TIES AND TALK: TRACING THE WORK OF INFORMAL TEACHER LEADERS THROUGH MIXED METHODS SOCIAL NETWORK RESEARCH

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Abstract

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While much of contemporary educational leadership scholarship focuses on formal leadership (that exercised through officially designated roles in schools and school systems), leadership exercised informally is an increasing focus of theorists in instructional leadership, distributed leadership, and teacher leadership, as well as practitioners. Research has insufficiently probed how informal leaders function in schools, particularly through interactions with colleagues. This study uses a mixed methods social network research approach, combining quantitative social network analysis with qualitative study informed by social network theory, to understand

informal leadership at an elementary school. All staff were surveyed regarding whom they turned to for various types of advice, information, and support; these questions produced three network diagrams used to select informal leaders for the qualitative stage. Qualitatively, three teachers leading informally were interviewed, observed, and asked to complete logs of their conversations; key teachers connected to informal leaders were also interviewed. Network analyses reveal similar highly ranked individuals across all three networks, though their leadership is exercised through different interpersonal relationships. Qualitative data focused on the interest of informal leaders in developing solutions to specific instructional issues, rather than enforcing a broad instructional vision. I propose three prerequisites to an informal leadership interaction: the vision for improved instruction of the informal leader, the presence of an instructional variation in the informal leader's own practice, and an invitation from a colleague to offer advice, information, or support on a specific instructional issue. These findings advance distributed leadership's consideration of how leadership is situated by particular contexts, and suggests the importance of certain leadership tools, including modeling teaching and the use of instructional technologies. Future questions and recommendations reiterate the need for work on leadership practiced informally, and suggest consideration of the contexts in which leadership interactions take place.

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Chapter 1.

Informal Educational Leadership:

Understandings and Complications

Contemporary educational leadership scholarship declares, with confidence, that adults throughout schools exercise leadership, changing organizational and professional practice. Most of this research focuses on the roles, practices, and effects of *formal* leadership—that is, leadership exercised by individuals or groups in officially designed positions within schools and school systems, such as principals, instructional coaches, or staff developers. While sometimes harder to see and generally less attended to in research, leadership may also be exercised *informally* by individuals and groups in a school system, typically teachers. While these individuals may understand their informal leadership in a variety of ways, using a variety of definitions, their actions are fully intentional, not merely the accidental side effect of serving as resources and sources of expertise for other staff members.

Leadership, understood broadly as planned efforts to influence the direction or actions of an organization, its members, or its processes (c.f. Hallinger, 2003; Leithwood, Patten, & Jantzi, 2010), also includes efforts to mobilize effort (though material, intellectual, and other supports) towards taking actions that improve the organization (Leithwood et al., 2012). In many new leadership theories, leadership is understood as an organizational quality, and authority is therefore deliberately focused and defined to

encourage interaction between leaders around key organizational challenges (Murphy, 2005). Both formal and informal leadership make up the leadership practice within a school or school system. High-quality formal leadership plays a vital role in that practice, where research has shown clear connections between leadership, improvements in teaching practice, and improvements in student learning. However, current scholarship lacks a clear understanding of what informal leaders do and how they do it; this wider and broader set of leadership practices likely plays a role in the narrative of school leadership as well.

To meet this need, this study uses a sequential, mixed methods design exploring the motivations behind and manifestations of informal leadership in schools. To understand informal leadership in schools means going beyond role definitions and designated responsibilities to understand how "leadership" is present and exercised in various people's actions and interactions within the school—in effect, considering all professional people in the school, not just those who are formally recognized as "leaders." To this end, and with the central focus of school activity (instruction) in mind, I pose the following questions:

1. In an elementary school, whom do teachers turn to for advice, information, and support on instructional matters? Who among these staff members exercise leadership informally?

2. What do these teachers practicing informal leadership intend to accomplish as leaders, and how do they translate those intentions into specific leadership actions?
3. How do those interacting with informal leaders participate in and respond to these interactions?

In this chapter, I argue that while existing theories of collective leadership address several overlapping, at times different, aspects of the nature of leadership in schools, they have insufficiently described how informal leaders lead in schools.

I show this first by describing the foci of three of these groups of theories. *Instructional leadership* theories focus primarily on what kinds of leadership are most important to school improvement, especially the improvement of teaching and learning in classrooms, and generally regards leadership by principals. *Teacher leadership* theories regard, primarily, whom and to what extent teachers—the core professional staff of a school—ought to and can exercise various forms of consequential leadership in schools, despite an authority structure that give administrators and district-level staff greater legitimacy, visibility, and "official" clout in leadership matters. Finally, *distributed leadership* theories consider where, and under what circumstances, leadership occurs, when multiple individuals participate in the leadership work of the school. Each of these, separately and together, provide valuable insights on the nature of leadership in schools, and strongly suggest that informal leadership merits attention. At the same

time, these theories run the risk of "talking past each other" and miss the opportunity to capture more fully the phenomenon of informal leadership. Concluding this chapter, I describe the need to integrate the theories to develop a framework focused on how informal leadership occurs in schools.

Where Informal and Collective Leadership Literatures Converge

Evidence demonstrates that the large, formal elements of leadership practice such as vision–making, managing an instructional program, and agenda–setting are critical to school improvement (Heck & Hallinger, 2010; Marks & Printy, 2003; Waters, Marzano, & McNulty, 2003). Less attention has been paid to what informal leaders do on a regular basis to influence the work of their colleagues. Noting the presence of both formal and informal leaders in school settings called to leadership by particular circumstances, this knowledge gap lays the groundwork for a study specifically examining interactions among teachers to identify colleagues who are informally exercising some kind of leadership and, further, to understand what those identified teachers are doing that embodies that leadership work.

By *informal leadership*, I refer here to leadership activities conducted by those without a designated job title, role, or set of responsibilities pertaining to that leadership. While the *formal leadership* of a school is often comprised of principals, department heads, faculty coaches, staff developers, and the like, informal teachers are other school staff (often classroom teachers) who participate in leadership activities to at

least some extent. Leadership's influence can be *mutual*: that is, individuals can influence one another rather than one individual solely influencing others (Hallinger, 2003). A related idea, explored in depth by contemporary leadership theories, is that leadership may reside not solely with a formally designated leader or leadership team, but with an organization as a whole (Ogawa & Bossert, 1995), within a situation or context (Spillane, Halverson, & Diamond, 2004), and/or across a team or teams with varying degrees of formal association and structure (Portin & Knapp, 2014).

Several recent conceptions of educational leadership converge on collectivity: the notion that several individuals, across times and contexts, work in concert to influence instruction in a school setting. Theories within three traditions highlight this focus on collectivity: instructional leadership, teacher leadership, and distributed leadership.

Instructional Leadership Theories

Instructional leadership theories argue that refining the content and practice of teaching can be the joint work of administrators and teachers (Printy & Marks, 2006). While instructional leadership theories initially understood, and still focus primarily on, the work of principals on instruction, some incarnations of instructional leadership understand leadership work occurring with teachers and teacher leaders (Portin & Knapp, 2014). Whether principal, teacher, or some other figure, instructional leaders consistently focus on the improvement of teaching and learning (Hallinger, 2003).

Many models use the term "instructional leadership," leading some scholars to lament inconsistent, varied applications of the idea (Alig-Mielcarek & Hoy, 2005). Others argue that the diversity of instructional leadership literatures have richly described "various leadership stances, styles, and qualities" (Knapp, 2014, p. 8) at play within schools. In (oftentimes) different ways, instructional leadership authors are making sense of an observed diversity in leadership approaches among principals and others, and testing whether common language can describe these practices. What underlies these approaches, however, is the central belief that leadership in schools is primarily the act of reforming and strengthening curriculum and instruction.

The diversity of the instructional leadership literature may also stem from a recent focus within that literature on collaboration and collectivity. During the nascent stages of instructional leadership, literature focused on connecting leadership practices to student outcomes without focusing on approaches to leadership practice (Hallinger, 2005). The trend away from "technological, rational planning" models of school improvement and toward "cultural, collaborative approaches" (Sheppard, 1996, p. 328), observed by instructional leadership authors, has encompassed several different interpersonal leadership styles. In turn, this shift may have also turned the attention of authors toward the collaboration itself, including actors other than the principal under the leadership umbrella; this is frequently the case in studies of "shared instructional leadership," that emphasize the principal's role in building shared decision making and

community among teaching staffs (Urick & Bowers, 2014; Marks & Printy, 2003). These studies frequently attempt to show links between collaborative practices and improved student outcomes through increased teacher empowerment, morale, and retention.

Scholars in instructional leadership have lent greater focus in recent years to understanding the relationship between accountability systems and leadership priorities. As policymakers put increasing demands on principals to improve student achievement as measured on standardized tests, instructional leaders have been forced to reconcile external accountability systems with existing internal accountability systems used to guide decisions about instruction (Halverson et al., 2007). The move toward accountability, according to instructional leadership scholars, calls upon principals not to create accountability where none existed before, but to shift the largely insular process of collecting and reflecting on student data toward meeting a new set of requirements and demands (Halverson et al., 2007). Simultaneously, instructional leaders personalize the demands of the system for individual teachers, "translating external expectations into terms that [engage] school staff" (Portin & Knapp, 2014, p. 49). As these foci have gained prominence in the instructional leadership literature, authors increasingly focus not only on whether and how instructional leaders use data to inform their practice, but also on how leaders go about selecting from multiple, competing sources of data—with their resulting assumptions about the nature of

teaching and learning—in composing a leadership practice that is responsive to external accountability demands and that creates buy-in among teaching staffs.

Instructional leadership theories still lend substantial, perhaps primary, focus to principals. Though instructional leadership theories are diverse, they share the belief that principals lead by defining and communicating goals, providing feedback on the teaching and learning process, and emphasizing professional development activities (Alig-Mielcarek & Hoy, 2005; Hallinger, 2005). Among some authors, these tasks also include setting a culture of high expectations, monitoring student data, and serving as a visible presence in the school (Hallinger, 2005). Still, the focus on principals as collaborative agents has lent focus to collaborative processes, and what kinds of leadership may be exercised within them. One subset of instructional leadership theories, under titles such as *learning–focused leadership* (Knapp, 2014; Murphy et al., 2007; Portin & Knapp, 2014), focuses on (a) group processes in schools which support learning (Murphy et al., 2007), (b) how school leaders of all stripes increase the capacity of their colleagues to learn more about quality instruction, and (c) how those colleagues channel the knowledge they have aquired into school–wide learning improvement. Instructional leadership catalyzes school improvement by allowing school leaders to confront "stagnation" in teaching and learning practices (Murphy et al., 2007). While theories of instructional leadership differ from theories of distributed leadership in important ways, authors within the learning–focused leadership tradition have begun

exploring the intersection of these two general ideas. In particular, instructional leadership focuses on how school leaders of all stripes increase the capacity of their colleagues to learn more about quality instruction, learn from their own and one another's instructional experiences, and channel those lessons into school–wide learning improvement.

Teacher Leadership Theories

Teacher leadership theories understand leadership beginning from the perspectives and needs of classroom teachers. Formally, the term "teacher leader" is used to refer to teachers with a variety of job arrangements and assignments outside of the classroom, from full–time, formal coaching positions to occasional "drop-in" observation or advice–giving (Lord & Miller, 2000); informally, teachers may serve as leaders by engaging in these activities irrespective of their job description. An egalitarian view of teachers and teaching, combined with the newness of teacher leadership positions, has fed a line of scholarship separate from literature on principal leadership (Neumerski, 2013). By beginning with teachers, teacher leadership theories implicitly take a critical stance toward a perceived monopoly on leadership held by principals (Harris, 2003). Some, though not all, authors within the teacher leadership tradition have used this critical stance to critique leadership theories that appear to disregard the work or craft knowledge of teachers. Despite this, teacher leadership is

increasingly "embedded in the language and practice of educational improvement" (York-Barr & Duke, 2004, p. 255).

Teacher leadership scholars, under several different conceptions of what leadership is and might mean, have focused attention on non-supervisory, school-based leadership roles (Mangin & Stoelinga, 2008). While some teacher leadership authors focus on formalistic job responsibilities and roles—studying teachers who build professional development, critique lessons, and serve on committees (Lord & Miller, 2000)—others have taken an explicitly anti-hierarchical approach, understanding expertise and the building of relationships as key leadership practices (Firestone & Cecilia Martinez, 2007). Still other authors focus on how environments foster opportunities for, or even expectations for, teacher leadership (York-Barr & Duke, 2004).

Literatures on teacher leadership provide some additional context for the motivations and tools used by informal leaders, though framed in slightly different terms. Beginning from the perspective of teaching tasks, teacher leadership theorists suggest a "professional model" of teaching which recognizes the "variety, uncertainty, and ambiguity" of the core tasks of an educator's work, and relies on their individual expertise to mitigate those uncertainties (York-Barr & Duke, 2004, p. 356). In this understanding, leadership power is derived from the tasks teachers already perform as a core part of their work; in comparison with formal leaders, teachers rely on

collaboration to increase the collective power of their individual pools of expertise and experience (York-Barr & Duke, 2004, p. 264).

Teacher leadership theories have also explored how teacher collaboration happens in the context of competing ideologies about teaching and learning. While some authors have focused on the ability of teachers to develop leadership agency through collaboration (Little, 2003; Talbert & McLaughlin, 2002), Achinstein (2002) suggests managing strong beliefs creates major challenges when maintaining senses of community among teachers. Further, recent scholarship has found cultural factors and relationships can limit the extent to which teacher leaders influence the practices of their colleagues (Neumerski, 2012). However, effective teacher leadership—as represented in validated inventories and belief scale surveys—has a demonstrated relationship with a staff's sense of collective efficacy, and therefore with student outcomes (Derrington & Angelle, 2013). Several authors use the agency of teacher leaders as a key distinction separating teacher leadership from collaboration (Lai & Cheung, 2014) and, in turn, separating impactful interactions between teachers from non-impactful interactions.

While teacher leadership scholarship may have entered a "third wave"—in which leaders are understood as those who work to improve the skills of their colleagues rather than improve systems or curricula—some scholars still declare teacher leadership scholarship in its infancy (Silva, Gimbert, & Nolan, 2000). Conceptually, the many

diverse types of leadership classified as teacher leadership have weakened the strength of the model's recommendations (York-Barr & Duke, 2004). While schools and districts may have diverse motivations for adopting teacher leadership theories, the belief in teacher leadership as a contributor to or means of school improvement requires a close look at what it means in practice. Nevertheless, the substantial role of teacher leadership theories in discourse with other scholarship means an understanding of these theorists is critical toward a comprehensive understanding of informal leadership in schools.

Distributed Leadership Theories

Finally, distributed leadership theories argue that leadership is a situational, rather than permanent, quality of individuals. In distributed leadership's understanding of leadership in schools, leadership is present across multiple individuals and multiple, particular contexts. Many individuals within a school can serve as leaders or co-leaders during particular times or in areas in which they have expertise (Spillane et al., 2004). For distributed leadership scholars, leadership occurs when a particular situation demands leadership, and an individual or individuals interacts with that situation. Such distributions may occur consciously—as when a formal leader delegates authority to another person, or when a person takes on a responsibility at their own initiative—or occur unconsciously as the increasing complexity of school operations place new demands upon school staff. While this

process can reinforce a single vision, often set by formal leaders, distributed leadership can also challenge authority or provide conflicting visions of change in ways that make joint movement more difficult (Printy, 2007).

Given this, distributed leadership scholars focus on the situations in which leadership occurs. Distributed leadership has evolved from a human-relations focus in the 1970s, toward a focus on staff empowerment, then later into rethinking traditional ideas of authority in schools (Copland, 2003). By proponents, distributed leadership is seen as a key response to leadership studies which have left unanswered questions about the impact of leadership on instructional improvement (Harris, 2004, p. 13). Empirical studies in distributed leadership look to "capture" leadership activities which other models might miss (Harris, 2004, p. 14). In particular, certain authors within the distributed leadership strand redirect focus from individual capacities toward the idea of a collective capacity for leadership (Harris, 2004). This focus reflects an emerging consensus that distributed leadership is not merely the division of tasks among several persons but is a manifestation of the interactions that leaders and recipients have with each other (Timperley, 2005).

In distributed leadership theories, the situation is treated as the primary unit of analysis; distributed leadership attempts to understand how the cognition of actors is distributed by time, place, and socialization (Spillane, et al., 2004, p. 9). The focus on situatedness puts distributed leadership theories in dialogue with contingency theory,

which argues the effectiveness of a leader is contingent upon applying the right leadership approach (and, perhaps, the right leader) to a particular leadership situation (Northouse, 2007). Distributed leadership ties together knowledge, belief and action: "activity is a product of what the actor knows, believes, and does in and through particular social, cultural, and material contexts" (Spillane, et al., 2004, p. 10). Further, a focus on interactions emphasizes the roles of organizational routines and tools in determining how leadership is constructed and how it manifests (Harris, 2008).

Distributed leadership theories also highlight the importance of expertise, or the potential expertise of actors, in creating opportunities for leadership. In distributed leadership theory, expertise rather than hierarchy is a source of authority (Copland, 2003). Expertise is tied to a process of continual learning among teachers about curriculum and instruction (Harris, 2003). Further, the reliance of distributed leadership theories on expertise as a measure of authority, along with its focus on multiple leaders existing in each situation, suggests that multiple types of individual expertise are often required to solve collective problems (Mayrowetz, 2008). Distributed leadership scholars have begun to address this issue by understanding expertise in a somewhat different way, as existing across leaders as well as the within tools leaders use in their practice (Spillane et al., 2004).

Taken in concert, these ideas advance the view of distributed leadership scholarship that leadership itself is a characteristic that resides in situations—and their

associated learning problems, tools, and sources of expertise—and not solely within one person or even a group of people. While the term distributed leadership is used in varying contexts—at times as a prescriptive model for school democratization and improvement (Mayrowetz, 2008), at others as a term for relatively routine practices of delegation—I here refer to those distributed leadership theories that argue from empirical observation that many individuals within a school can serve as leaders or co-leaders during particular times or in areas in which they have expertise (Spillane et al., 2004).

Nevertheless, distributed leadership theories' openness to various contexts for leadership introduces its own analytical complexities: in an environment where everyone *can* lead, it is more difficult to identify and discuss the role of the leader apart from other roles. Further, conceiving when, or under what circumstances, leadership takes place is not the same as describing how leadership functions, nor the tools and techniques that leaders use to achieve their objectives. To engage these questions requires conceptual framing at the intersection of these theories.

Three Theoretical Schools Contrasted

While instructional, teacher, and distributed leadership theories exist within a healthy and mature academic dialogue, they still differ in what facets of leadership they examine. As argued above, instructional leadership focuses on *what* leadership regards, seeks to influence, and ought regard; teacher leadership focuses on *who* leads, exercises

influence, and ought lead; and distributed leadership focuses on *when* and *where* leadership occurs or the situations in which leadership takes place (as well as how multiple individuals within a situation are implicated). In concert, these theories may also help shed light on *how* and *why* leaders lead. However, these inquiries are not immediately answered by theoretical work in these fields.

Instructional leadership literatures have primarily focused on the intents, visions, and mechanisms by which principals as individuals exercise leadership. As a result, this approach has largely ignored the leadership work that a variety of other individuals, some of them in teams, are enacting in schools. While instructional leadership scholars have begun to broaden their focus, they face the challenge of applying theories previously focused on *shifting* the focus of principals toward instruction toward including leaders like classroom teachers, who have *maintained* focus on instruction as an inherent part of their practice. In this shift, the intentions of leaders become even more critical: while a principal instructional leader may focus on instruction to create buy-in with their staff and respond to formal pressures for accountability, the nature of an informal leader's focus on particular instructional matters suggests a more complex set of influences and desires. A theoretical base previously focused on understanding how the interests and agendas of principals and teachers can *align* around a particular vision for instructional improvement now must

address what happens when these interests and agendas collide, diverge, or come from different theories of action.

Teacher leadership theories, in their more normative focus on devolving leadership power and influence as a tool of democratizing schools, have left underdeveloped the conceptual tools necessary for understanding how collective leadership occurs in practice. By focusing largely on the characteristics of the institutions through which teachers can express leadership (e.g., professional learning communities, building leadership teams), the teacher leadership literature provides relatively few details on teachers as leaders themselves, including how individual teacher leaders might differ from one another in their foci or approaches to leadership practice. Further, the focus on institutional forms of leadership neglects the informal interactions around which this project focuses, and can lead teachers in practice to associate "leadership" exclusively with those scheduled, formal opportunities. Additionally, teacher leadership theories can imply that such leadership is an asset under all circumstances, neglecting the ways in which the leadership of different teachers or groups of teachers can work for contrary ends or against the interests of instructional improvement, however that improvement is understood.

The reflection of teacher leadership theories amongst other theoretical strands may also limit its unique utility. Mangin and Stoelinga (2008) describe their take on teacher leadership as explicitly instructional, building on theorists who provide obvious

connections between teacher expertise and the development of instruction. Distributed leadership theories share with teacher leadership theories foci on collective action, empowerment, and shared agency (Harris, 2003, p. 317). These non-normative tenets of teacher leadership exist in mature dialogue with instructional and distributed leadership theories. This is particularly true of teacher leadership's central revelation: that teachers lead in schools, especially on developing the core technology of teaching and learning (York-Barr & Duke, 2004, p. 255).

Distributed leadership theories have also often assumed that leaders within school environments, both formal and informal, carry a more or less unified vision for how to lead, that they work as a team. This assumption is difficult to reconcile with teacher leadership literatures, which have emphasized teacher leadership as at least a counterbalance to principal power. The assumption also leaves under theorized how leadership comes into being, or how a consensus on the ideas surrounding teaching and learning might be built over time. While distributed leadership scholarship has firmly established that particular situations call particular individuals to leadership, it provides relatively little information on the details of those situations, or a framework connecting the characteristics of leaders to the characteristics of their leadership situations. Existing frameworks, which quantitatively measure the impact of leadership on student outcomes by quantifying the amount of leadership activity in a school, cannot reach back in time to observe this emerging consensus. Distributed leadership

theories have also left under theorized the mechanisms of leadership: while leadership tools are often referred to as a defining element of practice, this literature has yet to fully understand which tools are more or less effective than others, and why.

However, the intersection of these three groups of theories does suggest an important emphasis leading to this project's focus on informal leadership: *collectivity.* Instructional leadership theories' primary innovation over the leadership theories that preceded it was the belief that formal leaders (i.e. principals) could and should move beyond managerial tasks and interact with the work of instruction conducted by teachers. Through their inherent focus on teachers, teacher leadership theories have confronted processes and roles through which teachers have simultaneously taught and lead. Finally, distributed leadership suggests processes through which non-formal leaders can exercise leadership tasks and from which responsibilities have arisen, both consciously and by necessity, in schools. Together, these ideas suggest an intermingling between the roles of *teaching* students and *leading* the development and improvement of a school's instructional program and practices. Chapter 2 more fully describes and defines this intersection as used in this study.

Current Understandings of Informal Leadership Activity

Leadership scholars, particularly distributed leadership scholars, are quick to recognize that individuals without formal leadership authority—including classroom teachers—can and often do participate in school leadership. Scholars can imagine—and

have imagined—many types of educators who lead their colleagues, within and across various job titles, and across a spectrum of formality. While leadership theories have done much to broaden understandings of who can lead, less work has addressed the specific actions which informal leaders take in the process of meeting goals related to school improvement (Portin & Knapp, 2014). In addition, while describing informal leadership activities, research has yet to connect these actions with improvements in teaching and learning.

The presence of, and at times the need for, informal distributed and/or instructional leadership is cited among three broad categories of discussion for leadership scholars: the redesign of teachers' work, the process of interpreting new ideas about teaching and learning, and the reform of leadership structures. In each case, however, less attention has been paid to the actions informal leaders take in order to accomplish these goals.

First, both distributed and instructional leadership models identify new leadership responsibilities emerging in schools which call new individuals to leadership. Among distributed leadership scholars, these responsibilities are conceptualized as part of a larger movement toward redesigning teachers' core work. Teachers desire to shift their responsibilities to include those outside the classroom: these may include tasks such as curriculum development, observation and evaluation, individual student or policy advocacy, and the like (Mayrowetz, Murphy, Louis &

Smylie, 2007). This kind of (often individualized) vision–setting requires leadership skills similar to those which set visions for schools or for learning improvements. Mayrowetz and coauthors therefore see "both collective and individual work redesigns" running simultaneously within schools (Mayrowetz et al., 2007): just as individual teachers reimagine their roles, schools concurrently reallocate their staffs to new tasks and challenges.

Instructional leadership, similarly, begins from the foundational idea that leaders and teachers share some element of work in schools (Knapp, Mkhwanazi, & Portin, 2012). In addition to the "core work" of instructional leadership (Knapp et al., 2012, p. 195), Portin and Knapp identify a set of new work tasks for educators. These are created by, in part, the growing learning needs of students, the press for increased use of data in schools, and the increased intensity of external demands for improving student performance (Portin & Knapp, 2014). If the core work of instructional leadership already meets or exceeds the capacity of occupied principals (Knapp et al., 2012), new responsibilities and vision setting activities require the participation of more actors.

Informal leadership work is also used in the interpretation of new ideas about teaching and learning. Through both deliberate processes and informal communication, those leading informally exert influence over how other perceive challenges in practice, understand new initiatives, and explain "how we do things around here"(Copland, 2003; Louis, et al., 2009). Louis and co-authors refer to this process with the term

"sensemaking," an idea developed from the organizational psychology literature concerned with how an organization's leaders help others "make sensible" the organization's processes and actions (Weick, 1995; Spillane, Reiser, & Reimer, 2002). Sensemaking concerns a particular routine and cyclical process through which an individual notices an event, identifies discrepancies between their observations of the event, and offers plausible speculation to explain those discrepancies (Weick, 1995). However, those leading informally can also participate in related processes like understanding new ideas about teaching and learning that may not fully affect the cognitive processes of colleagues. Weick (1995) labels these acts "interpreting" to include both sensemaking and several other activities through which individuals like leaders can help others understand the observational data gathered by an organization. Further, it seems teachers need not encounter widespread resistance to a new policy or practice, as described by authors on sensemaking (Spillane, Reiser, & Reimer, 2002) in order to still affect the work of their colleagues.

As part of their focus on vision- and agenda-setting, many leadership authors have focused on how leaders make "deeper challenges to embedded assumptions" (Louis et al., 2009, p. 160; Harris, 2003; Marks & Printy, 2003). While these kinds of large actions clearly full under the rubric of leadership activities, the shared nature of informal leadership suggests those leading informally need not create seismic shifts in collective attitudes or senses to contribute to instructional improvement. Many

members of an organization may, in principle, contribute to shared understandings or visions of the organization or school improvement, and they may do so in seemingly large and small ways. Informal leaders play a particular role in this process by providing data directly from their own work about teaching and learning, sharing instructional practices with one another, and acting as essential stakeholders in the implementation of a shared vision.

Finally, informal leadership is recognized in the desire to reform outdated or incomplete leadership structures in schools. Harris argues that distributed leadership entails a close tie between formal team structures and "ad hoc groups" that can offer more immediate responses to the developmental needs of schools (Harris, 2004, p. 20). Unlike other types of leadership activities, the systems that are used to build organizational knowledge are often quite fragile (Harris, 2008). Informal leaders are often called upon to fill these gaps as a function of their craft knowledge, as well as a relief of the resource constraints that often prohibit schools from hiring several formal leaders; proximity to a school's teaching and learning proves, in many cases, a decisive leadership resource toward continuing a process of organization-wide learning. Here, scholars recognize that new work responsibilities may require long–term changes in how school staffs make decisions.

Informal leaders are distinguished primarily by tasks and expertise. Distributed leadership theories strongly suggest the need for support from formal leaders; trust and

quality relationships act as the force empowering informal leaders to join leadership conversations (Angelle, 2010). This support is often framed in terms of consensus: a group of leaders, informal and formal, must agree on the problems facing the organization and share a culture of "collaboration, trust, professional learning, and reciprocal accountability" (Copland, 2003, p. 379) when enacting change.

However, there are functional limits to this definition. First, it presumes leaders are teamed and that they always have alliances with other leaders on whom they rely. Second, it greatly complicates the idea that schools could be led iteratively: that is, it excludes the idea that individual teachers as leaders could independently take actions that in sum drive a school toward learning improvement—what some literatures term shared leadership (Printy & Marks, 2006; Leithwood & Mascall, 2008; Penuel et al., 2010). In this sense, who does what (and/or who is delegated to do what) provides limited context for understanding how leadership affects teaching and learning.

Under-explored Effects of Informal Leadership

While leadership theories have sought to emphasize the importance of informal leadership and identify what that leadership might consist of, existing theories have neglected to some degree *how* leadership takes place. In part, this gap arises from the inherent methodological difficulties surrounding identifying, inquiring about, and observing activities without set schedules and planned end products: to document

informal social practices, researchers must find techniques for observing leadership in informal settings and instances.

Further challenges in studying leadership generally, and informal leadership particularly, come from its situated nature in schools and districts. If, as educational scholars often recognize and emphasize, the contexts of individual schools and classrooms play a large role in the effectiveness of particular practices in particular schools, the best leadership approaches or techniques in these schools may also be unique, and not easily transferable across all contexts. When read by practitioners, a study which contains a "toolbox" of specific leadership strategies effective for promoting student learning in a particular instance does not necessarily provide a roadmap for organizations which is ideal in all circumstances. This complication limits the degree to which a description of *what* informal leadership is fully explains *how* informal leadership affects schools generally.

Two major dimensions of informal leadership, chiefly, are under-described by the theories referenced in this chapter: the relationship between informal leadership and student outcomes, and the ways in which informal leaders set the context for instructional improvement.

First, the nature of informal leadership, as a less directed process of influence, has lead scholars to dissatisfaction with current understandings of the relationship between informal leadership and student outcomes. While instructional leadership has

examined the work of principals in detail, and distributed leadership has examined the work of teams, "we need to uncover more about how, why, and when instructional leaders are successful in altering teaching and learning" (Neumerski, 2013, p. 334). Still, existing quantitative and qualitative evidence points toward resources which informal leaders develop in schools that support student learning.

Many scholars frequently measure the relationship between informal leadership and student outcomes through the influence of leaders on their colleagues, with the understanding that the ability to influence is "an infinite resource" (Leithwood & Mascall, 2008, p. 529) which informal leaders can tap. The large-scale Wallace Foundation study conducted by Leithwood, Louis, and colleagues (Leithwood et al., 2012) considers collective leadership and finds a relationship between collective leadership, teachers' work setting, teacher motivation, and teacher knowledge and skills. Opportunities to learn from colleagues were the primary motivators of this change. Collective leadership also enhances teacher trust in leadership overall and in the development of shared visions for improvement. Qualitative evidence from theories of teacher leadership confirms these observations, discussing how informal leaders can build relationships between formal leaders and others, helping to facilitate collaboration and organizational growth (York-Barr & Duke, 2004).

Further, the relationship between informal leadership and setting the context for instructional improvements more broadly is also underexplored. Many instructional

leadership scholars argue the purpose of formal leadership is what Hallinger (2005) calls *academic press*: setting a vision for instructional improvement, observing and critiquing instruction, and the like. However, the process recognized in several diverse empirical literatures suggests regular contact between leaders, other faculty members, and core ideas regarding how teachers teach and how learners learn. While formal leaders can and do participate in that process, informal leaders are "embedded" in the day-to-day life of instruction and are arguably better positioned to routinely connect these ideas to practice. Further, informal leaders may be better prepared to explain, model, articulate, and otherwise communicate to their colleagues what ideas about school improvement mean in everyday practice

Instructional leadership scholars, however, have not fully translated their understanding of "academic press" to these informal leaders. Left open are key questions surrounding "how leaders' actions and interactions produce learning" (Knapp, 2014, p. 9); scholars still dispute which tasks informal leaders undertake as instructional leaders (Firestone & Cecelia Martinez, 2007). Missing from accounts of the importance of informal leadership is a concrete understanding of how informal leaders translate the formal push for learning improvement into leadership practices, particularly under the conditions of external pressure schools face that emerge in more recent studies. Key to understanding this relationship are questions on the role of visions or ideas for learning improvement. While these literatures clearly identify that

formal leaders have visions for instructional improvement that may or may not align between district and school levels, scholars have under theorized how visions of instructional improvement held by informal leaders interact with these three levels, and with each other.

One potential frame for informal leadership's alternative to the "academic press" is a focus on facilitating and promoting adult learning. This idea runs parallel to a focus on leadership competencies or capabilities, rather than roles, present in some recent leadership work (Robinson, 2010). In accountability-heavy environments, informal leaders influence "specific pedagogical practices" in ways that may be congruent with those pressures (Sun et al., 2013a, p. 617). Sun and co-authors propose leadership is most successful when the aims of informal leaders regarding pedagogy align with aims of formal leaders in responding to accountability pressures.

Comprehensively Studying Informal Leadership

Missing from the leadership literature, therefore, are concrete understandings of how informal leaders translate the formal push for learning improvement into learning practices (Firestone & Cecelia Martinez, 2007; Knapp, 2014; Neumerski, 2013), particularly under conditions of external pressure. To describe this process, scholars must trace the work which informal leaders do, following and understanding leadership practices themselves in concrete detail. While this work may occur through

some formal processes, much of it is likely to occur in small group or one-on-one interactions around instructional problems or instructional needs.

Informal leadership could manifest itself in several different ways in schools. This project focuses primarily on one of these: interactions between informal leaders and other members of schools, particularly other teachers. I understand *interaction* as a type of action involving the exchange of ideas between two or more individuals; in this case, it is the exchange between informal leaders and other teaching staff in a given school. While still referenced in vague terms, scholars across the leadership literature have frequently pointed to interactions as an important arena of inquiry. This emphasis is clearest among distributed leadership scholars, who treat interactions as the place where leaders, followers, and situations requiring (or at least inviting) leadership intersect (Spillane et al., 2004). Additionally, as distributed leadership has interacted with other theoretical traditions, a focus on interactions has appeared (albeit differently) in instructional leadership (Neumerski, 2003) and teacher leadership literatures (Coburn & Russell, 2012) as a precursor to professional learning and a signal of the quality of a teacher's leadership practice. This project focuses on interactions both as a recognized representative element of informal leadership practice more generally, and in an effort to understand other deficits in the existing understanding of informal leadership practice in these literatures.

Tracing interactions requires first a focus on the *intentions* of informal leaders. If informal leaders are not distinguished from other teachers by their formal roles—if, indeed, a teacher who does not perceive themselves as a leader can in some sense lead—leaders are recognizable as leaders by what they intend to accomplish as the result of a particular action or practice. Leadership, in almost all scholarly formulations, is or is composed of deliberate or planned actions; intention describes that deliberateness. Here, as elsewhere, influence lies at the center of leadership; therefore, it is vital to understand what leaders intend to influence others to do or think in order to attribute their actions to specific leadership approaches. Literature has left largely unexplored the question of why informal leaders do what they do.

Second, understanding the reach of informal leadership work requires understanding leadership both from the perspective of leaders and those interacting with leaders. What I describe in later sections as types of advice giving, information sharing, and support giving are each categories for describing the forms and foci of interactions between individuals. The content and context of such relationships is necessarily mediated by all their members: in schools, those interacting with leaders control both the kinds of leadership they seek and the extent to which they are receptive to that leadership. When studying informal interactions as leadership, the perspective of those interacting with leaders is even more essential: unlike formal leadership practices that may be more administrative, teachers generally volunteer to enter into

informal interactions about instruction with their colleagues, and can lead or not lead at various times and in various circumstances.

With the question of who constitutes a leader made more complex by each of these considerations, this project seeks to find leaders through their actions and interactions rather than their roles. As described in Chapter 3, the school under study here, like many others, does not employ formal leaders beyond the principal; instead, teachers take on a variety of roles with degrees of formality. Knowing, therefore, that every member of a school's instructional staff can lead in informal ways, this project focuses on the teachers who exercise the most informal leadership irrespective of their formal roles. From identifying these leaders, it further studies how informal leaders intentionally influence organizational directions and activities beyond the purview of their job description.

Research Questions

While scholarship on informal leadership is growing at a rapid pace, it lacks the theoretical robustness with which instructional leadership has described why principals lead, and with which distributed leadership has described how leadership tasks are spread among actors. Much of this gap lies in theorizing about and explicating the work of teachers who lead informally; to this point, research on informal leaders focuses primarily on their characteristics rather than their behaviors (Neumerski, 2013, p. 324). Additionally, studies on interactions between formal and informal leaders tend to focus

on how principals serve as a support or barrier for interactions among teacher leaders (Neumerski, 2013, p. 325), keeping primary focus on the actions of formal leaders.

In this instance, it is appropriate neither to analyze leadership within a single individual nor within a single team. This question proposes an approach that, like the teacher leadership literature, studies informal leaders as individuals. While it has the ability to capture leadership which occurs in teams, teaming is not a requirement of its understanding of leadership. Instead, this question presupposes that any educator can lead by virtue of interacting with their colleagues on instructional issues.

Second, by focusing on the intentions of these individuals, this study helps link this work to existing literatures. Distributed leadership's focus on improving joint culture and instructional leadership's focus on improving instruction have provided ample evidence of the motivations of leaders in both those contexts. In order to better understand the relevance of these literatures to the informal leadership described here, therefore, it is necessary to collect data on and compare the intentions, as well as the actions, which drive informal leaders to lead.

While leadership scholars, particularly proponents of learning-centered leadership models, have largely achieved consensus that informal leaders play important roles in schools, a remaining challenge is to fill in details, and resolve disputes, surrounding what informal leaders do, as well as how and why they do it. To those ends, this study visits the below questions in detail:

1. In an elementary school, whom do teachers turn to for advice, information, and support on instructional matters? Who among these individuals exercises leadership informally?
    a. How do the leaders selected vary depending upon the types of advice, information, and/or support sought by teachers to improve their instruction?
    b. Are leaders to whom the teachers turn formally designated in leadership roles, and if so, which designated roles? How do the types of advice, information, or support given by informal leaders otherwise reflect the leader's current and past position(s) and experience base?
    c. How do teachers who are frequently turned to for instructionally related advice, information, or support describe the resources and competencies they have available to exercise leadership?
2. What do these teachers practicing informal leadership intend to accomplish as leaders, and how do they translate those intentions into specific leadership actions?
    a. To what extent do those exercising leadership informally see themselves as leaders with explicit intention to influence the instructional practice of others?

b. What are the places, times, and circumstances under which informal leadership interactions come about? How do these activities relate to curriculum and instruction?

c. How do teachers practicing informal leadership articulate the relationship between their leadership intentions and the specific actions they take as leaders?

3. How do those interacting with teachers practicing informal leadership participate in and respond to these interactions?

Chapter 2.

Using Social Network Research to Understand Informal Leadership

Beginning from the need to understand and explicate informal leadership activities within schools, this study builds upon the intersection of three literature bases: distributed leadership, instructional leadership, and the use of network analysis in the study of schools. The conceptual framework at their intersection draws upon distributed models of instructional leadership, network theory, and an approach drawn from network analysis for modeling leadership as a function of teacher interaction.

Informal Leadership Approaches toward Instructional Improvement

Scholars propose several frames to bring together distributed, instructional, and teacher leadership theories; at their intersection lies a broader conception of school leadership that includes often-neglected dynamics of "informal leadership." Perhaps the strongest of these is framed as using distributed leadership as an analytic tool or frame over instructional and teacher leadership (Neumerski, 2013). This mode, which Mayrowetz (2008) calls a "descriptive theoretical lens," Portin and Knapp call "distributed images of instructional leadership" (Portin & Knapp, 2014), and Printy and Marks (2006) call "shared instructional leadership," combines distributed leadership's emphasis on situations—and its resulting analytic assumptions—with the light instructional leadership theories shine on how leaders develop and influence

instruction. These lenses on multiple leadership theories provide conceptual space for informal leadership dynamics alongside form leadership.

As discussed in Chapter 1, distributed and instructional leadership theories differ in the focus of their analysis: instructional leadership on the subject(s) of leadership, and distributed leadership on the situation(s) in which leadership takes place. Scholars who attempt to integrate these theories, while conscious of these differences, recognize that different leadership theories can shed light on different parts of the same leadership practice or the same leader. Further, the tendency of different theories of educational leadership to speak to different elements of leadership practice enhances, rather than detracts from, their potential compatibility. Because this project's questions regarding how leadership takes place lie somewhat outside the central focus of several theories, it is appropriate to include many different perspectives in the construction of a conceptual model.

While recognizing the role of non-administrators in leadership, this literature to date has focused primarily on the interaction of individuals, mostly with designated leadership responsibilities, within formal team structures (Portin & Knapp, 2014). I argue here for the inclusion of *informal leadership*, in or out of a team context, alongside formal team leadership within the idea of distributed images of instructional leadership. The integration of theories considered here provides for a more complete understanding of informal leadership dynamics. Because leadership is viewed as

shared, various individuals may be part of leadership work, regardless of their formal role or position's responsibilities. Because authority is predicated more on expertise than position in such a framing, anyone with requisite expertise (at least as perceived by colleagues) may participate in leadership work. Further, because this framing attends to social interactions more centrally, any social interactions among adults in a school are potential opportunities for leadership work.

Neither distributed nor instructional leadership suggest that leaders must work together—or work toward the same ends. Indeed, distributed leadership's presumption of wide opportunities to lead throughout school environments implies the ability of teachers to lead outside team structures—or even lead toward aims counter to those of leadership teams or of designated formal leaders in a school hierarchy (e.g., principals, department heads, instructional coaches). It is conceptually necessary to consider and include these forms of leadership as well. To that end, I explore methodological strategies in this project to conceptualize and understand the question of "who leads" outside team structures; while not necessarily limited to individuals without formal or designated leadership roles, the search for leadership outside team structures is likely to bring into focus much of "informal leadership work."

Visualizing Leadership through Social Network Dynamics

To understand leadership work based on social interactions, occurring wherever situations, leaders, and followers converge, and unconstrained by any formal

designation for leadership responsibility and role, network theory (and its associated analytic tools) offer a particularly strong set of additional tools.

Network theory serves as both this study's primary methodological strategy as well as a way of understanding what occurs in distributed images of instructional leadership. Network theory first emerged as a critique of "sociometry," the first field in psychology that attempted to map social relationships (Prell, 2012). Building on the work of mathematics, social psychologists were among the first to make sociological observations about networks: for example, that individuals who are similar to one another tend to be tied together (Friedkin, 1998), or that individuals who act as "bridges" between two otherwise unconnected individuals often transmit information between them (Granovetter, 1973). Sociologists, particularly James Coleman in the 1960s and thereafter, drew upon networks as a way of empirically understanding the (then emerging) construct of social capital (Prell, 2012).

Network analysis, the primary tool extending from network theory, uses graph theory to describe social relationships: individuals (*nodes* or *egos*) are connected to other individuals (*alters*) through what network theory terms *ties*—that represent various conceptions of how individuals can be related. This representation allows the analysis of groups and subgroups both mathematically, when networks are formatted as matrices, and visually, when networks are displayed as graphs. However, the assumptions of network theory also lend themselves to qualitative work, where social

interactions are the primary unit of analysis. This study undertakes both quantitative network analysis and related qualitative work, what Baker-Doyle (2014) calls "mixed methods social network research."

The use of networks in sociology—as mechanisms that transmit information—provides a foundation for understanding networks as representations of leadership. In the study of social networks, ties among actors represent ongoing social relations such as friendship or professional cooperation (Borgatti & Ofem, 2010). Networks are both cognitive structures, in that they exist within the minds of an organization's members, and opportunity structures, in that they enable or constrain action (Balkundi & Kilduff, 2005). The leader's participation in an organization's network enables or constrains coalition building (Balkundi & Kilduff, 2005), affects a leader's assessment of their colleagues (Balkundi & Kilduff, 2005), and can help leaders create organizational changes that diffuse and sustain over time (Daly, 2010). Teacher participation in networks can enhance a sense of efficacy and engage teachers in "deeper levels of conversation" on teaching and learning (Daly, 2010, p. 1).

The leadership theories identified above and network theory, therefore, make similar assumptions: individuals are interdependent with one another, social relationships are a mechanism for exchanging valuable information, and the content of individual relationships in aggregate can enable or constrain organizational change (Balkundi & Kilduff, 2005). With distributed leadership theories, network theory shares

an emphasis on communities of actors, as well as the power of expertise. With instructional leadership theories, network theory shares an emphasis on cognitions as key levers of change in organizations. The assertion of some of these theories—that a leader in a school can be anyone who attempts to deliberately influence instructional change—relates to the construction of networks as social structures that enable or constrain action. These similarities ensure that a network perspective can "compliment existing work [in leadership] without repeating it" (Balkundi & Kilduff, 2005, p. 943), providing particular insight into the nature of leadership in complex, idea-driven organizations like schools.

A growing literature on social networks in education has focused itself in three major areas of improvement activity and reform effort: using networks to challenge the norms of the teaching profession, using networks to develop organizational improvement, and using networks to build staff expertise on instruction.

Understanding Teacher Collaboration and Teacher Leadership

One line of social network scholarship in education focuses on the relationship between teacher collaboration, teacher leadership, and the work of formal leaders. Paralleling work in teacher leadership, this line of work attempts to answer questions posed by the teacher leadership literature regarding how teachers share information and advice when barriers to this kind of interaction are reduced or eliminated.

Moolenaar's 2012 literature review discusses developments during the 1990s and 2000s with respect to teacher collaboration and network analysis. Most notably, the use of network theory as a theoretical lens involves, for many scholars, reference to social capital theory, particularly the notion that resources reside in social structures and that individuals can draw upon these resources to various extents (Moolenaar, 2012). Across quantitative and qualitative studies, Moolenaar finds clear consensus that internal social networks vary widely among schools (Moolenaar, 2012), that schools are often structured in homogenous subgroups in which teachers seek colleagues like themselves (Moolenaar, 2012), and that network structure often varies from a school's formal hierarchy (Moolenaar, 2012). Across studies, teacher connectedness appears linked to student outcomes through variables like collective responsibility, collective trust, and teacher influence on decision making (Moolenaar, 2012), a finding that parallels the leadership literature. Finally, the diversity of studies on teacher collaboration within the network literature suggests networks serve multiple purposes—around both professional and personal needs (Moolenaar, 2012).

These theoretical developments have lent themselves to practitioner–oriented literature on the importance of developing strong social ties. Baker-Doyle (2012) writes for teachers on the importance of building networks of professional expertise. "Organized teacher communities of practice" are useful for the profession by providing added flexibility: teams of teachers can respond to changes in policy more frequently

than other advice networks can (Baker-Doyle, 2012, p. 5). Baker-Doyle summarizes scholarship that suggests teacher networks can shape teacher work selection, commitment, turnover, socialization, professional development, and a host of other factors (Baker-Doyle, 2012). The centers of teacher networks can also serve as alternative sources of power within schools: strong ties develop between teachers and those with whom they interact to solve professional problems (Baker-Doyle, 2012).

Purinton (2011) similarly argues that a network perspective on school change offers a different perspective on the school reform movement. Purinton pits the "professionalizers," a group of reformers focused on standardizing teaching practice by developing a strong and universal body of knowledge, against the "deregulators," who focus instead on using market mechanisms to disrupt what they see as entrenched school bureaucracies. In the middle, Purinton argues, sits a network prospective on the governance of school change. Networked teachers focus simultaneously on strengthening their power and professionalism, reorienting professional development within the career toward a focus on collaboration and knowledge transfer.

Taken together, literature on teacher collaboration applying network theory has generally asserted that teachers have complex interaction patterns, that these interactions can link to improvements in student learning, and that informal interactions are sources of both power and expertise in schools. Further, the factors linking social interaction and improvements in student outcomes in this literature

parallel several factors in the leadership literature—including trust and organizational cohesion. In this sense, networks may serve as an opportunity to observe elements of organizational culture. However, Lima (2010) urges caution around the normative application of networks to school improvement: too little evidence exists, he argues, to demonstrably prove teacher networks make significant, positive differences for all types of schools. Networked interactions can just as easily reinforce prejudices, sustain bad practices, and strengthen exclusionary norms as much as the opposite; an underemphasis on the potential "dark side of networks" (Lima, 2010; Moolenaar, 2012) suggests the need for caution around the normative claims of Baker-Doyle and Purinton. As such, Lima suggests network analysis as a complementary, rather than supplementary, approach to understanding processes such as adult learning, trust-building, identity, and change (Lima, 2010).

However, this primarily normative approach to understanding teacher networks provides some important lessons for the study of informal leadership through teacher networks. First, these authors put the role of power and authority into the context of collaboration: for better or worse, teachers are seeking greater authority over school operations, particularly in this age of accountability. Second, this approach describes some of the potential impacts of informal leadership on teachers as a group: beyond the spread of ideas, the sense of empowerment which teacher networks can create has effects on retention, levels of professional development, job satisfaction, and the like.

Finally, the critique of authors like Moolenaar (2012) and Lima (2010) cautions leadership scholars to avoid seeing more informal leadership as necessarily better; in line with the distributed instructional leadership literature, informal leadership through networks should be studied as a non-normative phenomenon, exploring the detailed features of what informal leaders accomplish through networks and how they accomplish it.

Modeling Decentralized Modes of Organizational Improvement

Quantitative and mixed methods social network research methods have been used, in part, to model decentralized modes of organizational improvement, shifting the focus of network analysis from individual teachers to schools as organizations or systems. Daly, working with several co-authors, has written extensively on the relevance of social networks to the improvement of school districts facing sanctions (Daly & Finnigan, 2010), reforming teachers' work (Daly et al., 2010) and the use of data in school systems (Daly, 2012)—among other topics. In keeping with much of the existing literature on organizational improvement in schools, Daly and co-authors emphasize across these pieces the central importance of teacher sensemaking in school reform. Networks provide the opportunity for staff to co-construct the meaning of cultural artifacts, such as data on student outcomes (Daly, 2012), and illustrate the oftentimes technical nature of interactions between schools and district central offices (Daly & Finnigan, 2010). Informal leaders play a critical role in spanning boundaries

between institutions and brokering between district and school officials (Daly, 2012). In this set of work, social network analysis proves a tool for understanding how individuals within institutions with different levels of nominal authority and different work tasks understand common objectives.

Work by Atteberry and Byrk (2010), here and elsewhere, suggests strong social networks have an additive effect on school reforms. In the context of studying a teacher professional development program on elementary literacy, they find a "causal cascade" (Atteberry & Byrk, 2010, p. 53), in which relationships—first between a literacy coach and school-based colleagues, then between teachers and the coach—leads to ultimate changes in classroom practice. Unsurprisingly, they find network density increases in most schools in which the literacy initiative, which emphasizes collaboration, was implemented with fidelity (Atteberry & Byrk, 2010). The authors note, however, that it is simultaneously important to both identify the central actor(s) in such networks and describe the level of interactions relevant to the reform (Atteberry & Byrk, 2010). Further, the implications of Atteberry and Byrk's quantitative work is bounded by the specific design features of the program under study and the set of hypotheses under test; the authors suggest methodological techniques rather than fully substantive conclusions (Atteberry & Byrk, 2010).

Working with several co-authors, Penuel has focused on using social network analysis to understand how ambitious reforms influence changes in instructional

practice. In several of these studies, Penuel and co-authors take advantage of large network sizes and longitudinal data to conduct complex network analyses of whole school networks and to understand the relationship between district initiatives designed to promote collaboration and actual network density and tie strength. Additionally, they demonstrate the strength of multi-site studies in this area, demonstrating significant correlations between new ties on district initiatives and common grade levels between teachers (Penuel, Frank, & Krause, 2010), linking leadership distributed through social interaction and implementation of reforms (Penuel et al., 2010), correlation between frequent network interaction and participation in an initiative on writing instruction (Penuel et al., 2012), and the relationship between meeting design, reform effectiveness and existing teacher networks (Penuel et al., 2009), among a host of other findings. These studies demonstrate the importance of aligning organizational structure and incentives with natural tendencies in teacher networks in order to promote cultural change.

While the studies that share this theme have aims highly compatible with existing school improvement literatures, perhaps their greatest limitation to date has been a focus on methodological demonstration over substantive or generalizable conclusions. They demonstrate successfully that quantitative network analysis can identify associations between social interaction and behaviors in schools; however, they are, on the whole, designed idiosyncratically, with few detailed design features in

common and utilizing unique institutional environments or instructional programs. Among large sample size work, such as that of Penuel and co-authors, context for interactions is either under-theorized or embodied in existing instruments measuring constructs like teacher trust, school culture, or the like. Further, and important to the leadership distinctions described in Question 1, little effort in this work is made to distinguish the effects of informal, as compared to formal, leaders, or to differentiate leadership from ordinary collaboration.

Understanding the Spread of Expertise on Instruction

A third set of network literature discussed here considers the ability of networks to spread resources, particularly information. As with the literature on instructional leadership, one type of important information spread by networks is expertise on instruction. Bidwell and Yasumoto (1999) were among the first authors in this vein, describing a theory of collegial focus. Network theory, they argue, assumes that examining how colleagues together control instruction is tantamount to understanding how a school faculty creates the collective capacity to solve problems (Bidwell & Yasumoto, 1999). Conducting their analysis among 13 high schools, they use a hierarchical linear model to associate network connectedness with a scale of progressivist attitudes by teachers. They find teachers tend toward homophilous connections with teachers who share their seniority, teaching field, and relative level of progressivism (Bidwell & Yasumoto, 1999). This work is among the first to find that

subgroups of teachers who share important similarities were more likely to transmit information and collectively solve problems than heterogeneous groups.

Qualitative social network research, like that utilized by Coburn and co-authors, speaks to the close link between networks and building individual expertise on instruction. Coburn and colleagues use social network analysis in combination with traditional qualitative case study to understand the significance of individual teachers' networks of advice and expertise on instructional issues. They find that tie span and strength, access to expertise, trust, and the depth and congruence of interactions contribute to social capital, in turn fostering instructional improvement (Coburn & Russell, 2008). The authors also endeavor to understand the link between network strength and specific policy interventions. Their longitudinal data suggests that district supports, such as instructional coaching and professional development (Coburn et al., 2012), were necessary to increase depth of interactions and therefore ensure the sustainability of a new mathematics curriculum (Coburn et al., 2012). Qualitative comparative analysis indicates that the presence of desirable network qualities is directly related to the ability of teachers to continue delivering high quality instruction.

Spillane and Kim advance similar interests quantitatively by examining the position of formal instructional leaders within elementary school networks. Their work conceptualizes a school not only as an organization but also as "a group of groups" (Spillane & Kim, 2012, p. 76), and uses network analysis as a means of discerning the

makeup of these groups within the groups. They show that "part-time" leaders are significantly less likely to be isolates in their school's networks (Spillane & Kim, 2012). These leaders were also more likely than other actors to broker relationships between other staff members. In focusing on groups within the larger group, the authors suggest information is ideally transferred by formal leaders who are, nevertheless, embedded in the other practices of their organization. Still, this work focuses primarily on the relationship between formal mechanisms and the formation of ties—rather than the content carried through ties.

As among the newest of the network literatures in education, studies of this type are evolving to consider various types of leaders and diverse sources of expertise and power. However, this literature should not stop at the identification of informal leaders or an exhortation of their importance. Literature of this type offers researchers the valuable opportunity to consider the relationship between formal and informal types of leaders. Further, it provides the opportunity to move beyond the identification of leaders and leadership characteristics to an explication of the work they do, through in-depth qualitative analysis. While providing powerful conceptual guidance for what the nature and purpose of teacher networks are, the studies referenced here have not fully explored the concrete details of the interactions they model.

Synthesizing Network Literatures around Cognitions and Interactions

The diverse literatures described above call upon network theory in various related ways. However, in important respects, these literatures have yet to interact with one another. The themes identified above each provide a partial picture of what networks might "show" about schools and the leadership within them. Quantitative studies, which comprise the majority of these, tend to rely on normative rather than descriptive approaches to networks, demonstrating the virtue of networks by correlating density with existing scales of effective culture. Qualitative studies referenced here leave underdeveloped the voices of leaders themselves, relying fully on the networks to tell stories relevant for school policy. In education to date, scholars have yet to fully theorize the application of network theory as a part of larger research narratives on how leadership functions in schools.

To advance this theorization, I return to Balkundi and Kilduff's (2005) assertion that networks serve as both *cognitive structures*—that is, networks "exist" in the minds of participants —and *opportunity structures*—that is, networks enable or constrain an individual's actions. My conceptualization understands networks as cognitive structures by focusing on teachers' individual sense of whom they can turn to for advice, information, and support. First, individuals' perceptions of others, to whom they might turn for advice, information, and support—in other words, leadership—is critical: the perception of an individual that the other (potential) leader is

knowledgeable, trustworthy, creative, personally compatible, or the like is likely to determine whether leadership activity will actually occur. At the same time, as opportunity structures, networks are likely to regulate of what kinds of relationships actors in a school will choose to enter into, as well as the content exchanged in those relationships. Together, I posit, networks lead to negotiated, individual relationships among actors in a school, relationships which have embedded within them instructional and/or distributed leadership that is essentially informal: that is, not arising from formally assigned responsibilities, activities, or role expectations.

This approach circumvents certain limitations and barriers that have prevented previous leadership work from understanding the totality of informal leadership in schools. First, focusing on individual cognitions (e.g., a teacher's perception of colleagues who provide informal leadership) rather than collective opinions of a colleague avoids the risk that the popularity of a particular individual is confused with whether and how they lead. Second, my approach lends a particular focus on the opportunities leaders have to lead others through communication by emphasizing with whom those leaders have established quality relationships, and the extent to which alters consider new information from leaders trustworthy, conceptually valid, or innovative. Finally, the nature of informal leadership is such that it is not readily observed. Rather than relying on formally structured and announced leadership events—professional learning community meetings, coaching sessions, walkarounds,

etc.—as a way of identifying where and how leadership occurs, my approach attempts to select leaders first, then allows those leaders the opportunity to point to instances of informal leadership activity.

Distributed images of instructional leadership and their allied frameworks emphasize learning, both of students and of adults. Authors of these frameworks sometimes implicitly, but often explicitly, assert that the best student learning comes at the hands of teachers who themselves are regularly learning about and critically examining new content and pedagogical techniques, and seek to understand these in broader contexts. A focus on cognitive processes, as represented by networks, places a strong focus on the learning of educators—both whom they learn from and how they learn—as one part of the complex process of strengthening student learning. By linking cognitive structures with opportunity structures, it further lends its focus to the process of continuous school improvement through adult learning and knowledge production.

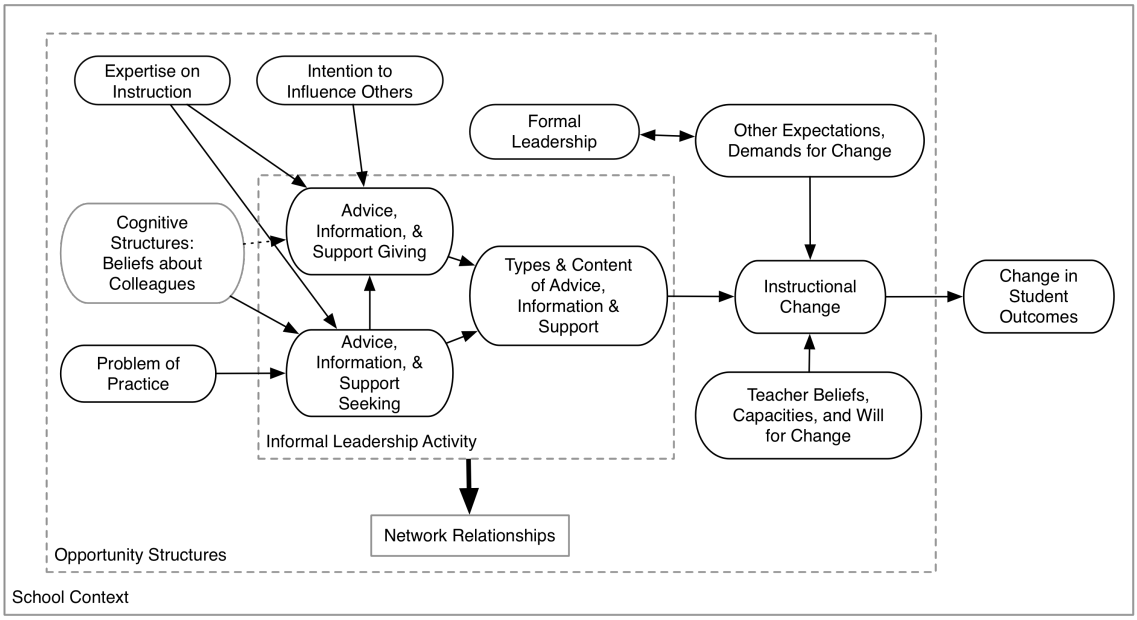
As with many subjects of research in education, networks do not take physical form. Network visualizations and measures can, at best, approximate what lies in the thoughts (and implicitly in the behaviors) of people. However, as with many other determinants of influences on cognition, learning, or organizational behavior, networks exercise power over what people do and how they do it. By imagining a network's members as individual manipulators of a few "topographic" features of networks (e.g., who actors are connected to, their "betweenness" between key individuals, etc.),

researchers disregard the network as a conduit or pipe through which leadership, or leadership expertise, might flow (Hadfield & Jopling, 2012). This project's attempt to gather both quantitative and qualitative features of informal leadership networks is an attempt to capture as much of the leadership behavior represented by them as possible.

Conceptual Framework

My conceptual framework (see Figure 1) combines distributed images of instructional leadership with ideas of social network dynamics drawn from the literature on networks in educational leadership. I refer to interactions between instructional leaders and others that regard leadership functions as informal leadership activity. Together with Hadfield and Jopling's (2012) work, this conceptual frame understands that organizations like schools contain multiple networks of individuals, each providing different types of advice, information, support, personal friendship, and the like. Here, I focus on networks as conduits for the spread of expertise about curriculum and instruction. While not the only way to understand networks within schools, this focus informs crucial design choices, including the nature and form of the questions used to identify networks (Moolenaar, 2012). This approach seeks to both better integrate network literatures with one another and slightly shift the use of network analysis in education toward a descriptive, complementary methodological and conceptual tool.

Figure 1. Conceptual Framework



From distributed images of instructional leadership, I build on three main ideas: first, that leadership in schools is distributed, in large part, based on instructional expertise, at least as far as the core work of the school is concerned; second, that leaders may vary in their level of formal involvement in hierarchical structures, and that teachers with no formal role or identity as "a leader" may still be actively engaged in leadership, albeit informally; third, that the complex set of tasks that comprise the school's "core technology" of teaching and learning benefit from ongoing adult learning and communal critique. From network theory, I focus on networks as mechanisms for transmitting information: in this case, information about instruction. While past the scope of what a study of this scale can measure, these assertions suggest, I argue, a link between informal leadership activity, changes in instructional practices, and resulting

changes in student outcomes (though, clearly, other factors can also influence these). The intent of my work in this area, therefore, is to bolster understanding of the relationship between network dynamics, informal leadership activity, and factors highlighted by the distributed lens on instructional leadership.

Finally, this approach is designed to respect the myriad factors outside leadership that drive instructional change. The indirect link between leadership and student outcomes frequently proves a stressor for leadership scholars. Alongside the countless in- and out-of-school factors that influence how well students learn, leadership itself, networked or otherwise, is not inherently a force for improvement. Some network researchers have begun to discuss the role of "negative ties" in schools (Moolenaar, 2012; Baker-Doyle, 2014), just as some leadership researchers seek to distinguish between leadership *per se* and leadership that drives improvement (Robinson, 2010). My approach's greatest limitations lie in their inability to see inside the "black box" of student achievement, as well as the framework's seeming inability to pinpoint concrete instructional changes resulting from leadership interactions. What this study does propose to measure, however, is influence, the *sine qua non* (Northouse, 2007) through which leaders exert power by attracting cooperation and adherence. The effectiveness of any particular influence is, at best, anecdotally described here. However, the prerequisite nature of influence to high-quality leadership motivates careful and innovative study.

Chapter 3.

Research Design and Methods

To pursue the questions outlined in Chapter 1, within the conceptual framework just described, I mounted a five–stage explanatory sequence model study using both quantitative network analysis and qualitative data to explore informal leadership activity within an elementary school. These stages included:

I. A quantitative social network survey, in which teachers and the principal were asked to participate in an electronic survey primarily focused on identifying those within the bounded network with whom they interact, using three separate questions related to curriculum and instruction;

II. An analysis of the quantitative data, focused on both identifying subjects for qualitative inquiry and comparing characteristics of top actors within networks;

III. A basic qualitative study (Merriam, 2009), during which interviews, a logging instrument, and observations directed at key actors identified in Stage II documented when and for what purpose(s) informal leadership activity take place;

IV. An analysis of the qualitative data, focused primarily on understanding the intentions and other characteristics of leaders' interactions with colleagues; and,

V. An integrative analysis of all data, in which quantitative and qualitative data were considered together to triangulate major findings and holistically understand informal leadership at the school.

Network researchers choose to work in one of two major traditions: whole or bounded network research, in which social connections within a defined group are examined, and egocentric network research, in which all the social connections to and from particular individuals are examined (Borgatti & Ofem, 2010). Use of a bounded network approach is an appropriate fit for a study like this one of internal organizational dynamics; additionally, it meets a relative literature gap in studying the bounded networks of informal leaders. Additionally, given the relative invisibility of informal leadership, and absent any knowledge about who in a given bounded system exercises that informal leadership, a strategy that attends to all possible interactions is clearly useful.

Mixed Methods Framework

The mixed–methods network analysis described here was built upon both the mixed methods research tradition in the education sciences and the mixed methods tradition in network analysis. While developed separately, these approaches are complementary and mutually supporting.

Alongside, but apart from, conversations on mixed methods in the education sciences, network researchers have increasingly called for the use of mixed methods

and critiqued an over–reliance on exclusively quantitative network measures (Edwards, 2010). Proponents of a mixed approach point to the ability of qualitative data to build in a sense of context to research, capture insider's views to complement the "outsider" views of quantitative data, and provide some ability to examine change in networks over time (Edwards, 2010). Because of a joint interest among network researchers in the structure of social relations and the processes which generate those relations, network analyses lends itself to mixed inquiry (Edwards, 2010; Nordengren, 2014).

Qualitative data enhances quantitative network data, Hollstein (2010) argues, by considering the contexts in which communications occur, allowing individuals to locate themselves in networks, suggesting which mechanisms and conditions produce certain network outcomes, and providing the ability to track the emergence and change of networks (Holstein, 2010). At the same time, quantitative approaches offer the ability to "map and measure certain aspects of social relations in a systematic and precise fashion" (Edwards, 2010, p. 5). While approaches to mixing these data sources vary, they frequently begin with a formalized survey, often with a name generator or a name roster to encourage individuals to identify specific ties, as well as qualitative interviews with network actors of interest (Hollstein, 2010). Network scholars have also sought ways to combine quantitative and qualitative analyses throughout the research process: using content and thematic analysis on survey data (Edwards, 2010) or using network

visualizations to qualitatively interpret quantitatively modeled networks (Molina, Maya-Jariego, & McCarty, 2014).

Finally, mixing qualitative and quantitative network data provided additional opportunities for measuring validity, particularly construct validity. Typically in studies of whole or complete networks, a validity problem arises when participants define a type of relationship differently than researchers (Wald, 2014). My own work suggests the composition of networks can vary widely by the qualitative question asked participants (Nordengren, 2013) or by the quantitative measure used to assess whom in those networks is a leader (Nordengren, 2014). In these cases, it is difficult or impossible to decide which perspective on the relationship—the participants' or the researcher's—is the "right" one. In studies of informal leadership, such conflicts may arise when participants' professional or personal experiences narrow their definition of leadership, or when the researcher's qualitative understanding of who holds explicit authority limits their understanding of leaders outside dominant social groups or with different job descriptions (Nordengren, 2014). The collection of mixed data provided the opportunity to balance these considerations, comparing and contrasting insider and outsider views of what constitutes leadership and further contextualizing and developing rich sources of data.

The literature on mixed methods network studies pointed toward a design which Creswell and Plano Clark (2007) call an explanatory sequential model. Generally in

explanatory designs, an initial quantitative phase of data gathering is followed by a qualitative phase whose design is influenced by the results of quantitative data. In one form of this design, called the participant selection model (Creswell & Plano Clark, 2007), quantitative information is collected because it is needed to purposefully select participants for qualitative study. In this case, quantitative data was essential for taking the group of possible leaders within the network among teachers, discovering who leads, and determining which leaders are most important for follow up qualitative work. A quantitative analysis and selection process, as opposed to the qualitative strategy I have used previously (Nordengren, 2013), provided opportunities to compare network data to each other, as well as to other characteristics of teachers and teacher leaders.

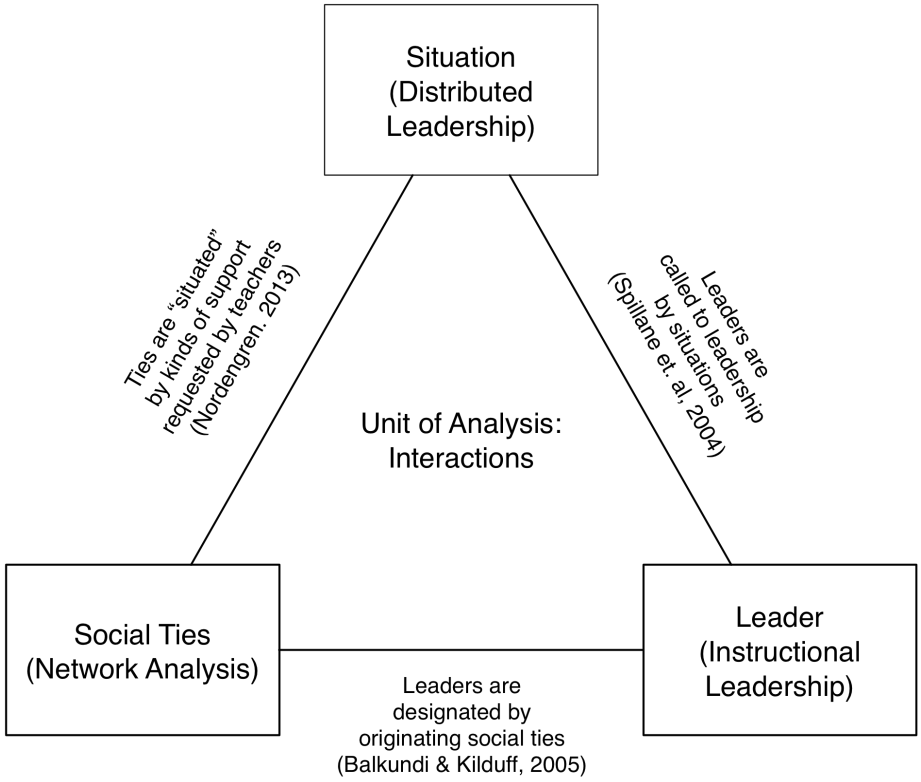
This study broke with Creswell and Plano Clark's design by emphasizing the qualitative phase over the quantitative phase of data collection (Johnson & Onwuegbuzie, 2004). The order of the phases, quantitative followed by qualitative, was dictated by the tool of social network analysis. However, the conceptual framework described in Chapter 2 suggests that leadership is best understood in the specific situations in which it takes place. What Creswell and Plano Clark call the study's "theoretical drive" (2007, p. 82) rests with the nature of the qualitative data. Therefore, the qualitative data gathering stage was longer, more complex and received a greater narrative focus throughout the study's analyses.

The diverse conceptual and methodological frameworks on which this study is based presented different units of analysis for research. Conventional distributed leadership approaches, for example, suggests the "situation is the appropriate unit of analysis for studying practice" (Spillane et al., 2004, p. 9) and focuses on identifying where leadership appears. Instructional leadership research has traditionally focused on the qualities, abilities, and individual work of the leader or leadership team members as they have sought to influence organizational practice. Finally, network analysis has focused on the quantifying and contextualization of social ties between individuals.

This dissertation locates its own "unit of analysis" at the center of these three ideas (see Figure 1), focusing primarily on interactions between individuals. Drawing on additional literatures, it argues situations, leaders, and their social ties are inextricably linked together, necessitating a focus on the understudied interaction of these three forces. As previously noted, distributed leadership connects leaders and situations, arguing the ability of any one person to lead is dependent upon the situations that require leadership. In studying leadership with network analysis, Balkundi and Kilduff (2005) argue that leaders are the originators of social ties measuring the spread of information, advice, and support. Finally, my own work (Nordengren, 2013) suggests social ties that spread these types of supports in schools are themselves "situated" by particular curricula, the kinds of support teachers request, perceptions of expertise, physical proximity, and other potential factors. In sum, this

work suggests both that situations, leaders, and social ties cannot be fully understood without understanding the connections among them, and that interactions (which sit at the center of these three foci) cannot be understood without better understanding situations, leaders, and social ties. This study, through distinct data gathering and analysis periods, is designed in separate stages to capture each of these foci.

Figure 2. Unit of Analysis



Interactions are intangible. A network analysis approach helps to make interactions more visible and available for systematic study. However, the visualizations of interactions that network analyses produce are not full representations

of interactions, nor do they provide the same data as accounts of the interactions themselves. Beginning from those visualizations, this study seeks to understand interactions beginning from individual perspectives on those interactions, aligned with findings in the leadership literature that suggest what participants seek to get from a leadership interaction is an important indicator of what that interaction truly is. Beginning from individual perspectives on interactions also provided an opportunity to develop trust with participants, an invaluable step prior to asking participants to reveal specific details about their day-to-day activities. From this interview evidence, the qualitative portion of the study sought to gather information on interactions through accounts of specific interactions in both logs and observations. Within the constraints of time and resources, the study used these three types of evidence to triangulate interactions by capturing social ties (through network analysis), leaders and leadership (through interviews), and situations (through logs and observations).

School Selection

School selection for this study was designed to maximize the opportunity to observe informal leadership activity by following an elementary school with a developed, common discourse on instructional strategies, based on the judgment of informants. Using literacy as one example around which this common discourse might take place, I worked with informants to identify school staffs in which discussion of instruction was seen as common, and informal leadership (however it was understood)

was viewed as commonplace. By selecting an elementary school, the study also sought to maximize the extent to which teachers shared common students over time, as well as common instructional and subject-level concerns.

Several authors have provided conceptual explanations for the relationship of time developing a common discourse and informal leadership in schools. Copland's 2003 study suggests teacher leaders themselves undergo stages of developing their instructional inquiry skills as programs develop (Copland, 2003), suggesting the growth of instructional advice and support networks over time. Harris' 2002 study, in contrast, suggests principals in challenging contexts enable more or less teacher leadership capacity based on their assessment of a school's learning process. Literature on high–reliability organizations (Lorton et al., 2013) might instead argue that networks around instructional leadership consolidate around key actors over time as organizations learn who their most dependable leaders are. Among several other findings, these suggest divergence in the field regarding the effects of time on informal teacher collaboration.

Selecting a school with a highly developed discourse around common learning problems is one means of addressing this divergent literature. By selecting a school where discourse has had at least some time to develop, this study was able to observe somewhat retrospectively how informal leaders rose to prominence in a school, including the role of the principal, teacher colleagues, and situations in that process. While not a fully retrospective study (and thus unable to fully test Copland's (2003)

assertions about the growth of networks), this study exploited a purposefully sampled school to better understand the relationship between a school's past challenges and needs and its current informal leadership approaches.

During an exploratory phase for the study, multiple schools were considered for inclusion on the basis of this criterion. The high level of commitment required for a study of this type limited the ability of many schools to participate. Network studies of organizations require high degrees of initial participation: Moolenaar (2012) suggests over 80% of organizational actors must participate. Additionally, selected leaders must have the time and desire to work with several qualitative stages throughout the year including interviews and observations. Given these constraints, one school was able to participate in the study.

The participating school (hereafter, Walden Elementary School, a pseudonym) is a grades 3-6 intermediate school in a city on the urban fringe of a major metropolitan area in the northwest United States, with around 320 students, 21 certified faculty members, one principal, and around fifteen paraeducators. The school has developed a common discourse around literacy for several years under the oversight of a clinical faculty coach from a local university, a principal with ten years of tenure in the school, and teachers who average 10.5 years of experience in the building. In interviews, staff consistently remarked on this retention rate and what they described as a positive work environment. "We share lessons with each other and we think of the students as 'our

kids'" (Teacher W14). Notions of respect and kindness were common in survey responses. The idea of teamwork was also consistent across these comments.

As the population in the neighboring community has changed, Walden's demographics have changed with it: over 50% of students now receive free or reduced price lunch, compared to around 33% for most of the 2000s and the district's present average of around 20%. More students at Walden receive special education services than average: 20%, compared with 14% across the district. While both the school and the district populations are primarily white, Walden's student population includes 20% Latino/a students, around twice the district average.

During the period of population shift, much of Walden's instruction has shifted. A small group instructional model, first adopted in reading and increasingly adopted in mathematics, is promoted for most classrooms, based on the CAFE (Comprehension, Accuracy, Fluency, and Expanding Vocabulary) system. These changes have come largely at the behest of Walden's principal and teachers; many teachers describe the district as taking a largely hands-off approach and the superintendent as wanting "teachers to be making the classroom decisions" (Lucy). Teachers also consider the district to be taking an "experimental" approach across schools.

While the school has adapted to the needs of this changing population by transitioning to a school–wide Title I model within the last five years, some community members are still left with negative impressions of the school. In part, these perceptions

are due to performance on state assessments: while Walden averaged around an 80% proficiency rate in all subjects and grades in 2006-7, they have since declined to around 60% proficiency in reading and 50% proficiency in mathematics, approximately 10% below the district average. While many teachers cite other measures of student success, some express concern about the school's focus. "Emphasis was on test scores where I came from and then the emphasis here is more about feelings," in response to the increased neediness of many students (Teacher W07). One teacher attributed this stagnation to a need for deeper coordination: "Unfortunately, it's like 30 teachers, 30 pistons going everywhere and the engine is not quite tuned right … if I'm saying there's a wealth of knowledge here, where's the proof?" (Teacher W02). Walden has responded to these challenges with a renewed focus on collective monitoring of student progress and a strong focus on targeted support programs for struggling students.

Design and Procedures Across Five Stages of Research

Within the school, I proceeded through the five stages of this mixed methods design in the ways described below. In each stage, I note the steps undertaken, the justification for doing so, related methodological issues, as well as limitations implied by my design choices.

Stage I: Network Survey

In Spring 2014, I conducted a survey of all teachers and principals at Walden with the primary purpose of building a set of data for a whole network analysis. Here,

the focus on schools as organizations and a desire to focus on informal leadership activity suggests a whole network approach using a membership on a school staff as a "self–evident" definition for inclusion (Marsden, 2010, p. 371) in the study. While bounded approaches require high participation rates within the organization, they are also ideally suited for uncovering the structural patterns of primary interest to leadership scholars (Moolenaar, 2012).

The survey included three network questions, designed to capture three different types of advice, information, and support (respectively) exchanged in schools:

1. "Whom do you turn to for expertise on teaching and learning?"
2. "Whom do you turn to in order to brainstorm about a problem you're experiencing in the classroom?"
3. "Whom do you turn to for information about your school's curriculum?"

Respondents were provided a list of all of their colleagues in the school, and instructed to select as few or as many of their colleagues as they like (Marsden, 2010). In turn, these questions were used to construct three separate directed networks, in which relational arrows point from the respondent to the persons they identify. The use of three separate network questions were designed to capture a varied assortment of informal leadership activity while recognizing many types of networks, with both positive and negative implications for school improvement, overlap in schools. Framing

interactions in terms of information, advice, and support also builds on those themes present in other school network studies (Moolenaar, 2012).

Additionally, respondents were asked their general impressions of collegiality within their building and the district as well as whether they feel they have appropriate time and flexibility to interact with their colleagues on issues related to instruction. These questions were both an opportunity to gather data and, per recent research on the importance of contextualizing questions about social relationships (Marsden, 2010), provide a leadership context for addressing the questions that follow.

Limitations. Unlike in many other network analyses, the primary focus in this survey was on the differences between the questions themselves rather than asking respondents to rank the importance of their relationships or the frequency of interactions. My previous work (Nordengren, 2013) suggests large potential differences in the types of interactions captured by questions like these; these differences relate more clearly to theoretical questions than interaction frequency or other measures of magnitude. Network questions 1 and 2 were piloted in the previous study (Nordengren, 2013); network question 3 more directly relates to the nature of school selected here. In understanding informal leadership activity, my intent is to study what Coburn and Russell (2008, p. 208) call "patterns of interaction," relying on participants' assessment of the nature and importance of their own interactions.

Perhaps the largest risk in this approach is the lack of a clear reference period (Schaeffer & Presser, 2003) for the interactions of interest in network questions. Undoubtedly, this survey relies to a great degree on a participant's recall as well as on their ability to subjectively categorize which relationships are important or have meaning. To that end, respondents could choose their own reference period (which may vary from respondent to respondent), or have no reference period in mind at all. I attempted to mitigate this risk slightly in the instructions for this question set, which say, "Attempting to recall conversations you've had in the last week or month may be helpful." Still, there is no empirical justification for the assumption that interactions in the given week or month of the survey instrument are representative of broader trends, nor that such a suitable period for each staff member could be found. Further, participant recall may have served to summarize broader trends in staff interaction patterns that might be obscured through the specification of a time period. There was a clear methodological tradeoff here between the precision (or presumed precision) provided by declared definitions and a clear reference period as opposed to allowing participants to engage in qualitative interpretation. However, this study was built around the assumption that subjective understandings of a relationship's importance have meaning and are of primary importance; the only way to allow these subjective understandings to take on this role is to allow for variations in reference period or other definitions between respondents.

Question-order effect. Question–order effect, or the ways in which responses vary based on the questions asked, is a serious concern in any survey. Regarding "name generator" social network surveys like the one in this study, Pustejovsky and Spillane (2009) explore the particular risks of question–order effect. Like this survey, theirs asks elementary teachers whom they turn to for advice on instructional topics, and uses out degree (that is, the number of individuals who identify a potential leader as a source of advice, information, or support) as the measure of interest. However, their questions ask for expertise in certain subjects (reading and mathematics) rather than on certain activities. The authors find an effect in which participants select fewer colleagues on the question asked second, which they attribute in part to the nature of their questions: because teachers conversed about fewer topics in mathematics, for example, asking that question first narrowed the scope of participants' understanding of their advice-seeking behavior in other subjects (Pustejovsky & Spillane, 2009).

The school population described here is unlikely able to adjust for question–order effect by randomizing the order of questions provided participants: given the skew of network data (Pustejovsky & Spillane, 2009), the assumption of normality is violated. Additionally, because the questions asked for three different types of leadership activity, comparing their statistical properties directly is inappropriate. However, the design of the survey questions and their intended uses were designed to adjust for order effect where possible. Unlike Pustejovsky and Spillane, I did not ask

questions about specific subjects nor other areas likely to limit participants' understanding of advice seeking. Instead, I asked targeted questions about behaviors with the question containing the largest scope (that on expertise about teaching and learning in general) first. Additionally, using network questions primarily to select leaders, rather than to determine other features of networks provided the opportunity to further counterbalance the effects of question order. Indeed, of the leaders selected in the study, none ranked lower than fourth on the first network question, and lower than sixth on either of the other two questions.

Stage II: Quantitative Leader Selection

In Stage II, the data gathered in the social network survey were analyzed using quantitative social network analysis. Here, network questions develop data on out-ties: individuals indicate whom they turn to for advice, information, or support. Leaders turned to by others are understood to enact informal leadership activity, and the actors with the most connectedness—that is, the most arrows pointing to them—are considered the most prolific leaders. For purposes of conceptual clarity, I refer to actors with large numbers of in-ties as *egos*, and those they are connected to as *alters*. While several measures of centrality are suggested by the literature (Prell, 2012), my retrospective analysis of data previously collected in a qualitative network study of school leadership (Nordengren, 2014) suggests the use of the most basic of these: in-degree centrality, or the number of in-ties an actor has divided by the number of

possible ties. Using in-degree centrality, ranked for each of the three networks, I solicited the participation of three leaders, attempting where possible to select top actors across each of the three networks. The in-degree centrality of each member of Walden's staff, along with the selected leaders, are described in Table A1. Chapter 4 provides more information about the differences between selected leaders on these measures.

In the leader selection process, the question of how leaders differ on their level of formality becomes more critical. Walden maintains no formal teacher leaders (e.g., full time instructional coaches) subject to selection here. However, selected informal leaders may have various formal leadership roles in addition to their teaching roles—they may participate in the building leadership team, be responsible for data collection and analysis, head departments or other curricular teams, or the like. Regardless, the survey asked teachers to select leaders not on the basis of role, but on the basis of actions. Further, qualitative analysis will focus specifically on leaders and leadership events that are informal, as that idea is defined in the previous chapters. As I argue previously, the full extent of informal leadership activity in a school environment is unknowable without a qualitative understanding of the content of leadership activity as a whole, noting both formal and informal elements.

Using these leader selections, I also solicited the participation of six total alters for participation in qualitative interviews. Alters were selected on the basis of their ties

to leaders, as expressed both through the network diagrams and the logging instrument discussed below. The selection of alters occurred primarily on the basis of convenience sampling: because alters were selected on the basis of the egos to which they are tied, the potential group of alters was already relatively limited. Additional selection criteria included (in order of importance) connectedness to multiple leaders, connectedness on different network questions, and variations in role or grade level taught at the school. The first criterion provided the opportunity to work with alters who could compare and contrast their interactions with multiple individuals in the same interview, perhaps facilitating more insight into the nature of particular relationships. Pragmatically, interviewing individuals connected with multiple leaders also increased the amount of data on the interactions of each individual leader. The additional selection criteria described are designed to maximize variation between alters in the study.

Quantitative network analysis also provided opportunities to consider the methodological implications of this study's use of three conceptually distinct network questions. As described in Chapter 4, few conventional network analysis techniques are appropriate for networks in which samples are relatively small and contexts are preliminary. Quantitative data analysis in this project used several different types of correlation between networks to uncover and discuss important similarities and differences between them, which have likely implications for the study's overarching findings.

Stage III: Qualitative Data Gathering

During the qualitative stage, comprising approximately three months, the three leaders who agreed to participate were asked to participate in one semi-structured interview (Merriam, 2009) at the beginning of the period (September 2014), complete a log of their interactions with adult colleagues over a four week period (October 2014), spend a school day shadowed by the researcher (November 2014), and participate in a second unstructured (Merriam, 2009) interview following the logging period.

Leader interviews. The purpose of the first interview with leaders was to understand their perspective on their leadership activities in advance of collecting concrete information about those activities. Semi-structured interviews were used not only to allow participants to both provide the specific information in which the interviews were interested but also to allow participants to provide unique details of their experiences as well as their own worldview and perspective (Merriam, 2009).

Leaders were asked to account for their formal roles in the school as well as how they see themselves informally. In light of these roles, they were asked whether they see themselves as leaders and how, if at all, they have sought to lead in the school or what elements of instruction they "push" their colleges to do differently. Leaders were asked to recall specific events in the previous few weeks in which they have professionally interacted with colleagues, and they were asked to describe these events: who instigated the interaction, why the interaction took place, and what they intended to

accomplish from the interaction. After this, leaders were asked to extrapolate from specifics to describe their informal leadership activity in generalities: who starts conversations, what they start about, what they attempt to accomplish in interactions, and what unique skills they bring to the process of informal leadership. Finally, leaders were asked to compare and contrast their own leadership priorities and objectives with those of formal leaders in the school or the organization as a whole.

One potential risk that arises when asking informal leaders to describe their leadership activities is the risk that participants will not see themselves as leaders at all. The qualitative structure of this portion of the study allowed for understanding these participants' experiences and objectives on their own terms. However, an underlying assumption drawn from the study's conceptual framework and methods is that, by virtue of their frequent advice giving and support on instructional issues, participants identified in this stage are leaders of a sort, regardless of their self-identity. This risk, therefore, may present the opportunity to compare the participant's self-identification and feelings of responsibility with those described in the literature on informal and collective leadership.

Logging instrument. During a common log period for all leaders, lasting four weeks, participants were asked to describe any time when they interacted with a professional colleague, using prompting verbs such as "I sought out," "I consulted," "I advised," "I helped," etc. In journals, participants were asked to note whom they spoke

with, roughly how long they spoke, the general topic(s) of conversation, and any reflections on how they acted as a leader during those conversations.

Though relatively uncommon, logging or journaling practices have been used in a study of distributed leadership to record principal activities (Spillane, Camburn, & Pareja, 2007), and as a measure of instructional practices on literacy (Rowan et al., 2009) and science (Martinez, Borko, & Stecher, 2012). Here, the intent of logging was to avoid the potentially obtrusive process of conducting extensive observation on private conversations among teachers while also still gathering data on a key component of leadership interaction: the conversations themselves. Logs help remedy the difficulty participants often have recalling the specifics of day-to-day activities after a long period (Spillane, Camburn, & Pareja, 2007). Still, logs can increase response bias and non-response as participants develop inaccurate or biased techniques for completing logs or choose to ignore them (Rowan et al., 2009). The log design here mitigated this risk by being relatively short, open-ended, and requiring participation over a limited period.

However, the length of the logging period presented additional challenges. It may be difficult to extrapolate from four weeks of logging patterns of interactions that extend beyond the period. There are substantial trade offs between the amount of data collected and the burden of logging on participants, which may produce fatigue over time or increase the likelihood participants will choose not to respond. This risk was increased in this study where the pool of potential participants in this stage was limited

by the quantitative leader selection process. Like the observations described below, logging instruments were used primarily in analysis as a means of triangulating findings derived from interviews.

Alter interviews. During or before the logging period, I also sought to interview at least two alters connected to each leader. Semi-structured interviews were again used to allow participants to define selected leaders in their own terms, as well as to allow participants to compare the selected leaders as appropriate.

During this shorter interview, I asked the alters to describe why they have turned to the leader in the past, to provide some specific examples of times when they have turned to the leader for professional support, and to illustrate (if possible) the ways in which informal leadership activity from that leader has led to changes in their instructional practice. I asked them, in this process, to compare and contrast one of their first professional interactions with the leader as well as a more recent interaction. Alters were also asked what they felt about how the leadership goals of the leader in question compared with the objectives of formal leaders and of the school collectively. Some alters provided information on more than one leader; in these cases, I asked alters to discuss their interactions with each leader individually, then posed questions that asked them to compare and contrast these interactions with each other.

Interviewing alters connected with leaders provided an opportunity to gather information on the "other side" of interactions, keeping the interactions themselves in

focus. While it would be methodologically difficult to isolate for study informal interactions before they occur, the qualitative design of the study provides for the triangulation of interactions through three main perspectives or types: the perspective of leaders (leader interviews), the perspective of those closely tied to those leaders (alter interviews and, to a lesser extent, qualitative elements of the survey instrument), and through accounts of interactions as they occur (logs and observations).

Observations and follow-up. Through evaluation of journals and consultation with the participants, I also sought to conduct observations of leadership events as contextually appropriate and as participants allowed. Observations included at least one full day of shadowing each leader after the initial interviews and the logging period; both these instruments provided content from which to develop unique observation protocols for each leader. Observations of additional events occurred through consultation with both participants and their logs as appropriate. These observations served as an additional source of triangulation for self-report data.

The intent of observations, where possible, was to observe instances of informal leadership activity that were like those recorded in logs. Because the places and contexts in which informal leadership occurs may vary widely by leader, and informal leadership activities are by their nature somewhat private and spontaneous, cooperation with participants in selecting times and places for observation was crucial. They were presumed likely to include, however, one-on-one or small group meetings,

"drop-in" observations of teaching practice or coaching sessions, or similar events. By observing a complete instructional day for each selected leader, I was able to witness events where informal leadership might take place, irrespective of specifically planned meetings or other formal activities that might have obscured my view of informal leadership. Observation logs paid particular attention to the intentions of informal leader(s) in the interaction, how those intentions were understood by alters, and the form and content of how interactions occurred between informal leaders and alters. This included transcriptions of events where acceptable to participants.

A final interview, after both the logging period and observations, was designed to maximize the utility of these data. Leaders were provided a transcript of observation notes in advance of the interview: this served both to provide participants an opportunity to reflect upon specific interactions that had occurred throughout the day and an opportunity to member check (Merriam, 2009) data with them. Though deliberately unstructured, the second interview focused selected leaders on both events from the observation day and specific responses in the log, providing leaders the opportunity to relate these individual instances to broader trends, or suggest the ways in which these events were extraordinary. Having previously transcribed and preliminarily analyzed the first semi-structured interviews with participants, I also asked them to contrast their thoughts regarding these instances with descriptions that took place in the first interview, and to attempt to determine whether their ideas about

themselves as a leader or their leadership priorities have changed as a result of the qualitative data collection process. Together with the other forms of qualitative evidence, this approach struck a balance between too much burden and too little information designed to maximize response.

Limitations. The limited time period for data gathering proved the most significant limitation to the qualitative portions of this study. Informal leadership is by its nature a somewhat sporadic activity; there may be relatively few opportunities to witness informal leadership activity during any given day or week when teachers leading informally may be occupied with their own classroom responsibilities. This need for data is balanced, however, by the burden "an outsider" recording details of sensitive communications can place on school staffs, potentially limiting cooperation and potentially shifting the nature of the data collected. In this study, this tension was further enlarged by the need for early cooperation from the entire school staff for the social network survey. While these factors explain the need for a relatively short data collection period, closer ethnographic work with informal leaders can provide greater detail on how they communicate with colleagues and otherwise accomplish their goals. The findings of this study also suggest the need for that work to be longitudinal in order to capture how informal leaders subtly influence colleagues over a period of years.

While contributing to a coherent conceptual framework, the qualitative portion of the study's use of social network theory as a guiding lens limits the scope of the informal leadership activities it examines. There are likely several types of informal leadership activity that are not represented in social interactions, such as curriculum planning or policy advocacy. Additionally, this study's focus solely on interactions within the school leaves out various formal and informal leadership activities selected leaders participated in within their district or with other schools. These leadership activities likely require studies with more direct cooperation from a school district, as well as access to more diverse types of data including e-mails and other important documents.

Finally, the selection criterion used to pick the selected leaders for the qualitative stage requires other important caveats. The teachers selected here are not the only informal leaders at Walden, in part because the three network questions asked do not represent the full potential scope of informal leadership in any school. Additionally, the alters interviewed regarding these leaders were selected for their potential to provide a high volume of insights rather than as a representative selection of who sought advice, information, and support at the school. This study, therefore, addresses only some of Walden's informal leaders, likely in only certain aspects of their work. However, the focus of this study was to extract features of informal leadership potentially transferable to other contexts rather than to provide a full case study of informal leaders. Analysis

and write-up, therefore, treated the data as typical instances of informal leadership activity rather than as the only or the strongest potential instances.

Stage IV: Qualitative Analysis

The qualitative analysis strategy used in this study is described in full detail in Chapter 5. While a variety of qualitative data analysis techniques are available for use by network researchers (Hollstein, 2010, p. 412), this study evaluated transcribed interviews, log documents, and observation notes using a hybrid open and focused coding strategy in which common qualitative tools for analysis such as noticing patterns and themes, seeing plausibility, making metaphors, and making contrasts and comparisons (Miles, Huberman, & Saldaña, 2014) were utilized. Some analysis work took place simultaneously with data gathering: for instance, it was necessary to at least partially analyze logging documents in preparation for the observations and second series of informal interviews. However, the bulk of qualitative analysis occurred after qualitative collection.

Stage V: Integrative Analysis

In this study, the primary intent of a period of integrated analysis was to draw a set of inferences which address the connection between individual understandings of leadership activity by leaders and how those activities comprise the overall nature of informal leadership activity within the school, a key element of the first research question. This integrated analysis included both qualitative and quantitative evidence.

The integrated analysis also provided an opportunity to examine potential threats to validity when both data sets are considered as a whole: in particular, the opportunity to consider whether displaying a school's leadership functions as a social network is appropriate to the specific context of Walden as an organization. Other purposes for mixed inquiry emerged as questions from previous analyses went unanswered or answers were left underdeveloped.

A period of integrative analysis also allowed for the use of several strategies of triangulation. Triangulation across participants includes an instrument that captures data from each teacher within a school (the survey), deep data collection with selected leaders, and brief interviews with individuals connected to leaders. Triangulation across time occurs due to data collection during three time periods in two school years, ultimately encompassing activity within a school semester. Qualitative triangulation occurs between both leader interviews, interviews with those closely tied to selected leaders, the logging instrument, and observations. Finally, each of these sits within the broader intent of the study to triangulate interactions by triangulating between evidence on social ties, leaders, and situations.

Key Assumptions

My research plan makes three key assumptions that separate it from other kinds of leadership research. First, this work places emphasis on the relevance of formality and informality to how leadership is conducted. What other authors might characterize

as collaboration, this work characterizes as a kind of informal leadership and contrasts that with other formal leadership styles. Unlike collaboration, therefore, informal leadership is not necessarily reciprocated by the other party, though it may be reciprocated. Second, this plan uses interactions among teachers as the primary measure of leadership occurring. While acknowledging that not all leadership occurs within the context of interactions, my design assumes that the bulk of leadership surrounding the improvement of instruction has some interaction component that can be observed and discussed. Finally, this plan emphasizes the importance of the transfer of advice, information, and support as leadership activities. While not necessarily assuming that leaders work in teams or toward the same ends, this emphasis does function only in environments where teachers are receptive to input from one another, and excludes leadership styles that encourage or promote more direct forms of ensuring compliance with principal or district mandates.

While this study, therefore, sits within both several educational leadership theories and a growing body of network analysis in education, it positions itself as one part among many of both of these discourse communities. It sought to develop network analysis as a non-normative methodological tool that, like all methodological tools, fits within a spectrum of tools necessary to create a full picture of leadership and school improvement.

Chapter 4.

Walden's Informal Leaders and Leadership Networks

This chapter orients and discusses the results of quantitative and visual analyses conducted from Walden's survey of all teachers and administrators. It begins with potential analytic strategies for using networks to understand informal leadership activity. It then discusses three separate networks (and the leaders selected from them) at Walden, first discussing a three-part correlation strategy used to compare the structural features of networks, then discussing the selection of leaders and alters from network data, and concluding with a discussion of two visualization techniques for understanding the three networks.

Analytic Strategies

Network researchers have produced a variety of formal analytic strategies for understanding networks and drawing conclusions from them. In addition to these quantitative strategies, there is increasing recognition among scholars that the ways in which networks are visualized have important implications for how researchers and readers interpret the meaning of networks. My own work has found that seemingly minor changes in the statistic used to select educational leaders can dramatically change the leaders selected (Nordengren, 2014). In this context, it is important to consider and weigh analytic strategies as part of describing the overall method of the study.

Degree Centrality

This study uses degree centrality, perhaps the "most intuitive" form of centrality (Prell, 2012, p. 97), as its central outcome of interest. Specifically, I aggregate responses from all participants on each network question (their *outgoing* ties, collectively their *out-degree,* a measure of the number of colleagues with whom teachers seek ties) to compute *in-degree* centrality for each actor on each network question. Participants are ranked only on the number of colleagues who selected them as leaders, and not on the number of colleagues they selected.

Degree centrality is one of several proposed measures of the importance of individual nodes in networks. However, more complex nodal measures behave in unpredictable ways when used to understand relatively small networks in schools. The intuitive nature of degree centrality as a central outcome of interest is an asset where networks under study are purposefully selected and used for qualitative data collection.

Predictive Modeling

Network analysts have developed several sophisticated statistical models that attempt to demonstrate the structural features of networks. The most common of these, the *p2* model developed by van Duijn, Snijders, and Zijlstra (2004), is a multi-level random effects model designed to take into account the dependent nature of network data: in other words, the idea that the relationship between actor *i* and actor *j* is not fully independent from the relationship between actor *i* and actor *k*. The modeling

technique attempts to explain an actor's high level of in-degree either as a function of actor-level characteristics, entered as covariates, or as a function of pure random effects apart from density and the reciprocity of social ties, both of which can be obtained from network data alone. Now in regular use by network analysis in education (Spillane, Kim, & Frank, 2012; Spillane, Hopkins, & Sweet, 2014), *p2* modeling is particularly effective when predicting whether a tie between actors occurs and attempting to explain the sources of that tie.

While valuable, predictive modeling does not meet this study's objectives. This study does not seek to demonstrate the circumstances under which a teacher may create a tie with a particular leader. Second, this study lacks the sample size to do so convincingly: Spillane and co-authors (2012), for example, studied 1,210 elementary teachers. Finally, the potential for various types of response bias associated with surveys further limit the utility of models that assume a null or random network graph as a basis for comparison. Model-based comparison is most appropriate, write Butts and Carley (2001, p. 7), where "structural processes are well–understood and hypothesized effects are clearly specified." In this study, where predictors as well as network connections are particularly subject to the biases and potential confounding that occurs in self-reported data, comparisons with null models may produce spurious relationships or other unintended results.

Density and Network Level Statistics

Unlike many network studies, this study is primarily interested in the characteristics of individuals within networks rather than the characteristics of networks as a whole. Though network-level statistics provide some insight into the nature of a network, they also present analytic issues when, for example, particularly high density is attributable to one or a handful of well-connected actors, or density decreases primarily as a function of a network's size (Prell, 2012). More importantly, the literature does not suggest either a baseline or an ideal level of density, reciprocity, or any other network-wide statistic, when considering networks derived from survey data on elementary schools like those in this study.

However, comparing the networks in the school to each other provides, for this study, both potential analytic value and hypotheses generation for qualitative follow-up. I compare the three networks for each school to one another in three ways.

First, *in-degree* correlation is a linear correlation of the in-degrees of each actor in each network. A high correlation on this measure demonstrates, generally, that those actors who tend to be identified as leaders on one question are also identified as leaders on another question.

Second, *dyadic* correlations reflect the correlations between two networks as matrices, adjusted for the dependent nature of the data using the Quadratic Assignment Procedure or QAP (Krackhardt, 1987). This correlation demonstrates the extent to which

individuals who express a tie on one question also express that tie to the same person on a second question. Further, QAP serves as a test of spuriousness, using several Monte Carlo permutations of the network being correlated to demonstrate that similarities between any two networks are not due to chance. Unlike several similar procedures for comparing two networks, QAP is robust against "directed network data" where, unlike in some network situations, the *direction* of a tie matters: in this case, QAP allows consideration for the way in which the data were collected and the associated implications for the data's meaning.

Third, this study uses a method of *inter-structural* correlation proposed by Butts and Carley (2001). In addition to one-on-one relationships, network researchers often wish to compare the general structure of groups of relationships; doing so proves more complex here, where different networks represent different types of underlying relationships, and theory does not necessarily support treating these relationships as equivalent in importance or meaning. Inter-structural correlation, therefore, is primarily an attempt to understand how the types of relationships between groups vary between graphs, and therefore measures the similarity or difference between how the different networks measured here function in practice. Correlations on this measure denote the extent to which actors in the two networks are connected in similar, rather than identical, ways: for example, if an actor shared reciprocal connections with a second actor but only an in-tie with a third actor in both network maps. This procedure can

provide additional hypothesis generation for the close visual examination of network maps. Like the previous measure, this one also alleviates the need to select a theoretical model with which to compare networks (Butts & Carley, 2001) and, unlike clique analysis or other approaches to comparing sub-groups (Prell, 2011), is also robust against directed network data.

Visualization

Finally, this study visualizes networks as part of its analytic strategy, though with important caveats as to their utility. The visualization of networks through figures often called *sociograms* has become one of the most powerful features of network analysis. Sociograms allow network researchers "to communicate the structural features of social networks to informants, to communicate between researchers with different qualitative/quantitative backgrounds, and to explore new models about the social world" (Molina et al., 2014, p. 306). If networks are not visualized through some means, the network analyst has few ways to effectively present the structural characteristics of a network and discuss their implications for understanding an organization or system. However, the implementation of sociograms between studies is far from consistent: 17 different sociogram–drawing algorithms are provided in R's sna package (Butts, 2014) alone. As representations of networks, sociograms are both easily understood by readers of several disciplines and have the potential to create misconceptions or advance findings not grounded in evidence when read or presented incorrectly.

Research on the drawing conventions for sociograms is limited. In part, this is because the relationships between nodes, and not their physical positions, are what network researchers examine. However, Huang, Hong, and Eades (2007) find that physical positioning of nodes affects how readers perceive network composition. They find that readers prefer important nodes be placed in the top or center of diagrams, and that nodes are clustered into groups as conceptually appropriate (Huang, Hong, & Eades, 2007). Traditional algorithms for visualizing network data presume networks containing hundreds or thousands of nodes, within which the physical placement of particular nodes may be less important. Egocentric network studies, on the other hand, can place the actor of interest in the center of a network diagram with little concern about confusing or misleading the reader. Neither is the case here.

Beginning with network matrices collected from survey data, I converted matrices into a list of each individual network tie using the igraph package in R (Csardi & Nepusz, 2006), and then translated these into the dot language (Gansner & North, 2000; Gansner, Koutsofios, & North, 2010) for purposes of network visualization. Dot prepares hierarchical, directed graph visualizations, using a general algorithm prioritizing hierarchical node placement, avoiding visual anomalies, providing the shortest distance between nodes, and favoring symmetry (Gansner, Koutsofios, & North, 1993). Further, dot is highly scriptable, allowing for further control over graph

organization. Most importantly, dot's instructions are reproducible and transparent, furthering the interest of communicating a visualization's purpose to readers.

Network and In-Degree Analyses

Network statistics and diagrams are presented in the Appendix. The selection of leaders and alters at Walden was drawn from analysis of leader in-degree on each question (Table A1), excluding the principal. The selected leaders (in order: W09, W01, W06, and W03) represent the top-ranked available teachers on at least two of the three network questions. One leader (W06), having left the school since the survey was conducted, was unable to participate.

Network 1 concerns the question "Who do you turn to for expertise on teaching and learning?" Among 22 total actors, it contains 89 total ties, a mean of 4.24 ties per actor. In this network, 77% of actors (17 of 22) are connected to at least one of the three selected teachers leading informally, suggesting their strong influence on matters of teaching and learning.

Network 2 concerns the question "Who do you turn to in order to brainstorm about a problem you're experiencing in the classroom?" Among 22 total actors, it contains 98 total ties, a mean of 4.67 ties per actor. As evident in network diagrams, there is a higher degree of interconnection between the three leaders on this question than on the other two questions. However, 68% of actors in this network (15 of 22) are connected to at least one of the three selected teacher leaders; while the network is more

connected overall than the network on expertise on teaching and learning, the selected teacher leaders ultimately wield influence with fewer teachers. This may also reflect that the question in Network 2 does not explicitly reference expertise but instead asks teachers to indicate whom they brainstorm with, regardless of why they do so. Chapter 6 discusses this potential implication in more detail, drawing on qualitative data.

Network 3 concerns the question "Who do you turn to for information about your school's curriculum?" Among 22 total actors, it contains 93 total ties, a mean of 4.43 ties per actor. On this network, 77% of actors (17 of 22) are connected to at least one of the three selected teacher leaders.

Correlations between the networks are displayed in Table A2. These suggest that the relationship between all three networks is positive, and that these relationships pass related tests of spuriousness. However, the relationship between the in-degree of networks is substantially higher than the dyadic or inter-structural relationships between networks. This suggests that, while the leaders are relatively similar between networks, leaders work through the relationships within networks in different ways, both on the individual relationship level and as a group. Further, all correlations between networks 1 and 3, as well as networks 2 and 3, are stronger than correlations between networks 1 and 2, suggesting substantial differences between who teachers at Walden turn to for advice on teaching and learning generally and turn to in order to

brainstorm about specific problems in their practice. This may, again, reflect the reasons other than expertise why one teacher may choose to brainstorm with another teacher.

Alters associated with leaders were selected on the basis of both the network maps and individuals frequently mentioned in the qualitative logging instrument. Using network maps, I selected three alters (W10, W13, and W16) connected to each one of the selected leaders on at least one question, and who tied together those leaders with a number of teachers who were not connected to the leaders directly; two of these teachers participated. Network theory suggests these actors can act as information "brokers" or carriers from the actors of chief interest in this study to others throughout the organization. Determining whether, and how, these actors act as brokers is therefore important to addressing the question of how the selected informal leaders act as leaders. Using qualitative log instruments, I selected three additional alters who were frequent interaction partners with individual leaders: actors W02, W07, and W08. Of these six alters, all but W16 participated in interviews.

Descriptive statistics on all survey questions are provided in Table A3. As statistics, each in–degree measure shows a wide range, with means from 4.24 to 4.67 and standard deviations between 3.56 and 3.83. Each selected leader, therefore, has in-ties one standard deviation or more above the mean on at least one of the three network questions. This suggests that, while the selected leaders may not be the only informal leaders at Walden (and does not include the principal, a clearly influential but formal

leader), their influence as represented by the network questions was higher than average. On the three composites of respondents' assessments of their own expertise, their school's expertise, and their district's expertise, means are relatively similar. However, answers on the questions regarding prerequisites for leadership are relatively similar: means range from 3.05 to 3.24 (all slightly above the "Agree" value of 3.00), with relatively small standard deviations.

Network Visualizations

Visualizations hold tremendous promise for communicating the structural features of networks and producing deeper understanding of how networked organizations function. Accordingly, like network measures, a myriad of software packages and algorithms flourish to visualize networks of all sizes. However, little empirical evidence addresses the communicative effectiveness of these packages and algorithms (Huang et al., 2007). Researchers have a vital role to play in reducing confusion and producing "truthful" graphs. While developing an intended visual interpretation to a graph is a good strategy, it merely minimizes but does not preclude the risk of unintended, and potentially false, interpretations (McGrath & Blythe, 2004). The need to rely on non-algorithmic cognitions, and the somewhat inexact nature of this practice, is best summarized by the question posed by Purchase (1997): "Which aesthetic has the greatest effect on human understanding?"

Avoiding the appearance of hierarchy or the suggestion that one actor is more important than another is key for this study: it neither theoretically nor empirically supports the idea that information flows one way from identified leaders to identified followers. To avoid the suggestion of that kind of hierarchy, therefore, I sort network diagrams on the horizontal axis, emphasizing both subgroups of actors and the structure of individual nodal ties. The below visualizations depict two prominent visualization strategies: one that highlights the group of selected leaders, the other that maps additional survey information onto the network diagram. Both of these also follow the algorithmic conventions of dot (Ganser et al., 1993), which simplify the graphs by reducing tie length and ties that cross over one another, in keeping with Huang and coauthors' (2007) recommendations.

Visualization 1

In visualization strategy 1, graphs for each of the networks were formatted to cluster the selected leaders together on the left side of each diagram, highlight in-ties from each leader in a unique color, and use grey to indicate the nodes and ties representing actors ineligible for selection in the study (the principal and the departing teacher). In this way, these visualizations adopt the "group layout" approach deemed most usable by respondents in Huang and co-authors' (2007) study, to highlight the group of interest: selected leaders. These coded diagrams were used both to discuss

general trends of the three networks and to select alters for interviews. These visualizations appear in Figures A1, A2, and A3.

Network 1 (Figure A1), regarding expertise on teaching and learning, shows a relatively high degree of connectedness for each of the three selected informal leaders. There are few isolated actors in the network, indicating that teachers are frequently connected to at least one other individual when talking about teaching and learning. Regarding academic specialists, there are high in-degrees for some specialists (W01, W17) with relatively low in-degrees for others (W12, W19). Finally, comparing this graph to the grade levels of Walden's teachers shows little segmentation by grade level: in other words, teachers do not adhere to strict grade level boundaries when interacting around teaching and learning.

Network 2 (Figure A2), the most connected of the three networks, has no isolates, suggesting that every teacher in the building has at least one individual to whom they turn to brainstorm about classroom problems. Additionally, all but one actor (W12) has in-ties on the question, suggesting almost all teachers are turned to for brainstorming. On this question as compared with others, ties appear to concentrate around the alters selected for qualitative interviewing: as brokers, alters convey information between teachers primarily in their role as resources regarding instructional problems.

Network 3 (Figure A3), unlike the other two networks, suggests two major groups of leaders: the three selected leaders on one end of the map, and the principal on

the other end. As a result, this map is more tightly clustered than the other two maps, suggesting less frequent interaction between teachers not designated as leaders here. To test this assertion, I conducted a triad census (Prell, 2012) on all three networks, a common procedure for counting the types of relationships between groups of three actors. Only one type of triad was substantially more common in Network 3 than in other networks, the type known as a "triadic out-star:" 143 were present in network 3, compared to 88 in network 2 and 29 in network 1. In a triadic out-star, one actor sends out-ties to two other actors, with no other relationship between the three. For example, in network 3, W07 has out-ties to W21 and W02 with no other relationship in the triad; similarly, W10 has out-ties to W12 and W15 without other relationships. The unique presence of this relationship type may suggest that, on curriculum versus the other two issues highlighted here, those frequently turned to are less likely to consult with one another, or are less likely to have a reciprocal relationship with those who turn to them for advice.

Visualization 2

Visualization strategy 2, devised and conducted after visualization strategy 1, is designed to capture the same data in a different context in order to generate more potential qualitative hypotheses and examine the efficacy of using survey data as a factor in visualizations. For this visualization, I selected the survey question with the highest variability (excluding the two experience variables) and clear theoretical

implications: the aggregate score of teachers' self-assessment of their expertise. This measure, which aggregates six related four-point Likert-type questions (Cronbach's α = 0.776, suggesting relatively good internal consistency), ranges from 13 to 23, with a mean of 18.28 and standard deviation of 3.14. In this visualization strategy, actors are ordered on the horizontal axis from lowest to highest on this measure, with a scale provided at the bottom of each visualization. Further, nodes and ties are colored in the same way as in visualization strategy 1. This method follows the principles proposed by Brandes, Raab, and Wagner (2001), although sorting of nodes by data point was conducted manually rather than algorithmically. The actor who declined to participate in the survey was removed. Networks are shown using visualization strategy 2 in Figures A4, A5, and A6.

This visualization strategy presents a potential alternative to the use of correlation or regression. None of the network in-degrees correlate with self-assessment of expertise, likely because a study of this size is underpowered to find such a relationship. However, the visualization enables an examination of both the in-degrees of each actor by their self-assessment of expertise and a general comparison of the direction through which network ties travel on that measure. In general, in-ties flow from low levels of self-assessed expertise to high levels of self-assessed expertise, particularly in network 1; this appears less true in network 2. This may mean that teachers at Walden are more likely to consider themselves experts if they are referred to

on issues of teaching and learning than if they are referred to in order to brainstorm about classroom problems. While speculative, this assertion is one that could not be made with either regression or *p2* modeling without reference to a null model.

All three of the selected informal leaders appear with relatively high self-assessments of their expertise. Of the leaders, actor W01's ties appear to have the most range between levels of self-assessment on network 2, while actor W09 has the most range on network 3. This may suggest that teachers with lower self-assessed expertise are more likely to turn to W01 when brainstorming about problems in their classroom, and W09 when asking questions about curriculum. The leaders appear to have roughly equivalent range in network 1, suggesting they are all resources on teaching and learning for those with low self-assessed expertise.

Finally, this visualization underlines the potential limits of self-assessed expertise. Actor W02, the fifth most turned to actor on issues of teaching and learning, has one of the lowest self-assessments of their expertise, approximately 1.4 standard deviations below the mean. Several other ties across all three network maps extend from actors with high self-assessed expertise to low self-assessed expertise. While a relatively effective predictor of advice-giving activity, self-assessment of expertise can produce unexpected data requiring further explanation.

Discussion

Results from the network data at Walden suggest a relatively high degree of interaction between staff members. The three selected leaders are well connected across all three questions, with each leader having in-ties at least one standard deviation above the mean on at least one question. Additionally, leaders are somewhat well connected to one another (suggesting a certain degree of coordination, if not outright team-based leadership), but also connect to different individuals in some cases. In network 3, regarding advice on curriculum, the three selected leaders constitute a core group of advisors separate from other staff. Similarly, alters selected for interviews are relatively well connected themselves, as well as being connected to all three leaders, though on different networks.

Drawing from the non-network survey questions, results indicate that teachers at Walden are generally satisfied with the resources they have available to lead with little variation between individual questions. The three networks depicted here have similar densities or levels of connectedness. However, the use of separate correlation measures here indicates that the networks differ from each other structurally: while individuals have fairly similar in-ties across all three networks, they gain these ties through different individual connections and relationships. The most substantial difference across networks is one between those whom teachers turn to for advice on teaching and learning and those with whom they discuss specific learning problems.

These findings about Walden suffer from limitations related to the compatibility of the network survey structure with internal organizational characteristics. Between the school year in which the survey was conducted and the school year of qualitative study, six teachers changed grade level or position (most between adjacent grades), leading to some changes in professional relationships. Additionally, the survey was unable to quantify some of the structural characteristics that teachers mentioned as limiting relationships during interviews, such as the physical division in the school building between lower and upper grades. Further, certain actors complicate questions surrounding the validity of the constructs measured in these variables; this study cannot quantitatively explain the in-degrees of actors W02, W18, and W21, who each rank highly on one network but have much lower ranks on the other two networks. While this difference underlines the idea that the separate network questions truly measure separate constructs, it provides little clear empirical explanation for its results.

As expected, the three leadership constructs measured here using separate network questions show both similarities and differences. Across the three measures of correlation provided here, each of the constructs is moderately but significantly correlated with each other, a signal that each measures somewhat similar explanations for who connects with whom at Walden. However, the variation in correlation coefficients between these networks and measures (from 0.494 to 0.885) suggests differences in how each construct compares to the others in terms of both individual

relationships and the structures of groups. This finding created initial assertions explored in greater detail in the qualitative portion of this study. It also suggests the continued need for work by leadership researchers to understand how different types of leadership interactions can draw upon different leaders and relationships.

Methodologically, the network analysis process undertaken in this study highlights the strengths and weaknesses of network analysis among relatively small groups. While there are many mathematical tools for understanding networks, few have ready empirical implications among networks of this size. Without a full conceptual understanding of what any particular network model means in school networks, it makes little sense to use models of density or predictive modeling. However, the method of comparing correlations between networks suggested in this work provides a means of comparing the structures of network data taken among the same population to each other without reference to the null model, providing the opportunity to make some testable assertions about interactions.

The survey approach used in this network study brings together several complicated factors in data analysis including the use of three separate network questions and the potential risks associated with self-reported data. However, none of the network questions presented in this study, or in the literature on networks in education generally, makes an effective case for itself as the sole measure of informal leadership. As long as this is the case, the use of multiple network questions is

necessary, especially where qualitative data selection depends upon the selection of a representative group of leaders. Further, this study suggest that there are real tradeoffs to the selection of network data for primarily qualitative versus quantitative purposes: focusing on gathering a valid sample of complete network data limited the time and resources available to gather data from more schools, thereby limiting this study's ability to quantitatively test the relationships between network questions and other variables.

These limitations suggest future research opportunities regarding mixed network inquiry in education. This study does not take advantage of the use of motion or other visualization techniques used to depict network data over time (McGrath, Krackhardt, & Blythe, 2003). While these techniques may introduce their own sets of complications and concerns, gathering network data in the same environment over several time points could provide valuable insight on how leadership and collaboration relationships change as institutional circumstances change.

Additionally, this study suggests the needs for mixed methods studies that draw upon larger initial data sets. This potentially includes a sequential exploratory mixed methods study that begins with several schools and uses network data to purposefully select well-connected teachers who contrast on other variables. A larger data set could also provide an opportunity to validate network questions against established measures of school and/or teacher leadership. This possibility, however, comes with its own

caveat: the participation of teachers within each school must remain high in order to obtain valid results and capture a sample of the full network. This network analysis, therefore, hopes to encourage the growth and advancement of network studies of informal leadership in education with more fully tested methods and greater resources.

Chapter 5.

Walden's Informal Leadership and Its Prospects for Influencing Instruction

This chapter discusses the results of qualitative inquiry conducted at Walden. Through multiple interviews with the three selected informal leaders emerging from the network analysis reported in Chapter 4, logs of interactions prepared by informal leaders, interviews with teachers closely connected to the selected leaders in the three networks, and observations, qualitative inquiry sought to reveal an account of how informal teacher leaders—that is, teachers with no officially designated responsibility for providing leadership to colleagues—go about the practice of leading, as well as what prompts and facilitates their leadership. By examining the relationship between leadership intentions and specific leadership actions and interactions, this portion of the study further emphasizes the unique nature of informal leadership, along with the myriad constraints under which informal leaders operate.

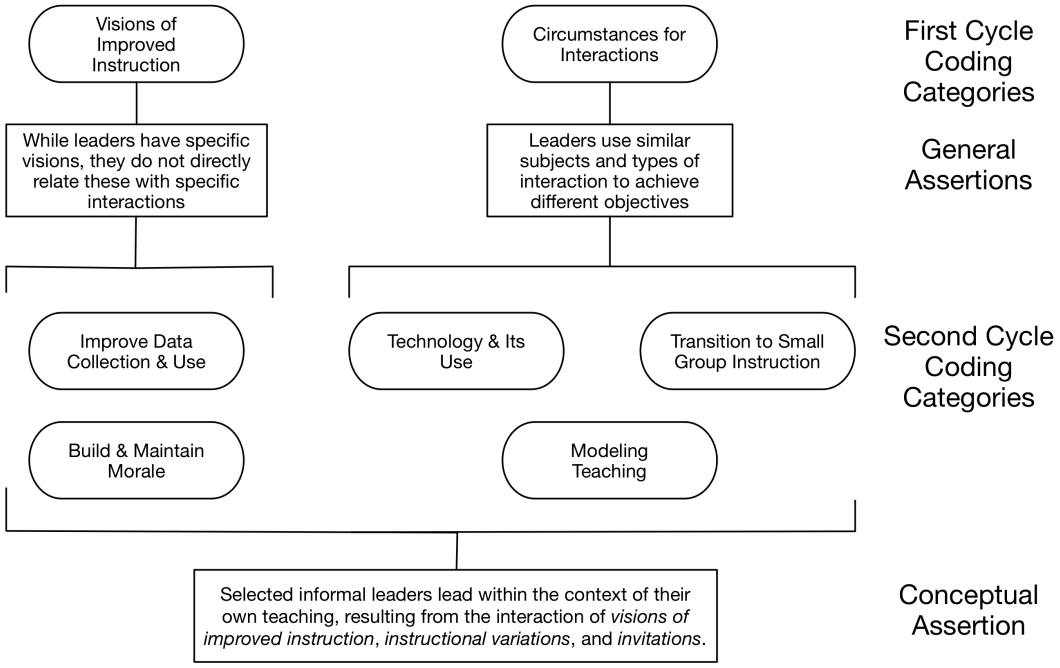
This chapter begins with a discussion of the techniques used for analyzing qualitative data, as well as the informal leaders under study. It continues by describing both the visions of improved instruction and circumstances that motivated interactions, and concludes by discussing three factors that together motivate informal leadership actions at Walden: visions for instructional improvement, variations in instructional

practice relevant to colleagues, and invitations to provide advice, information, and support.

Analytic Questions and Analysis Technique

Figure 3 documents, in brief, the stages and components of the analysis documented in this chapter, based on the data processing procedure described by Miles and co-authors (2014). After an exploratory period, the first cycle of coding focused primarily on three main categories. First, I identified the intentions of informal leaders, using what Miles and co-authors (2014) call values coding procedures. I used this group of codes in an effort to understand what leaders hope to accomplish through their interactions with their colleagues at Walden, as a necessary prerequisite to understanding how they go about leadership. Second, I identified instances of specific leadership interactions using a descriptive coding procedure. This process included both coding for types of interactions (i.e., how and where interactions took place) as well as the subject of those interactions (i.e., the primary topic of conversation). Finally, I sought to understand the relationship between intentions and actions using both a process coding procedure and additional pattern coding. Together, this three-part coding strategy was designed to mine available data to understand how individual informal leaders translated their individually tailored intentions into leadership actions and interactions.

Figure 3. Qualitative Analytic Process



To address the second research question ("What do these teachers practicing informal leadership intend to accomplish as leaders, and how do they translate those intentions into specific leadership actions?"), each leader was analyzed using a case-oriented approach (Miles et al., 2014). After the first coding cycle, a period of coding categorization produced two general assertions, discussed in detail below, that centered the second coding cycle around two types of intentions expressed by leaders, and three groups of circumstances that were instances for interactions between selected leaders and other teachers.

Research Question 3 asks "How do those interacting with teacher leaders participate in and respond to these interactions?" To answer this question, qualitative

data drawn from the survey, interviews with those closely tied to selected leaders of leadership, and from observation logs were analyzed descriptively to find all data points indicating how these teachers, selected for their proximity both to the selected leaders and to other teachers in the building, used and relied upon the advice and consultation provided by leaders. This data is discussed alongside the discussion of common circumstances for and intentions of leadership documented in this chapter.

Taken together, these techniques seek to answer the following analytic questions:

1. Why do selected teachers leading informally interact with colleagues? Of these intentions, which constitute or contain a vision for instructional improvement?
2. What is the relationship between the intentions identified above and the actions selected teachers leading informally take? How, if at all, does the vision of improved instruction attached to those intentions influence how, where, what, or why interaction(s) take place?
3. What other circumstances influence how, where, what, or why these interaction(s) take place? On the whole, what sets informal leadership in motion?

Finally, this chapter concludes with a discussion of the conceptual assertion that summarizes the results of qualitative work, along with a consideration of the strengths and limitations of the study's focus specifically on interactions as the center of informal leadership activities.

The three teacher leaders selected for this study are described briefly in Figure 4, below. Together, they represent diverse grade levels and specializations across Walden, as well as being among the highest rankers on each of the network questions provided in the survey. While each has spent less than the average tenure at Walden, each has at least five years of experience at the school. While inclusive of much of the mainstream educational experience at Walden, the selected leaders and alters expressed few connections to either Walden's gifted or EBD (emotional behavioral disability) programs; this study is unable to speak to leadership activities in those environments.

Figure 4. Selected Informal Teacher Leaders at Walden

Pseudonym	Lucy	Elizabeth	Susan
Network ID	W01	W03	W09
Position	Special Education	Grade 6	Grade 4
Years of Teaching Experience	5	10	12
Years at Walden	5	8	9
Top Network	Q2 (Brainstorm)	Q3 (Curriculum)	Q1 (Teaching and Learning)
Frequent Subjects of Interactions	Instructional differentiation Data collection and assessment	Encouragement and support Communicating informal norms	Techniques in reading instruction Curricula in mathematics

Informal Leaders' Intentions

To answer Analytic Question 1 ("Why do selected teachers leading informally interact with colleagues? Of these intentions, which constitute or contain a vision for instructional improvement?"), analysis focused on the *intentions* of informal leaders—that is, the specific reason or reasons why they sought particular interactions with colleagues. This study considers intention a critical element in distinguishing informal leadership practice from other forms of collaboration or sharing in schools; consciously or unconsciously, leaders seek something from their interactions, and these goals are what distinguishes leadership as a deliberate activity. Further, a focus on intention recognizes the tension in existing leadership literature, presented in Chapter 1, between describing school leadership as driven by a vision of quality instruction (as instructional leadership authors frequently assert) and describing school leadership as driven by specific situations and circumstances that call for leadership action (as distributed leadership authors frequently assert). Informal leadership may arise from either or both of these factors (among many others), and therefore intention is understood, where possible, to encompass both.

Qualitative data revealed at least 35 unique intentions for leadership activity among these three leaders alone, presented in Figure 5, below:

Figure 5. Coded Leadership Intentions of Informal Leaders at Walden

Advance the CAFE model[45]	Gather research on quality instruction[4]
Advance an inclusion model[5]	Improve professional "focus"
Avoid learning gaps	Identify struggling students
Avoid over-selection for SpEd	Interpret data[2]
Build inclusive relationships[1]	Involve new teachers[1]
Communicate informal norms[1]	Listen to colleague's concerns[1]
Communicate more with colleagues[1]	Meet one's responsibilities[5]
Coordinate intervention for a student[4]	Motivate colleague to attend PD[1]
Coordinate use of EAs[4]	Prevent lost teaching time[4]
Demonstrate a new practice[4]	Promote use of a tablet in instruction[3]
Design new curriculum[4]	Provide non-judgmental support[1]
Develop a grant application[3]	Push teachers to see own capabilities[1]
Differentiate instruction	Reduce fear around teaching[1]
Encourage colleague's persistence[1]	Reduce lost instructional time
Ensure lessons paced simultaneously[4]	Refine own teaching practice
Establish professional boundaries[1]	Share effective teaching techniques[145]
Find avenues for one's own ideas[45]	Share a new curriculum[145]
Gather data on students[2]	

1: Related to building and maintaining morale
2: Related to improving data collection and use
3: Related to technology and its use
4: Related to the transition to small group instruction
5: Related to modeling teaching

After intentions were described and coded, I then grouped these intentions into categories, focusing on intentions which contained or constituted a *vision for improved instruction* (namely: building and maintaining morale, and improving data collection and use), and those which referred to a *circumstance for interaction* (namely: technology and its use, the transition to small group instruction, and modeling teaching). While treated separately from visions for the purposes of categorization, circumstances for

interaction may also contain visions of improved instruction: that is, informal leaders may understand a particular set of best practices for the school's specific situation or particular needs.

The results of this categorization suggested two visions for improved instruction and three circumstances for interaction about which data could speak substantially. This categorization included 29 of the 35 intentions, including all of the intentions that were referenced by more than one of the selected informal leaders. Additionally, while the intentions that were not categorized pertain more directly to the leaders' responsibilities in their own classroom (e.g., identifying struggling students in one's own class, improving one's own professional focus, differentiating instruction for one's own students, etc.), they provide some additional insight into the learning challenges and concerns which frame both leaders' vision for instruction and instructional improvement, as well as the circumstances under which leaders interact with others.

These five categories, therefore, provide an overall view of the relationship between intentions for interacting with colleagues and informal leadership activities. They are, as all leadership however, contextualized by Walden's needs and challenges. These five categories are by no means the only ones through which informal school leadership can express itself; however, a qualitative discussion of their features and manifestations sheds light on how informal leadership functions in specific circumstances in one elementary school.

Visions of Improved Instruction

To answer Analytic Question 2 ("What is the relationship between the intentions identified above and the actions selected teachers leading informally take? How, if at all, does the vision of improved instruction attached to those intentions influence how, where, what, or why interaction(s) take place?"), this project's focus on visions comes directly from the instructional leadership literature, which argues effective leaders typically approach leadership work with specific ideas about effective teaching and learning in general, and effective instruction at their schools in particular (Murphy et al., 2007; Portin & Knapp, 2014; Schlechty, 2009). To a lesser extent, vision setting has also played a role in distributed leadership's understanding of what leaders do, but locates the process of establishing what that vision is within the interaction of a group of leaders (Spillane, Halverson, & Diamond, 2004; Heck & Hallinger, 2010). While much of the empirical literature in these theories focuses on how a vision is enacted in schools, little literature seeks to understand the role of visions of improved instruction among leaders without the formal responsibility or authority to project their vision to a larger group.

The enumeration of leadership intentions conducted in the previous section clarifies somewhat the relationship between intentions for leadership interactions and visions of instructional improvement. While most interactions between the selected leaders and colleagues had a clear intention, these intentions had a primarily implicit

relationship to the leaders' visions of improved instruction. While Walden's informal leaders can clearly express their visions for the school, they appear reluctant in qualitative data to pair specific visions with specific leadership actions; that is, while selected leaders discussed their visions for improved instruction, they did not describe these as forms of leadership, nor did they suggest they were trying to convince colleagues of the merits of that vision per se. Further, when asked about their goals as leaders, participants generally pointed to classroom practices they hoped to introduce or strengthen, rather than visions for improving the instructions of others: for Elizabeth, staying focused on her goals meant "staying focused on my students." In this way, participants understood improving professional discourse as a means of improving conditions for their own students: "I guess I just want kids to learn. So that's my goal is to make sure that kids have every chance to do that. And I think if we're working together, usually that happens more often" (Susan).

This implied link between leadership intention and leadership vision suggests a more complex relationship between the two factors. While the selected leaders have clear opinions about best practices for instruction, their interactions were limited to helping colleagues improve their instruction within the context of colleagues' existing practices and perceived strengths or as an aid to the leader's own problems of practice. Whether situated by visions of improved instruction, a circumstance in the school suggesting interaction, or both, individual interactions between leaders and colleagues

were an attempt to iterate practice or solve a particular problem rather than introduce radical changes in teaching.

Build and Maintain Morale

One vision of improved instruction implicit in intentions, cited by all three informal leaders, concerned building and maintaining a sense of morale, particularly among new teachers. Here, I understand morale to include both those factors contributing to positive or negative mood or professional atmosphere as well as those related to instilling a sense of self-confidence or self-efficacy; informal leaders cited building self-confidence more frequently than providing different kinds of personal support as reasons to interact with other teachers, particularly other teachers at their grade level. "Confidence," Elizabeth noted, "is a big part of teaching."

First, in the service of building specific colleagues' confidence and morale, selected informal leaders at Walden saw themselves as intending to help teachers process new ideas regarding teaching. Elizabeth identified several specific actions she takes during "check-ins" with other members of the staff, including being available to talk (being a "friendly face"), regularly "popping in" to the classrooms of new teachers, communicating Walden's informal norms and practices with new teachers, being available to listen to the ideas of others, and making others feel "part of the community." Each of these topics, she noted, lead into conversations where she could promote self–confidence regarding how other staff, especially new staff members, were

teaching: "I don't think that a staff member should be feeling like they don't like what they have to offer, especially if it's working and they have evidence that it's working." When asked why colleagues nominated her as a resource, Elizabeth believed it was because she was willing to try unique practices in her own classroom: "if other people feel like they're doing something really good and innovative … they'll come to me, like sort of commiserate, I guess, like, 'Nobody else understands what I'm doing. Is this really crazy?'"

Susan's recognized role among staff as someone who regularly read and digested research (Teachers W08 and W10) was also represented in her interactions with others: Susan spoke of intending to help teachers process their own strengths in terms of research on curriculum and instruction. "When somebody's reading [a book on Walden's instructional techniques] and they're like, 'Well, it says to do this' … I blend in other things to what I do so it's not maybe exactly like what one book says to do" (Susan). Another teacher recounted how Susan helped her prioritize elements of an instructional technique by telling her what parts of a book on instruction to focus on and illustrating how that technique could be blended with her existing practices.

Informal leaders also spoke more generally of their vision that building and maintaining positive morale improved instruction. Both Lucy and Elizabeth spoke of assuming "non-judgmental" attitudes toward the mistakes of others. For Lucy, this manifested as listening, "trying to figure out ways to help … [and] understand that

we're all human and we all make mistakes. Then trying to give strategies that are actually helpful." Elizabeth noted that by referring to her own classroom as a "work in progress," she felt she could reassure colleagues that they were "not being judged." Like Lucy, Elizabeth also pointed to these moments as instances where teachers could be pointed toward processes of instructional improvement without elements of judgment. "I say a lot of things like, 'Yeah, it took me awhile to get here.' Or, 'I had to, I read this book.' … You don't want to feel stupid just because you need some help with something" (Elizabeth).

Though all three selected informal leaders were heavily promoting the use of small group instruction, in line with Walden's shifting focus, they also cited the need to balance curricular mandates with "what works," by which they seem to mean finding practices that fit in with colleagues' existing techniques while also addressing new curricular and instructional mandates. This message was also communicated explicitly to colleagues. In one such instance, Elizabeth recalled talking with a teacher who felt she was implementing CAFE-style reading instruction poorly:

> [The teacher] would say things like 'I'm not doing CAFE well. I can't figure out CAFE. I just keep going back to the same old thing that I'm doing. I must basically suck as a teacher because this is what works for me and it's not what the school is doing.' And I'm like, 'Every thing that you're doing can be put into this CAFE model. Just means you're breaking up your lessons into shorter

chunks. You're still teaching the same exact awesome stuff. Look at what your kids are producing. Look at what they're talking about. Look at what they're doing and how excited they are.'

Susan also spoke of facilitating the promotion of the CAFE model by encouraging other teachers to find new books or practices that could fit within the framework of their existing classroom practices with slight modifications.

While much of the morale boosting undertaken by Walden's informal teacher leaders regarded a particular instructional transition, it represents many of the themes of teacher leadership theories, including the "third wave" focus on improving teacher skills within the context of a particular instructional program. These data also illustrate the direct connection Walden's informal leaders perceive between the morale of teachers and those teachers' sense of self-efficacy.

Improve Data Collection and Use

Another vision of improved instruction implicit in several intentions concerned the presence and use of data in teachers' work, a practice that the three teacher leaders were well positioned to promote among their colleagues. For Lucy, the need to incorporate regular assessment into interventions for special education students helps drive a primary focus in her leadership practice on data collection and data interpretation. While both classroom teachers profiled as leaders here, as well as other teachers at Walden, regularly interact with formative assessment data, Lucy's need to

coordinate instructional interventions across several teachers and teaching assistants providers a unique context for leadership activity around the collection and use of data.

During the study period, Lucy served several roles at Walden related to data: she was the representative to the school's building leadership team focused on data as well as the supervisor of several para-educators tasked with, among other responsibilities, regularly assessing special education students throughout the building. For many teachers, Lucy was also a point of support regarding the shared electronic document used by many teachers to record data points for each student. However, Lucy also saw regular data collection as a tool for coordinating and simplifying practices for classroom teachers: "my hope is that the behavior plan makes their job easier, not just one more thing that they have to do."

Lucy cited the school's transitions in instructional programs, including to the Common Core, as a major reason why a well-established program of pre- and post-testing for all students had become disrupted. In the previous curriculum, "every single grade level was using it and there was a pre- and post-test every Thursday," each of which went into the shared document. "I could pull [a particular standard] up and then see every single 4th grader and see how they did on that post-test … It was just really clear and specific." Lucy saw reminding teachers to consistently collect data and helping develop new assessments for the new curricula as part of her role working with classroom teachers to improve practice school-wide. Primarily, however, Lucy saw

formative assessments of students as connected directly to her own practice: "What were the holes? What were some kids' misconceptions? What examples of problems were kids struggling with? That will help me plan my intervention for the next two weeks."

However, most conversations regarding improving data collection and assessment began for Lucy as extensions of conversations about specific students or specific curricular units. One such conversation I witnessed during a planning period began when one member of the specialist team began talking to Lucy about planning the next few weeks of intervention with a particular fourth grade student. After reviewing the shared student data document, Lucy discovered that several of the student's planned assessments either had not occurred or were not recorded. The push for more documentation for the student "who still doesn't know how to divide," in the specialist's terms, became a broader conversation when a third specialist entered the room and argued strenuously for the need to collect more data on students more often, in order to avoid a "constant triage load." With two specialists now presenting aligning but unique accounts of what all three saw as a problem of practice in the school, Lucy sought to intervene by asking fourth grade teachers, during a regular planning meeting, to assess their students on at least a monthly basis and record these scores in the shared document.

The relationship between problems of practice and a leadership action—in this case, advocating a new data collection scheme with the fourth grade faculty—suggests the situated nature of leadership discussed by distributed leadership scholars. It also alludes to the ways in which leadership is shared: in this instance, Lucy relied on her colleagues to help identify problems and formulate potential solutions. However, Lucy's role in the situation is also unique: Lucy's two colleagues turned to her to frame the potential solution to the problem and to advocate with the appropriate staff. While much of the impetus for Lucy to take the lead with staff may come from her personal relationships, it may also tie directly to professional responsibilities. When turned to for help, one teacher said, each of the three leaders selected for the study "have a vested interest in actually getting something out of [a task] instead of clocking in and clocking out" (Teacher W10). The situatedness of teacher leadership may, in this way, relate directly to a teacher leader's day-to-day instructional practice as well as her expertise.

An important limitation to discussing this vision of improved instruction is the limited information this study has about the ways in which the other two selected informal leaders address data collection and use in their interactions or in their professional practice more generally. First, this suggests important cautions around discussions of the promotion of data use prominent in other leadership literature: because Lucy's practice involves work with students across grades and classrooms, she is uniquely positioned among the informal leaders in this study to see and respond to

school-wide problems of data collection and use. While the other two informal leaders almost certainly use a variety of data as part of their own practice, they are not similarly positioned (it would seem) to address issues of data related to the practice of others.

Second, conversations about data collection and use even for Lucy begin within the context of her own practice and the perceived needs of individual students. In both the observed example and in those discussed in interviews, Lucy's understanding of the school's strengths and weaknesses with respect to data were directly informed by attempts to collect and use data on her own students. While these ideas cohered into an overall vision for improved instruction, accompanied by a causal understanding of why data collection had decreased and how to solve that problem, that vision was inextricably connected to the scope of her professional practice, the need to coordinate interventions across classroom teachers and teaching assistants, and the like. While specific to Lucy, this vision therefore provides an example of how seemingly abstracted understandings of school problems and priorities can emerge from within the context of one's own professional practice.

Circumstances for Informal Leadership Interaction

To answer Analytic Question 3 ("What other circumstances influence how, where, what, or why these interaction(s) take place? On the whole, what sets informal leadership in motion?"), this study also seeks to understand informal leadership interactions by exploring the subjects and types of interactions that occur at Walden. In

so doing, I make some distinction between the subject of an interaction (e.g., literacy instruction, how to differentiate, student behavior, etc.) from the type of an interaction (e.g., modeling teaching, collaborative lesson planning, conferring regarding a student, etc.), while also recognizing that these two elements are often closely related to one another. Unexpectedly, none of the three selected informal leaders seemed to concentrate their leadership in a particular academic content area or area of instruction to the exclusion of others. Instead, selected informal leaders use similar subjects of interaction, it seems, to achieve different objectives. This may suggest a common set of concerns shared across staff situated in Walden's particular context.

Further, most of the leadership interactions described in logs were of similar types (for example, "drop ins" to other teachers' rooms and formal grade level meetings) and mostly excluded others (for example, emails and phone calls). While some alters described unique out-of-school contexts for their interaction (a regular shared exercise routine or travel to a professional conference), most interactions occurred at sporadic intervals during the school day. Time—or lack thereof—was cited by both leaders and alters as a major barrier to more regular professional interaction: most interactions outside of formal meetings occurred as a secondary part of common planning times, when available, or over lunch.

This section highlights three circumstances for interaction: conversations about technology and its use, conversations regarding Walden's transition to small group

instruction, and opportunities for the modeling of instruction that were sometimes spurred by Walden's principal. Like the visions for improved instruction discussed above, these are inextricably bound in Walden's contexts and challenges; however, their features suggest how those who seek informal leadership often seek and receive it and at least some ways through which formal leaders can bolster informal leadership activity.

Technology and Its Use

One circumstance that frequently prompted interaction between selected leaders and colleagues concerned technology and its use. Walden was implementing several new technologies during the period of the study, including providing tablets to several classrooms, sharing data from student assessments through both a shared document and an electronic notebook system associated with the school's literacy program, using digital whiteboards in each classroom, and providing shared resources on mathematics instruction through a district-wide network. Each of the selected leaders referred to providing help, technical or otherwise, with at least one of these technologies in their logs of leadership interactions. Providing help with technology was mentioned as an important area of leadership by alters at least once for each of the selected informal leaders at Walden.

By itself, technology and its use are not inherent parts of instruction or instructional effectiveness. However, the scope of these new programs, combined with

their potential learning curve, speaks to a potential connection between the use of new technologies and the implementation of Walden's instructional program. When asked about this connection, Elizabeth argued that a lack of fluency by teachers in a technological tool can be a barrier to implementing a curricular change that comes with a technological component. Susan suggested that comfort with technology makes teachers more likely to "go and look for" new tools to aid their practice. Susan also focused on reducing what she called "technology phobias" among staff: students "need to use more technology, so if we're not using it then I think sometimes they don't have the opportunities either." Susan noted that use of an electronic conferring notebook around literacy enabled better communication between teachers: "before, pages would be missing. [Teachers] took them out and they never got put back. There was just a lot more to it that I think could go wrong." Similarly, Lucy noted that assessment data was more complete because it was tracked in a common resource; Lucy also used her own technological fluency to secure a grant with the school librarian to use digital audio players in literacy instruction.

Susan's practice also provides an example of how sharing a particular technological tool can aid in the spread of an instructional technique. To support her own classroom practice of student-managed activities during reading time (part of the "Daily 5" component of CAFE), Susan used her electronic whiteboard to track the activities her students were completing during the week, asking each of them to tell her

both what they were doing and their goal for that particular activity. As other teachers queried Susan about how she manages her classroom during these periods, she provided this organizational tool as a key part of her management technique: "I show them what to do to organize [check-ins] … sharing with them how I make it work." In this way, sharing how to use a particular piece of technology in a different way played a role in making the practice of "Daily 5" itself less daunting for other teachers.

While considering "technology" as a singular entity in schools can misleadingly conflate different types of instructional practices, the reputation of each of the three selected informal leaders in the study as particularly technologically literate is noteworthy. Little research currently evaluates the push by instructional leaders to adopt new technology in schools, particularly technology's tradeoffs with respect to teaching and learning (Kruse & Buckmiller, 2015). While understanding digital media as tools that appear to aid instructional practice, this study's findings also concur with the need for more research on how instructional leaders consider technology in their practice.

Transition to Small Group Instruction

While playing a role throughout most of the circumstances of leadership mentioned by the selected leaders themselves, Walden's transition to small group instructional models, first in reading and increasingly in mathematics, was referenced by several alters as an important source of interaction. As with technology, each of the

selected informal leaders in this study referred to their own professional training in small group instruction prior to its introduction at Walden and were each considered a resource on how to make such instruction "work" in colleagues' classrooms. "If I turn to [the selected leaders], it's usually for advice or, 'How do you do it?' or, 'What's a good way to do this?' Or 'How do we do it? 'What do you guys do here?'" (Teacher W07). Teachers W08 and W13 also emphasized the role selected school leaders played in explaining how small group instruction took place in their classrooms. All three leaders have also provided advice and guidance to colleagues regarding how to train and work with para-educators to implement the small group approach.

Elizabeth described her relationship with Walden's small group, CAFE-style curriculum as directly tied to her personal feelings. "I don't use the curriculum if I don't agree with it, which is kind of terrible, but I don't … The things that we've adopted here I feel very strongly about" (Elizabeth). Having been professionally trained in CAFE prior to moving to Walden, Elizabeth and Susan were both early adopters of the approach in literacy as sixth grade teachers, and attended additional classes and seminars. When Susan transitioned to teach grades 3 and 4, both teachers served as resource for other staff in their respective buildings among upper or lower grade levels. Elizabeth described her role in CAFE's spread as involving both sharing her own instructional techniques and inviting other members of her grade level team to exhibit and incorporate their own teaching:

> CAFE has been an issue with some people. They don't really know how to implement it. And so the elbow-to-elbow thing, I'm constantly like, 'This is what I'm doing. This is what I'm doing. This is what I'm doing. Do you have any ideas for this?' Just showing my team that they have all of these ideas in their head and it totally fits with the model that we're using.

Elizabeth further emphasized that allowing time for the implementation of a new instructional strategy is important: "I valued this and so … I just kept doing it with integrity."

Susan's practice as an informal leader and resource on CAFE was closely tied to her acknowledged role among staff as a source of research. Susan emphasized the importance of persistence with colleagues in reinforcing the techniques, as well as being able to adapt knowledge to particular situations:

> There's just a difference in teaching whole group to small groups and I'm hoping people are seeing that that's a good change. I know it's a lot more work, though. So I've talked to a couple people who sometimes will reminisce about how you could just follow the curriculum page by page and it would just tell you what to do. And when you're teaching this way, it's not like that. You are really trying to be responsive to what your kids need. So there isn't a manual you can just follow from cover to cover.

Teacher W08 recounted turning to Susan after becoming frustrated with teaching mathematics to the class as a group; Susan's response was to lay out for Teacher W08 a relatively new model for using CAFE in mathematics. Susan's advice, according to several colleagues, "is backed by current research in education" (Teacher W08).

Lucy, a special education teacher, saw the spread of CAFE as an opportunity to build a more inclusive educational model for special education students: "I just started piggybacking on what the classroom teachers were doing." Lucy noted the relative ease with which a small group instructional model allowed her work with students in their primary classrooms to appear ordinary to other students. Regularly, including in at least one observed instance, a student was shifted from a small group led by a classroom teacher into Lucy's group in the middle of a lesson because the pace of Lucy's group was seen as more appropriate. Lucy noted that the normalization of small group instruction facilitated conversations with other teachers and brought special education students more closely into the general education program: "before—and I know other Resource Room teachers feel this way—you're kind of your own little entity. You're not getting to work with other teachers, because you're not doing anything they're doing." In contrast, the new curriculum "gave me more of a reason to communicate more closely with" classroom teachers.

Modeling Teaching

Another circumstance prompting interaction between selected leaders and colleagues involved teachers, including selected leaders, modeling instruction for colleagues; instructional modeling was seen as a key element contributing to the promotion of small group instruction. Both leaders and alters referred to modeling instruction as one of Walden's principal's chief priorities as an instructional leader: he is known for encouraging teachers to visit other classrooms, offering to take over their classrooms or provide substitutes during observation periods, and pushing teachers to record their observations on an office bulletin board. Susan saw this as a strategy on the principal's part to promote the spread of small group instruction in the building: while the principal is "not the type to say 'you have to do this,'" he had encouraged teachers to specifically visit Susan and Elizabeth's classroom to view how they conducted small group instruction. Teacher W10 also mentioned the principal's push for other teachers to observe Susan's practice.

Susan acknowledged that her own intention when modeling instruction is showing a teacher how a strategy works with a group of students: other teachers "want to see how does it actually work, what does it look like, [and] how are the kids checking in with me." Increasing other teachers' comfort with this idea was one of her main leadership goals going forward. "I just tell them, 'You'll come in and you'll see what

you see.' Sometimes it's not perfect … Sometimes things go smoothly and perfectly and other times things happen."

Modeling instruction aligned with several other themes of informal teacher leadership at Walden including reinforcing the strengths of colleagues by observing their own classes, demonstrating the use of technology in the classroom, and facilitating the transition to a small group instructional model by providing concrete practices for other teachers to follow. This particular interaction was also one in which the strategy of Walden's principal was particularly apparent: rather than compel teachers to follow the small group approach, all three informal leaders noted, the principal encouraged observation of their practices to show that such an approach could be successful with students. Unlike some other informal leadership activities, direct administrative supports have lead the modeling of instruction to take a central role in Walden's overall improvement strategy.

Discussion

This qualitative study's focus on informal teacher leaders through their interactions produces a complex and, at times, ambiguous picture of adult interaction in one elementary school. This study reinforces the idea, present in the literature, that particular circumstances in schools are primarily responsible for motivating specific leadership actions. Further, there is no one overriding narrative underlying the

leadership practice of the three selected leaders at Walden: no one individual is the sole expert on an academic subject, instructional technique, or student group.

However, within these constraints, Walden's selected informal leaders exhibit leadership behaviors put into context both by their own teaching and student needs. In this sense, the study concurs with the emphasis placed by distributed leadership theories on the *situated* nature of informal leadership, entwined with a set of tools, situations, and actors that, in this case, seem to primarily originate from the informal leader's own students and teaching. This situated nature leaves a central role for the intention of informal leaders: to act as leaders, individuals must still deliberately choose to participate in or perform a leadership act for a certain reason. However, this study provides a set of factors that situate leadership intention when informal leaders lead through interaction with colleagues.

I find that particular leadership actions or activities instigated by informal teacher leaders at Walden require at least three elements: a vision of improved instruction held by the informal leader, a particular variation in instructional technique perceived to be relevant to a colleague's needs, and an invitation from a colleague to provide input on a particular question or concern regarding student learning. These are described below, with examples of each element provided in Figure 6.

A *vision of improved instruction* is a particular idea an informal leader holds about good teaching and learning, grounded in the leader's own practice, which they may or

may not implicitly believe can improve the school's instructional practices in various ways. As anticipated by literature on collective leadership in schools, I find that informal leaders at Walden have clear and developed conceptions of effective teaching and instructional improvement. This study suggests that informal leaders do not necessarily seek overtly to spread these beliefs to others: indeed, in some cases represented by the intentions categorized in Table 5, identified leaders interacted around improving their own instruction (and particularly on improving equity). In both cases, however, the specific kinds of advice, information, and support discussed by informal leaders were ultimately grounded in informal leaders' understanding of what works well in their own classrooms. While visions of improved instruction can originate from broad understandings of good teaching and learning (e.g. the importance of teachers' own sense of self-efficacy and morale), they may also emerge from what informal leaders believe are best practices in a school's particular circumstances (e.g., the best ways to implement a small group instructional approach).

An *instructional variation* refers here to any kind of instructional approach that differs from the way things are ordinarily done in a particular school or district. The informal leaders selected for this study share a focus on Walden's development of a small group instructional model informed by their own conceptions of effective teaching. Each of them was, in unique ways, part of that model's early development at the school and continue their involvement by using the approach in new academic

subjects and new teaching contexts. Correspondingly, as more and more of their colleagues have adopted small group instructional models, these leaders are frequently consulted regarding the specifics of bringing the model to fruition in classrooms. While it does not appear necessary that a school share a model of instruction for informal leaders to lead, as this school does, the fact that informal leaders are already exhibiting one or more instructional variations (and not necessarily the same ones), might predispose others to see them as a potential resource. What Walden's leaders have in common is the connection between their leadership interactions and instructional approaches that others either seek to learn more about or believe can solve particular problems.

Finally, an *invitation* refers here to a specific question or concern regarding student learning, raised by a teacher other than the leader, that connects, in the mind of the informal leader, a particular practice he or she knows with a need outside their classroom. Such a question or concern need not be one that has been formally recognized as a focus for professional development or other more legitimized and formal leadership events. While Walden offers several opportunities for formal and planned professional development, the studied informal leaders had access to relatively few opportunities to formally share their classroom practices with colleagues. Instead, particular problems in student learning—teachers struggling to implement a new lesson, students shared with other teachers requiring specific support, confusion

regarding new initiatives, etc.—spurred conversation about how to use a particular instructional variation to solve a particular problem.

This framework provides a more detailed understanding of the situations in which leadership arises in Walden. Concrete examples of such situations are provided in the table below:

Figure 6. Examples of Factors in Leadership Interactions

Vision of Improved Instruction	Lucy: Frequent monitoring of student data ensures teachers can appropriately plan for each student's individual learning	Elizabeth: Effective teaching comes, in part, from agreeing with and believing strongly in the curriculum one teaches	Susan: Small group-based reading instruction should require students to help manage their daily reading activities
Instructional Variation	Several teachers, including Lucy, assess regularly and use a shared document to track scores for each student	Elizabeth frequently experiments with instructional and classroom management techniques, including the CAFE model	During each reading period, Susan checks with each student to see what their activity is, and places this on a "check in sheet"
Invitation	Another specialist asks Lucy for information regarding planning a lesson for a fourth grade student with little data provided on	A teacher Elizabeth sees as successful, but who teaches outside the school-wide CAFE model, shares concerns about not adjusting quickly enough	A teacher comes to Susan requesting help on how to manage the classroom during small group reading activities

	the shared document		
Action / Interaction	*Lucy and specialists discuss how to achieve greater assessment frequency and documentation*	*Elizabeth speaks with the teacher about contextualize their existing lessons and approaches within the CAFE model*	*Susan shares her check-in sheet with the colleague and models how to use it in their classroom*

The table illustrates primarily how individual instances of leadership interactions were understood to include each of the three elements identified. They also serve as concrete examples of the relationship between these three elements.

In one instance, classroom observation and follow-up interviews show Susan emphasizes the relevance of having students monitor their own progress during small-group reading activities, a function she performs using a digital "check in" sheet visible to the class. Susan also referred to a time when a colleague requested help on classroom management strategies during small group reading activities. Here, Susan connected the colleague's problem with one of her own practices (including an underlying vision for effective small group reading activities), and provided the "check in" sheet to the colleague. While this system may not have originally been intended as a management technique per se, this interaction facilitated both a response to the colleague's concern and a means by which Susan's understanding of quality instruction was passed onto the colleague in the form of a particular practice.

In particular, this way of understanding leadership interactions highlights the resource constraints present for informal leaders; when leadership is not part of one's already busy job description, one's leadership role can become limited and segmented across a school day or year. This, in turn, may suggest why Walden's selected leaders did not articulate a more direct relationship between their visions for improved instruction and their leadership actions.

Qualitative data at Walden also emphasizes the central role of those who interact with the selected informal leaders in motivating and shaping leadership interactions. First, those who "receive" leadership under certain circumstances can also exert influence over the focus, form, and ultimate effect of the leadership work; each of Walden's selected informal leaders repeatedly emphasized their own regular need for advice and support from colleagues in some areas of practice. Additionally, however, the role of those interacting with informal leadership in asking questions, raising issues regarding particular students, and otherwise setting the agenda for leadership interactions plays a major role in what elements of their practice leaders share, and therefore what elements of a school's instruction are targeted for improvement.

Together, these notions speak to Ogawa and Bossert's description of leadership as "an organizational quality … flow[ing] through the network of roles that comprise organizations" (Ogawa & Bossert, 1995, p. 225). While an individual leader's roles in an organization bind their leadership actions and individual traits can further enable or

constrain those actions, it is in interaction between the aims and abilities of the leader, their social relationships with others, and a school organization's context that determines how and where informal leaders exercise their influence.

These findings further emphasize the connected nature of visions for improved instruction and the circumstances of leadership that lies at the heart of distributed models of instructional leadership. The visions of effective instruction that instructional leadership authors speak of do not arise in a vacuum: they come as the direct result of the strengths, weaknesses, and challenges leaders experience as part of their daily work in a particular school or situation. Simultaneously, the circumstances of leadership that distributed leadership scholars seek to understand carry with them leaders' understandings of what good instruction is, whether in general or within the context of a particular situation. Leadership work, particularly for informal leaders, requires in this way reference to both the specifics of a school, a teacher, or a student, and the general principles of quality teaching and learning.

Limitations

The qualitative portion of this study also has important limitations. First, the role of location and proximity in the colleagues to whom individuals turn, and how frequently, is not captured here. Though frequently mentioned by alters as a factor preventing interactions they would otherwise engage in, this study provides no means

of understanding how changes in staff location could potentially influence the level of interactions.

Insights into non-informal parts of Walden's leadership and school culture are also limited. In part because they had relatively few connections to other staff members on the network instrument, this study offers no insights on activities by teachers in either the EBD classrooms at Walden, or the high capability classroom spanning grades 4-6; it therefore excludes those who teach both the lowest and highest performing students. This limitation places important caveats on discussions regarding general teaching practices and the spread of ideas at Walden. Further, this study by design does not seek to completely describe the role of formal leadership, including Walden's principal, in the school's overall leadership activity. While I choose to not discuss that work here in order to highlight and privilege the interpretations of informal leaders over formal ones, formal leaders also have interaction patterns worthy of study and with strong potential impact on instructional improvement.

Finally, the qualitative portion of this study does not, and cannot, speak to the relationship between informal leadership and student outcomes. At most, the study's conceptual framework posits a relationship between informal leadership interactions, changes in instructional practice, and changes in outcomes. However, changes in instructional practice are themselves beyond the scope of the study: in many instances, Walden's informal leaders sought changes in colleagues' practice over time rather than

the immediate present. These relationships become all the more pertinent in accountability-heavy environments or where (as in Walden's case) stagnating student achievement scores are a major concern for formal leadership and teachers alike. The following chapter further considers the relationship between informal leadership and student outcomes.

Chapter 6.

Conclusions and Implications

This chapter summarizes the quantitative and qualitative stages of this study using techniques drawn from the mixed methods research literature to integrate, juxtapose, and test the soundness of assertions drawn from both stages of evidence. It considers each of the study's research questions in turn, drawing from both sources of evidence. This chapter concludes by providing methodological implications of this work, important questions for future work, and recommendations for scholars, policymakers, and practitioners.

The term "mixed methods social network research" is applied to the quantitative and the qualitative stages of this study to reflect elements of social network theory throughout design, data gathering, and analysis. Though driven by this study's focus on leadership questions and concerns, this study's procedure holds important similarities with Baker-Doyle's (2014) "tri-modal" technique for "mixed-methods social network research" (Baker-Doyle, 2014, p. 4) on teachers. First, quantitative network data provided the background for both qualitative data gathering and some qualitative analysis. Second, data focused on gathering "networks in stories" by "interviewing and observing participants specifically about the ties they developed in relation to the issue being researched" (Baker-Doyle, 2014, p. 5). Third, qualitative strategies for understanding shifted to understanding "stories in networks" by examining each of the

selected informal leaders as cases of the phenomenon under study. Finally, each of these stages informs and checks the validity, reliability, and credibility of data gathered in the other two stages, the process undertaken in this chapter. This process, albeit an emergent one, justifies consideration of this and similar work as a unique form of mixed methods research with social network elements infused throughout.

Integrating Qualitative and Quantitative Information

To address the implications of qualitative and quantitative data in concert, this chapter uses the mixed methods analysis strategy labeled "warranted assertion analysis" (Onwuegbuzie & Combs, 2010) to review both sets of data and reveal defensible and relevant inferences. This strategy builds upon the assertion of pragmatist mixed methods research that both qualitative and quantitative data can be discussed under one unified conceptual framework. Starting with the research questions that guided this project, the chapter also seeks to draw out or connect potential inferences to research questions where they are answered by data sources alone or together. In this case, the intent of analysis is not necessarily to combine one type of data into another, but to use the data (and, particularly, inferences from the data) in combination to address those research questions that lend themselves to mixed methods inquiry.

Question 1: Who is Sought for, and Exercises, Informal Leadership

Question 1 asks "In an elementary school, whom do teachers turn to for advice, information, and support on instructional matters? Who among these individuals

exercises leadership informally?" Quantitative data identifies, for this study's purposes, three teachers (who were not positional leaders) with in-ties greater than one standard deviation above the mean on at least one of each of the three informal leadership questions asked. Qualitative data revealed that identified leaders each had early experiences with the small-group instructional techniques rising to prominence at Walden; their particular expertise was not specific to a topic of instruction or grade level, but focused on helping colleagues apply techniques to specific circumstances. Together, responses to network questions and associated quantitative analyses successfully identified different routes through which advice, information, and support travel at Walden, thereby demonstrating leadership activities in which teachers could and did take part. Further, a limited number of individuals were turned to for these types of leadership. Qualitative data further suggested that the trend toward use of a new instructional technique in the school motivated a substantial portion of questions colleagues asked these informal leaders on teaching and learning.

As suggested in the distributed leadership literature (e.g., Copland, 2003; Mayrowetz, 2008; Spillane et al., 2004), quantitative data confirms the strong role expertise plays in the influence of informal leaders. Each of the selected informal leaders was strong in the network addressing expertise (that is, they were turned to as resources on teaching and learning): additionally, in both the networks in which teachers sought expertise in teaching and learning and information about curriculum,

77% of the teachers at Walden turned to at least one of the three selected leaders for advice, information, and/or support. Qualitative data suggests, however, that none of the three selected leaders provides expertise exclusively in one grade level or subject area. Logs, observations, and interviews with alters suggest that each of the leaders are turned to for a variety of advice, information, and support across grade level and across subject area. Further, selected informal leaders are not the most experienced teachers in the building, either at Walden or in the teaching profession in general. Instead, they appear to be connected as teachers who gained early experience with new instructional techniques, becoming resources as that technique spread. To a certain extent, quantitative network structures reflect this pattern: the question on information about curriculum features heavy in-ties for the selected leaders.

However, qualitative data provides an enhanced understanding of the relationship between expertise and personal comfort with a leader implicit in the network questions. Network question 2, regarding whom teachers turn to in order to brainstorm about problems of practice, is the most different of the three questions, perhaps because it does not explicitly reference colleagues for their expertise. Qualitative interviews with alters confirm, to some extent, this speculation: colleagues of selected leaders frequently spoke of factors like their approachability, willingness to listen, and non-judgmental stance in articulating why they were turned to for advice, information, and support. This difference is a reminder that expertise is not the only

qualification of an effective leader; for informal leaders, one's personal approach appears to play a substantial role in becoming a valued resource on instructional matters. This notion appears related as well to the explicit focus of all three selected leaders on building and maintaining the self-efficacy of their colleagues.

Future studies could explore more fully how leadership is exercised in networks that form around brainstorming solutions to problems of practice. Here, the findings from my study suggest the network was more diffuse with a wider variety of individuals potentially exercising some form of informal leadership. Quantitative data shows that all but one teacher at Walden was turned to by at least one colleague to provide brainstorming about problems of practice, an important difference from the other two, more clustered graphs. Both quantitative and qualitative data indicated that brainstorming was a significant source of influence for alters: those individuals were picked for interview in this study because they work to tie otherwise disparate groups of colleagues together. While brainstorming is an opportunity to spread ideas about teaching and learning, what ideas it spreads and how it spreads them remains an important gap in the field's understanding of how leadership is distributed across school staffs.

Question 2: How Leadership Intention Translates into Action

Question 2 asks "What do these teachers practicing informal leadership intend to accomplish as leaders, and how do they translate those intentions into specific

leadership actions?" To answer this question, quantitative network data was necessary to select the appropriate participants for qualitative analyses. In qualitative interviews, the identified informal leaders referenced many separate intentions, though they did not exclusively link these to leadership actions. Instead, interviews together with log and observation instruments suggest leadership interactions require three distinct elements: the visions for improved instruction of informal leaders, specific instructional variations that appear to leaders to meet the needs of colleagues, and invitations from colleagues to provide specific advice, information, or support. Informal leaders professed a strong personal belief in the instructional techniques they used, alongside a desire to provide "non-judgmental" support to colleagues.

Teachers leading informally were therefore not (at least overtly) interested in promoting a particular instructional vision with colleagues. Instead, their intent was to promote a sense of self-efficacy and confidence among colleagues while still "authentically" representing the work they conducted in their own classrooms. Quantitative correlations between networks confirm this finding by suggesting the same informal leaders interacted with different individuals when providing different types of advice, information, and support. Departing somewhat from the current focus of the formal leadership literature, interactions between teachers leading informally and colleagues, identified quantitatively and explicated qualitatively, focused more on the specific application of particular techniques of instruction than in setting or enforcing a

broad instructional vision. These activities included processing new ideas regarding teaching, digesting research, modeling instruction, and discussing how to balance the vision with "what works" in particular classrooms or for particular teachers. Observation and log data suggested that, occasionally, these interactions broadened to include more school-wide issues of policy or practice, such as the frequency of assessment or the efficacy of a curriculum.

Together, these findings point to an important theoretical gap regarding how influence occurs. While all sorts of activities and interactions influence the direction of an organization, not all would or should count as "leadership," and the nature of their influence on events or activities may not reflect what is rightfully understood as leadership. Much of these types of activities have been understood in the leadership literature as forms of sensemaking, following in the tradition of Weick (1995) and other authors in cognitive science. That is, leadership activities and interactions can help teachers, for example, identify and understand discrepancies between a student's expected performance on an academic task and their actual performance, or between how a curriculum is described theoretically and how it is experienced in practice.

As described in Chapter 1, the actions of teachers leading informally need not contain the full structure of sensemaking to provide value to the organization: that is, they need not contain all parts of Weick's (1995) well-developed process by which individuals make sense of events. Informal leaders at Walden working with small-

group instructional models, for example, guided colleagues on what elements of those techniques were most important or best fit with the colleagues' existing instructional practices without necessarily engaging colleagues in a fully developed cycle of understanding and interpretation. These acts of "interpreting" are further distinguished from sensemaking because, as Weick (1995) argues, they are manifested in both processes and products. Walden's informal leaders, to that point, emphasize products: a data recording system, a mechanism for tracking student-managed activities, the use of science kits, and the like. Though they emphasize concrete applications of techniques over the complete understandings described by sensemaking theories, Walden's informal leaders are nevertheless contributing to the effectiveness and self-efficacy of their colleagues in meaningful ways.

Question 3: How Colleagues Respond to Informal Leadership

Question 3 asks "How do those interacting with teachers practicing informal leadership participate in and respond to these interactions?" Quantitative analyses indicate that the three networks examined here vary most in terms of whether pairs of individuals are or are not connected to one another (the dyadic level), suggesting that while the teachers connected to the most colleagues were similar across each time of leadership activity, each represents relatively different sets of relationships. Qualitative data also illustrates the important role played by colleagues seeking leadership in inviting informal leaders to provide advice, information, and support. Where time and

resources limit the formal opportunities for teachers to share classroom practices, research, data about students, or the like, informal leaders rely on colleagues to ask appropriate questions and raise important problems in student learning to broader attention.

In qualitative interviews, colleagues of informal leaders were reluctant to identify selected teachers as "leaders," saying both that many teachers in the school practice leadership and that some of the identified teachers were inexperienced. However, observations and logs confirm that the identified informal leaders are turned to in order to brainstorm about instructional techniques, facilitate the use of technological tools, summarize current research, and communicate important priorities to other staff members. The apparent conflict between staff perceptions of who leads and the findings of other measures in this study may relate to the drive toward egalitarianism common in many school cultures (Lord & Miller, 2000; Neumerski, 2012), where selecting any one teacher for praise or otherwise conferring higher status on a teacher is considered inappropriate. Such a culture is further advanced by the notion that being a "leader" is an aspirational quality. In line with authors who perceive leadership as a quality pertaining to interactions (e.g., Coburn & Russell, 2008; Penuel et al., 2012; Spillane et al., 2014; Sun et al., 2013a), this study does find important shared roles for all parties in a leadership interaction, emphasizing the invitation colleagues make to informal leaders to provide advice, information, and support, and further

suggesting that such invitations themselves are a part of "leadership." However, this study also confirms the central role of expertise—at least unique expertise in what the school is presumed to need—as a trait separating leaders from others on a school staff.

Future Questions

This study suggests four major areas for future inquiry. First, future studies should explore the link between informal leadership and how some scholars describe *organizational learning*. While various strains of scholarship exist on organizational learning, in recent years, both leadership scholars (Collinson, Cook, & Conley, 2006; Finnigan & Daly, 2012; Yukl, 2009) and authors of practitioner-oriented literature (Schlechty, 2009) have pointed to a reciprocal, collective learning process that occurs in schools by which the learning of adults correlates with and supports enhanced learning by students. In this line of scholarship, organizational learning is taken as a process where colleagues together use information to build new "theories of action" or challenge existing "theories-of-use" that govern how they go about their practice, both individually and collectively (Collinson, Cook, & Conley, 2006). This study presents insightful examples of informal leaders raising and spreading information to colleagues regarding the processes of instruction. However, scholarship has yet to examine fully how such information, after being spread by informal leaders, is retained by their colleagues, put into action, and translated into organization-wide learning and growth. Future methodological and conceptual tools should develop around tracking the spread

of ideas in schools in these critical ways. These explorations may produce further connections for social network researchers, who share with organizational learning scholars mutual concern for the "social processing of knowledge" (Finnigan & Daly, 2012, p. 65).

A second arena for future inquiry concerns the relationship between informal leadership and outcomes for students. While both quantitative network data and qualitative data from teacher interviews, logs, and observations suggested plentiful informal leadership at Walden in a variety of areas, some teachers still express concerns this leadership has not translated into better results for students. "If I'm saying there's a wealth of knowledge here," as Teacher W2 put this problem, "where's the proof?" One part of the problem is that both informal and formal leadership's impact on student outcomes while potentially substantial, is heavily mediated by other factors. Formal leaders affect student outcomes through a variety of changes to instruction and the contexts surrounding it, such as establishing goals and expectations, planning and evaluating teaching and curricula, promoting and enhancing teachers' professional development, building and supporting a positive school environment, and many others (Robinson, Lloyd, & Rowe, 2008). Informal leadership's immediacy and proximity to timely classroom concerns suggest its impact on outcomes may be similarly substantial; however, the understudied nature of informal leadership, combined with the relative

difficulties in documenting and understanding specific informal leadership practices, further complicate identifying the relationship between it and student outcomes.

However, whether and how school leaders seek to develop informal leadership will be driven by indicators, either positive or negative, of informal leadership's impact on students. In one sense, the informal leadership portrayed in this study could be characterized as primarily reactive: teachers spreading information about new teaching techniques for working with a changing school population, a population among whom improvement on standardized test scores has stagnated over the last several years. Such leadership may instead be a proactive response to "small" challenges in the classroom that will only grow as Walden's students continue to change. Regardless, Walden's recent informal leadership arrangements will impact student outcomes only after years of implementation, if they do at all. Leadership scholars must continue, therefore, to pursue the relationship between informal leadership and outcomes, however difficult, in order to best understand the relationship between informal leadership activities and what actually happens for students in classrooms.

Third, this study suggests the need for more specific inquiry on the intersections between formal and informal leadership. Quantitative data and analyses suggested that the principal is well engaged in the process of leadership in the building: he had the highest in-degree on each network question, and was the only formal leader at Walden. In qualitative interviews, both selected informal leaders and their colleagues spoke

approvingly of the principal's exercise of leadership as "hands off." Selected informal leaders described a process through which, using various explicit and implicit pushes for staff to observe the instruction of selected informal leaders, the principal had played a role in the spread and acceptance of small group instructional techniques in the building. Together, these findings suggest that teachers leading informally may mitigate the need for formal leaders to engage in "enforcement" of an academic vision, in the way literature currently understands.

Unfortunately, this study's design stops short of understanding how that process took place over time and how the principal's current leadership priorities and activities interact with those of informal leaders. Future work could examine more directly the relationship between formal and informal leaders in school settings, recognizing that the idea of academic press (Hallinger, 2005), suggested in the instructional leadership literature, may be inappropriate or ineffective in settings where teachers leading informally maintain important influence and expertise. Further work can connect studies that begin with the perspective of informal leaders directly to scholarship interested in how formal leaders nurture and support other kinds of leadership alongside their own (e.g., Lambert, 2003).

Finally, this study reiterates the need for better understanding how informal leadership activities—here represented within three different social networks—differ from one another. Quantitative network data in this study reveals important differences

in the relationships through which informal leaders provide three different types of advice, information, and support. While these differences are themselves instructive, they do not identify the specific practices that make up the process of providing expertise on teaching and learning, brainstorming about problems of practice, or providing information about curriculum. Social network researchers in education should continue to provide both breadth and depth around this set of methods, asking and comparing responses to questions that target different constructs or understandings of informal leadership activity. Additionally, as qualitative data from this study confirms, qualitative research on informal leadership in schools can also benefit from more targeted inquiry about what informal leaders do and how they do it. Studies of the time use of informal leaders, or with ethnographic approaches to observation, may shed new light on the phenomena explored here. This study's approaches only begin to help researchers fully understand the day–to–day activities of informal leaders.

What Formal Leaders, Policymakers and Scholars Can Learn

For school leaders, the results of this study reflect the importance of remaining conscious of how personal relationships spread ideas about teaching and learning, and how they might create conditions that would foster those relationships. While expertise is an important component of the effectiveness of informal leaders, the less tangible elements of human relationships also play important roles in connecting informal

leaders with colleagues. Further, as this study indicates, teachers use different relationships to seek different kinds of advice, information, and support, adding an additional dimension to understanding how to build a staff culture centered on responding to learning problems. Qualitatively, informal leaders in the study repeatedly emphasized the need for time, an invaluable resource toward building an informal leadership practice. Creating the opportunities for informal leadership to flourish in schools provides formal leaders the opportunity to build staff self-efficacy and buy-in, particularly around new approaches to curriculum and instruction.

For policymakers, this study highlights the potential interplay between staff relationships and school performance. In attempting to model types of informal leadership not frequently represented in the schools literature, this study joins others in the teacher leadership literature—as well as those on supporting professional environments (Kraft & Papay, 2014) and the "spillover effect" of participation in professional development (Sun et al., 2013b)—in bringing to the fore the role of the classroom teacher in the development of school culture and the support of instructional improvement. To that end, the relationships between teachers contribute here as much as, or more, to leadership activity than any individual teacher.

Finally, this study provides scholars with additional understanding of distributed leadership's notion of the "situated" nature of school leadership. Building from the idea contained in distributed leadership theories that leadership occurs within

the interaction of leaders, followers, and situations, this study finds important differences in how leaders use different relationships and different situations in concert to create opportunities to spread new ideas about instruction. These findings, therefore, underline the importance of considering both the time available to leaders and the opportunities for leadership created by "followers" in attempting to predict where and when school leadership will come about. Like several collective theories of school leadership, this study reiterates the idea that leadership in schools is a joint and social enterprise, requiring interaction across and between classrooms for leadership to flourish. In that spirit, this study further pushes distributed leadership scholars to apply more resources to the study of informal leadership—both informal leaders and informal leadership situations—in their attempt to understand leadership in schools in a more comprehensive fashion.

Methodological Implications

Network analysis, Little (2010) writes, offers tools to examine how "change is legitimated (or not), ideas given meaning, relationships built, broken, or changed, and practice sustained or transformed" (Little, 2010, p. xii). This project joins a growing body of mixed methods social network research that attempts to take this explanatory power further through the use of additional, targeted qualitative inquiry, what Baker-Doyle (2014) calls exposing the "networks in stories" and the "stories in networks." Methodologically, this study also attempts to clarify what it is that a network represents

in the professional lives of educational leaders, proposing some quantitative tools for evaluating different representations of an informal leadership network. Findings in Chapter 4 reiterate the central importance of defining the construct or constructs of interest prior to gathering network data, and using these constructs to carefully build and refine network questions.

However, this study also encounters some of the limitations of using self-reported data for constructing networks: teachers have complex relationships with one another that they may understand differently from one another, recall incompletely, and that shift over the course of a study. Feedback on the logging instrument used in this study suggests, additionally, that teachers have relatively few opportunities to record their interactions as they happen. E-mail records provide one promising potential source for constructing networks based on objective data. Two major factors, however, complicate their use: the enormous ethical implications associated with gathering private communications, and the reliance of many teachers and teacher leaders on other forms of communication. Observing and recording details about teacher conversations provide another potential source of network data, though this study suggests that gathering such data would require large investments in both research personnel and time. Ultimately, creative techniques to refine the recall of teacher leaders offer the most practical source of gathering more data on how informal

leaders operate in schools. Deeper explorations of how teacher leaders allocate and use time—a critically underappreciated resource—may also be warranted.

Finally, this study validates in important respects the use of network analysis as a participant selection method (Creswell & Plano Clark, 2007) for selecting leaders in mixed methods leadership studies. In this sense, the methods used in this study reinforce the premise that leadership is, in part, an empirical matter, residing in evidence of influence and of the pathways along with ideas and support travel. The three teachers selected for closer study here need not be the only informal leaders at Walden, nor need they stay leaders over time. Instead, they comprised most of the individuals for whom the practice of leadership, as measured by number of interactional ties, was reliably above average during the period of time under study here. While representing diverse grade levels and skills, the selected teachers shared common traits and bodies of expertise with a clear qualitative relationship to Walden's contexts and goals. Whether these leaders shaped the contexts in which they lead, were shaped by them, or both, this study begins to trace the work of informal teacher leaders, highlight the situatedness distributed leadership scholars deem critical to understanding leadership practice.

Studying Interactions

Much of the strengths and weaknesses of this analysis come from this study's central focus on interactions as the places where informal leadership occurs. Most

notably, interactions among adults may be a limited commodity in schools: "A lot of times in education it seems like there's not enough communication" (Teacher W10). While the selected informal leaders made some arrangements for one-on-one interactions with colleagues (including common workout routines, outside activities, or travel to conferences), most interactions occurred at Walden during the school day, within which both time and physical space limited opportunities. Several teachers cited location as a factor inhibiting their interactions with some leaders; an unintended consequence of Walden's division in two buildings between the upper and lower grades is interaction patterns that mostly stay within one's own building. Teachers also cited increasing class sizes as another factor restricting the opportunity to participate in an "extra" activity like collaboration or interaction with colleagues.

A focus on interactions benefits this study primarily by focusing conversations about informal leadership on specific actions by leaders. By focusing on a discrete element of leadership, it was easier to focus this examination on informal, rather than formal, leadership structures. Further, each of the selected leaders remarked that the logging activity was insightful as an illustration of how much leadership they actually conducted over the period. While logs did not produce extensive data, and have some weaknesses compared to observations, it appeared that completing the logs provided focus for selected informal leaders in the second interview, where they were asked more directly to provide meaning to their leadership activities.

This study also revealed clear limitations to an exclusive focus on interactions as measures of informal leadership. Most notably, it is difficult for research to understand leadership activity as manifest in interactions over a short period of time in observations. Even for selected informal leaders at Walden, leadership is still a relatively small part of a teacher's day. Additionally, many leadership situations (e.g. in Walden's case, the growth of CAFE–style instruction) require months or years to witness from beginning to end. Observations also neglect several forms of non-verbal communication, particularly written communications that participants may be reluctant or unable to disclose. While a more ethnographic approach might uncover more examples of leadership interactions, such an approach would seemingly require an extensive investment for relatively little data on leadership.

Further, a focus on interactions does not fully resolve ambiguity around the definition of informal leadership. Across qualitative data collection, participants wondered aloud and in writing what interactions "counted" as leadership or of interest, suggesting ambiguity around what leadership is or means in informal contexts. On the other hand, exacting definitions and boundaries around what constitutes informal leadership may limit participant response and gathered data. Further, this study does not fully delineate the distinction between informal leadership and collaboration; at least one alter at Walden felt the school's levels of collaboration were actually much lower than in other schools in which she had taught. Finally, it is difficult to understand

how interactions, as part of informal leadership, change practice, both because informal leadership is not limited to interactions, and because the impact of a particular interaction is not immediately discernible. These limitations suggest the need for clearer conceptual framing around informal leadership's occasional nature.

The Lines Around Leadership

In this era of collective leadership, scholars run a tangible risk of including so many practices, techniques, and interactions under the banner of "leadership" that, in meaning everything, the concept comes to mean nothing. Educators often run the opposite risk, being unwilling to take credit for, or unable to see, the full implications of elements of their work for a school as a whole or for identifiable subgroups within it. This study wrestles with the question of where teaching and collaboration end, and where leadership begins, without a clear line of demarcation. To address this question, the study attempts to separate collaboration from leadership by beginning with the notion that leaders intend to exert influence on colleagues, however implicitly, and explicating the role of that intention in leadership activities along with the roles played by specific instructional techniques on which colleagues may want help and the specific invitation colleagues make to informal leaders to provide that help. Further, it demonstrates some of the mechanisms by which classroom teachers and specialists can exert influence over and provide support for the work of their colleagues. Primarily, it illustrates how one type of interaction— between informal leaders and their colleagues,

typically in one-on-one situations—is nested within a broader interaction—between a leader's aims, their interpersonal interactions with colleagues, and a school's contexts and needs.

This project uses social network research as a tool for understanding informal leadership interactions in schools, bringing the method into lines of conversation accumulating in the study of leadership across methods, in the study of school networks across organizational levels, and in a practice arena challenged by bringing the ideals of collaborative and shared leadership to fruition. In focusing on interactions, the study also highlights the role of relationships in quality leadership: effective leaders are not just experts but are also personally trusted by those with whom they practice leadership. By addressing informal educational leadership in elementary schools, this study hopes to provide practitioners concrete understandings of how and why teacher leaders engage in informal, informal leadership activity. Methodologically, it looks to better understand the relationship between how leadership is measured and how it is understood, particularly as leadership literatures begin to examine informal leaders and their activities. Most importantly, this study documents a set of largely undocumented processes deemed critical to school improvement, advancing a conversation on bringing these practices into more school environments.

This examination occurs within the broader context of unprecedented pressure on schools and their leaders to deliver strong educational outcomes for all students.

Walden's teachers, like their colleagues around the country and at all grade levels, are asked by policymakers and the public to continually gather data on their students' learning, respond to that data with individually-tailored instruction, and raise student achievement to meet stringent requirements. In these environments, leadership tasks grow rapidly as the ranks of formal leaders in schools remain the same. In many schools, teachers have and will continue to rise to these challenges, crafting new forms of advocacy, professional communication, and information sharing to help them straddle the previously impermeable line between teaching and leadership. To understand those actions, researchers are called to better understand who informal leaders are, what they do, what prompts and supports this leadership work, and what consequences it may have for the quality of teaching and learning in schools.

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Appendix: Network Data

Table A1. Leader In-Degree and Rank

Leader	Q1 (Teaching and Learning)	Q1 Rank	Q2 (Brainstorm)	Q2 Rank	Q3 (Curriculum)	Q3 Rank
W04*	13	1	16	1	14	1
W09	**10**	**2**	**7**	**4**	**9**	**3**
W01	**9**	**3**	**10**	**2**	**8**	**4**
W17	8	4	3	12	3	12
W02	7	5	3	12	4	6
W03	**7**	**5**	**6**	**7**	**8**	**4**
W06**	7	5	9	3	11	2
W08	6	8	4	8	4	6
W10	6	8	7	4	4	6
W13	4	10	4	8	4	6
W07	2	11	2	16	1	18
W12	2	11	0	21	1	18
W16	2	11	4	8	4	6
W18	2	11	4	8	2	15
W21	2	11	7	4	4	6
W05	1	16	1	19	2	15
W22	1	16	2	16	2	15
W11	0	18	2	16	3	12
W14	0	18	3	12	1	18
W19	0	18	1	19	1	18
W20	0	18	3	12	3	12

* Ineligible for selection: Walden's principal
** Ineligible for selection: Not teaching at Walden during period of qualitative study

Table A2. Network Correlations

	Network 1	Network 2	Network 3
Network 1 *In-Degree* *Dyadic* *Inter–Structural*	—		
Network 2 *In-Degree* *Dyadic* *Inter–Structural*	 0.784** 0.494** 0.534**	—	
Network 3 *In-Degree* *Dyadic* *Inter–Structural*	 0.830** 0.562** 0.562**	 0.885** 0.632** 0.672**	—

**: p<0.05, **: p<0.01.*

***Note**: In-degree correlations indicate the correlation between each actor's in-degree (n=21) on each network map. Dyadic correlations reflect the results of Quadratic Assignment Procedure tests, in which the similarity of two networks is compared to chance similarity through 1,000 permutations. Inter-structural correlations reflect Butts and Carley's (2001) procedure for comparing the structural features of two networks to chance similarity, also through 1,000 permutations.*

Table A3. Descriptive Statistics on Survey Data

	Min	Max	Mean	SD	Skewness	Kurtosis
Indegree: Expertise on Teach and Learn	0	13	4.24	3.83	.66	-.52
Indegree: Brainstorm	0	16	4.67	3.72	1.56	3.12
Indegree: Curriculum	1	14	4.43	3.56		1.42
My Expertise (Composite)	13	23	18.48	3.14	-.45	-1.16
School Expertise (Composite)	14	24	18.86	2.85	.15	-.47
District Expertise (Composite)	12	24	17.90	3.13	.48	.17
I Am a Leader at this School	2	4	3.14	.57	.04	.32
I Have Support from Admin to Lead	2	4	3.19	.51	.36	.60
I Have the Time to Lead	2	4	3.05	.59	.00	.35
I Have Expertise to Lead	2	4	3.19	.68	-.25	-.65
I Have Experience to Lead	1	4	3.19	.81	-1.00	1.20
I Have Respect from Colleagues to Lead	1	4	3.24	.70	-1.33	4.21
Number of Years at School	1	25	10.48	7.26	.88	-.07
Number of Years Teaching	1	32	15.57	8.78	.07	-.97

Notes: *n=21 for all statistics. Values are rounded to nearest hundredth. One case was removed on all variables (non-respondent to the survey). Standard error for all skewness statistics is 0.501. Standard error for all kurtosis statistics is 0.972. Expertise composite variables sum six separate measures of expertise, each on four-point scales ("Low" to "High"). Remaining evaluative questions were each provided on four-point Likert-type scales ("Strongly Disagree", "Disagree", "Agree", "Strongly Agree.")*

Figure A1. Network 1 (Expertise on Teaching and Learning), Visualization 1

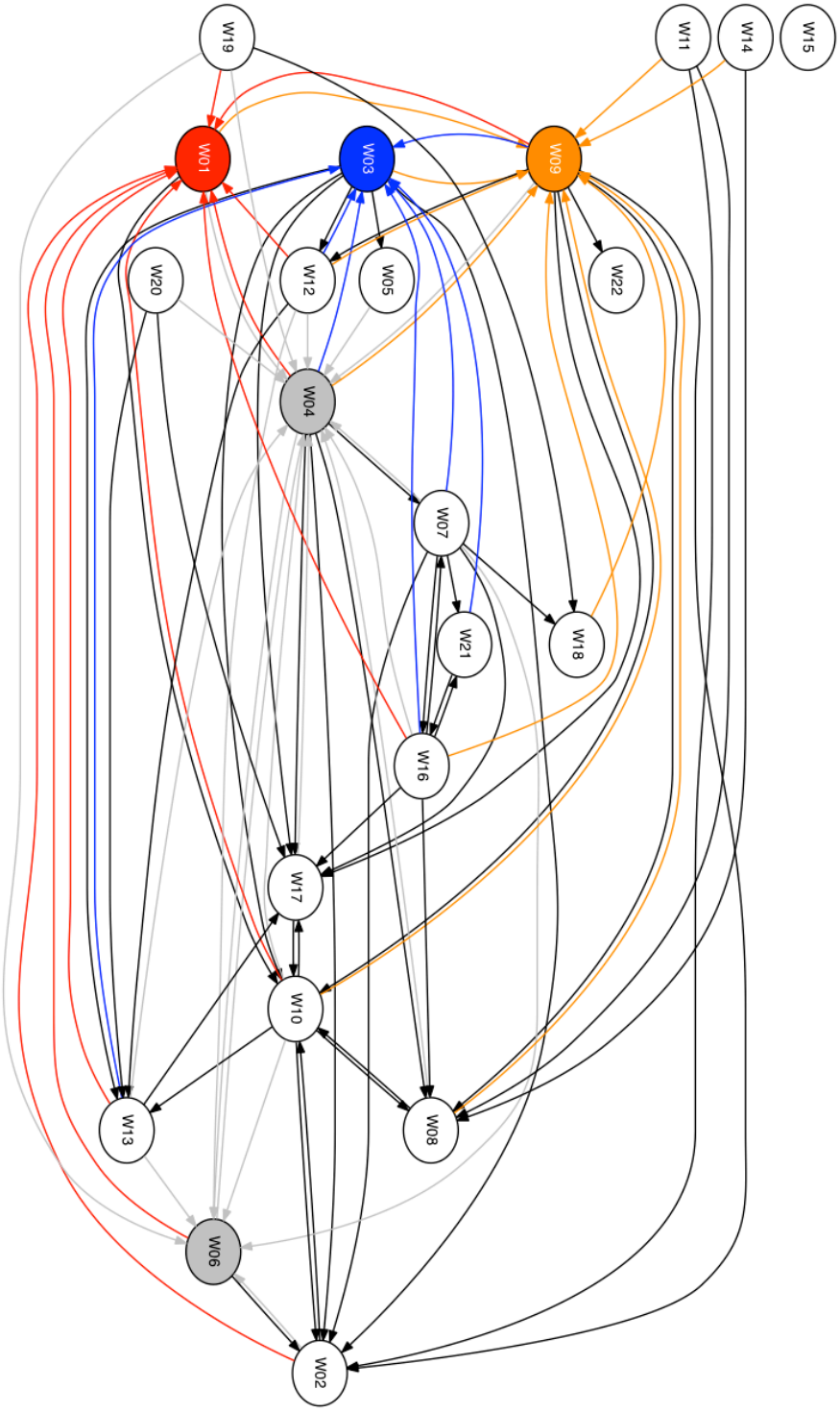

Figure A2. Network 2 (Brainstorm About a Problem), Visualization 1

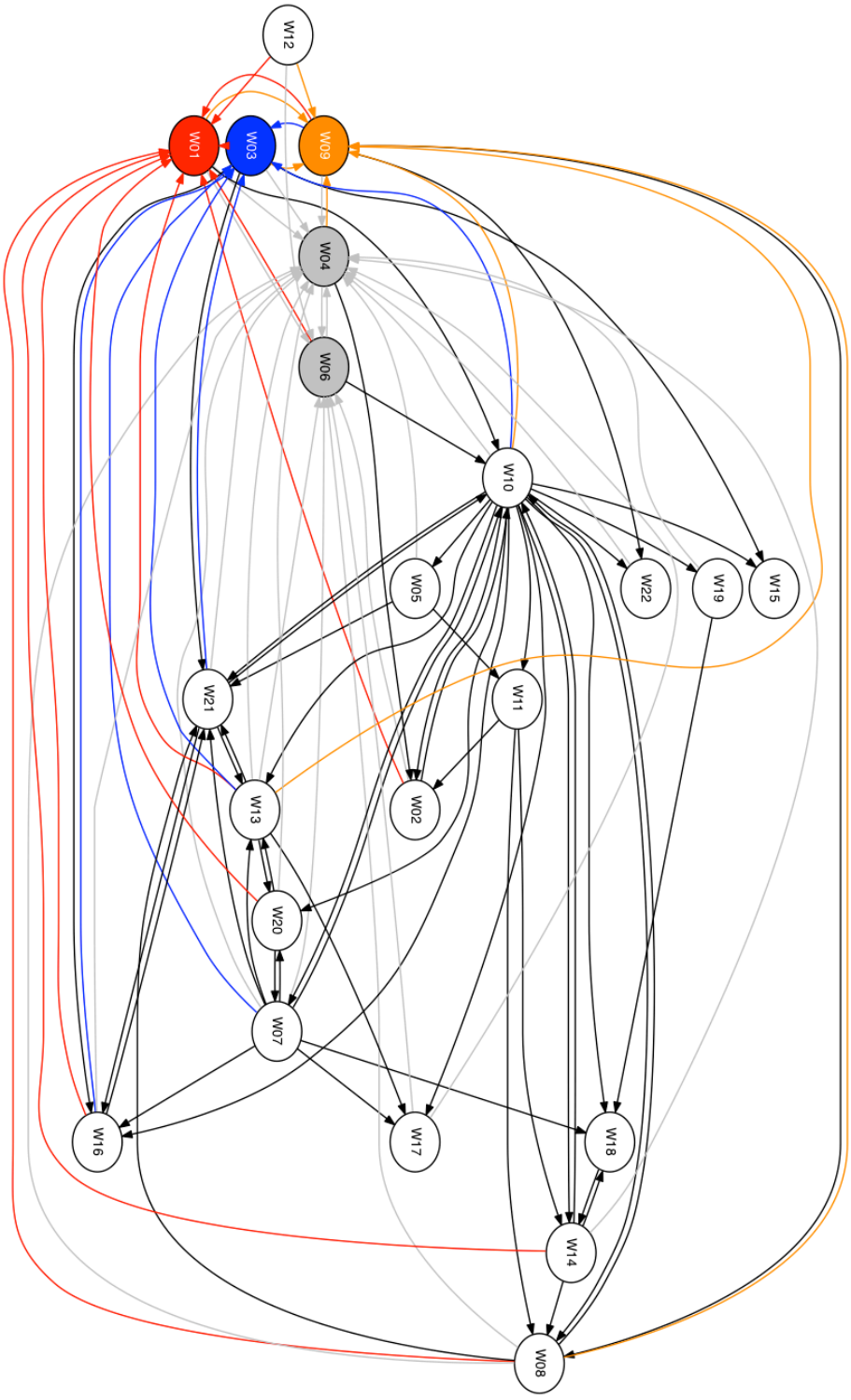

Figure A3. Network 3 (Information about Curriculum), Visualization 1

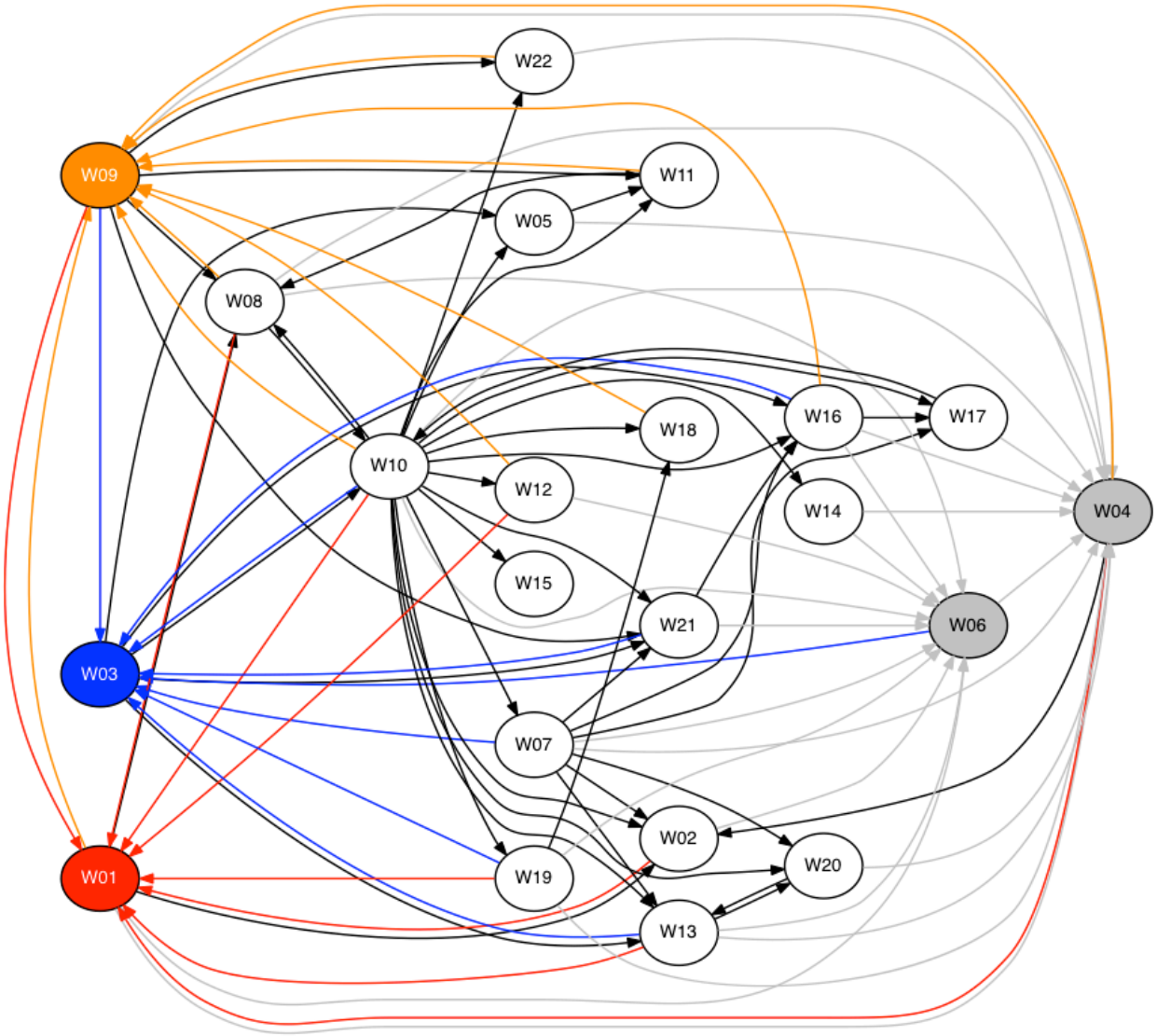

Figure A4. Network 1 (Expertise on Teaching and Learning), Visualization 2

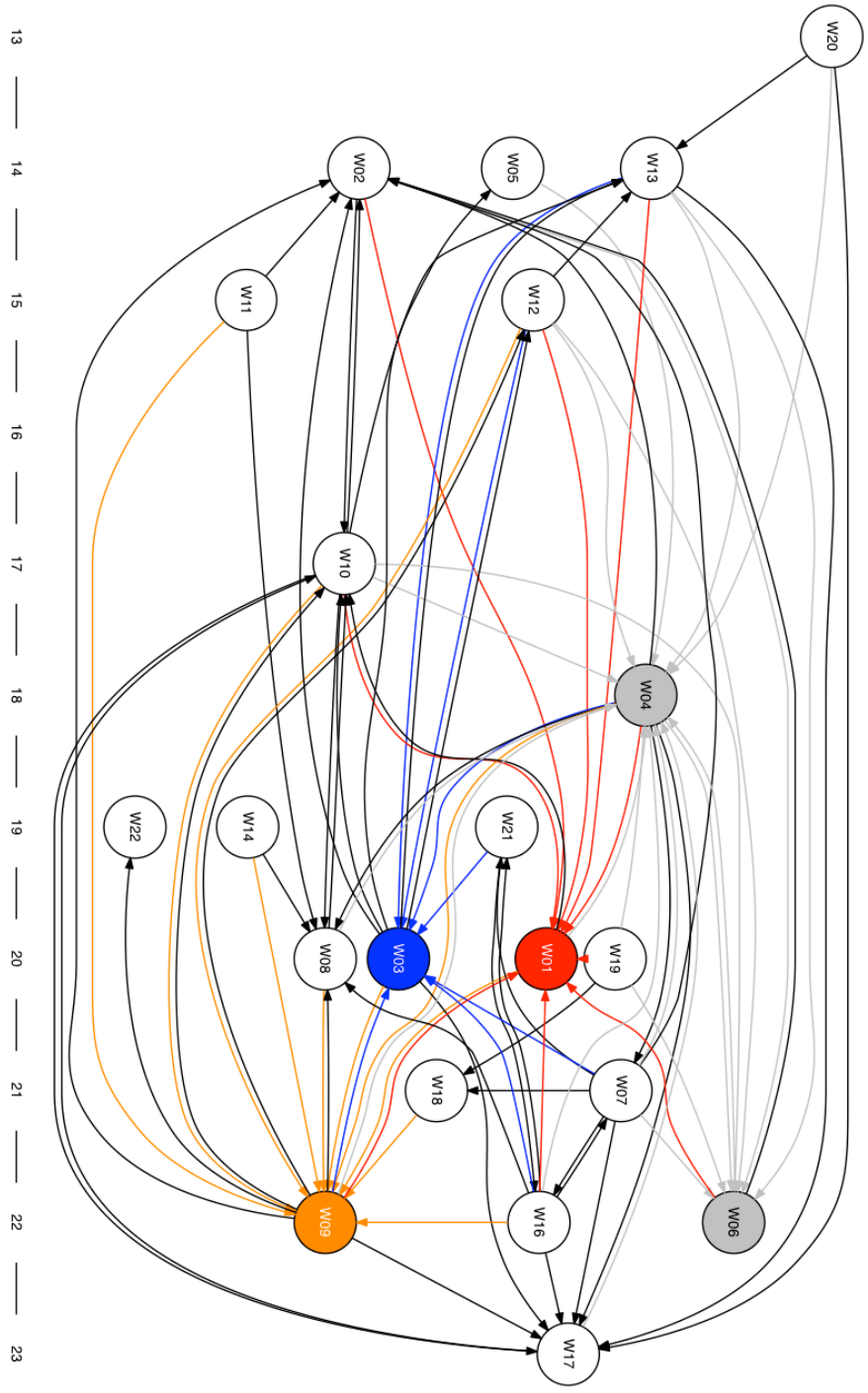

Figure A5. Network 2 (Brainstorm About a Problem), Visualization 2

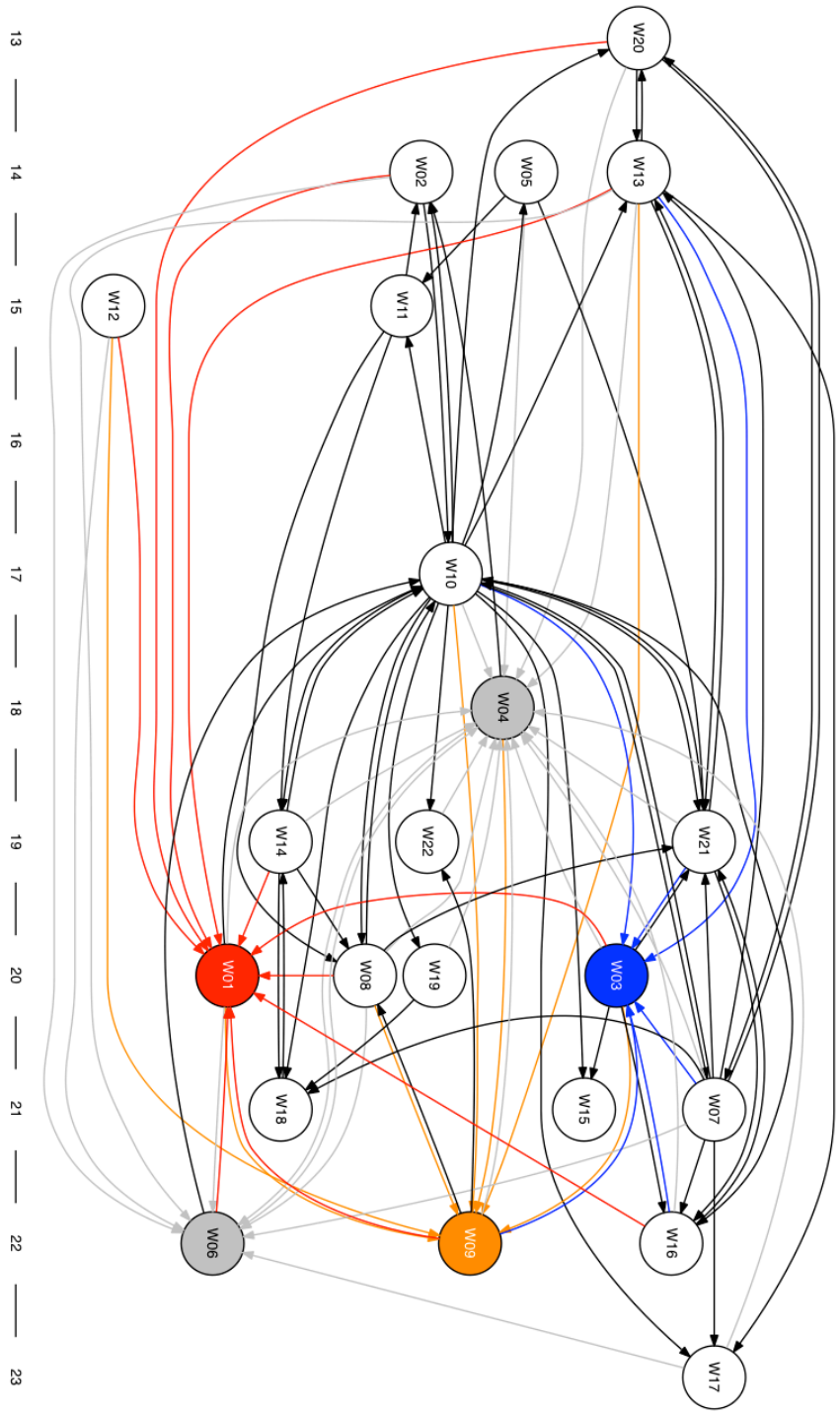

Figure A6. Network 3 (Information about Curriculum), Visualization 2