

**Resistance in the Core: A Mixed Methods Investigation of Secondary Teachers' Collegial Learning Networks in the Context of Reform**

by

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## DEDICATION

To my wife, Rebecca

*Without you, none of this would have been possible. This is as much yours as it is mine. Your willingness to be part of this journey from the first time we met, your love and support as we began a life together, and your patient understanding through the difficult times...all of these things have brought me, brought us, to this place. And I can't imagine how I would have come this far without you. I love you...and thank you so much. This work is dedicated, first and foremost, for you.*

To my son, Max

*When you were born, we were not sure if you would survive, and if you did survive, we weren't sure how you would live. The morning after your birth, a researcher from the university asked if we were willing to have you be a part of a study about babies who had seizures. Without hesitation, we agreed because we wanted your life to have purpose beyond our own little corner of humanity; we wanted you to help other babies like you. Fortunately, you thrived, and the last five years have been as normal (and as wonderful) as we could have asked for. I can only hope that this research makes the world a little bit better for teachers like me, in much the same way that you made the world better for babies like you. When you're older and you're reading this, remember this one thing: continue to make the world better, just like you did when you were born.*

*...Oh, and take care of your Mom and me when we're old. That's an important one too.*

To Mom

*I have a deep sense of the memories from my childhood when we were in the car together, be it the mini-van or the Datsun. In those memories, the details are fuzzy, but what is important is the talk, the endless conversation, the dialog we had. Maybe that's why language has been so important to me throughout my adult life. I can think of a thousand reasons why you talked with*

*me so much (your sisters weren't in Florida, Dad was working 2<sup>nd</sup> shift or sleeping after 3<sup>rd</sup> shift, I was the only child left in the house, etc.), but in the end, you decided that I was worthy of conversation. I know now that's a rare gift for a parent to give a child. And for that, I dedicate this labor of language to you, Mom. I love you.*

To Dad

*I'm not sure if you remember this, but when I was younger, at the end of a long and detailed description of how your dad treated you when you were young, you said to me, "Just be a little bit better than me." I think that's what I've tried to do my entire life, at least that's what I hope I've done. I hope you're proud of me and what I've accomplished, not just with this dissertation but also with Rebecca and Max.*

*I can't count the number of times I've thought about you and what you would think of me or how I've mimicked (unconsciously) the ways that you say things or how you think about things...and I never once said to myself that was a problem. Almost always, I thought, "Getting more and more like Dad every day." And I smiled to myself because, despite your advice, I've become a lot more like you than I (or you) ever thought I would be, and that has enabled me to be the person I've become, to be a father and a husband, to be a professional in the workplace. Thank you, Dad, for being a better man and showing me how to do the same.*

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## TABLE OF CONTENTS

DEDICATION .....	ii
ACKNOWLEDGEMENTS .....	iv
LIST OF FIGURES .....	ix
LIST OF TABLES .....	x
LIST OF APPENDICES .....	xi
ABSTRACT .....	xii
Chapter 1: Introduction .....	1
Origins of a Study on Collegial Learning .....	1
Overview of the Study .....	2
Overview of the Chapters .....	3
Chapter 2: Analytic Framework.....	5
Collegial Learning .....	5
An Instantiation of Collegial Learning: Professional Learning Communities .....	6
An Essential Component: Formal Structures.....	7
A Key Intermediate Outcome: Social Structures.....	8
Measuring and Documenting Social Structures.....	9
Unresolved Questions and Attendant Research Questions.....	14
Chapter 3: Methodology .....	16
Research Questions.....	16
Context and Setting.....	17
Research Design.....	20
Data Sources, Collection, and Analysis.....	24
Summary.....	33
Chapter 4: Findings.....	35
Quantitative Findings.....	36
Integration.....	38



Qualitative Findings.....	45
Chapter 5: Discussion, Implications, and Conclusions.....	65
Integration: Discussion of Major Findings .....	66
Imagining Collegial Learning and Reform.....	70
Discussion of Other Findings .....	71
Limitations .....	71
Implications and Conclusions.....	72
APPENDICIES.....	76
REFERENCES .....	84

## LIST OF FIGURES

Figure 1.1. Progression from Teacher Community to Collegial Learning .....	3
Figure 2.1. Outcomes of Formal Structures of Professional Learning Community Reform.....	9
Figure 2.2. Three Basic Types of Mixed Methods Designs (Creswell, 2012).....	13
Figure 3.1. Phases of an Explanatory Sequential Mixed Methods Research Design .....	21
Figure 3.2. Phases, Procedures, and Products of an Explanatory Sequential Mixed Methods Research Design (Creswell, 2015).....	25
Figure 3.3. Multilevel $p_2$ Model for Four SPSD High Schools, 2014-15 .....	28
Figure 4.1. Sociogram of Kirby High School Learning Network (Wave 1), 2014-15 .....	40
Figure 4.2. Sociogram of Kirby-H Subgroup, (Wave 1), 2014-15 .....	44
Figure 4.3. Valence of Thematic Instances from PLC Texts.....	46
Figure 4.4. Thematic Co-occurrence from PLC-coded Blocks of Text.....	52
Figure 4.5. Learning Incidents (N = 88) .....	64

## LIST OF TABLES

Table 2.1. Characteristics of Professional Learning Communities.....	7
Table 3.1. Alignment of Research Questions and Methodologies Employed.....	17
Table 3.2. Student Characteristics in Four SPSD High Schools, 2014-15 .....	18
Table 3.3. Full-time Instructional Staff and Administration Characteristics in Four SPSD High Schools, 2014-15 (By School) .....	18
Table 3.4. Full time Instructional Staff and Administration Characteristics in Four SPSD High Schools, 2014-15 (Aggregate) .....	19
Table 3.5. Full-time Instructional Staff and Administration Survey Participation Rates in Four SPSD High Schools, 2014-15 .....	26
Table 3.6. Learning Network (Wave 1) Subgroup Typology .....	30
Table 3.7. Framework for Analysis of Interview Transcript Data, by Text Type and Coding Schema .....	32
Table 4.1. Findings from Multilevel $p_2$ Model for Four SPSD High Schools, 2014-15 .....	36
Table 4.2. Properties of Learning Networks (Wave 1) at Four High Schools, 2014-15 .....	39
Table 4.3. Radii of Kirby High School Learning Network (Wave 1) Subgroups, 2014-15 .....	41
Table 4.4. Average Reform Self-Efficacy (and Item Participation Rate) of Learning Network (Wave 1) Schools, 2014-15.....	41
Table 4.5. Average Reform Self-Efficacy (and Item Participation Rate) of Learning Network (Wave 1) Subgroups, 2014-15 .....	42
Table 4.6. Subgroups in Learning Network (Wave 1) Subgroup Typology.....	43
Table 4.7. Kirby-H Interviewees with Pseudonym, Sociogram ID, and Centrality Classification within Kirby-H.....	44
Table 4.8. Themes and Number of Thematic Instances from PLC Blocks of Text.....	45
Table 4.9. Descriptions of Learning Incidents, by Valence.....	59
Table 4.10. Comparison/Contrast of Formal and Informal Learning Incidents, by Preference ...	62
Table 5.1. Sequential Explanatory Joint Display.....	66

**LIST OF APPENDICES**

Appendix A. SNA Survey.....76  
Appendix B. Interview Protocols.....81

## **ABSTRACT**

This sequential explanatory mixed methods study analyzed teachers' collegial learning networks in the context of a specific teacher learning reform, Professional Learning Communities (PLCs). Teachers from four high schools in one district participated in the quantitative data collection. Social network analysis modeled variables that affected the formation and dissolution of new collegial learning network ties, clustered teachers into network subgroups, and individualized interview protocols. Phenomenography via focused ethnography was employed during the qualitative phase of the study. Interview data from one unique subgroup (Kirby-H) facilitated exploration of these teachers' collegial learning networks and reform experiences.

Membership in the same PLC content/grade-level group was significantly correlated with new collegial learning ties, but Kirby-H described the formal reform and its associated learning incidents in overwhelmingly negative terms, preferring or attaching a positive valence to informal collegial learning in almost two-thirds of the total learning incidents. The qualitative data suggest that teachers in Kirby-H did not believe that the PLC facilitated their professional learning. Therefore, the strong quantitative correlation between same PLC membership and new collegial learning ties suggest that collegial ties are composed of learning outside of formal structures (i.e. informal learning). Further, maladaptive beliefs of Kirby-H members may have complicated the success of the PLC reform. Findings suggest the following: 1) PLC content/grade-level groups were constructed on top of preexisting, informal learning networks and bounded by content area, and 2) teachers within key subgroups have the potential to complicate the success of teacher learning reforms and their informal learning must therefore be taken into account during the design phase of a professional learning reform.

## **Chapter 1: Introduction**

### **Origins of a Study on Collegial Learning**

During the last four years of my teaching career (2007-11), I taught *Advanced Placement* (AP) U.S. History, and as a result, I was given the opportunity, along with hundreds of other colleagues, to score student essays from the final exam for that course, an event commonly known as “the reading.” The readers (as we were called) congregated in a large conference hall in Louisville, Kentucky, sitting at tables of six to eight. At each table, we were led by a veteran reader and trained on how to score student essays. For seven days, eight hours a day, we sat, in relative silence, and read and scored hundreds (some read and scored thousands!) of student essays. The obvious question for the uninitiated might be, “Why would someone do that?” One possible answer came from a colleague I met at the reading: because the reading is the best professional development a history teacher can attend.

Soon after I first attended the reading, I began my career as a doctoral student, and my experiences in Louisville prompted questions that I would eventually take up in my research. I began asking myself why my colleague would claim that the reading was the best professional development for a history teacher, which led to more questions about what was being taught at the reading, which led to questions about how it was being taught and how practitioners were understanding and making sense of their own learning at the reading. My back-of-the-napkin hypothesis was that the formal content of the learning at the reading was how to score student essays, but that was likely not the direct antecedent of my colleague’s “best professional development” comment. I thought about what I had learned at the reading (i.e. how to manage student expectations in an AP course, the kinds of activities that will be most effective for students who “shouldn’t” be in AP, how best to cover the Era of Good Feelings, etc.), and I realized that I had learned many of these things from the other readers, from the colleagues at my table and from those at lunch time, colleagues who carpooled with me to the local fine dining establishments after the work day and those who gathered in the hotel social lounge in the evenings for card games. Scoring essays was only a small part of what I learned that week; most

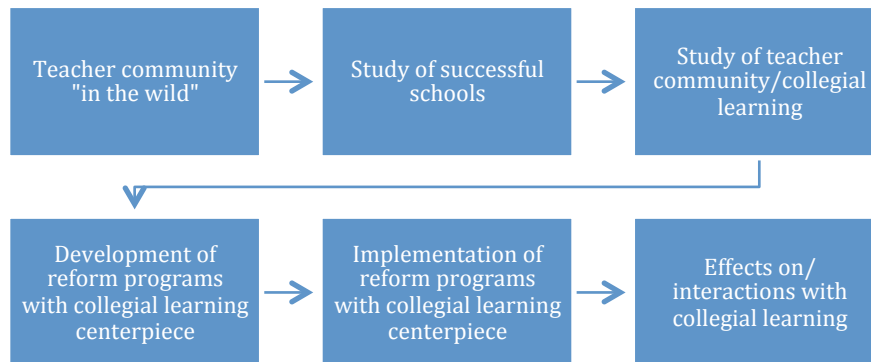
of my learning was closely connected to the informal collegial ties at the reading rather than the formal work of scoring essays.

Once I began making these connections, I attempted to design a study with the reading table as the case under examination, but the more I thought about what I was interested in (informal collegial learning), the less I was convinced that the reading was the best place to study it. I eventually decided that the reading was less grounded in teachers' day-to-day experiences than I preferred, and as a result, I began the process of securing sites within Stanley Public School District (SPSD), as discussed in Chapter 3. During that process, my research stumbled into a happy accident: SPSD was beginning a Professional Learning Community (PLC) reform. Because PLC reform is concerned with collegial learning, another fruitful dimension was added to my design, and it also harkened back to my experience as a reader, wherein the formal content of the learning might or might not have been the same as what I was learning informally from colleagues. It was in this kind of research context that I was able to begin exploring the phenomena of collegial learning and teachers' own understandings of that learning.

### **Overview of the Study**

This study is rooted in the overlaps, contradictions, tensions, and symbiotic relationships between collegial learning and teacher learning reform. Teacher community was first studied nearly 30 years ago as an organic element of successful schools and was later codified into reform efforts through the lens of collegial learning (Figure 1.1). While there is substantial research on the effects of teacher learning reforms (e.g. Professional Learning Communities) on collegial learning, there are few, if any, studies of how teachers understand or make sense of the effects of teacher learning reforms on their own collegial learning.

Figure 1.1  
*Progression from Teacher Community to Collegial Learning*



This line of research is important because, in the end, teachers are the “street-level bureaucrats” (Weatherley & Lipsky, 1977) that mediate the reform and its implementation. Also, as adult learners, they contribute key ingredients to the process of professional learning. Understanding their perspectives and insights regarding their own learning and the attempts to influence their learning constitute is an important element of a theory of change for professional learning.

### **Overview of the Chapters**

Chapter 1 was an introduction to this dissertation, which included a narrative of its origins in my own experience as a teacher and a general overview of the study itself. The chapters that follow detail this study’s analytic framework, the methods used to collect and analyze data, the findings that resulted from the data analyses, and the implications of the findings.

Chapter 2 makes a case for the study of collegial learning in the context of a PLC reform by highlighting the role of teachers’ social structures in both and suggests specific methodological approaches (social network analysis, phenomenography, mixed methods) for measuring and documenting these social structures. The chapter concludes with the presentation of research questions that addresses the central constructs of the study (collegial learning and PLC reform) through the methods outlined therein.

Chapter 3 expands on the last part of Chapter 2 by explicating the study’s research methodologies. After the context and setting are described, the mixed methods research design (explanatory sequential) is reviewed, followed by a more detailed discussion of how mixed



methods and the attendant points of integration, social network analysis, and phenomenography via focused ethnography apply to this particularly work. Data sources, collection, and analysis procedures as framed through an explanatory sequential approach are described, in detail, for the balance of the chapter.

Chapter 4 presents the findings of the study. First, the quantitative results of the formal model are explained and summarized. Next, an explanation of how the quantitative results were integrated into the qualitative data collection and analysis is detailed. Third, the qualitative results are discussed in two subsections: “Reform texts within interview transcripts” and “Learning incident texts within interview transcripts.” In the “Reform texts within interview transcripts” subsection, results from the thematic coding, valence coding, and thematic co-occurrences are described. In the “Learning incident texts within interview transcripts” subsection, a definition and operationalization of “learning incident” is provided. Then, four holistic categorizations of learning incidents (description of formal learning, description of informal learning, comparison/contrast of formal and informal learning, and other), along with their associated valences (positive, negative, or neutral) or preferences (formal, informal, or neither), are explicated within the context of the study. Finally, the four categories of learning incidents are reconstituted, which helps summarize the qualitative findings.

Chapter 5 is a discussion of the findings of the study. In it, a joint display of both the qualitative and quantitative data help explain the study’s three major findings, which center on the idea of informal collegial learning as a prime driver of teacher learning. The study’s limitations are also discussed and followed by the implications of the study for three sets of stakeholders: scholars, administrators, and teachers.

## **Chapter 2: Analytic Framework**

This chapter lays out the analytic framework for this study. First, I discuss the history of collegial learning research, specifically as it flowed into the work on Professional Learning Communities. Second, I review three models of Professional Learning Communities and highlight an essential component, formal structures, and a key intermediate outcome, social structures, of all three. Third, I explicate possible methods of measuring and documenting social structures as an intermediate outcome of Professional Learning Communities. Finally, I address questions that are unresolved and attendant research questions.

### **Collegial Learning**

Judith Warren Little's work (1982) focused attention on the role of collegial social relationships and professional community in building teachers' capacity and improving schools. The idea that learning was born out of social interactions with colleagues constituted a major departure from the behaviorists and the cognitivists, and it was energized by Vygotsky's work. The translation and revival of Vygotsky's work by Western scholars in the late 1970s and early 1980s (Roth & Lee, 2007; Sinha, 1989), which largely overlapped with Little's initial work on teacher learning, contributed to the articulation of sociocultural approaches to learning (Lave & Wenger, 1991; Rogoff, 2003; Wertsch, 1991). What the socioculturalists suggested was that learning only happens in a context and in social spaces. Therefore, in order to study learning, researchers must study the context and social interactions of the learning under consideration.

Little's work, and the work of her scholarly descendants, emphasized the importance of productive social interactions on the professional work of teaching and education. Little (1982) found that successful schools tended to have teachers who interacted with their colleagues more frequently around topics of professional interest. Rosenholtz (1989) highlighted the importance of teacher collaboration on increased efficacy, especially as it pertained to teachers' own practice and the capacity of students for learning. Elmore (2004) made a case for focusing professional social interactions around meaningful and common professional learning as a part of larger and more systemic change efforts.

As the research on collegial learning became more robust, the private sector discovered Senge's *The Fifth Discipline* (1990) and its call to create learning organizations. Education reformers (Darling-Hammond & McLaughlin, 1995; Lieberman, 1995; Lieberman & Miller, 1999) began weaving together the ideas of teacher community, the learning that takes place within those communities, and Senge's learning organizations. From these currents flowed an early, and still influential, tributary of collegial learning reform: Professional Learning Communities.

### **An Instantiation of Collegial Learning: Professional Learning Communities**

Despite the recent advances in school improvement efforts based on collegial learning (Bryk, Gomez, Grunow, & LeMahieu, 2015; Cohen, Peurach, Glazer, Gates, & Goldin, 2013), Professional Learning Communities (PLCs) continue to be front and center in many teacher learning reform efforts (Feger, Arruda, Pringle, & Briggs, 2008). PLCs began to act as centerpieces in education reform programs in the 1990s, notably through the work of Hord (1997), Louis and colleagues (Louis & Kruse, 1995)<sup>1</sup>, and DuFour and colleagues (DuFour, DuFour, Eaker, & Many, 2006; DuFour & Eaker, 1998). In general, PLC reforms attempted to foster collaboration among teachers through a systematic breakdown of the "egg crate school" (Lortie, 1975, p. 14) into which teachers had been socialized for decades. This breakdown was accompanied by the implementation of formal structures that were designed to replace the cellular social organization of schools with a more reflective and responsive system of interpersonal interactions.

While Hord and Louis and colleagues explicitly attended to the scaffolds (leadership, support, resources) necessary for this shift to take place, DuFour and colleagues decided to deemphasize these scaffolds in favor of a focus on the actions and responsibilities of teachers (Table 2.1). Hord and Louis and colleagues both acknowledged the roles of leadership and context in shifting from cellular to collaborative systems of schooling. To be sure, DuFour and colleagues do attend to these matters in their work, but their earliest descriptions of PLC characteristics instead highlight the multiple dimensions of, for example, Hord's "shared personal practice" (1997, pp. 23–24) and "collective creativity" (1997, pp. 18–19), which manifest themselves in DuFour's work as a focus on learning, collaborative culture, collective

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<sup>1</sup> This volume of related work was edited by Louis and Kruse and included contributions from Louis, Kruse, Anthony Bryk, Jeremy Hopkins, Jean A. King, M. Peg Lonquist, Mary Ann Raywid, Sharon Rollow, and Daniel A. Weiss.

inquiry, action orientation, and results orientation. Further, DuFour et al. described the need for an action orientation (“learning by doing”) (2006) and a results orientation (“a focus on outcomes rather than inputs”) (1998, p. 469) that is not in the foreground of either Hord or Louis and colleagues in their descriptions of PLCs. In later work, DuFour et al. (2008) named “widespread leadership” as a topic that became clearer since their early work and also devoted an entire chapter to the principal’s work in a school/district committed to the work of PLCs. Even so, DuFour and colleagues still did not highlight either the role of leadership or the conditions/resources when answering the question, “What is a Professional Learning Community?”

Table 2.1  
*Characteristics of Professional Learning Communities*

	Hord (1997)	Louis and Kruse (eds.) and colleagues (1995)	DuFour et al. (1998)
Leadership	Supportive and shared leadership	Supportive leadership	[Implicit]
Teacher interactions	Collective creativity	Reflective dialogue; collaboration	Focus on learning; collaborative culture; collective inquiry; action orientation; results orientation
Culture	Shared values and vision	Shared values and norms; collective focus on student learning	Focus on learning; commitment to continuous improvement
Context	Supportive conditions	Structural conditions; human/social resources	[Implicit]
Teacher practice	Shared personal practice	Deprivatization of practice; collaboration	Focus on learning; collaborative culture; collective inquiry; action orientation; results orientation

### **An Essential Component: Formal Structures**

Despite this divergence, all PLC models rely on formal structures to achieve their goals. The central formal structure of PLC reforms are the content/grade-level teams (often referred to as “PLCs”).<sup>2</sup> Hord referred to content/grade-level teams, collectively and generally, as “an environment where staff are communally organized” (1997, p. 26), but the clearest and most succinct articulation of this formal structure comes from DuFour et al., who define “team” as a “group of people working *interdependently* to achieve a *common goal* for which members are

<sup>2</sup> Throughout this work, content/grade-level teams that are the product of a PLC reform will simply be referred to as “PLCs,” and the school- or districtwide PLC reform initiative will be referred to as either the “PLC reform” or “PLC initiative.”

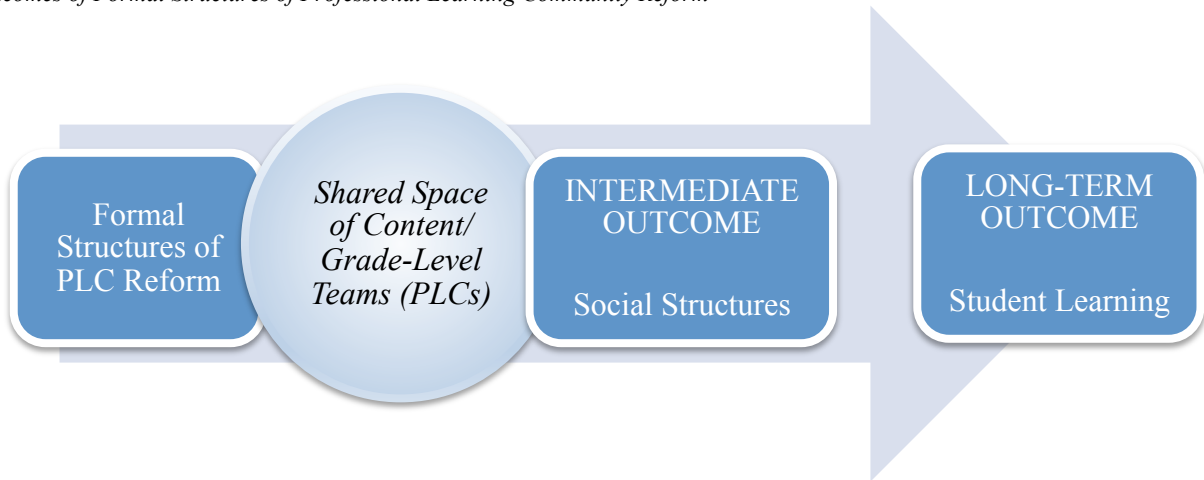
held *mutually accountable*” (italics in original) (2008, p. 471). They further elaborate by noting, “Collaborative teams are the fundamental building blocks of PLCs.” Content/grade-level teams (PLCs) provide teachers with a direct avenue to collaborative analysis of artifacts of common practice, advice from colleagues about how to improve one’s practice, and peer accountability for proposed changes in practice.

One might argue that essentializing a PLC reform to its content/grade-level teams is misrepresentation, but I contend that this choice is necessary in order to understand PLC reforms as they are experienced by teachers themselves. Many of the characteristics of PLCs as described by Hord, Louis and colleagues, and DuFour and colleagues (Table 2.1) are explications of the school or district as a whole. For example, Hord’s “shared values and vision” (1997, pp. 19–20) are only shared if they extend beyond any given team and reach all stakeholders within a school or district, and teachers are, by and large, not privy to the values and vision of multiple teams. Those characteristics that are experienced directly by teachers—“deprivatization of practice” (Louis & Kruse, 1995, pp. 31–32) and focus on learning (DuFour & Eaker, 1998)—are experienced within a specific context, and that context often takes the form of content/grade-level teams (PLCs).

### **A Key Intermediate Outcome: Social Structures**

PLC reforms aim, in the long-term, to improve student learning through the installation of formal structures (notably content/grade-level teams) that foster a key intermediate outcome: the growth of social structures that support collegial learning. These social structures include content/grade-level teams (PLCs) but also encompass less formal interactions as well (e.g. regular after-school gatherings, teacher-led “lunch-and-learns,” informal gatherings during planning or passing periods). Put another way, content/grade-level teams (PLCs) operate in the shared space between the formal structures of PLC reforms and the social structures that are the intermediate outcome of PLC reforms (Figure 2.1).

Figure 2.1  
*Outcomes of Formal Structures of Professional Learning Community Reform*



PLC models count on the fact (even if only tacitly) that content/grade-level teams (PLCs) will serve as petri dishes for less formal interactions that can then grow in the wild of a school organization, working symbiotically with other productive social interactions and choking out maladaptive species of social interactions.

The intermediate outcome of a PLC reform and the social structures that precede the implementation of a PLC reform are differentiated by their purposes. Social structures that blossom out of a PLC reform serve the purposes of the reform. They facilitate productive collegial learning and promote functional professional relationships. Social structures that precede the PLC reform may serve a variety of purposes. Some of those purposes may align with those of the PLC reform, and others may not. Some may contribute toward reform goals, and others may not. Some may promote functional professional relationships, and others may not. Part of the work of any PLC reform will involve the breakdown of preexisting “egg crate” social structures (as noted above). Either way, PLC reforms must successfully navigate these preexisting social structures in order to achieve their goals.

### **Measuring and Documenting Social Structures**

This dissertation study hinges on understanding social structures in schools, both as an intermediate outcome of PLC reforms and as a system that preexists, adapts to, and continues after a PLC reform. Understanding schools’ social structures is contingent upon *measuring* and *documenting* them. *Measurement* connotes a more quantitative approach, one that relies on the

assignment of numerical values to phenomena in order to better understand it. *Documentation* connotes a more qualitative approach, one that relies on language and the meanings made of language to better understand phenomena of interest. In terms of social structures, a quantitative approach permits descriptions of networks that are characterized by the presence or absence of ties between nodes (i.e. actors) and the quality of those ties as defined in numerical terms. For example, a teacher may learn from another teacher (presence of tie between nodes) on a daily basis (“180,” which would indicate learning from that teacher everyday of a given school year). A qualitative approach highlights the meaning and sense made by individuals. A mixed methodology attends to both types of data and uses them dialogically in order to generate questions, analyses, discussion, and conclusions that were unavailable to either approach when used without reference to the other. This work uses mixed methods to understand, as fully as possible, the social structures among teachers in the context of a PLC reform. In the next section, I provide an overview of social network analysis, the role of centrality, and the importance of subgroups.

**Measuring Social Structures: Social Network Analysis.** Social network analysis is a predominantly quantitative methodology used to measure social ties, how individuals fit within their network of social ties, and the effect of these social ties on individuals. At their most basic, social network data are composed of ones and zeros to represent the presence or absence of ties between actors. The actor giving a tie is called an “ego,” and the receiver of a tie is called an “alter.” These binary data are often attached to a scale value as well, to indicate the strength or frequency of a tie. For example, an ego might say that an alter is a friend and that the strength of their friendship is an eight out of 10. In terms of frequency, an ego might say that an alter calls or texts them three times a week, which would mean that the frequency is a three out of possible seven. Social network data can be represented graphically with sociograms, with actors represented by nodes (or vertices) and ties represented by lines (or edges) between actors.

One of the key measurements of how individual actors fit within their network of social relationships is centrality. In social network analysis, there are three basic methods for measuring an actor’s centrality in a network: degree centrality, closeness centrality, and betweenness centrality (Freeman, 1979). “Degree centrality” refers to the number of direct ties an actor has with other actors in the network. “Closeness centrality” is the mean of the distances between an actor and every other actor in the network. “Betweenness centrality” is the number

of times that an actor is on the shortest path between two other actors in the network. When combined with formal modeling, these measures of centrality (and variants thereof) and other data generated through social network analysis can help researchers understand the effect of one's social ties on outcomes of interest or vice versa.

When applying social network analysis to a large organization, like a school, it is important to move beyond individual measures and consider the role of primary groups (or subgroups) because they mediate the relationship between the individual and the organization and are home to the deepest and richest social interactions (e.g. Cooley, 1909). As a result, social network analysts have constructed various methods by which to cluster actors into subgroups based on sociometric data (see reviews in Frank, 1995; Hallinan, 1980; Wasserman & Faust, 1994). When considering the role and effect of these subgroups (and social networks, in general), sociometric data are always measuring some resource (e.g. "advice") or relationship (e.g. "friendship") around which social ties are formed. As a result, an actor can be a member of multiple networks and associated subgroups. For example, an actor can be a member of an "advice" subgroup within an "advice" network and also a member of a "friendship" subgroup within a "friendship" network. Both networks and associated subgroups are based on sociometric data from the same population, but each represents the social ties concerning a specific resource or relationship. Assuming a sociometric data set attuned to collegial learning, the resulting network would represent the social relations of a population as it related to their collegial learning. The subgroups derived from this data set would represent the social clusters of actors that learn with and from one another about matters of professional interest.

**Documenting Social Structures: Phenomenography.** In the previous section, I provided an overview of social network analysis, and in this section, I will discuss phenomenography, the qualitative approach in this study. Phenomenography is primarily concerned with second-order perspectives, how people experience and describe the world around them, over and above first-order perspectives, which involve statements about the world itself and not about the thoughts of those who perceive the world (Marton, 1981). Phenomenography assumes that there is a real world external to one's self and that a central feature of social science research should be the explication of human experiences of things in that world.

The primary data for phenomenographical research are interviews that are tailored to elicit robust descriptions of a phenomenon from the perspective of the interviewee. Transcribed



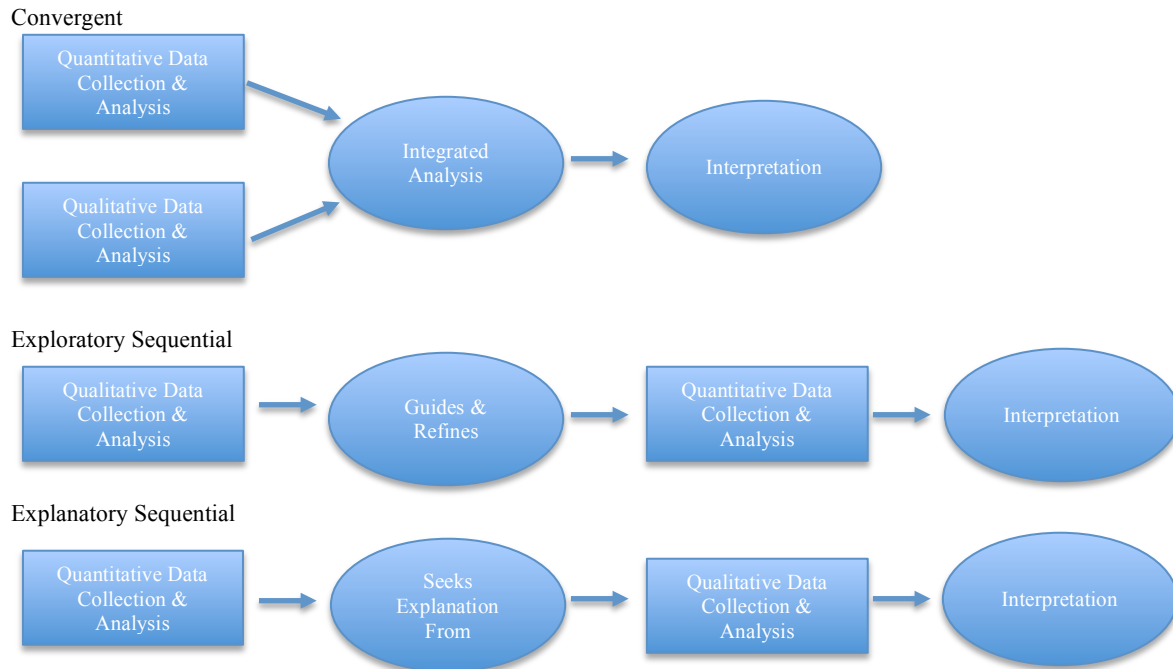
interview data are analyzed for “utterances” (Marton, 1988, pp. 153–154) that are placed into “categories of description,” (Marton, 1981, pp. 194–196) which are “the most significant outcome[s] of [phenomenographical] research” (Marton, 1988, p. 146).

A key part of this kind of analysis is the interpretation of meaning in order to identify the appropriate category of description for an utterance. Meaning can be both implicit and explicit; it can be both a readily identifiable element of the utterance itself or it can be hidden in the context of the utterance (Marton, 1988, p. 153). Therefore, meaning may be gleaned from either the utterance itself, from the utterance’s context, or from both. Further, the categories of description take on greater salience as the analysis incorporates more data, generating a “pool of meaning” (Marton, 1994, p. 4428) from the collective descriptive understandings of multiple participants in the research.

Two elements of phenomenography stand out as particularly relevant for this work. First, for phenomenographers, “what people believe to be true is more important than any objective reality; people act on what they believe” (Fetterman, 1988, p. 18). In terms of social interactions, second-order perspectives guide behavior, especially if the interactions under consideration explicitly involve a thing outside of one’s self that can be perceived by those involved with the interaction. Second, phenomenographical work has informed the construction of quantitative measures of categories of description (Micari, Light, Calkins, & Streitwieser, 2007). With this in mind, I posit that the reverse is also true, that phenomenography will be able to compliment social network analysis through a qualitative explication of quantitative findings.

**Using Mixed Methods.** Although a variety of approaches exist within mixed methods, Creswell argues that there are three basic types of mixed methods research designs: convergent, exploratory sequential, and explanatory sequential (Figure 2.2) (2012, p. 541). Most phenomenography, a fully qualitative method, has interacted with quantitative research through exploratory sequential designs, where the qualitative data collection and analysis precedes and informs the quantitative work, but I have elected to use an explanatory sequential design for this study, one in which the order and roles described above are reversed.

Figure 2.2  
*Three Basic Types of Mixed Methods Designs (Creswell, 2012)*



Mixed (or complimentary) methods are used to collect and analyze data in ways that are unavailable to researchers using only a single methodology. Each of these three relies on collection, analysis, and integration of both quantitative and qualitative data at key points in the research. Convergent designs collect both types of data at the same time, analyze each type of data separately but concurrently, and rely on a high degree of integration between the two types of data during the analysis phase. Exploratory sequential designs begin with qualitative collection and analysis in order to guide the construction of quantitative instruments that refine the initial exploration. Phenomenographical research has a history of employing this design type (Eley, 1992; Entwistle & Tait, 1994; Micari et al., 2007; Trigwell & Prosser, 2004). Explanatory sequential designs begin with quantitative collection and analysis, followed by the use of qualitative methods to explain the quantitative findings. This approach allows researchers to explain quantitative data in terms of concepts (like meaning, for example) that are not easily measured.

A mixed methodology was an appropriate fit for this study given the need to use both

social network analysis and phenomenography to study teachers' social structures in the context of a collegial learning reform. Social network analysis is a powerful tool for mapping social interactions and tracking the flow of resources through social connections, but its weaknesses are highlighted when variables in a quantitative model are unable to explain social behavior or the meaning of resources flowing through the network is in question. Phenomenography does not focus on first-order descriptions of the world. Instead, its focus rests squarely on one of social network analysis's blind spots: meaning ascribed to the world through description.

### **Unresolved Questions and Attendant Research Questions**

The literature is quite clear that PLC reforms positively affect a number of dimensions of teaching, learning, and schooling (Berry, Johnson, & Montgomery, 2005; Bolam et al., 2005; Englert & Tarrant, 1995; Hollins, McIntyre, DeBose, Hollins, & Towner, 2004; Louis & Marks, 1998; Phillips, 2003; Supovitz, 2002; Supovitz & Christman, 2003). That said, the relationship between PLCs (content/grade-level groups) and social connections based on collegial learning is not fully understood. This lack of clarity stems from the instantiation of "teacher community" and "collegial learning" as "Professional Learning Communities." The informal social structures of highly effective schools observed by Little in the 1980s were formalized into a reform program by DuFour and colleagues in the 1990s. This is not suggest that PLC reforms failed to accomplish their goal of enhancing teacher community, but it does raise the question of how informal social dynamics are related to formal reform structures, specifically those structures that are designed to enhance collegial learning. The relationship between informal social dynamics, teachers' own understanding of the reform, and the formal reform structures provides a basis for the overarching research question:

*Overarching Research Question (ORQ): How did secondary teachers and their collegial learning networks interact with a teacher learning reform (e.g. Professional Learning Communities)?*

In order to address the relationship between secondary teachers' collegial learning networks and PLC reform, I focused on key elements of each. I used new collegial learning ties as the measure of secondary teachers' collegial learning networks. Membership in the same content/grade-level groups (also known, colloquially, as "PLCs") was the measure used in this

study to operationalize the PLC reform.

*First Research Subquestion (RQ1): What is the correlation between membership in the same content/grade-level group (PLC) and the formation of new collegial learning ties?*

One key element of PLC reform in this research context is the contrast between its formality and the informality of the learning it seeks to inculcate in teachers. Because learning is constructed in a context and through social spaces, then questions about the meaning ascribed to a formal reform (its rollout, artifacts, social objects, texts, etc.) by those who are the objects of said reform are relevant (even central) to understanding how a PLC reform might or might not change the informal learning of teachers. Further, a focus on specific groups of individuals affected by a PLC reform (those with influence in their networks and doubts about the reform) may yield categories of descriptions that highlight the interplay between the formal PLC reform, their preexisting and informal learning networks, and their understanding of themselves as learners. In short, apart from questions of implementation and fidelity, how do these kinds of teachers construct meaning about their own learning within the context of a teacher learning reform?

*Second Research Subquestion (RQ2): How did teachers in a key subgroup understand the PLC reform?*

*Third Research Subquestion (RQ3): How did teachers in a key subgroup understand their own learning in terms of formality and informality?*

In the next chapter, I will describe the context and setting of this study, explain my rationale for choosing an explanatory sequential research design, and provide details regarding the data sources, collection, and analyses I used to answer these four research questions.

### **Chapter 3: Methodology**

This chapter provides a review of the methods employed to address the research questions that framed this study. The chapter begins with a brief review of the research questions that emanated from the analytic framework. Then, the study's context, setting, and sample are discussed, followed by the research design, which is divided into four parts: an overview of mixed methods, the quantitative approach used in this study, the qualitative approach used in this study, and a specification of the three points of integration between the quantitative and qualitative methods. Data sources, collection, and analysis are then explicated through its six constituent elements: field visits, surveys, qualitative sampling, interview protocol, interviews, and analytical integration. The chapter concludes with a summary of this study's methodology.

#### **Research Questions**

While the research questions were first discussed at the end of Chapter 2, a description of their evolution throughout the study may shed light on their methodological salience. This study began as an exploration of collegial learning, and the initial research questions were focused on this exploration. During the negotiations to access the research sites, it became clear that the teacher learning reform efforts already underway within the district, a Professional Learning Community reform, needed to be accounted for in the study's design and that the research questions would need to be modified. This shift in the research questions also mirrored a shift in the overarching methodological approach. At its inception, this study relied on parallel research designs for two data sets because the need for methodological integration was not clear. After site negotiation and early field visits, an explanatory sequential mixed methods design that relied on multiple points of integration was determined to be the best methodological orientation for studying these phenomena.

In Table 3.1, the research questions are aligned to the methodological orientation used to respond to them.

Table 3.1

*Alignment of Research Questions and Methodologies Employed*

Research Questions		Methodological Orientation
ORQ	How did secondary teachers and their collegial learning networks interact with a teacher learning reform (e.g. Professional Learning Communities)?	Mixed Methods
RQ1	What was the correlation between membership in the same content/grade-level group (PLC) and the formation of new collegial learning ties?	Quantitative
RQ2	How did teachers in a unique subgroup understand the PLC reform?	Qualitative
RQ3	How did teachers in a unique subgroup understand their own learning in terms of formality and informality?	Qualitative

The overarching research question (ORQ) incorporates both quantitative and qualitative methods into its approach. RQ1 addresses the quantitative side of this mixed methods study and leads into the qualitative data through methodological integration. RQ2 and RQ3 addresses the qualitative side of this mixed methods study and is framed within the context of the quantitative findings.

### **Context and Setting**

This study was conducted during the 2014-15 school year in Stanley Public School District (SPSD).<sup>3</sup> SPSP borders a major city in the southeastern United States and is primarily composed of suburban, semi-rural, and rural communities. SPSP serves 68,000 to 73,000 students, who are approximately 70% White, 5% African American, and 20% Hispanic/Latino. The vast majority of the remaining 5% are multiethnic and Asian American students. The 4,000 to 6,000 instructional staff in Stanley are roughly 90% White, 7% Hispanic/Latino, and 2% African American.<sup>4</sup>

**Characteristics of students in participating schools.** The assistant superintendent gave all 13 high schools within SPSP the opportunity to participate in this study. Four high schools elected to do so: Allred High School, Buscema High School, Kirby High School, and Lim High School.<sup>5</sup> Table 3.2 provides a description of the student body at the four schools in this study and highlights their enrollment, racial, and socioeconomic heterogeneity. Enrollment varied by over 1,000 students across the four schools. While all schools' student populations were

<sup>3</sup> All proper names (district, schools, personnel) used in association with the subjects of this study are pseudonyms.

<sup>4</sup> These demographic ranges and percentages are intentionally stated in a broad manner in order to protect the identities of the school district and the participants therein.

<sup>5</sup> A fifth school was initially included in the study, but its low survey participation rate and lack of administrative support precluded it from the final analysis.

majority White, the non-White population varied considerably, from almost half to less than one-sixth. The English language learner population was relatively stable across all four schools, but the free or reduced lunch proportion, which is often used as a proxy measurement for poverty in schools, ranged from a little less than one-third to more than two-thirds. The students in these schools represent a wide array of experiences and highlight the possibility of making claims that extend beyond schools that are composed of a single demographic type.

Table 3.2  
*Student Characteristics in Four SPSD High Schools, 2014-15*

	High Schools				Aggregate			
	Allred	Buscema	Kirby	Lim	Minimum	Maximum	<i>M</i>	<i>SD</i>
Enrollment	1,191	1,267	1,740	2,332	1,191	2,332	1,633	526
Female	48%	51%	47%	51%	47%	51%	49%	2%
Race, White	67%	84%	59%	52%	52%	84%	66%	14%
English language learners	2%	1%	2%	2%	1%	2%	2%	1%
Free or reduced lunch	68%	70%	30%	30%	30%	70%	49%	23%

### **Characteristics of instructional staff and administration in participating schools.**

Tables 3.3 and 3.4 provide basic descriptive statistics of the instructional staff and administration at the four high schools included in this study. The instructional staff and administration at these four schools were overwhelmingly White and mostly female. Mean total years of experience teaching was almost 13 years, and on average, teachers spent a little less than half of their teaching career at the current school.

Table 3.3  
*Full-time Instructional Staff and Administration Characteristics in Four SPSD High Schools, 2014-15 (By School)*

	Allred	Buscema	Kirby	Lim
School-level <i>N</i>	86	87	100	134
Female	50 (58%)	57 (66%)	67 (67%)	86 (64%)
Race, White	78 (91%)	83 (95%)	87 (87%)	108 (81%)
Years of Experience, Current School	<i>M</i> = 8.74 <i>SD</i> = 7.21	<i>M</i> = 7.33 <i>SD</i> = 7.99	<i>M</i> = 4.56 <i>SD</i> = 2.91	<i>M</i> = 4.44 <i>SD</i> = 3.69
Years of Experience, Prior to Current School	<i>M</i> = 7.09 <i>SD</i> = 8.33	<i>M</i> = 5.72 <i>SD</i> = 6.46	<i>M</i> = 8.79 <i>SD</i> = 8.62	<i>M</i> = 6.37 <i>SD</i> = 8.21
Years of Experience, Total	<i>M</i> = 15.82 <i>SD</i> = 9.54	<i>M</i> = 13.06 <i>SD</i> = 9.88	<i>M</i> = 13.35 <i>SD</i> = 9.32	<i>M</i> = 10.81 <i>SD</i> = 9.14

Table 3.4

*Full-time Instructional Staff and Administration Characteristics in Four SPSD High Schools, 2014-15 (Aggregate)*<sup>6</sup>

	Minimum	Maximum	<i>M</i>	<i>SD</i>	Item Response <i>n</i>
School-level <i>N</i>	86	134	102	22	N/A
Female	58%	67%	64%	4%	N/A
Race, White	81%	95%	87%	3%	N/A
Years of Experience, Current School	1	36	6.05	5.92	332
Years of Experience, Prior to Current School	0	43	6.90	8.01	329
Years of Experience, Total	1	44	12.95	9.57	329

**PLC reform context.** During the 2012-13 school year, a new district superintendent took office, instituting organizational and policy changes for the 2013-14 school year. One of these changes was the implementation of a Professional Learning Community (PLC) reform based on the work of DuFour and colleagues, whose work was discussed in Chapter 2. DuFour et al. defined a PLC as “an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve” (2006, p. 11). PLC reform is implemented over time and preceded by an initial, top-down burst of formal structure building within schools, typically content/grade-level teams that develop common curricula, pedagogies, and assessments (Blankenship & Ruona, 2007; Lee & Shaari, 2012). These content/grade-level teams (colloquially referred to as “PLCs”) may vary slightly in terms of membership or focus, but the “community” dimension of these teams is at the heart of PLC reform initiatives like the one implemented in SPSD.

The PLC reform in SPSD hinged on the creation of and support for these PLCs. At the high school level during the first year of the reform, each administrative team created the PLCs for their school and charged them with creating common assessments and scales for those assessments. These assessments would then help the PLCs generate student achievement data that was accessible and relevant to all participants in the PLC group, thereby fostering positive conditions for group discussions of best practices and effective pedagogical strategies. PLCs met regularly, some more often than others, but in general, PLCs met once a week.

The SPSD PLC reform was a five-year project, and district-level administration did not anticipate full implementation until the 2018-19 school year. Full implementation would

<sup>6</sup> I have included Table 3.4 in this chapter because the statistical model used data that was aggregated across all four research sites.



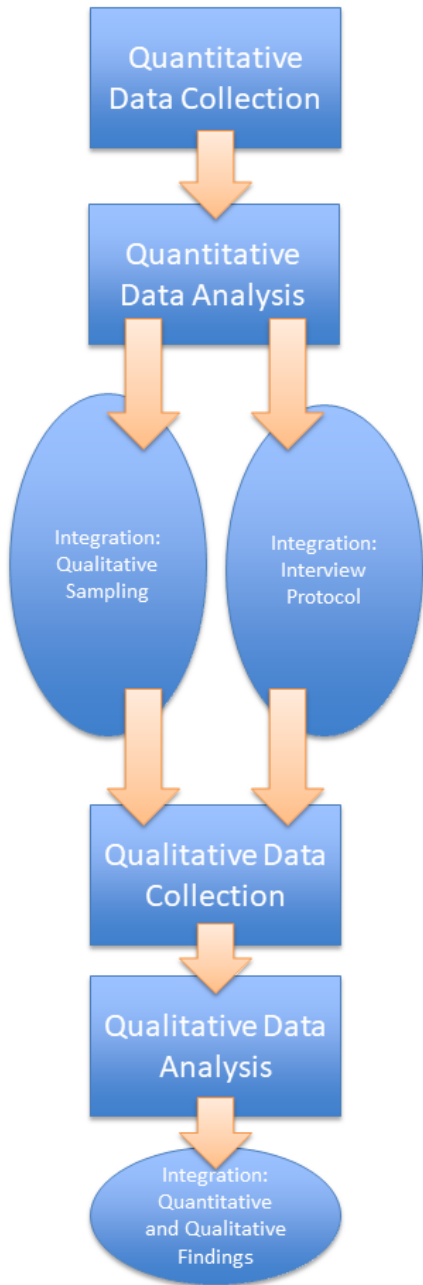
necessitate increasingly reflective and expansive goals for the PLCs each subsequent year. For example, scales and common assessments were the foci of PLCs during the 2013-14 and 2-14-15 school years, and district personnel anticipated an expanded focus for the PLCs in subsequent years, including lesson studies.

### **Research Design**

This study was designed as an explanatory sequential mixed methods (Creswell & Plano Clark, 2011) study for four reasons. First, I wanted to understand the learning networks among teachers as an entree into how teachers made sense of the PLC reform and their own learning in the context of the PLC reform. Without first knowing the outlines and shape of the teachers' networks, I would have been collecting qualitative data without an anchor to collegial learning, the key construct of the study. Second, as argued in the next chapter, if this study had solely relied on either quantitative or qualitative data, the results would have failed to capture the full complexity of the interactions between teachers' learning and the PLC reform in SPSD. Third, an explanatory sequential mixed methods design was employed due to its efficiency compared to other mixed methods designs in terms of the research timeframe and participants' own resources. It allowed for remote quantitative data collection and targeted, face-to-face qualitative data collection. Fourth, by using two different methods of collecting and analyzing data about teachers' own understandings of their learning, I was able to take the central premise of PLC reforms at face value and attempt to make a case, from at least two different perspectives, about how that premise plays out in the lived experiences of teachers.

In Figure 3.1, I have outlined the phases of this research design and explicated them below. First, I collected quantitative data and analyzed them. Then, I used the results of my quantitative data analysis to select a qualitative sample and to individualize the interview protocol for the participants in the qualitative sample. Next, I began collecting qualitative data and analyzing them. These analyses were then integrated into a discussion of both the quantitative and qualitative findings.

Figure 3.1  
*Phases of an Explanatory Sequential Mixed Methods Research Design*



The following explication of my research design is comprised of four subsections: mixed methods, quantitative methods, qualitative methods, and integration. The mixed methods subsection provides a brief overview of mixed methods and how it applies to this study. The quantitative subsection describes the relationship between sociocultural theory and social network analysis and the instrument used to collect social network data. The qualitative

subsection highlights my use of phenomenography via focused ethnography as a means of collecting interview data. Finally, in the integration subsection, I describe the three levels of integration in this study.

**Use of mixed methods in this design.** Mixed methods research designs integrate quantitative and qualitative data into a coherent whole and allow researchers to robustly respond to questions about complex systems and processes (Greene, Caracelli, & Graham, 1989). In this study, two phenomena were operating simultaneously in the setting and sample: 1) collegial learning and 2) teachers' understanding of and relationship to the PLC reform in their district. The social structures of collegial learning were captured through social network survey items, and teachers' relationship to the PLC reform was measured by their scaled responses to a survey item about their own implementation of the reform. These data were then used to inform the qualitative sampling procedure and the interview protocol. Qualitative data regarding teachers' understanding of the PLC reform and their own collegial learning emerged from interview transcripts.

For this study, social network analysis was the method of quantitative data collection and analysis, and focused ethnography, which is a variant of classical ethnography, was the specific qualitative analog employed within a broader phenomenographical approach. Taken together, social network analysis and focused ethnography complemented each other in exploring collegial learning in the context of a PLC reform with a richness that was unavailable if either had been used independently.

**Use of quantitative methods in this design.** Sociocultural theory played a key role in the analytic framework (see Chapter 2), and as a result, I elected to use social network analysis in exploring collegial learning. Sociocultural theory suggests that social and cultural interactions are the vehicles for human learning. Therefore, social network analysis, which assign numerical values to interactions, resource flows, or relationships between actors, has the potential to capture the social interactions that facilitate learning in much the same way that other social network analysts have argued that social capital flows through teachers' social interactions (Frank, Zhao, & Borman, 2004; Penuel, Riel, Krause, & Frank, 2009; Spillane, Kim, & Frank, 2012).

The quantitative survey instrument was designed to elicit dyadic- (i.e. actor-to-actor) and individual-level sociometric data regarding participants' collegial learning networks and their

self-efficacy in terms of the PLC reform (see Appendix A for the full survey). Participants were asked to indicate, from a list of all instructional staff and administrators at their school, those *from whom* they had learned anything of professional concern during the last 12 months, followed by an item asking respondents to indicate the frequency of these interactions.<sup>7</sup> The decision to phrase the item directionally, from those who learn to those who “teach,” rested on the idea that respondents can only speak to their own collegial learning, even if the learning is shared. The reform self-efficacy (RSE) item asked participants about their level of confidence in their own implementation of the PLC reform initiative.

**Use of qualitative methods in this design.** The use of ethnography as a complimentary method to social network analysis, especially in the last two decades, has not been uncommon (Edwards, 2010). In this study, I elected to use a variant of classical ethnography, called “focused ethnography” (Knoblauch, 2005) or “compressed ethnography” (LeCompte & Schensul, 2010, pp. 122–124) as the vehicle for a phenomenographical approach to the qualitative data. In classical ethnographic studies, the researcher invests a large amount of time embedded within the phenomena under investigation. Given the limited timeframe of this study, I decided that focused ethnography was warranted because of its ability to generate phenomenographic data within compressed timeframes. Additionally, it is highly useful as a method that complements social network analysis. Knoblauch (2005, para. 21) claims that focused ethnography is particularly attuned to communication activities, including the untangling of individual actions and interactions. In a complementary methods framework though, both social network methods and focused ethnography have the ability to speak to communication activities, in addition to describing and analyzing individuals’ and social groups’ choices. The use of these complementary methods enabled triangulation, which is key for this type of ethnography “to produce a comprehensive and consistent picture of a specific cultural domain” (LeCompte & Schensul, 2010, p. 122).

More specifically, I used focused ethnography for three reasons. First, given my own background as a classroom teacher, this study meets Knoblauch’s “alterity” precondition for the use of focused ethnography, which is a “backdrop of communality” between the researcher and the subject of the research (2005, para. 8). Second, I was working with a compressed timeframe for field work. During my four one-week field visits in the Winter/Spring 2015 semester, data

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<sup>7</sup> These frequencies were recoded into days per school year (daily = 180, twice a week = 72, once a week = 36, twice a month = 18, once a month = 9, twice a semester = 4, once a semester = 2, once a year = 1).

collection was maximized by scheduling interviews beforehand and using audio recording technology during interviews. Third, regarding my focus on collegial learning, Knoblauch asserts that the “entities studied in focused ethnographies are not necessarily groups, organizations or milieus but rather situations, interactions and activities” (2005, para. 28). Given that the interviews largely centered on collegial learning interactions, focused ethnography seemed the most appropriate data collection method. LeCompte and Schensul echo Knoblauch in their emphasis on a singular focus, noting that the research carried out with compressed ethnographic designs “cannot attempt to cover a wide spectrum of beliefs and behaviors in different cultural domains” (2010, p. 122).

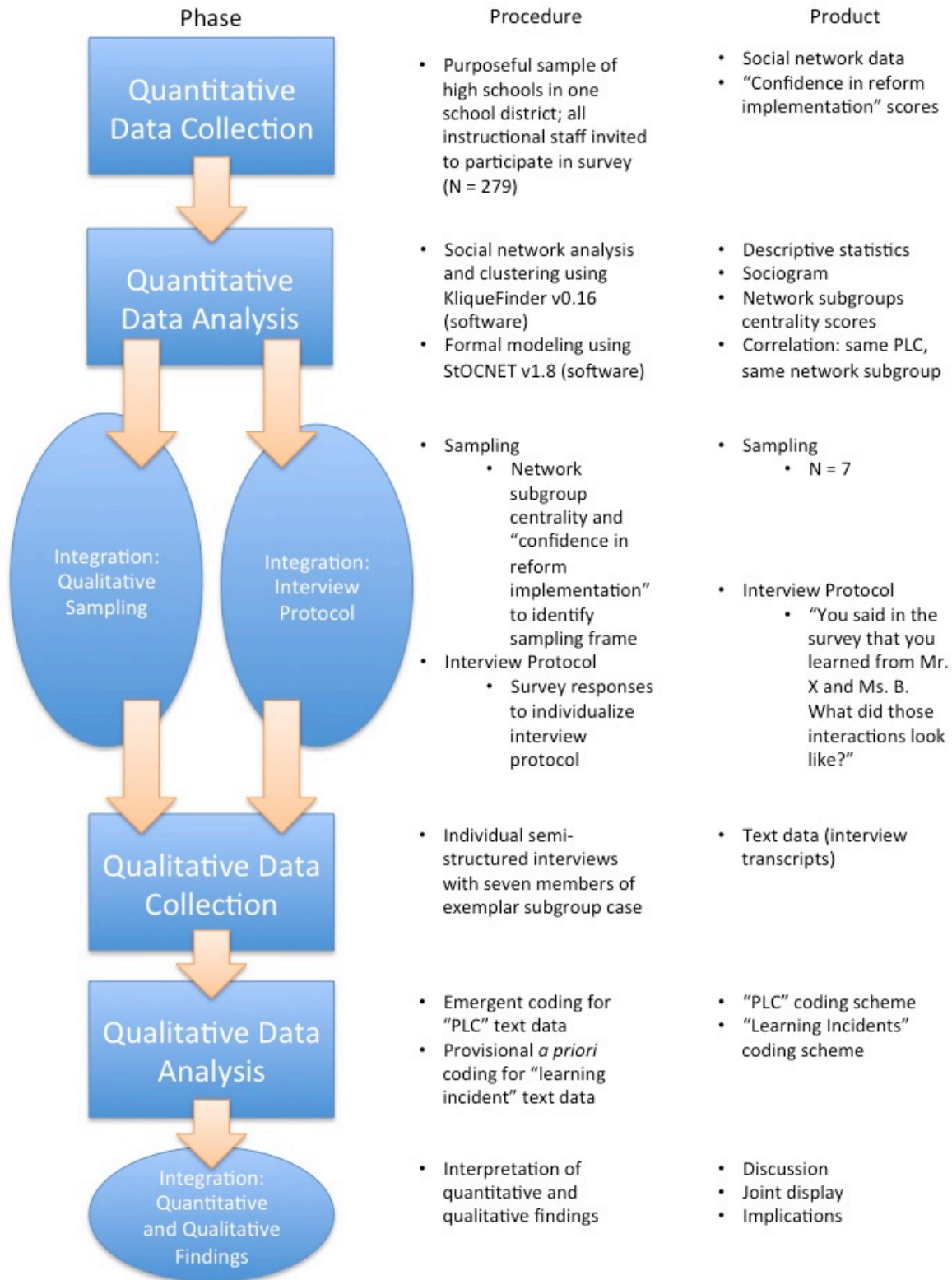
**Role of integration in this design.** In this study, I have integrated the two data sets at three levels: design, methods, and interpretation (Fetters, Curry, & Creswell, 2013). Figure 3.1 succinctly positions all three levels of integration relative to each other and the other phases of the study. At the design level, I chose to integrate the quantitative and qualitative data through an explanatory sequential design. The quantitative data was collected and analyzed first, which then informed qualitative data collection and analysis. In terms of methods, I connected the two data sets by using the quantitative results to inform my qualitative sampling frame, and I built upon the quantitative results by using them to inform my qualitative data collection instrument. Finally, I used a joint display to interpret my results from both the quantitative and qualitative data sets (Guetterman, Fetters, & Creswell, 2015).

### **Data Sources, Collection, and Analysis**

Often, in a methodology chapter, data sources, collection, and analysis are separated into two or three different sections, but when using mixed methods with explicit points of integration, a slightly different approach is necessary. Because of the sequential nature of this study, the analysis of quantitative data directly informed the qualitative sampling and qualitative data collection protocol. Therefore, this section presents the data sources, collection, and analysis according to the sequential nature of the research design (see Figure 3.2) and the actual timeline by which I encountered the data sources, collection, and analysis.

Figure 3.2

*Phases, Procedures, and Products of an Explanatory Sequential Mixed Methods Research Design (Creswell, 2015)*



In this section, field visits are described, then, sources of survey data, their collection, and their analysis (which included subgroup identification, sociogram creation, and formal modeling) are explained. Next, two points of integration, qualitative sampling and interview individualization, are detailed. In the interview subsection, an explanation of how interview data was collected, how the texts were extracted for analytical purposes, and how these excerpts were coded is provided. Finally, a brief explanation of interpretive integration through joint displays is presented.

**Quantitative sample.** Survey participation rates of the instructional staff and administration at the four high schools included in this study are listed in Table 3.5. The survey was administered in two waves, which is described below in more detail. Wave 1 participation rates among the four high schools ranged from 66% to 86% and ranged from 71% to 78% for Wave 2. Of the 407 staff included in the study, 314 (77%) participated in Wave 1, and 300 (74%) in Wave 2. After excluding participants with missing responses, the quantitative sample that was used in the formal model was 68.5% of the total instructional staff and administration at the four SPSD high schools included in the study ( $n = 279$ ).

Table 3.5  
*Full-time Instructional Staff and Administration Survey Participation Rates in Four SPSD High Schools, 2014-15*<sup>8</sup>

	High Schools				Aggregate			
	Allred	Buscema	Kirby	Lim	Minimum	Maximum	<i>M</i>	<i>SD</i>
Wave 1 Survey Participation	76%	86%	66%	82%	66%	86%	78%	9%
Wave 2 Survey Participation	76%	81%	72%	74%	72%	81%	76%	4%

**Qualitative sample.** Qualitative sampling was one point of methodological integration in this study. Its role in the mixed methods analyses will be discussed in detail below.

**Field Visits.** Survey and interview data were collected during four one-week field visits from January to June 2015. The field visits entailed 5-15 minute, face-to-face interactions with teachers in participating schools. These “check-ins” were designed to encourage survey participation and gauge interest in semi-structured interview participation. Also, field visits were used to conduct semi-structured interviews with teachers in the qualitative sample.

**Quantitative: Surveys.** Instructional staff and administration in SPSD’s participating high schools completed two waves of surveys, the first before the end of January 2015 and the

<sup>8</sup> Respondents were counted as “participating” if they completed the social network items at the beginning of the survey.

second before the end of the school year in June 2015. Both waves of surveys were initially distributed through email to all instructional staff and administrators at participating high schools. Survey data was securely housed online. In order to increase survey participation rates, instructional staff and administrators at participating high schools received follow-up emails from the researcher three days, one week, and two weeks after initial distribution. Also, throughout my four field visits, I conducted check-ins with teachers in order to increase survey participation.

Analysis of the social network data occurred in two stages: subgroup clustering and formal modeling. Subgroup clustering was carried out using *KliqueFinder* v0.16, which is able to cluster actors within a network into non-overlapping, cohesive subgroups (Frank, 1995, 1996). These subgroups are often described as “naturally occurring” because the number of subgroups is not predetermined or estimated by the researcher. Instead, the algorithm examines the social network data to determine the number of subgroups as they naturally occur within the data. The *KliqueFinder* analyses were then exported to *NetDraw* in order to create sociograms for each school’s network. This export included a radius score for each subgroup, which indicated a subgroup’s distance from the center of its network. Radius is a measure of centrality; the lower the radius score, the more central the subgroup. In addition, subgroup reform self-efficacy (RSE), which is the mean RSE for all participants in the subgroup, was calculated from responses to the following: “Indicate the degree of confidence you have in your implementation of the PLC initiative.” Responses were reported on a zero (“no confidence”) to 10 (“complete confidence”) scale. StOCNET v1.8 was used to run a multilevel  $p_2$  model (Robins, Elliott, & Pattison, 2001; van Duijn, Snijders, & Zijlstra, 2004) based on previous educational studies related to collegial learning (Frank, 2009; Frank, Muller, & Mueller, 2013; Spillane et al., 2012) (Figure 3.3). Results, in the form of odds ratios, were reported as a given independent variable being more or less likely to correlate with the formation of a new learning network tie.



Figure 3.3  
 Multilevel p<sub>2</sub> Model for Four SPSD High Schools, 2014-15

Level 1 (*ij*: dyadic characteristics):

$$\begin{aligned} & \log(p[\text{collegial learning}_{ij}=1] / 1 - p[\text{collegial learning}_{ij}=1]) = \\ & \alpha_j + \beta_i + \\ & \delta_1 (\text{prior collegial learning tie})_{ij} + \delta_2 (\text{same PLC})_{ij} + \\ & \delta_3 (\text{same gender})_{ij} + \delta_4 (\text{same race})_{ij} + \delta_5 (\text{same geography})_{ij} + \\ & \delta_6 (\text{reciprocity : collegial learning}_{ji}) \end{aligned}$$

Level 2a (*j*: characteristics of sender of collegial learning a.k.a. receiver of tie)

$$\begin{aligned} & \alpha_j = \\ & \gamma_0^{(j)} + \\ & \gamma_1^{(j)} (\text{PLC facilitator})_j + \gamma_2^{(j)} (\text{non-PLC facilitator formal peer leader})_j + \\ & \gamma_3^{(j)} (\text{quasi-tie : years teaching experience at current school})_j + \\ & \gamma_4^{(j)} (\text{years teaching experience prior to current school})_j + \\ & \gamma_5^{(j)} (\text{time in PLC-related collegial development in last 12 months})_j + \\ & \gamma_6^{(j)} (\text{time in non-PLC-related collegial development in last 12 months})_j + \\ & u_{0j} \end{aligned}$$

Level 2b (*i*: characteristics of receiver of collegial learning a.k.a. sender of tie)

$$\begin{aligned} & \beta_i = \\ & \gamma_0^{(i)} + \\ & \gamma_1^{(i)} (\text{PLC facilitator})_i + \gamma_2^{(i)} (\text{non-PLC facilitator formal peer leader})_i + \\ & \gamma_3^{(i)} (\text{quasi-tie : years teaching experience at current school})_i + \\ & \gamma_4^{(i)} (\text{years teaching experience prior to current school})_i + \\ & \gamma_5^{(i)} (\text{time in PLC-related collegial development in last 12 months})_i + \\ & \gamma_6^{(i)} (\text{time in non-PLC-related collegial development in last 12 months})_i + \\ & v_{0i} \end{aligned}$$

The primary dependent variable in this model, *collegial learning<sub>ij</sub>*, was based on respondent *i*'s reported interaction(s) and frequency of interactions with respondent *j* during Wave 2. As noted earlier, this interaction was based on the idea of *i* learning from *j* regarding any matter of professional concern in the previous 12 months. Because the model required a dichotomized rendering of the dependent variable, I coded all *collegial learning<sub>ij</sub>* tie frequencies less than "once per month" as "0." All *collegial learning<sub>ij</sub>* tie frequencies greater than or equal to "once per month" were coded as "1." The dilemma in this decision was how to capture collegial learning interactions in a way that mirrored the lived experience of teachers without including interactions that were so infrequent as to dilute the power of sustained and frequent learning interactions. Since PLCs occurred once per week and other mandatory, formal meetings occurred once a month, the "once per month" cut score was most useful to this study. While it is certainly the case that collegial learning can occur less than once a month, the *collegial learning<sub>ij</sub>* variable was focused on more longitudinal interactions, those that occurred over a sustained period of time. This rendering captured interactions that occurred more than once a week, once per week, less than once a week but more than once a month, and once per month.

The primary independent variable in this model, same PLC<sub>ij</sub>, was based on the content/grade-level group to which each teacher had been assigned. This selection model showed the log odds ratio effect of same PLC membership on the formation of new collegial learning ties. Five other dyadic variables were included in the model. Dyadic variables indicate the existence (“1”) or non-existence (“0”) of a similar characteristic. The dyadic-level covariates were:

1. *collegial learning*<sub>ij</sub> during Wave 1 (prior collegial learning tie<sub>ij</sub>),
2. if *i* and *j* were the same gender (same gender<sub>ij</sub>),
3. if *i* and *j* were the same race (same race<sub>ij</sub>),
4. if *i* and *j* were in the same geographic region of the school (same geography<sub>ij</sub>), and
5. if *j* reciprocated the nomination made by *i* (reciprocity : collegial learning<sub>ji</sub>).

The variable prior collegial learning tie<sub>ij</sub> controlled for the effects of previous collegial learning interactions between respondents. The variables same gender<sub>ij</sub> and same race<sub>ij</sub> controlled for the tendency, which is often found in social networks, to associate with others who are similar (McPherson, Smith-Lovin, & Cook, 2001). Reciprocity between actors regarding the variable collegial learning<sub>ji</sub> controlled for nominations sent within tight-knit network clusters in the expectation of a return nomination from others in that cluster, as opposed to actual collegial learning interactions.

Individual variables are data about the actors within the network, regardless of their connections to other actors in the network. Some individual-level variables indicate a given actor’s role (e.g. PLC facilitator), and others are an expression of experience over time (e.g. years teaching at current school). This information was collected for nominators (*i*, those who indicated that that they learned from someone else) and, when possible, nominees (*j*, those who were marked by nominators). Individual-level covariates (for both nominators and those nominated) included the following characteristics:

1. PLC facilitator,
2. formal peer leader (not PLC facilitator),
3. years teaching at current school,
4. years teaching experience prior to current school,
5. time spent in PLC-related professional development over the last 12 months, and
6. time spent in non-PLC-related professional development over the last 12 months.

One would expect that peer leaders, including both PLC facilitators and non-PLC-facilitator peer leaders, might be nominated more than non-leaders. The decision to split this group into two rested on the notion of the PLCs as a formal and central space for collegial learning. One might also expect those with more experience at their current school to possess greater amounts of local knowledge that might be of professional interest to others. Those with more years of experience would be expected to be nominated more than those with less experience, or at minimum, those with a certain number of years experience should represent a threshold, above which nominations are more frequent and below which nominations are less frequent. Those with more time spent engaged in professional development activities should be nominated more than those with less time spent in professional development activities because they ostensibly possess greater amounts of professional expertise.

**Integration: Qualitative sampling.** As illustrated in Table 3.6, three criteria were used to construct a maximal variation subgroup typology (Coburn, Russell, Kaufman, & Stein, 2012). These three criteria are 1) learning network subgroup radius scores, 2) reform self-efficacy (RSE), and 3) RSE item participation rates. From this typology, a qualitative, purposive sample was selected (Flyvbjerg, 2011; Patton, 2002). The purpose of the qualitative sample was to explore a unique subgroup’s experience of their own collegial learning in the context of reform. Subgroups with a radius score of 3600 or less were identified as “core” subgroups. Those with radius scores greater than 3600 were identified as “periphery” subgroups. “Core” and “periphery” categorizations were cross-checked with learning network sociograms to ensure accuracy. Subgroups were also categorized by RSE. Subgroups with an average RSE less than or equal to four were categorized as “low” and greater than or equal to six as “high.”

Table 3.6  
*Learning Network (Wave 1) Subgroup Typology*

<u>Type #1 (Core-High)</u> Radius category: core RSE category: high RSE item participation rate $\geq 0.70$	<u>Type #2 (Core-Low)</u> Radius category: core RSE category: low RSE item participation rate $\geq 0.70$
<u>Type #3 (Periphery-High)</u> Radius category: periphery RSE category: high RSE item participation rate $\geq 0.70$	<u>Type #4 (Periphery-Low)</u> Radius category: periphery RSE category: low RSE item participation rate $\geq 0.70$

**Integration: Interview protocol.** Survey responses from participants within the qualitative sample were used to individualize the semi-structured interview protocol. First,

participants were asked to provide more details regarding their “top three topics of discussion when you learned from the colleagues” listed in the learning network survey item (Appendix A). Second, participants were asked to provide a rationale for why they nominated colleagues on the learning network item and describe learning incidents with these colleagues.

**Qualitative: Interviews.** Qualitative data sources and collection included check-ins and individualized, semi-structured interviews (see Appendix B for interview protocols). The check-ins served a wide variety of purposes. They were initially designed to increase survey participation, but they also had the other, unintended effects. Check-ins sensitized me to the emic perspective, provided context for the study, and established important background information, all of which I was able to draw upon during analysis. The check-ins also gave me the opportunity to assess participants’ willingness to be interviewed later in the study. I did not audio record these interactions but instead relied on succinct summaries in my field notes, which were written during or immediately after the conversation ended. The semi-structured interview protocol consisted of main questions, probes, and follow-up questions (Rubin & Rubin, 1995, pp. 145–158). During the second, third, and fourth field visits, I conducted one semi-structured interview with each available and willing member of the unique subgroup from the typology in Table 3.6. By unique, I am referencing the expectation that one subgroup will solely inhabit one of the four cells of the typology in Table 3.6. Each semi-structured interview with members of the unique subgroup was transcribed using a rudimentary version of the denaturalized transcription process (Bucholtz, 2000) in order to privilege the oral nature of the interactions at the heart of this study. One purpose of the semi-structured interviews was to follow-up or clarify previous statements from the check-ins (Olson, 2011, pp. 40–41; Schensul & LeCompte, 2013, pp. 175–178).

Two sets of data were generated from the interview transcripts: texts related to the PLC reform and texts of learning incidents (Table 3.7). Texts related to the PLC reform were lifted from the interview transcripts if they discussed the PLC reform directly or reform-related social objects, meaning physical objects specific to the reform that mediated social interactions (Conole & Culver, 2009). PLC reform texts were analyzed using an emergent and iterative descriptive coding of themes (Miles & Huberman, 1994, pp. 58–62). When learning incident texts were lifted from the interview transcripts, Cooley, Hodkinson, and Malcolm’s (2003) four dimensions of in/formality in learning (setting, process, content, purpose) initially served as the *a priori*

coding scheme. “Reflection” was added to this coding scheme to enhance the robustness of Colley et al.’s construct. Texts of learning incidents were pulled from the interview transcripts if they described a learning incident and exhibited one of the five dimensions of learning (or some combination thereof).

Table 3.7  
*Framework for Analysis of Interview Transcript Data, by Text Type and Coding Schema*

Text Type	PLC Reform Thematic Instance		Learning Incidents			
Coding Schema			Holistic Categorization			
			Descriptions		Compare/Contrast	Other
			Formal Learning	Informal Learning	Formal/Informal	
	Valence of Thematic Instances	Thematic Co-occurrences	Valence of Descriptions		Preference for Formal or Informal	
	Positive, Neutral, Negative		Positive, Neutral, Negative		Formal, Informal, Neither	

The PLC reform texts were coded thematically. Each instance of a theme was coded for its valence, which can also be defined as “affect.” A thematic instance consisted of a text within the PLC reform texts that did one of three things: initially prompted a theme to emerge, fit within my working understanding of a theme, or strengthened my working understanding of a theme. These instances included the actual thematic referent, but many of them also included the context necessary to make sense of the referent. Each thematic instance was coded for its valence as either positive, neutral, or negative.<sup>9</sup> Thematic instances with a hostile or critical tone toward the PLC groups or PLC reform were coded as negative. Neutral instances were often statements of fact. They could nevertheless have been couched within a larger text that was not neutral. Thematic instances that exhibited a tone that was difficult to classify as either positive or negative were coded as neutral. Thematic instances that expressed a benefit or positive effect of the PLC groups or PLC reform were coded as positive. Examples of positive, neutral, and negative valences will be provided in Chapter 4. Within each PLC reform text, thematic instances were cross-referenced with one another through a thematic co-occurrence matrix (Guest, MacQueen, & Namey, 2012, pp. 146–147).

<sup>9</sup> Several studies have used three-point valence scales to categorize participant texts or narratives. For example, see Himelboim et al. (2014), Painter and Kring (2015), and Scott et al. (2012).

Using the five dimensions of learning adapted from Colley et al. (2003), learning incident texts were holistically categorized as either “description of formal learning,” “description of informal learning,” “comparison/contrast of formal and informal learning,” or “other.” The decision to categorize the learning incident texts holistically, as opposed to an aggregated measure of all five dimensions along a formal/informal scale, rested upon the interrelatedness of the those five dimensions (Colley et al., 2003, p. 37). Simply summing the five dimensions within any given learning incident was not sufficient. On the other hand, a holistic categorization scheme helped resolve apparent contradictions within specific learning incidents and accounted for contextual factors not present in the learning incident.

In order to ascertain the relative value of formality and informality in the unique subgroup’s learning, holistic categorizations were assigned either a valence or a preference. There were three valences: positive, neutral, or negative. These were assigned to both descriptive categories of learning incidents and were determined through textual and contextual markers of efficacy and emotional affect. Learning incidents that included a comparison or contrast between formal and informal learning were assigned preferences. These preference were determined by one of four criteria: the stated preference for one kind of learning over another, words or phrases that implied a preference for one kind of learning over another, a statement that one type of learning occurred more frequently than another, or an implication that one type of learning occurred more frequently than another.

**Integration: Analysis.** In Chapter 5, I will use a joint display to present a mixed methods interpretation of the quantitative findings in light of qualitative excerpts. Joint displays are used to explicate the integration of quantitative and qualitative data and provide a visual representation of methodological integration in mixed methods studies (Fetters et al., 2013; Guetterman et al., 2015). Further, joint displays facilitate insights into a study’s findings that might have been unavailable given displays of a data set attached to one methodology.

### **Summary**

In this chapter, I have presented four research questions, followed by a discussion of the study’s PLC reform context, the district within which the study was conducted, and the sample of schools included in the study. I then described my research design, which was graphically articulated in Figure 3.1. I argued for a presentation of my data sources, collection, and analysis that differs from the usual social science dissertation genre due to its mixed methods explanatory

sequential design (Figure 3.2). I provided an overview of mixed methodology, a description of the quantitative data collection and analyses performed, a description of the qualitative data collection and analyses performed, and a specification of the four points of integration that occurred at three different levels of integration.

## **Chapter 4: Findings**

This mixed methods study focused on how collegial learning operated in the context of a formal Professional Learning Community (PLC) reform. Given the breadth and depth of evidence for the positive effects of PLC reform on collegial learning, one might reasonably expect the formal learning related to PLC reform to have been both predominant among and preferred by teachers. The quantitative evidence across four schools affected by the PLC reform suggested that this was the case. New learning ties were statistically correlated with same PLC (content/grade-level group) membership, but the qualitative evidence appeared to tell a different story. In one school affected by this reform (Kirby High School), one unique group of teachers (Kirby-H) reported negative affect with regard to the formal PLC reform, more positive descriptions of informal learning incidents than formal learning incidents, more negative descriptions of formal learning incidents than informal learning incidents, and a preference for informal learning over formal learning.

These results follow the flow of the sequential explanatory mixed methods research design employed in this study: quantitative results, integration processes, and then qualitative results. The results that emerged out of the mixed methods approach address the overarching research question (ORQ): How did secondary teachers and their collegial learning networks interact with a teacher learning reform (e.g. Professional Learning Communities)? The quantitative results address the first subquestion (RQ1): What is the correlation between membership in the same content/grade-level group (PLC) and the formation of new collegial learning ties? I have included a section on integration with four subsections: “Learning Networks and Subgroups,” “Reform Self-Efficacy,” “Qualitative Sampling,” and “Interview Protocol.” The integration section explicates how the quantitative results informed the qualitative design and data collection and, by extension, the qualitative results. In subsection “Reform texts within interview transcripts” (hereafter “Reform”) the qualitative results address the second subquestion (RQ2): How did teachers in a unique subgroup understand the PLC reform? In subsection “Learning incident texts within interview transcripts” (hereafter



“Learning”), the qualitative results address the third subquestion (RQ3): How did teachers in a unique subgroup understand their own learning in terms of formality and informality?

## Quantitative Findings

The quantitative addressed RQ1: What is the correlation between membership in the same content/grade-level group (PLC) and the formation of new collegial learning ties? I used a formal model to determine the existence and strength of this correlation in light of other related variables.

**Formal model.** Table 4.1 summarizes the results of the multilevel  $p_2$  model (as presented in Chapter 3) estimating the effects of the independent variables on the formation of new collegial learning network ties (dependent variable). Results, in the form of odds ratios, can be reported as the odds of a new learning network connection being formed given an independent variable. What follows is an explanation of the results related to RQ1, other statistically significant results, and notable non-significant results.

Table 4.1  
Findings from Multilevel  $p_2$  Model for Four High Schools, 2014-15

	Parameter $e^{\text{estimate}}$	Estimate	SE	Quantiles			
				0.5	2.5	97.5	99.5
Provider variance	-	8.62	5.96	3.47	3.74	23.60	27.29
Receiver variance	-	4.24	2.77	1.73	1.85	10.78	11.88
Provider-receiver covariance	-	4.77	4.06	1.24	1.40	14.57	16.30
Density	-	-7.61	1.76	-9.58	-9.42	-3.28	-2.82
Reciprocity	-	1.02	0.22	0.44	0.56	1.42	1.49
Individual level (Level 2)							
Provider level (Level 2a)							
PLC facilitator	1.23	0.21	0.24	-0.37	-0.24	0.69	0.77
Non-PLC facilitator formal peer leader	0.86	-0.15	0.22	-0.66	-0.54	0.33	0.43
Years teaching experience, current school	0.99	-0.01	0.03	-0.08	-0.07	0.03	0.05
Years teaching experience, prior to current school	0.97	-0.03	0.02	-0.09	-0.08	0.02	0.03
Time in PLC-related professional development	1.18	0.16	0.16	-0.14	-0.10	0.59	0.69
Time in non-PLC-related professional development	1.14	0.13	0.15	-0.21	-0.14	0.36	0.39
Receiver level (Level 2b)							
PLC facilitator	2.75**	1.01	0.22	0.50	0.59	1.44	1.56
Non-PLC facilitator formal peer leader	2.83**	1.04	0.22	0.45	0.59	1.45	1.51
Years teaching experience, current school	1.02	0.02	0.02	-0.02	-0.01	0.05	0.06
Years teaching experience, prior to current school	1.02	0.02	0.02	-0.03	-0.02	0.06	0.06
Time in PLC-related professional development	0.89	-0.12	0.12	-0.40	-0.37	0.12	0.16
Time in non-PLC-related professional development	1.25*	0.22	0.11	-0.01	0.02	0.46	0.53
Dyadic level (Level 1)							
Prior collegial learning tie	52.46**	3.96	0.14	3.61	3.70	4.23	4.30
Same gender	1.91**	0.65	0.10	0.42	0.47	0.85	0.90
Same geography	3.42**	1.23	0.12	0.94	1.01	1.47	1.54
Same PLC (content/grade-level group)	13.12**	2.57	0.16	2.22	2.27	2.87	2.94
Same race	13.69**	2.62	0.16	2.24	2.33	2.96	3.05
Deviance	-	3,837.11	-	-	-	-	-
Bayesian information criterion (BIC)	-	103,333.46	-	-	-	-	-
Newton-Raftery $p_4$	-	-1,927.76	-	-	-	-	-
Log-likelihood	-	-2,107.41	16.60	-2,154.12	-2,141.52	-2,075.89	-2,067.23

Note. Sample size was 279 (68.5%) after excluding missing values for Level 2a and Level 2b variables. Burn in was 4,000, and sample size was 10,000.

\*\* = Significant at 0.01

\* = Significant at 0.05

The primary independent variable (being a member of the same PLC group) had a significant and positive effect on the formation of new learning network ties. The odds of forming a new learning network tie were 12.12 times greater within PLC groups than between them. This value was derived from the parameter  $e^{\text{estimate}}$  of the Level 1 variable, “same PLC group.”<sup>10</sup>

In terms of other statistically significant results for dyadic variables, the odds of instructional staff and administration forming a new learning network tie were 2.42 times greater with someone in their wing or region of the school building compared with someone in another wing or region of the school building. Also, being the same gender or race/ethnicity were both positive predictors of forming a new learning network tie. The odds of forming a new learning network tie with those of the same gender were 0.91 times greater than those of different genders and 12.69 times greater for those of the same race/ethnicity than those of different races/ethnicities.

Two individual level variables were statistically significant in terms of correlation with the formation of new learning network ties. Both PLC facilitators and non-PLC-facilitator peer leaders were positively associated (1.75 and 1.83 times greater, respectively) with receiving new learning network nominations from “learners” (i.e. tie providers). In other words, PLC facilitators and other formal peer leaders at the four high schools in SPSD were more likely to be someone who instructional staff and administration said they learned from regarding topics of professional concern.

Other statistically significant independent variables that correlated with the formation of new learning network ties included: the presence of a prior learning network tie from Wave 1 (51.46 times greater) and time in non-PLC-related professional development (0.25 times greater). None of the tie provider (“learner”) variables were significantly correlated with the formation of new learning network ties. Also, time in PLC-related professional development for the receiver

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<sup>10</sup> An odds ratio equal to 1.00 would mean that a change in the dependent variable is neither more nor less likely to occur given a particular outcome of a dichotomous independent variable. An odds ratio less than 1.00 would mean that a change in the dependent variable is less likely to occur given a particular outcome of a dichotomous independent variable. An odds ratio greater than 1.00 would mean that a change in the dependent variable is more likely to occur given a particular outcome of a dichotomous independent variable. Thus, when presenting findings in terms of a given dependent variable being, for example, “12.12 times greater” given a particular outcome of a dichotomous independent variable, the 1.00 difference between 12.12 (as presented in the text) and 13.12 (as presented in Table 4.1) is built into the phrasing of the finding.

(“teacher”) was not statistically relevant to the question of what affects the formation of new learning network ties.

**Summary.** In response to RQ1 (“What is the correlation between membership in the same content/grade-level group (PLC) and the formation of new collegial learning ties?”), same PLCs (along with prior learning network ties from Wave 1 and same race/ethnicity) was highly correlated with the formation of new learning network ties. Same geography, being a formal peer leader (both PLC and non-PLC) when “teaching” a colleague, and same gender were also correlated with the formation of new learning network ties. Time in non-PLC-related professional development for “teachers” was weakly correlated with the formation of new learning network ties. There were no significant correlations between individual characteristics of “learners” and the formation of new learning network ties.

### **Integration**

The purpose of mixed methods integration was two-fold: 1) qualitative sampling from social network and reform self-efficacy data and 2) interview protocol individualization from social network data. Learning network subgroups and reform self-efficacy scores were used to create a typology from which participants were sampled for semi-structured interviews. These semi-structured interviews were individualized based on responses to learning network items.

**Learning networks and subgroups.** The Wave 1 social network data from Allred High School, Buscema High School, Kirby High School, and Lim High School from were run through the *KliqueFinder* algorithm in order to identify the naturally occurring subgroups in each school. As seen in Table 4.2, all four schools’ networks had a p-value of  $< 0.05$  on an index of cohesiveness between subgroup membership and occurrences of ties between actors, meaning that they each reflected an underlying social structure and were not random in terms of clustering. These cohesiveness p-values were determined using a Monte Carlo simulation (Frank, 1995; Mooney, 1997), which compares the predicted values from the *KliqueFinder* algorithm with simulated values from random data.

Table 4.2  
*Properties of Learning Networks (Wave 1) at Four High Schools, 2014-15*

School	Allred High School	Buscema High School	Kirby High School	Lim High School	TOTAL
<b>Cohesiveness index p-value</b>	< 0.04	< 0.01	< 0.01	< 0.01	N/A
<b># of subgroups</b>	11	8	9	14	42
<b>Min. / max. subgroup size</b>	4 / 16	5 / 13	5 / 15	6 / 15	4 / 16
<b>Average (SD) subgroup size</b>	7.45 (3.36)	9.63 (2.92)	10.22 (3.53)	9.07 (2.56)	9.00 (3.12)

*Netdraw* was used to map the learning network in each school. The number of subgroups in each learning network ranged from nine to 14, and the subgroups ranged in size from four to 16, with an average size of 9.00. Sociograms were constructed for each learning network using both the raw social network data and the subgroup data (e.g. Figure 4.1). In each sociogram, network nodes are small colored circles that represent individual teachers (each network node is also assigned an identification number, positioned to its upper right), and larger white circles represent subgroups (each subgroup is assigned an identification letter, positioned to its upper right). Each network node is colored according to its subgroup assignment. Edges are lines that connect network nodes and represent learning network ties (arrows represent the direction of the tie, moving from nominator to nominee). The thickness of the edges represents the strength of the tie (thicker edges equals stronger ties).