research question with three collection methods being deployed by the researcher: 1) a semi-structured group interview, 2) participant-observations, and 3) unobtrusive measures in the form of digital artifacts. These methods allowed for triangulation of the data as well as provided a deep, rich account of the community's interactions (Mertler, 2014; Merriam, 2001).

Key questions that emerged from the data. A thematic approach to data analysis, that is recursive in nature, allowed for an exhaustive exploration and re-exploration of the data (Attride-Sterling 2001; Yin, 2016). From this thorough

investigation emerged five themes that encompass the impacting factors of the use of CMC to support teacher learning emerged:

1) structure and organization of face-to-face meetings
2) structure and organization of CMC
3) leadership
4) connection between face-to-face and CMC
5) participant preferences

In consideration of these themes, in conjunction with the participant-researcher's study and knowledge of effective professional learning community structures and instructional technology use, the following key questions were developed to drive the action plan:

1) How can we involve all levels of leadership in developing and implementing a successful professional learning plan that incorporates both face-to-face time as well as the use of available CMC resources?
2) How can we recognize that CMC is a powerful resource in assisting PLCs in overcoming known issues of time and time management when attempting to carry out successful community activities?

Action researcher. The action research was conducted at a middle school in the district in which the participant-researcher was employed as the director of instructional technology. As part of her duties, the researcher frequently visited the district's schools to mentor the technology integration specialists (TIS) and oversee the use of technology for instructional purposes. As part of the ongoing visits, the researcher would attend each school's team meetings, faculty meetings and PLCs to assist the TIS in providing training and resources to teachers, and to help the researcher understand their technology needs.

The position of director of instructional technology is one that oversees the instructional technology program and serves in a mentoring role to the TIS. It does not have an evaluative role beyond that of a coach that provides mentoring, resources and feedback to the technology integration specialists in meeting the needs of the teachers and carrying out the district's vision for instructional technology. The frequent visits as well as the absence of any threat of punitive outcomes from researcher-teacher and/or researcher-TIS interactions allowed the participant-researcher to establish a good rapport with both TIS and teachers. The idea that participation in the PLC was 'business as usual' for the researcher was of great benefit in conducting the research. As such, when approached by the researcher for permission to conduct the research, the members of the PLC were excited that they were being recognized as a model community. With these considerations, the investigation of the community through interviews and observations allowed a deep perspective in a natural setting of both the individuals and the community as a whole (Merriam, 2001).

Formulating the Action Plan

An action plan was formulated from intertwining the key questions that focus on both leadership involvement in implementing effective learning communities, and the recognition and promotion of the use of CMC to alleviate known issues in carrying out success teacher learning. The action plan will include access to training and materials from the Learning Forward (2011) organization's Standards for Professional Learning, in which the PLC under investigation used as a framework for their learning structure. Further, it will solicit varying forms of collaboration from all levels of leadership, including teachers, district and school level coaches, and school and district level

administration in creating a system for an effective learning community to exist. This will include a focus on necessary resources that include time, space and skills.

The training and utilization of instructional coaches positioned at both the district and school level, as well as school-level curriculum coordinators, all of whom are responsible for providing job-embedded professional development, will be of great significance in carrying out the action plan. The district has a mathematics coach, a science coordinator and an ELA coordinator who visit schools regularly to participate in PLCs and team meetings to provide training for teachers in developing lessons related to their respective content areas. The director of instructional technology serves as a mentor and coach to the technology integration specialists and regularly visits schools to work with the TIS as well as attend PLCs and team meetings.

In addition, each district school has a reading coach, a technology integration specialist and a curriculum coordinator. The reading coach is responsible for preparing and assisting classroom teachers with reading intervention strategies for struggling readers. The responsibilities of the TIS encompass the coaching, mentoring and training of teachers on incorporating the use of technology with classroom instructional strategies and learning practices. Curriculum coordinators oversee the development and implementation of curriculum with a focus on teaching strategies aligned to state standards and district initiatives. The purpose of the on-going training will focus on assisting instructional coaches and curriculum coordinators in providing well-structured and meaningful participatory training in PLCs to ensure their effectiveness, including the utilization of CMC, where appropriate.

The Action Plan

In consideration of the key questions formulated from this study's data and based upon the advice of the Learning Forward (2011) organization that states the need to carve out teacher learning time during the school day, the researcher's action plan will include the following phases: I) leadership involvement in providing resources, II) implementing an active learning plan for instructional coaches and curriculum coordinators, III) sharing technology integration techniques with academic coaches, and
IV) implementing the new PLC structure.

Phase I of the Action Plan – Leadership involvement in providing resources. In January, 2019, the researcher will meet with the deputy superintendent for curriculum and instruction and the assistant superintendent for planning and innovation. Part of the duties of the deputy superintendent for curriculum and instruction include the oversight of professional development for the entire district. He was involved with the implementation of the current PLC structure at RMS and has a strong background with the Learning Forward organization's South Carolina state affiliate. He is also responsible for overseeing the schedules and responsibilities of the district level curriculum coaches that consist of an ELA coordinator, a mathematics coach and a science coordinator. The assistant superintendent for planning and innovation is the direct supervisor of the researcher and is responsible for implementation and oversight of the district's 1:1 program, including utilization of the researcher's work time as well as the duties of the school level TIS.

The researcher will present an overview of the findings of the research with an emphasis on the positive effects of both sufficient time and time management on the PLC that was investigated. This conversation will also draw upon data from the conclusion of

Learning Forward and Advanc-ED®'s on-site investigation of RMS's PLCs that earned RMS the Learning School designation as it solidifies the effectiveness of the structure and use of resources by the PLC. Recommendations to the administrators will include conferring with principals on creating school-day schedules, implemented at the beginning of the coming school year, that allow focused time for structured PLCs.

Further, the researcher will recommend that all school level curriculum coordinator positions be solely focused on facilitating PLCs as is done at RMS. Currently, curriculum coordinators at most schools are given the task as an additional responsibility on top of their regular duties as assistant principals or reading coaches. As asserted in the review of the literature, engaged leadership is an essential component of ensuring that time is valued and used effectively (Carpenter, 2015; LeClerc, Moreau, Dumouchel & Sallafranque-St-Louis, 2012; Sims & Penny, 2015). The complete dedication of the curriculum coordinators to PLC tasks will further allow their time to be utilized in analyzing data to drive instruction for their teachers, something that Naomi and Laverne engaged in both frequently and continuously. The researcher will recommend a schedule for all instructional coaches and curriculum coordinators to attend and observe the RMS's PLC.

Phase II of the Action Plan – Implementing an active learning plan for instructional coaches and curriculum coordinators. The second phase of the action plan will take place in April 2019 with the implementation of weekly schedules for all instructional coaches and curriculum coordinators to attend and observe RMS's PLC. Each coach would do so for an entire week in order to observe the entire continuous learning cycle that is implemented by the PLC. Once all coaches and coordinators have observed the PLC, a debrief session followed by a series of collaborative work sessions

will occur where the Learning Forward (n.d.) *Standards for Professional Learning Facilitator's Guide* will be utilized in creating an effective learning framework for the PLCs in which curriculum coordinators will facilitate and coaches will participate. The initial session will include all coaches with subsequent sessions grouping coaches by early elementary, upper elementary and secondary so that targeted planning can be developed. Because they are known to be successful learning strategies, and in order to model these effective strategies for their implementation with teachers, these sessions will be highly participatory where coaches and coordinators will be engaged in collective inquiry, knowledge sharing, reflection and feedback.

Phase III of the Action Plan – Sharing technology integration techniques with academic coaches. At the beginning of May, 2019, the researcher, in her role as director of instructional technology, in conjunction with Laverne, will facilitate collaborative sessions with the school's TIS to develop a professional learning plan to instruct academic coaches on using technology resources in support of their facilitation of PLCs that will begin during the 2019-2020 school. These sessions will incorporate their own collective knowledge of technology integration with their newly acquired knowledge of the Learning Forward Standards. This professional learning plan will be implemented at the end of May, 2019 as the TIS team will conduct a series of hands-on learning sessions for academic coaches that will target instruction on the use of Schoology, Outlook Mail and the district's Office365 cloud services. Further, these sessions will include examples and instruction on the best practices utilized by RMS's PLC to support their face-to-face interactions. Together, the entire coaching team, both academic and instructional technology will create a solid PLC framework to be implemented with their school PLCs beginning the 2019-2020 school year.

Phase IV of the Action Plan: Implement the new PLC structure. With building level principals creating adequate time during the school day to carry out PLC activities, the PLC schedule will commence at the beginning of the 2019-2020 school year. As is the practice of RMS's effective PLCs, the curriculum coordinators will serve as their respective school's PLC lead, working closely with the TIS in developing active face-to-face and virtual learning environments to be utilized effectively by the community throughout the school year.

In addition, the director of instructional technology as well as district level academic coaches will offer ongoing support throughout the implementation, visiting the PLCs and conducting coaching meetings with the curriculum coordinators and TIS to offer assistance and feedback as well as collect data on the implementation.

Suggestions for Future Research

The study brought about questions that are viable suggestions for additional research. First, there has been a vast amount of research on the impact of technology use in the classroom on individual students, however, studies that specifically target teachers' use of technology that carries over to impacting students is limited. With the limited research on impact of technology use by teachers being directly and positively correlated to its use in the classroom by students (Hutchison & Colwell, 2011; Reil & Becker, 2000), the further investigation specifically of CMC use by teachers for their learning and what impact it has on teacher use in the classroom deserves attention.

Second, on-going, job-embedded instructional coaching has been shown to have a direct and positive impact on teacher practice that increases student achievement (Medrich, Fitzgerald & Skomsvold, 2013; The University of Florida Lastinger Center for Learning, 2016). Laverne's involvement in the planning and execution of PLC activities

as part of her overall coaching responsibilities had a positive impact on community effectiveness. In the investigation of effective coaching it was determined that it is "not a practice that can be viewed in isolation. At its best, it supports a quality instructional program in a school" (Medrich et al, 2013, p. 2). Therefore, an investigation into the effects of collaborative coaching on PLCs, that includes both academic and instructional technology, would serve the district well.

Lastly, research has discovered many benefits of 1:1 programs on student classroom learning and engagement, however, research on the impact of 1:1 programs on teachers as learners has not yet been a priority in studies. The study of RMS's PLC, where every teacher utilized a district-issued MacBook, although not the focus of the study, was recognized as having a possible impact on the utilization of CMC by the PLC.

Chapter Summary

The action research served to explore how a successful PLC utilized technology to support their PLC efforts with the purpose of creating a districtwide plan of action to assist PLCs that struggle with adequate time to carry out interactions effectively. The research, that began in November of 2017, observed the PLC as it implemented face-to-face learning as well as their use of CMC. The findings of this study revealed that CMC can be used as a viable support mechanism for face-to-face learning in PLCs. It showed that the application of CMC can support an effective learning community that has a solid structure, is well-organized, is given sufficient (not necessarily the recommended amount of) time, and is properly managed by leadership, all of which are targeted in the action plan. The conclusion of the research formed the basis for the formulated action plan outlined in this chapter where the plan focuses on engaging leadership, ensuring

sufficient skills are developed and that continuous support is provided for the implementation of the school communities.

There were four implications for creating the plan of action for the research: 1) a well-structured and supported environment is necessary for collaborative teacher learning to be effective regardless of CMC use, 2) adequate time for PLC activities is a necessity regardless of CMC usage, and 3) ongoing training is necessary to ensure teacher skills match both the face-to-face tasks in which they will participate, and the CMC that is expected to be utilized. The implication for further research suggests the investigation of how teacher learning and use impacts the use of technology by teachers in the classroom, how a concerted, ongoing coaching effort can have an impact on successful learning environments and how a 1:1 program can impact teacher learning.

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APPENDIX A

REQUEST PERMISSION TO CONDUCT RESEARCH (DISTRICT)

I am requesting approval to conduct my research at Riku (pseudonym) Middle School in order to partially satisfy the requirements for my EdD in Curriculum and Instruction as a doctoral candidate at the University of South Carolina. In addition to satisfying school requirements, I believe that time spent conducting the research will greatly benefit our district as it will provide great insight into how our teachers, administrators and support staff can successfully leverage available technologies to be more efficient and effective in carrying out necessary communication and collaboration to support student learning. I plan to use the outcome of the research to guide future instructional technology professional development.

I will be attending four sixth grade PLC per week for forty minutes as well as brief meetings with the principal and technology integration specialist for any administrative tasks and/or discussions that will be related to the observations and implementation strategies. The research period will begin in October of 2017 and continue for two to three months. Additional details that you may find helpful in approving this request are outlined below. I have already spoken to the school principal, curriculum coordinator, and technology integration specialist who wholeheartedly support this effort. I have secured approval from the principal (letter attached). Please let me know if you need any additional information.

Study Title: **Exploration of the use of computer-mediated communication to support the face-to-face collaborative efforts of a sixth-grade professional learning community**

Principal Investigator Name: Christine Horowitz

Specific Aims

To understand how the use of computer-mediated communication can support face-to-face communication and collaboration in professional learning communities (PLCs).

Background/Significance of Research

Research on PLCs has noted that time available to meet face-to-face in PLCs and using the limited time effectively are the two major factors that hinder the success of these communities. My research will evaluate how the group's use of technology, specifically computer-mediated communication, to communicate and collaborate can increase the group's efficiency in reaching established PLC goals. Currently, the research on technology and PLCs has focused on the use of technology to replace face-to-face meeting time with an emphasis of creating completely virtual efforts. My research has shown that teachers are not in favor of this effort and that they prefer time to meet

face-to-face with their peers. Therefore, my research focuses on how the use of technology can enhance these face-to-face meetings, making them more effective and time efficient.

C. RESEARCH DESIGN AND METHODS AND DATA ANALYSIS

I will begin the research by conducting a semi-structured group interview of the sixth grade PLC at Riku (pseudonym) Middle School and will be a participant observer in their PLC time starting November 2017 and continuing through April of 2018. The school's technology integration specialist will serve as my gatekeeper.

I have created a pseudonym for the school, and all participants' names will be protected. Attached you will find a copy of the participation form. I will only be working with teachers and administration related to the sixth grade PLC. No students will, at any time, be part of the research.

I would appreciate your approval by signature below. Please let me know if you have additional questions or a need for additional information prior to approving this request and I will be happy to provide it as soon as possible. Thank you!

Christine Horowitz
Doctoral Candidate
University of South Carolina
horowic@email.sc.edu

I, _____ give my consent to the above activities in order for Christine Horowitz to fulfill research requirements related to her doctoral work at the University of South Carolina.

_____ _____
Signature Date

APPENDIX B

REQUEST PERMISSION TO CONDUCT RESEARCH (SCHOOL)

RMS Principal,

I am requesting approval to conduct my research at Riku (pseudonym) Middle School (RMS) to partially satisfy the requirements for my EdD in Curriculum and Instruction as a doctoral candidate at the University of South Carolina. In addition to satisfying school requirements, I believe that time spent conducting the research will greatly benefit the school, and the district, as it will provide great insight into how our teachers, administrators and support staff can successfully leverage available technologies to be more efficient and effective in carrying out necessary communication and collaboration to support teacher learning.

I am requesting to observe the sixth-grade PLC beginning in October of 2017 and continuing for approximately two to three months. Additional details that you may find helpful in approving this request are outlined below. I have already spoken with your school technology integration specialist and your curriculum coordinator who wholeheartedly support this effort. I am also in the process of securing district approval. Please let me know if you need any additional information.

Study Title: **Exploration of the use of computer-mediated communication to support the face-to-face collaborative efforts sixth-grade professional learning community**

Principal Investigator Name: Christine Horowitz

Specific Aims

To understand how the use of computer-mediated communication can support face-to-face communication and collaboration in professional learning communities (PLCs).

Background/Significance of Research

Research on PLCs has noted that time available to meet face-to-face in PLCs and using the limited time effectively are the two major factors that hinder the success of these communities. My research will evaluate how the group's use of technology, specifically computer-mediated communication, to communicate and collaborate can increase the group's efficiency in reaching established PLC goals. Currently, the research on technology and PLCs has focused on the use of technology to replace face-to -face meeting time with an emphasis of creating completely virtual efforts. My research has shown that teachers are not in favor of this effort and that they prefer time to meet

face-to-face with their peers. Therefore, my research focuses on how the use of technology can enhance these face-to-face meetings, making them more effective and time efficient.

C. RESEARCH DESIGN AND METHODS AND DATA ANALYSIS

I will begin the research by conducting a semi-structured group interview of the sixth grade PLC at Riku Middle School and will be a participant observer in their PLC time once a week starting in November of 2017 and continue through April. Lisa Foster, who is the school's technology integration specialist, will serve as my gatekeeper.

I have created a pseudonym for the school, and all participants' names will be protected. Attached you will find a copy of the participation form. I will only be working with teachers and administration related to the sixth grade PLC. No students will, at any time, be part of the research.

I would appreciate your approval by signature below. Please let me know if you have additional questions or a need for additional information prior to approving this request and I will be happy to provide it as soon as possible. Thank you!

Christine Horowitz
Doctoral Candidate
University of South Carolina
horowic@email.sc.edu

I, _____ give my consent to the above activities in order for Christine Horowitz to fulfill research requirements related to her doctoral work at the University of South Carolina.

_____ _____
Signature Date

APPENDIX C

PARTICIPANT INFORMED CONSENT

Thank you for your willingness to participate in this study, which focuses on your use of technology to support the face-to-face communicative and collaborative efforts within your professional learning community (PLC).

The information that you provide through interviews and observations will be used for the sole purpose of the partial fulfillment of my EdD in Curriculum and Instruction at the University of South Carolina – Columbia. Upon approval, the completed research will be made publicly available; however, your individual participation, including recorded actions and answers, will be confidential, and neither your administration nor the University of South Carolina will be able to identify nor attribute your individual participation/answers directly to you. Your participation in the research will not be used in any manner to evaluate your job performance or have an impact on your employment and will be kept under the strictest of confidence.

At the end of this form you will be asked to give your consent to be a willing participant in the research that will consist of:

1. Participation in a pre-research group interview
2. Allow the researcher to participate as an observer in your professional learning community (PLC) to gather qualitative data on how technology supports your efforts within the PLC.

Please feel free to contact me at horowic@email.sc.edu or 864-590-3494, or the Institutional Review Board at the University of South Carolina at 803-777-7095 with any questions or concerns you may have about your participation in this study.

Before signing, please ensure that you have read this entire form and have asked any questions regarding the research prior to agreeing to participate.

Risks and Benefits of Being in the Study

There are no known risks involved in participating in this study. The benefit of your participation is to improve the understanding of the use of technology to support professional learning communities and the contribution to the body of knowledge in this area of study.

I, _____, give my full consent to participate in the study as outlined above. By signing, I understand the confidentiality and risks associated with the research.

_____ _____

Signature Date

APPENDIX D

CODING CATALOG

F2F Collaboration	Interaction on tasks between participants
CMC collaboration	Any use of CMC for the group to collaborate
F2F Feedback	Responsive information given for purpose of improvement
CMC File sharing	Sharing of digital files
CMC feedback	The use of CMC to provide feedback to/between group members
CMC Information retrieval	Using CMC to access information stored online
CMC Knowledge sharing	Using CMC to share information for understanding/increase knowledge
F2F Knowledge sharing	More knowledgeable participants sharing what they know
F2F Reflection	Analysis, consideration of own and others processes/learning/work/beliefs during PLC
CMC reflection	Participants using a form of CMC to reflect on their learning/understanding/work
Email use	Using email to exchange information, ideas
Schoology use	Specific use of the Schoology platform to carry out tasks
Time	issues and resolutions
Specific examples	Specific examples
OneDrive	Specific use of OneDrive to carry out tasks
CMC Information sharing	Use of CMC resources to share all types of information
Historical data	Digitally archived documents and information
F2F Active participation	'hands on' participation in own learning with other group members
Coaching/Mentoring	Veteran teacher offering advice/guidance to new teachers
F2F Collective inquiry	Group problem solving through active participation
CMC collective inquiry	Group problem solving using CMC
F2F Direct instruction	Team lead/TIS directed specific instruction
F2F Discussion	Any talking between group members (whole/small/1:1) about the PLC focused task
CMC discussion	CMC is used to carry out talks between group members focused on PLC tasks
Issues of F2F meetings	Processes, procedures, events that hinder group efforts
Issues of using CMC	Process, procedures that occur when using CMC
F2F perceptions	Group member attitudes/perceptions of their PLC

CMC perceptions	Group members attitudes/perceptions of using CMC specifically for PLC tasks
Modeling/explaining	explaining a concept by actively showing them how to do it
Questioning/clarification	Group members questioning PLC lead or other group members
Whole group direct instruction	All members of the PLC are together for PLC tasks/instruction
Small group	Community is in content group or RTI group
structure	Organization, design of community
Time management	Performance of tasks and time dedicated to tasks
Culture	Group dynamics
Verbal cues	Beyond normal talking that conveys participant feelings
Leadership	Persons, activities by those in charge (Jill, Aps, Principal)
Content group	Members are from same content area
RTI group	Members are grouped in RTI data teams
Socialization	Personal interactions between group members unrelated to specific PLC tasks
Non verbal cues	Body language, tone, movement
CMC during PLC	Use of any CMC during F2F meetings
CMC outside PLC	Use of any CMC outside of set PLC meeting times
Clarification	Responses by leadership to direct question during F2F time
MB use in PLC	Participants are using MBs during face to face meetings
MB use for collaboration	Use of MB to participate in collaboration during PLC
MB use for knowledge sharing	Use of MB to support knowledge sharing during PLC
MB use for information retrieval	Use of MB to retrieve information to support PLC activities
MB use productivity	Use of MB to assist in carrying out PLC tasks
MB use active participation	Use of MB to be able to participate in given PLC tasks
Tech use in PLC	Non MB technology use (i.e. ActivPanel, PC)
Lesson planning	Collaboration on coming week's lesson plans by content groups
Off task	Behaviors that are not part of the expected tasks to be carried out