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# Finnish Teacher Collaboration: The Behaviors, Learning, and Formality of Teacher Collaboration

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A dissertation submitted to the faculty of
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Doctor of Philosophy

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ABSTRACT

Finnish Teacher Collaboration: The Behaviors, Learning, and Formality of Teacher Collaboration

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Finnish teachers continue to receive significant attention among educators, educational leaders, and policy makers in the United States and around the globe. In addition, teacher collaboration continues to receive support as a meaningful part of teacher work and practice.

Teacher collaboration is frequently described in various ways within different contexts. This study aims to: (a) better understand the nature of Finnish teacher collaboration by examining three teacher collaboration behaviors (*sharing information and knowledge*, *planning*, *and problem-solving*); (b) explore the extent to which Finnish teacher collaboration is formal (or school-required) collaboration and informal (or voluntary) collaboration; and (c) investigate the extent to which Finnish teachers attribute teacher learning to teacher collaboration.

Using both qualitative and social network methods, the sample included 19 teachers from two comprehensive Finnish schools (1st–9th grades) who completed an online survey of professional network and open-ended questions. Analyses highlights the following: (a) Finnish teachers at a comprehensive school engage in the three teacher collaboration behaviors (*sharing information and knowledge*, *planning*, *and problem-solving*); (b) Finnish teachers at a comprehensive school value and collaborate in both formal and informal network structures; and (c) Finnish teachers at a comprehensive school attribute a degree of teacher learning, in terms of teacher improvement, to teacher collaboration.

Keywords: *teacher collaboration, Finnish teachers, formal collaboration, informal collaboration, network, teacher learning*

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# DESCRIPTION OF STRUCTURE AND CONTENT

This manuscript is presented in the format of the hybrid dissertation. The hybrid format focuses on producing a journal-ready manuscript that is considered by the dissertation committee to be ready for submission. Therefore, this dissertation differs from the traditional format, and the manuscript focuses on the presentation of the scholarly article. This hybrid dissertation has appended materials including an extended review of literature and a methods section with elaborated detail on the research approach used in this dissertation project.

The targeted journal for this dissertation is the *Teachers College Record* (2014 Impact Factor: 0.75; 5-year Impact Factor: 1.213). *Teachers College Record* has been sponsored and published by the Teachers College, Columbia University, since 1900. The journal is a peer-reviewed academic journal of "research, analysis, and commentary in the field of education." It welcomes all topics that are broadly conceived and connected to the field of education, including unsolicited submissions.

*Teachers College Record* publishes a variety of types of articles. This paper would be submitted as a featured article. For featured articles, the journal accepts both empirical and theoretical papers with developed theoretical frameworks that contain research, analysis, and commentary. According to Meriam-Webster, *empirical* means "verifiable by observation or experience" ("Empirical ", 2016). This paper includes verifiable experiences of teacher collaboration based on developed theoretical frameworks for teacher collaboration. This paper also includes primary research on teacher collaboration. In addition, *Teachers College Record*'s broad base of publishing educational research on various topics includes featured articles regarding research within and outside the United States as well as topics related to this study. A search of the journal's article database shows that the journal has published many articles on

topics such as the following: (a) teacher collaboration, (b) Finnish teachers, and (c) network analysis. Finally, this journal's relationship with Teachers College of Columbia University and its university press is also relevant to this paper. Pasi Sahlberg, the leading educational expert on the Finnish education system, published both editions of his seminal work on the Finnish education system, *Finnish Lessons* (2014), through Teachers College Press. This highlights an interest in educational research related to Finnish teachers by Teachers College's publishing entities.

Featured articles submitted to *Teachers College Record* journal are blind peer reviewed by scholars from around the world. The manuscript length for such articles needs to be at least 30 pages in length (see http://www.tcrecord.org/Content.asp?ContentId=17801). The target audience for the *Teachers College Record* is broad, including educational researchers, teachers, evaluators, and educational policy makers and planners.

## Background

Teachers, administrators, and educational policymakers in the United States are frequently scrutinized regarding the state of teaching and learning in American schools. Darling-Hammond (2010) stated that achievement in American schools is lagging behind that of schools in other nations of the world, that educational attainment has stagnated, and that the American educational system is generally losing ground. Among her main suggestions for increasing success is having administrators and educational leaders organize teacher collaboration to promote student learning. Darling-Hammond's examination of countries that have built strong teaching and learning systems (Finland, Singapore, and South Korea) demonstrates that each system provides ways for teachers to collaborate. There are also suggestions from the Organisation for Economic Co-operation and Development (OECD, 2011) that American educational leaders can benefit from learning from Finnish schools and teachers. While teacher collaboration is not a new topic in American schools, we can inform and improve our understanding of teacher collaboration by examining different approaches to collaboration, such as those used in Finland.

On any given school day in an American or Finnish school, teachers may engage with their colleagues in some form of teacher collaboration. However, the identifying behaviors that constitute teacher collaboration are not consistently clear in the educational research literature. According to Laive (2006), "the notion of teacher collaboration seems to offer a semantic field that is broad enough to be taken up by different discursive logics" (p. 774). A recent meta-analysis of collaboration research by Vangrieken, Dochy, Raes, and Kyndt (2015) also highlighted that teacher collaboration has varied definitions and purposes, and that

there appeared to be a lot of conceptual confusion concerning teacher collaboration. A

> considerable amount of different terms is used to describe this phenomenon: teacher teams, teacher collaboration, professional (learning) communities, (teacher) learning communities, (teacher) learning teams, etc. . . . These terms were often used interchangeably and different researchers tended to allot different interpretations to the same term (p. 23). . . . It became clear that different terms were used to refer to teacher collaboration [and] were often vaguely defined and used interchangeably. It can be questioned whether the terms refer to the same or different forms of teacher collaboration, making it difficult to draw warranted conclusions from current literature. (p. 35)

Such variation and lack of consensus is problematic for researchers and educational leaders who wish to implement the call for more effective teacher collaboration in their schools. In addition, researchers attribute equally varied outcomes and benefits to educator collaboration. Students, teachers, and schools all benefit from collaboration according to the literature (Vangrieken et al., 2015). Benefits range from improved student understanding, increased student achievement, teacher learning, and school innovation. Understanding, analyzing, or implementing any of these benefits may be desirable to researchers and educational leaders, but without clear definitions of the behaviors and structures of teacher collaboration, it becomes challenging to study and implement. To this end, our study seeks not only to investigate Finnish teacher collaboration in the context of a comprehensive school—the most basic and universal Finnish school setting—but also to explore and examine teacher collaboration based on the literature, key behaviors, structures (formal and informal), and their outcomes for teacher learning.

**Teacher Collaboration Behaviors**

The Vangrieken et al. (2015) literature review includes 82 academic sources from 2000–2013 regarding teacher collaboration. While they acknowledged their work does not include all available research, their study provides a reasonably thorough investigation into the topic of teacher collaboration. Regarding definitions of teacher collaboration, they commented,

> It can be stated that collaboration can be defined as joint interaction in the group in all activities that are needed to perform a shared task. This concept is not static and uniform but different types of collaboration can occur with varying depths. In a sense collaboration can be seen as an umbrella term, being part of different collaborative concepts. (p. 23)

They remain silent on what the exact interactions and structure of the group are because, as they state, these can vary. West (1990) indicated that "educational collaboration is an interactive planning or problem-solving process involving two or more team members" (p. 29). This definition adds clarity in that it includes two specific actions or behaviors (*planning and problem-solving*) as being part of the collaborative interaction and sets two parties as the minimum for a collaborative group. Sawyer and Rimm-Kaufman (2007) provided a similar definition of teacher collaboration stating that in teacher collaboration, "problem-solving or planning needs to occur for an interaction to be considered collaboration" (p. 213). However, *problem-solving* and *planning* are not the sole characteristics teacher collaboration.

In Barott and Raybould's (1998) discussion of changing schools into collaborative organizations, they provided additional characteristics defining collaboration both within an organization and among teachers. They suggested, "In changing schools into more collaborative organizations, we are asking people to share information, decision making, work together, or *co-*

*labor*. In essence, we are asking them to change patterns of their relationships so that they are more interdependent" (p. 29). The call for shared decision-making can encompass both *planning* and *problem-solving*. The inclusion of the characteristic of knowledge-sharing is important given that much of the research regarding teacher collaboration relates to teachers *sharing information* about teaching practice. Sharing is one of the collaboration behaviors that Vangrieken et al. (2015) also identified in their review of the literature. Combining the common elements of these collaboration definitions and behaviors provides the following definition for teacher collaboration used in this study: *Teacher collaboration involves two or more teachers in an interdependent relationship in which they interact by sharing information and knowledge, planning, and problem-solving.* The contextual focus for collaboration in this study is K–12 teacher practice.

Teacher or teaching practice, like collaboration, can be viewed as an ambiguous concept. Similar to teacher collaboration, the literature lacks clear definitions. Teacher practice may reflect a variety of instructional practices from the everyday work of being a teacher. But does it go beyond instruction, curriculum, and assessment? For this research, we define "teacher practice" broadly to reflect the dictionary ("Practice," 2016) definition of *practice*, which means "the carrying out or exercise of a profession." The exercise of being a teacher includes many facets beyond instruction, curriculum, and assessment. We also utilize Wenger's (1998) articulation of practice to further expand our broad view of teacher practice. Wenger's work regarding communities of practice is important in discussions of teacher collaboration because it is one of the earliest models used and frequently cited within teacher collaboration research. Regarding the concept of practice generally, Wenger states,

> Such a concept of practice includes both the explicit and the tacit. It includes what is said and what is left unsaid; what is represented and what is assumed. It includes the language, tools, documents, images, symbols, well-defined roles, specified criteria, codified procedures, regulations, and contracts that various practices make explicit for a variety of purposes. But it also includes all the implicit relation, tacit conventions, subtle cues, untold rules of thumb, recognizable intuitions, specific perceptions, well-tuned sensitivities, embodied understandings, underlying assumptions, and shared world views... Therefore, the concept of practice highlights the social and negotiated character of both the explicit and tacit in our lives. (p. 47)

Even though Wenger does not directly touch upon teacher practice and how the roles of instructional and non-instructional activities relate to teacher practice, Wenger's concept of practice can be usefully extended to our discussion. If practice generally includes a broad array of work activities and practices from explicit and tacit, then we assert that practice would include both the instructional and non-instructional work of a teacher. Instructional and non-instructional teacher practices both include Wenger's "well-defined roles" and "codified procedures" as explicitly defined by research, teacher education programs/training, and school-district expectations of teachers. In addition, a teacher's work or practice can include many of Wengers's tacitly learned "untold rules of thumb" and "shared world views" that teachers learn from each other and through their work. Therefore, teacher practice is conceptualized for this research, based on Wenger's broader theory of practice, as including all aspects of teacher work—not just those parts of a teacher's work that relates directly to instruction, curriculum, or assessment. Teacher collaboration, as it relates to managing or implementing, and not to instructional programs, would therefore also constitute teacher practice.

Additionally, the constructs represented in this study's definition of teacher collaboration are also found in the major forms or structures of teacher collaboration and popular teacher collaboration systems, such as the following: (a) professional learning communities (DuFour, DuFour, Eaker, & Many, 2006; Giles & Hargreaves, 2006; Hord, 2009; Schechter, 2010; Tonso, Jung, & Colombo, 2006), (b) teacher learning communities (Clausen, Aquino, & Wideman, 2009; Cochran-Smith & Lytle, 1999; Levine & Marcus, 2007; Lieberman, 2000; Little, 2003; Priestley, Miller, Barrett, & Wallace, 2011), (c) teacher networks (Chan, 2011; de Lima, 2010; Lieberman & Grolnick, 1996; Niesz, 2007; Penuel, Riel, & Krause, 2009; Schiff, Herzog, Farley-Ripple, & Iannuccilli, 2015), and (d) communities of practice (Gajda & Koliba, 2008; Goodyear & Casey, 2015; Levine & Marcus, 2007; Wenger, 1998; Wood, 2007). Therefore, for this study, the behaviors of *sharing information and knowledge, planning, and problem-solving* were used as the key collaboration behaviors.

**Teacher Collaboration Structures**

One approach to understanding teacher collaboration structures is to examine various collaboration systems, such as professional learning communities (DuFour, 2004; Hord, 2009; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006) or communities of practice (Wenger, 1998; Wenger, McDermott, & Synder, 2002) that have been shown to benefit teachers and students. However, while some variation exists within these more systematic and defined forms of teacher collaboration, limiting the study of teacher collaboration only to the application of these collaborative systems can limit a researcher's ability to analyze teacher collaboration in contexts where such systems may not be in place.

Regarding the structure of collaboration, Vangrieken et al. (2015) stated, "Groups of teachers may be fixed or they may be more loosely organized in the sense that the collaborations

are of a more ad hoc nature (no fixed groups of teachers who always work together but changing constellations)" (p. 25). This distinction of collaboration groups or structures being either fixed or ad hoc provides great utility for analyzing teacher collaboration groups because it is not dependent on any one form or system of collaboration and can therefore be applied to a wider range of contexts. These distinctions between collaboration groups can be further clarified in terms of *formal* and *informal collaboration,* which are currently used within educational research on teacher collaboration as well as outside educational research in both organizational behavior (Burns & Stalker, 1961; Ipe, 2003; Rotter, 1967; Selznick, 1948) and social network research (Chandler, 1962; Tichy, Tushman, & Fombrun, 1979).

The concepts of formal and informal teacher collaboration stand to inform *how* teachers collaborate and provide additional clarity to Vangrieken et al.'s (2015) distinction of fixed versus ad hoc collaboration. Sawyer and Rimm-Kaufman (2007) distinguished formal and informal collaboration in three ways. The first distinction is whether the collaboration is voluntary or required by the school. Formal collaboration is school-required, and informal collaboration is voluntary. The second distinction is that informal collaboration is more spontaneous, while formal collaboration is more structured or planned. The third distinction is found in the setting of the collaboration. Informal collaboration takes place in casual settings like the hallway or faculty lounge, while formal collaboration takes place during official settings like faculty meetings, collaboration teams, or professional-development sessions. Other researchers have also acknowledged distinctions between formal and informal collaboration (Leonard & Leonard, 1999; Mawhinney, 2010; Parise & Spillane, 2010; Schiff et al., 2015; Stevenson, 2004, 2008; Van Wessum, 1999). For example, "teachers considered informal collaboration to be more effective in terms of leadership provision for change than the more formal structures of planned

collaboration" (Leonard & Leonard, 1999, p. 237). Mawhinney's (2010) research highlighted the importance of "congregational spaces" (p. 972), such as teacher lounges, and the role these spaces play in informal collaborative knowledge-sharing. Schiff et al. (2015) also highlight the use of informal collaboration in similar ways as well as acknowledging that formal collaboration is part of structured school meetings and groups. Stevenson's (2004) work on informal collaboration documented that when it came to learning about technology, elementary teachers preferred informal to formal collaboration. Her later ethnographical work (2008) investigated the impact that factors like friendships, teaching similar grades, and having similar curricular points of view had on teachers who informally collaborated. However, research clarifying the distinctions between formal and informal teacher collaboration is still somewhat limited.

Vangrieken et al. (2015) suggested that to better understand teacher collaboration researchers should cross boundaries and consider different research traditions. Looking outside teacher collaboration research, the constructs of informal and formal working structures or interactions are well established. For example, Selznick (1948) and Burns and Stalker (1961) described and discussed the merits and limitations of formal and informal structures within an organization. Where Sawyer and Rimm-Kaufman (2007) were describing formal and informal teacher collaboration in schools, Allen, James, and Gamlen (2007) suggested that formal and informal networks within organizations are structures in which individuals communicate and transmit knowledge. Their research highlights that one of the key collaboration behaviors, *sharing information and knowledge*, takes place in both formal and informal network structures. In addition, the way in which they describe informal and formal structures supports two of the conditions found in the Sawyer and Rimm-Kaufman discussion. According to Allen et al., formal networks "are prescribed and forcibly generated by management, usually directed according to

corporate strategy and mission" (p. 181). In contrast, informal networks "are unsanctioned and ungoverned organic structures" (p. 181). Therefore, using Allen et al.'s definitions of informal and formal networks, both informal and formal teacher collaboration networks can exist within the school organization.

Rotter (1967) acknowledged that an individual's "informal and formal learning" (p. 651) is based on communication, or the sharing of information, with people he or she trusts. Ipe (2003) provided a useful point of comparison in her discussion of contexts in which members of an organization can *share information and knowledge* when she stated that "opportunities to share knowledge can be both formal and informal in nature" (p. 350). She referred to formal instances as "purposive learning channels" (p. 349) that include structured teams and training programs, and she contrasted that to informal opportunities based in informal settings between people who have personal relationships or are part of a social network. Ipe's (2003) work indirectly relates to teacher collaboration because the teachers are members of the school organization and *share information and knowledge* as one way of collaborating. Therefore, the two primary structures in which collaboration is investigated in this study are formal (or school-required) and informal (or voluntary) collaboration.

**Network Theory**

Network research informs the construction of the collaboration structures investigated in this study as well as the methodology and analysis of the data. The concept of a network is informative within the context of understanding teacher collaboration. The term *network* has been used by some researchers (Lieberman, 2000; Lieberman & Grolnick, 1996) to label and characterize teachers' collaborative structures. According to Scott (2001), social network analysis developed through various strands, including socio-metric analysts investigating small

groups, research out of Harvard in the 1930s looking at interpersonal relations and cliques, and anthropologists from Manchester studying tribal and village community relations. The focus of network research is investigating actors, or teachers in this case, and their relationship-based ties with other teachers (alters). Moolenaar (2012) utilized social network methods to investigate teacher collaboration and states that the utilization of a social network perspective

> offers a valuable framework for examining whether and to what degree teacher collaboration takes place. . . . By embedding teachers' individual behaviors in the pattern of their interpersonal relationships, social network analysis can capture multilevel nature of teacher collaboration to an extent that conventional methods and measures cannot. (p. 8–9)

Social network theory views the interaction of individuals or groups (actors, in network terms) in an organization or across organizations through relational ties and structures (Borgatti, Everett, & Johnson, 2013; Borgatti & Ofem, 2010; Carolan, 2014; Hite, Reynolds, & Hite, 2010). Carolan (2014) stated that a social network has "three essential elements: 1) a set of actors; 2) each actor has a set of individual attributes; and 3) a set of ties that defines at least one relation among the actors" (p. 7). Therefore, teachers interacting within a collaborative dyad or within a larger collaborative group of teachers are operating within a social network in the school. Collaborative network ties create bridges for the exchange or sharing of resources such as information, skills, instructional strategies, and social support (Hite, 2003). Moolenaar and Sleegers (2010) state that "social networks can be characterized by content exchanged within the social relationships. For example, collaboration networks may be built around information and knowledge exchanged related to work" (p. 100). Therefore, teachers collaborating or *sharing*

*information, planning, or problem-solving* regarding teacher practice constitute a type of social network—a teacher collaboration network.

Little (2010) indicated that "as a field, education has been relatively slow to capitalize on the theoretical, methodological and practical advances represented by social network theory and by the methods of social network analysis" (p. xi). He suggested that social network analysis can provide educational researchers with an "appreciation for the complex interplay between formal structures and informal patterns of interaction within and across organizations" (p. xii). Katz, Lazer, Arrow, and Contractor (2004) stated that a network lens can help investigate and explore crucial characteristics of small group interactions, which easily applies to teacher collaboration interactions. Group work structures and ties, like teacher collaboration, can come in many forms. Network analysis research has long suggested that these forms include both formal and informal work groups (Chandler, 1962; Tichy et al., 1979). Using network analysis, therefore, can provide understanding as to *how* teachers collaborate with each other as well as insight into the larger collaborative structures within the organization in which they are organized. Daly (2010a) stated that "building and supporting professional relationships and networks is a critical way to sustain the work of teaching and learning and ultimately of change" (p. 1).

**Collaboration and Teacher Learning**

Collaboration of any type does not occur within a political or social vacuum. As measured by the teacher, the educational leader, or the policy maker, the value of collaboration should be assessed according to its relevance to educational priorities. In the last three decades, American schools have received increasing scrutiny from policy makers and educational leaders. Historically, improvements in student achievement have been called for in reports like the U.S. government's *A Nation at Risk* (1983), legislation like Goals 2000 ("Goals 2000: Educate

America Act," 1994), NCLB ("No Child Left Behind Act of 2001," 2002), and ESSA ("Every Student Succeds Act," 2016); and federal grant programs like Race to the Top ("American Recovery and Reinvestment Act," 2009). Vagrieken et al. (2015) showed that teacher collaboration provided benefits at student, teacher, and school levels and acknowledged that teacher learning is a positive outcome of collaboration. Teacher collaboration has been found to positively influence student achievement in a limited number of educational research studies (Goddard, Goddard, & Tschannen-Moran, 2007; Levine & Marcus, 2007; Vangrieken et al., 2015); however, connecting teacher collaboration to student academic achievement is a challenging task, given the need to control the many variables involved.

To explain how teacher collaboration is related to student achievement, the literature establishes a positive relationship between collaboration and teacher learning (Clausen et al., 2009; Giles & Hargreaves, 2006; Levine & Marcus, 2007; Schechter, 2010; Vangrieken et al., 2015), see Figure 1. Next, even though a direct relationship between teacher collaboration and teacher quality is not firmly established, we believe that examining the research on teacher learning does suggest a possible connection. Research on professional development indicates that teacher learning can also improve teacher quality (Borko, 2004; Borko, Elliott, & Uchiyama, 2000; Darling-Hammond & Richardson, 2009; Dierking & Fox, 2013; Kennedy & Shiel, 2010). Finally, extensive research over the past 20 years has shown a positive relationship between teacher quality and student achievement (Darling-Hammond, 2000; Greenwald, Hedges, & Laine, 1996; Hanushek, 2003, 2011; Montt, 2011; Rockoff, 2004). Thus, a possible relationship between teacher learning and student achievement can be established in the current literature as reflected in Figure 1.The model reflects what authors propose to be teacher collaboration's relationship to student achievement, in that teacher collaboration contributes to teacher learning,

teacher learning increases teacher quality, and improved teacher quality positively impacts student achievement. Even though this study does not investigate each of the layers and connections, and focuses primarily on establishing clear behaviors (*sharing information, planning*, and *problem-solving*) and structures (formal and informal) of teacher collaboration and their connection to teacher learning, the conceptual model explained in Figure 1 highlights why teacher collaboration is viewed as important for educational leaders and researchers also concerned with student achievement or performance.

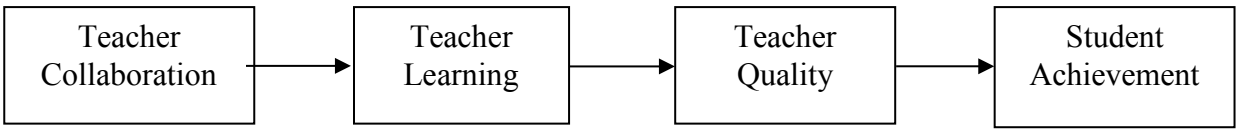


*Figure 1*. Conceptual model of the relationship between teacher collaboration and student achievement.

**Teacher Collaboration in Finland**

The Finnish education system provides an informative context for further research on teacher collaboration and collaborative teacher networks. Finland's education system is recognized as one of the most effective systems globally (Darling-Hammond, 2010; OECD, 2011; Sahlberg, 2014). The Organisation of Economic Co-operation and Development (OECD, 2011) published a report about the lessons the U.S. could learn from the Programme for International Student Assessment (PISA) test. In that report, they suggested that Finland is among the countries to which U.S. educational leaders and policymakers should look in considering a variety of education reforms (OECD, 2011). This feedback is also supported by Darling-Hammond (2010), who states,

> Finland has been a poster child for school improvement since it rapidly climbed to the top of the international rankings after it emerged from the Soviet Union's shadow. Once

> poorly ranked educationally, with a turgid bureaucratic system that produced low-quality education and large inequalities, it now ranks first among all the OECD nations on the PISA assessments in mathematics, science, and reading. The country also boasts highly equitable distribution of achievement, even for its growing share of immigrant students. (p. 164-5)

Sahlberg (2014) indicates that part of the reason the Finnish education system has been able to make such dramatic and positive improvements comes from lessons they have learned from education research and reform outside of Finland. He suggests that countries like the U.S. should follow a similar model, not copying the Finnish education model but learning from those aspects of the Finnish education system that contribute to the effectiveness of their system.

The quality and effectiveness of Finnish teachers is typically attributed as one of the key reasons for the success of Finland's education system (Darling-Hammond, 2010; OECD, 2011; Sahlberg, 2014). For example, Darling-Hammond stated that Finnish teachers "work together collegially, to design instruction that meets the demands of the subject matter as well as the needs of their students" (p. 172). In other words, these teachers are *sharing information and knowledge*, *planning*, and *problem-solving* regarding their teaching practice. Also, Finnish teachers receive some degree of additional compensation added to their salary for collaborating with colleagues for three hours a week beyond their normal contract (Sahlberg, 2015).

Research (OECD, 2011; Sahlberg, 2014) also suggests that high teacher quality in Finland is due, in part, to Finland's rigorous teacher preparation program. What is not yet fully explained in the literature is how Finnish teachers maintain their high quality and how much teacher learning Finnish teachers engage in. One study that touches on these topics as well as the topic of teacher collaboration was conducted by Eteläpelto, Vähäsantanen, and Hökkä (2015).

Their case study of novice Finnish teachers indicated that "teachers saw collaboration with their colleagues as an important resource for exercising professional agency through actively developing teaching practices" (p. 668). Teachers in this study indicated that they perceived collaborating with colleagues as a resource to "developing pedagogical practices and teaching methods; applications of new ideas" (p. 674), and "maintaining one's own ethical standards" (p. 675). "In addition, collaboration in planning instructional methods and materials was seen as the most important resource for developing teaching practices" (p.766). Their research highlights both direct connections to the collaboration behaviors analyzed in this study and Finnish teacher learning resulting from teacher collaboration. Eteläpelto et. al. (2015) also highlighted another characteristic of Finnish teachers in general, namely their value of autonomy. Research acknowledges the high degree of autonomy Finnish teachers enjoy in curriculum, pedagogy development, assessment, and *problem-solving* (Sahlberg, 2007, 2014; Webb et al., 2004) and that development of curriculum, pedagogy, and assessments often takes place in team structures (OECD, 2011). However, the context and structure of these teams in the midst of the highly autonomous Finnish system is not fully understood. The work of Webb, Vulliamy, Sarja, Hamalainen, and Poiken (2009) highlighted that professional learning communities with collaborative groups are found in Finnish schools, but their research is not clear about the extent to which these teachers operate within formal and/or informal collaborative structures or about the social network relationships within these structures.

Some research, however, has been done in Finnish contexts using a network lens to examine whole networks and egocentric networks of teachers (Kärkkäinen, 2000; Ryymin, Palonen, & Hakkarainen, 2008; Tuomainen, Palonen, & Hakkarainen, 2010). Kärkkäinen's (2000) research is particularly relevant because of the way in which it analyzed teacher

collaboration. This study investigated Finnish teams in elementary schools through a network lens to understand how teacher teams build contacts within and outside the school. Two teams were studied—a 1993 team and a 1994 team. Fundamental differences existed between the two teams. The 1993 team was created by teachers, goals were generated by the team, and the team was completely autonomous.

In contrast, the 1994 team was organized by an administrative official who also set the goals for the team's work. Kärkkäinen characterized the work and interactions within the teams differently, stating that the 1993 team was focused on *cooperation* and *collaboration*, while the 1994 team centered on *coordination*. These distinctions further support the use of the collaborative behaviors (*sharing information, planning, and problem-solving)*, in that these behaviors are reflected in the actions described by Kärkkäinen. *Coordination*, according to Kärkkäinen, includes such activities as asking for and/or giving help, information, or resources as well as coordinating units, while *cooperation* is planning and doing work together, discussing, negotiating, and disagreeing.

Even though this study primarily investigated network-building, bridging, and contact generation, the way in which Kärkkäinen distinguished these teams suggests potential differences between Finnish teaching teams and the resulting social networks. Based on the definition of collaboration as an interaction between two teachers regarding shared work, both teams represented forms of teacher collaboration, even though one team was characterized as merely coordinating. Members of the *coordinating* team were *sharing information* about students and were *planning* courses, each of which related to teaching practice. Kärkkäinen's observation in 2000 that the collaboration work of the two Finnish teams was different is still relevant to understanding teacher learning in collaborative settings and is worthy of careful

consideration. Specifically, Kärkkäinen's findings highlight the possible differences that may exist between teacher collaborative teams based on whether they are created voluntarily by teachers or are mandated by an administrator or school system.

**Statement of Problem**

Teacher collaboration has many benefits (Vangrieken et al., 2015) that make it valuable for educational researchers to study and for educational leaders to implement effectively in their schools. Vangrieken et al. made it clear that teacher collaboration has many interpretations and varied definitions. This variation is problematic for both educational researchers and educational leaders because it generates a lack of clarity regarding what behaviors and structures constitute teacher collaboration beyond simple interaction between two or more teachers. Lack of clarity makes it difficult for researchers to study and analyze the topic of teacher collaboration thoroughly and creates challenges for educational leaders who wish to encourage and foster collaboration within their schools.

While research shows that Finnish teachers do collaborate (Darling-Hammond, 2010; Eteläpelto et al., 2015; Kärkkäinen, 2000; Webb et al., 2009), clear collaboration behaviors and structures are also missing in the literature as is understanding regarding the role Finnish teacher collaboration plays in Finnish teacher learning. This lack of clarity is again problematic for U.S. educational researchers and educational leaders, particularly where it has been suggested that U.S. schools could learn from Finland (Darling-Hammond, 2010; OECD, 2011). Additional research is necessary, with attention to specific collaboration behaviors and structures as well as the role teacher learning plays in collaboration, to begin to fill in this research gap so that researchers and educational leaders can, indeed, learn more from the Finnish system.

**Research Questions**

The following questions guided this study:

1. What is the nature of teacher collaboration among Finnish teachers at a comprehensive school in terms of three key teacher collaboration behaviors (*sharing information and knowledge, planning, and problem-solving)* and in the context of teacher practice?
2. What is the nature of formal (or school-required) or informal (or voluntary) teacher collaboration for Finnish teachers at a comprehensive school?
3. To what extent and how do Finnish teachers at a comprehensive school attribute teacher learning to teacher collaboration?

## Methods

This study used qualitative and social network methods to explore and describe the construct of Finnish teacher collaboration as reported by Finnish teachers at a comprehensive school in a particularistic setting (Carolan, 2014; Flick, 2007; Miles, Huberman, & Saldaña, 2014), namely the Finnish comprehensive school. By investigating multiple teachers' descriptions of teacher collaboration within the larger context of two different schools as cases, this study followed Miles et al.'s (2014) suggestion to examine different cases, which offers an "even deeper understanding of the processes and outcomes of the cases" (p. 30). As Flick (2007) pointed out, qualitative research "starts from the notion of the social construction of realities under study, is interested in the perspectives of participants, in everyday practices and everyday knowledge referring to the issue under study" (p. 2).

**Sampling**

In this study, we sampled teachers from two Finnish comprehensive schools, each of which included first through ninth grades. The majority of Finnish students attend such schools, and these types of schools are credited as one the strengths of the Finnish education system (Sahlberg, 2014). Finland has very little inequity between schools, both in terms of the quality of teachers and in student educational outcomes from school to school (OECD, 2011; Sahlberg, 2014). In addition, teacher education programs are rigorously monitored and regulated, ensuring that consistently high-quality teacher candidates enter Finnish comprehensive schools (Sahlberg, 2014). Taking advantage of these systemic quality controls, this study used convenience sampling to identify the two schools as cases from which to sample teachers. Finnish education professionals who have connections to Finnish schools and educators provided third-party input for sampling choices. Principals of several potential Finnish schools were contacted to discuss the aims of the study, the principal's availability to meet with the lead researcher for a site visit, and their level of interest in participating in the study. From these discussions, two schools were selected as potential sites because they were traditional comprehensive schools, were interested in participating in the study, and were available to meet with the primary researcher. School 1 was located in a suburban community of 50,000, with 32 teachers serving 520 students. School 2 was located in a more rural community of 6,500, with 37 teachers serving 398 students. Both schools used Finnish as the primary, or mother-tongue, language. Finnish comprehensive schools like these include three classifications of teachers or teacher roles: classroom teacher (similar to an elementary teacher and teacher many subjects), subject teachers (similar to middle-school teachers who teach specific subjects), and special education teachers.

The primary researcher conducted site visits and principal interviews at the two schools to confirm that teacher collaboration took place among the faculty of the school, that the principal understood the research and process, and that the principal was willing to participate in the study. The principals at each school also provided a list of teams or groups in which teachers at their school collaborated. The principal at School 1 indicated that all teachers collaborated in at least one of the following eight formal (or school-required) collaborative teams: Environment, KIVA (bullying and conflict program), Security, Path to Culture, Physics, Special Education, SRK (church cooperation), and Well-Being in Work. The principal at School 2 indicated that teachers collaborated in at least one of the following five formal (or school-required) teams: Entrepreneurship and Sustainable Development, Internationality, Media and Culture, Life Skills, and Moving School. The teams at both schools were not grade- or subject-based. Some members of a team may have taught similar grades or subjects, while others did not. Given the broad definition of teacher practice we are using to contextualize teacher collaboration behaviors and structures, these teams reflect a variety of the instructional and non-instructional areas about which teachers collaborate.

**Data Collection**

Following the site visits and principal interviews at each school, a total of 69 teachers from the two schools were sent an online, Finnish-language survey administered through Qualtrics (2013). The data in this study comes from the 19 of the 69 (27%) teachers who were invited to participate. A total of 46 of the 69 (66%) teachers were nonresponders, and four of the 69 (6%) teachers refused to take the survey. At School 1, 10 (31%) of the school's teachers responded while at School 2 nine (24%) of the teachers responded, with most teachers fully completing the survey instrument. Several explanations may account for the low response rate

from teachers at both schools. The length of the survey and the network survey items may be one reason. Census-based network questions like those included in the second section of the instrument require a teacher to answer questions about every other teacher at their school, and this may have discouraged teachers from completing the survey. In addition, the researcher primarily contacted and worked with the principals before sending out the online survey, yet teachers had not had any direct contact with the researchers. The low response rate may also be a function of the autonomy Finnish Teachers enjoy as professionals. Similarly, low response rates (e.g. 10% and 39%) by Finnish teachers to online surveys have been found in recent Finnish education research (Pietarinen, Pyhältö, Soini, & Salmela-Aro, 2013; Seikkula-Leino, Satuvuori, Ruskovaara, & Hannula, 2015). Finally, technical issues may have occurred in sending surveys to teachers' email accounts.

Table 1 provides the completion rates for each the four survey sections used in this study. The 19 teachers included in this study answered all of the questions in the first two sections of the survey and responded to a majority of the other survey questions. Data analyses are based on the percentage of teachers who provided responses to the relevant survey items.

Table 1

*Teacher Survey Completion Rates by Survey Section*

| | School 1 Completion Rate n=10 | School 2 Completion Rate n=9 | Total Completion Rate n=19 |
|---|---|---|---|
| Demographic questions | 10 (100%) | 9 (100%) | 19 (100%) |
| Formal and informal collaboration questions | 10 (100%) | 9 (100%) | 19 (100%) |
| Collaboration network questions | 8 (80%) | 8(89%) | 16 (84%) |
| Open-ended qualitative questions | 8 (80%) | 6 (67%) | 14 (74%) |

The first section of the survey included demographic items for the teacher including age, gender, education, years taught, and teaching assignment. The second section included three items regarding formal and informal collaboration to assess if a teacher engaged in such collaboration with any colleagues at their school. Section three included census-based network items (Borgatti et al., 2013; Carolan, 2014) addressing teacher collaboration and the teachers' relational ties. These items asked teachers to indicate the strength of their collaborative relationships with all the other teachers at their school based on four-point agree or extent scales. These items included three questions about collaboration in general, with one for each collaboration behavior (*sharing information, planning, and problem-solving*), three questions about informal collaboration for each of the three behaviors (*sharing information, planning, and problem-solving*), and one question about formal collaboration. Section four included open-ended written response items about teacher collaboration focusing on collaboration behaviors, teacher learning, and informal and formal collaboration. Questions related to teacher collaboration in all sections were purposively broad and general in their context regarding teaching and teacher practice to support the researchers' intentionally broad or more holistic view of teaching and teacher practice. An English version of the entire survey instrument is available in Appendix C.

**Data Analysis**

Data analyses first summarized demographic data. To address the nature of Finnish teacher collaboration and the three key behaviors (research question one) and the nature of formal and informal collaboration (research question two), the following methods were used. First, we generated descriptive statistics (mean, percent, standard deviation, and count) of the collaboration behaviors both aggregated and for each school individually from network questions

in section three of the survey. Second, the collaborative network ties between the teachers were diagrammed and analyzed using social network graphs (Borgatti, Everett, & Freeman, 2002) to examine the nature of the collaboration relationships and network within each school. Third, strong network collaboration ties were identified when they were described as either *moderately descriptive* or *very descriptive* and *moderate extent* or *strong extent*. If a teacher's tie met either criterion, then it was considered to be a strong tie. Responses of *not descriptive* or *somewhat descriptive* and *no extent* or *low extent* were, by definition, weaker ties. All strong ties, or responses of *moderately descriptive* or *very descriptive* and *moderate extent* or *strong extent*, fell one standard deviation above the mean response to collaboration ties. Fourth, the teachers' egocentric collaboration network relationships with other Finnish teachers were compared and contrasted between teachers and between schools to identify trends and patterns of collaboration. Finally, the direct density of the different collaboration networks was compared. Density is reported as a percentage given that "the density of a network refers to the number of existing ties in a network in relation to the maximum number of possible ties" (N. M. Moolenaar, Sleegers, & Daly, 2012, p. 252). Denser networks are assumed to have the ability to transfer resources more quickly (Scott, 2001) and to be more desirable for the flow of network content, such as collaboration. Since we did not have complete network data, in that not every teacher at each school participated, we assessed only the egocentric directed ties of the 19 teachers and the direct density based on these ties.

The network collaboration survey provided data on formal and informal collaboration ties as well as those identified as having the three key collaboration behaviors. We calculated the number of formal and informal collaboration ties generally and for each key collaboration behavior. We measured the average number of informal ties directly. For each key

collaboration behavior, we estimated the average number of formal ties as the difference between the number informal ties and the total ties. For example, if a teacher indicated they had a *planning* tie but didn't indicate they had an informal *planning* tie with that same teacher, a *planning* formal tie with that teacher was estimated. One limitation of this strategy is that it assumes no overlap between formal and informal collaboration. Thus, we acknowledge that the formal tie data for the three collaborative behaviors are necessarily underestimated. The average number of informal ties for each key collaborative behavior was based on the number of informal ties each teacher had with each teacher at their school for that behavior alone. That is, if a participant indicated informal ties for all three collaborative behaviors with the same teacher, then the tie did not account for this multiplexity and was considered a single tie. This process was replicated for strong ties.

Qualitative analysis addressed all three questions through the use of open-ended survey items using NVivo 11 (QSR, 2015). This analysis was completed across both schools combined rather than at the individual school level due to the lower response rate of teachers (14 out of 19) to these items on the survey. Qualitative analysis began with open coding (Gibbs, 2007) and included matching responses to the research questions, memo writing, organizing the data into hierarchical categories, and identifying emergent themes based on a majority of teachers commenting on that category. In the second phase of the qualitative analysis, axial coding (Gibbs, 2007) focused on identifying patterns among the themes within the data and examining how these patterns might address the research questions. Lastly, selective coding focused on confirming the patterns of descriptions, definitions, relationships, and narratives that were most central to addressing and articulating the specific research questions of this study (Gibbs, 2007).

Finally, teacher names were recoded as "T," with two distinct numbers (exp. T 2-1), with the first number indicating the school and the second number indicating the teacher.

## Findings

The demographic data summarizing the 19 teachers in our study is provided in Table 2. Teacher demographics did not support any patterns in the data, likely due to the small sample size. The findings addressing the three research questions are presented in three sections, respectively. The first section, addressing the first research question, presents findings on the nature of Finnish teacher collaboration based on the behaviors of *sharing information, planning, and problem-solving*. The second section, addressing the second research question, presents findings on the formal (or school-required) and informal (or voluntary) structures of Finnish teacher collaboration. The third section, addressing the third research question, presents findings on the connection between Finnish teachers' collaboration and teacher learning.

Table 2

*Demographics of Teacher Respondents*

| Teacher Demographics | School 1 (n=10) | School 2 (n=9) | Both Schools (n=19) |
|---|---|---|---|
| Average Teacher Age | 46 | 41 | 44 |
| Standard Deviation of Teacher Age | 9 | 7 | 8 |
| Teacher Gender: Male | 2 (20%) | 2 (22%) | 4 (21%) |
| Teacher Gender: Female | 8 (80%) | 7 (78%) | 15 (79%) |
| Mean Years Teaching | 17 | 11 | 14 |
| Standard Deviation of Years Teaching | 9 | 8 | 9 |
| Mean Years at Current School | 10 | 6 | 8 |
| Standard Deviation of Years at Current School | 3 | 7 | 5 |
| Number of Classroom Teachers | 3 (30%) | 3 (33%) | 6 (32%) |
| Number of Subject Teachers | 5 (50%) | 3 (33%) | 8 (42%) |
| Number of Special Education Teachers | 2 (20%) | 3 (33%) | 5 (26%) |
| Number of Teachers with Master's Degree | 10 (100%) | 8 (89%) | 18 (95%) |
| Number of Teachers in Formal Groups/Teams | 10 (100%) | 9 (100%) | 19 (100%) |
| Number of Teachers Who Informally Collaborate | 10 (100%) | 9 (100%) | 19 (100%) |

**Nature of Finnish Teacher Collaboration**

The nature of Finnish teacher collaboration was informed by the analysis of the network collaboration relationships based on the three key teacher collaboration behaviors: *sharing information and knowledge*, *planning*, *and problem-solving*. The network collaboration data collaboration data indicated that all the teachers had ties (weak or strong) with another teacher at their school for *sharing information* and *problem-solving*. For *planning*, 95% of the teachers had weak ties, while 68% had strong *planning* ties with another teacher at their school. Thus, all but one teacher (95%) had collaboration ties in each of the three behaviors with another teacher at their school. These findings are further triangulated by the qualitative responses in which a majority (57%) of the teachers commented on all three behaviors.

Table 3 compares the collaboration network ties between the two schools in terms of collaboration behaviors (all ties), strong ties, and the direct densities of the networks. Given that strong ties were a subset of collaboration ties in both schools and across behaviors, the strong-tie networks have lower egocentric density. For both the average number of strong ties and the egocentric density of the networks, teachers engaged in more *sharing information* than in *planning* and *problem-solving* as collaboration behaviors. For strong ties and egocentric density, the main difference between the two schools was that teachers in School 1 engaged in more *planning* collaboration behaviors than *problem-solving*, while in School 2 teachers' collaboration behaviors indicated the inverse.

These findings highlight the overlapping nature of the collaborative behaviors. Given that the average number of *sharing information* ties was virtually the same as average number of ties having at least one of the three collaboration behaviors, *sharing information* overlapped with most of the *planning* and/or *problem solving* ties. This pattern held at both schools and also for strong

Table 3

*Average Egocentric Network Size and Density per Teacher by Three Teacher Collaboration Behaviors*

| Collaboration Behavior | Teacher Egocentric Collaboration Networks | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | School 1 (31 ties possible[1]) | | | | School 2 (36 ties possible[1]) | | | |
| | Network Size | Egocentric Network Density[2] | Network Size: Strong Ties | Egocentric Network Density[2] | Network Size | Egocentric Network Density[2] | Network Size: Strong Ties | Egocentric Network Density[2] |
| Sharing Information | 21 | 68% | 10 | 32% | 25 | 69% | 11 | 31% |
| Planning | 8 | 26% | 8 | 26% | 6 | 17% | 4 | 11% |
| Problem-Solving | 13 | 42% | 6 | 19% | 20 | 56% | 8 | 22% |
| Any of the Three Collaboration Behaviors[3] | 22 | 70% | 11 | 35% | 26 | 72% | 12 | 33% |

[1] Possible ties for each teacher were calculated as the total number of teachers at each school less one (the responding teacher). Thus, *possible ties* represent the maximum number of ties any teacher could have with other teachers at each school for each of the three collaboration behaviors.
[2] The average egocentric network size is the average number of teacher ties; average egocentric network density is the proportion of average actual ties of teachers over the maximum possible ties in the network.
[3] *Any of the Behaviors* was assessed as average number of teacher collaboration behavior ties with at least one of the three key behaviors. If a teacher had ties for all three collaboration behaviors, this tie was counted as only one tie.

ties. For example, a majority of the teachers (63%) had ties (or strong ties) based on both *planning* and *problem-solving* only with teachers with whom they also had a *sharing information* ties or strong ties. Among the other 37% of teachers, we still see the critical nature of the *sharing information* collaboration behavior. On average, these teachers had 83% of their *planning* and *problem-solving* collaboration ties and strong ties with teachers with whom they also had *sharing information* collaboration ties and strong ties. The overlap of *sharing information* behavior with *planning* and *problem-solving* behaviors seems rather logical in that one must *share information* to *plan* or *problem-solve*.

Finally, a pattern exists in the survey data regarding the extent to which Finnish teachers in this school collaborate. Findings indicated that, on average, these Finnish teachers collaborated with 71% of their colleagues and had strong collaborative relationships with 34% of their colleagues. Of these ties, they had ties to *share information* as a collaborative behavior with 68% of their colleagues and had strong collaborative ties based on this behavior with at least 31% of their colleagues. For *problem-solving*, they averaged ties with at least 42% of their colleagues and at least 19% for strong ties.

Similar to the network findings, *sharing information* as a collaborative behavior represented a main theme (79%) in the data in the open-ended survey questions. Sub-themes included sharing information about subjects or subject matter (57%) and sharing ideas or insights (50%). While not mentioned by a majority, some indicated that they shared information about materials (36%). For example, when asked what collaboration looked like at their school, one teacher stated, “We discuss our own subjects, share experiences, ideas, and lessons that are planned for the students” (T 2-1). However, only 22% of the teachers commented on *sharing information* related to students.

In terms of *planning*, 57% of the teachers discussed this collaborative behavior. For example, one teacher stated, "A lot of time is used towards joint *planning* but more could be used. Work towards breaking the borders of subjects. I have experienced everyone is open to collaboration" (T 2-6). While no clear sub-themes stood out regarding *planning*, teachers stated that they planned subject matter (29%), discussed *planning* as a function of other teaching activities such as *planning* events, school activities, or union meetings (29%), and discussed *planning* related to students (21%).

For *problem-solving*, 57% of the teachers responded with general comments. Some of these teachers (29%) indicated they were collaborating in an effort to figure out how to solve problems with students. For example, when asked about an example of when they had *problem-solved* with other teachers to improve practice, one teacher talked about "collaboration with the Special Needs teacher to overcome student's learning disabilities" (T 1-3).

Finally, in addition to the three teacher collaboration behaviors, another theme came out of looking at teacher collaboration generally. Many of the responding teachers (79%) commented that, for them, teacher collaboration had to be reciprocal in nature. For example, when asked about the primary way in which they collaborated with other teachers to improve their practice, one teacher described "using the other teacher's strengths and sharing own strengths, sharing of responsibility" (T 2-7). Some teachers (25%) also discussed deprivatized practice as a method in which they collaborated with their colleagues and found to be important to their improving their practice. For example, a teacher indicated that their preferred method of collaborating to improve their practice was deprivatized practice. They stated, "the best way is to take part in the other teacher's lessons. Then you can see how he builds his lessons, and you can find new tips for your teaching" (T 1-2).

**Formal and Informal Finnish Teacher Collaboration**

In both schools, teachers were involved in formal (or school-required) collaboration teams, with School 1 having eight such teams, and School 2 having five. Given the broad definition of teacher and teaching practice in this study, both the instructional and non-instructional purposes of these teams are relevant to our analysis of teacher collaboration. All teachers indicated that they participated in at least one of these formal (or school-required) collaboration teams. All teachers indicated that they also participated in informal (or voluntary) collaboration with other teachers in their school.

**Collaboration network structures.** Table 4 provides network size and density of teachers' formal and informal egocentric collaboration networks by the three collaboration behaviors in the two schools. These findings highlight the teacher's informal collaboration ties. For collaboration ties overall, the Finnish teachers at both schools had greater size and density of their informal collaboration ties than formal collaboration ties. At School 2, this pattern also held for strong ties. For sharing information, while teachers at School 2 demonstrated greater egocentric network size and density of informal ties over formal ties, teachers at School 1 had mixed results. For planning, teachers at both schools generally had greater size and density of informal ties than their formal ties. In contrast, for problem-solving, teachers at School 1 had greater size and density of their formal collaboration ties and strong ties. School 2 only demonstrated this pattern for strong ties, while their collaboration ties continued to favor informal ties. Another pattern was that School 1's strong ties were more often formal while in School 2, they were more informal. These patterns suggest a key difference between the two schools in terms of their collaboration network structures. First, teachers in School 1 had more formal collaboration ties and strong ties than teachers in School 2 as well as more formal ties

Table 4

*Average Formal and Informal Teacher Egocentric Collaboration Network Size and Density per Teacher by Three Collaboration Behaviors*

| Collaboration Structure | Teacher Egocentric Collaboration Networks | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | School 1 (31 ties possible[1]) | | | | School 2 (36 ties possible[1]) | | | |
| | All Ties | | Strong Ties | | All Ties | | Strong Ties | |
| | Network Size | Egocentric Network Density[2] | Network Size: Strong Ties | Egocentric Network Density[2] | Network Size | Egocentric Network Density[2] | Network Size: Strong Ties | Egocentric Network Density[2] |
| Formal | 15 | 48% | 8 | 26% | 10 | 28% | 6 | 16% |
| Informal | 16 | 52% | 4 | 13% | 18 | 50% | 8 | 22% |
| Formal Sharing Information | 12 | 39% | 7 | 23% | 8 | 22% | 5 | 14% |
| Informal Sharing Information | 15 | 39% | 4 | 13% | 18 | 50% | 7 | 19% |
| Formal Planning | 5 | 16% | 2 | 6% | 2 | 6% | 1 | 3% |
| Informal Planning | 6 | 19% | 2 | 7% | 11 | 31% | 3 | 8% |
| Formal Problem-Solving | 9 | 29% | 5 | 16% | 10 | 28% | 6 | 16% |
| Informal Problem-Solving | 7 | 23% | 2 | 7% | 12 | 33% | 2 | 6% |

[1] Possible ties for each teacher were calculated as the total number of teachers at each school less one (ego or the responding teacher). Thus, possible ties represent the maximum number of ties any teacher could have with other teachers at each school for each of the three collaboration behaviors.
NOTE: This is "possible ties for each teacher."
[2] The average density was calculated by taking the proportion of the average actual ties of teachers over the maximum possible ties.

based on the behaviors of *sharing information* and *planning*. As a result, the school overall would be more likely to have denser formal and formal strong-tie collaboration networks. On the other hand, teachers in School 2 had more informal collaboration ties and strong ties than teachers in School 1. Thus, based on all three collaboration behaviors, the school had denser informal collaboration networks. This pattern is also apparent when the informal strong collaboration networks at both schools are graphed visually (see Figure 2). The higher density of informal collaboration ties at School 2 becomes more apparent in the comparison of these two graphs.

Finally, Figure 2 shows network graphs of the teachers' strong informal collaboration ties at both schools. The squares represent every teacher at each school with larger squares signifying teachers participating in our study. Directional lines represent a strong informal tie a participating teacher had with another teacher. These network graphs highlight that 29% of the teachers in School 1 were isolates, meaning they did not have strong informal collaborations ties with any of the participating teachers at their school. This finding contrasts the network graphs of the other types of collaboration ties at these two schools, in which the collaboration networks had either no isolates or only a few. The network graph indicating 29% of the teachers as isolates is different than the rest of the collaborations network graphs, which did not show any meaningful differences between the schools. These findings suggest that greater variation existed between the two schools than expected in terms of the three collaboration behaviors when they were contextualized by formal and informal structures based on strong ties.

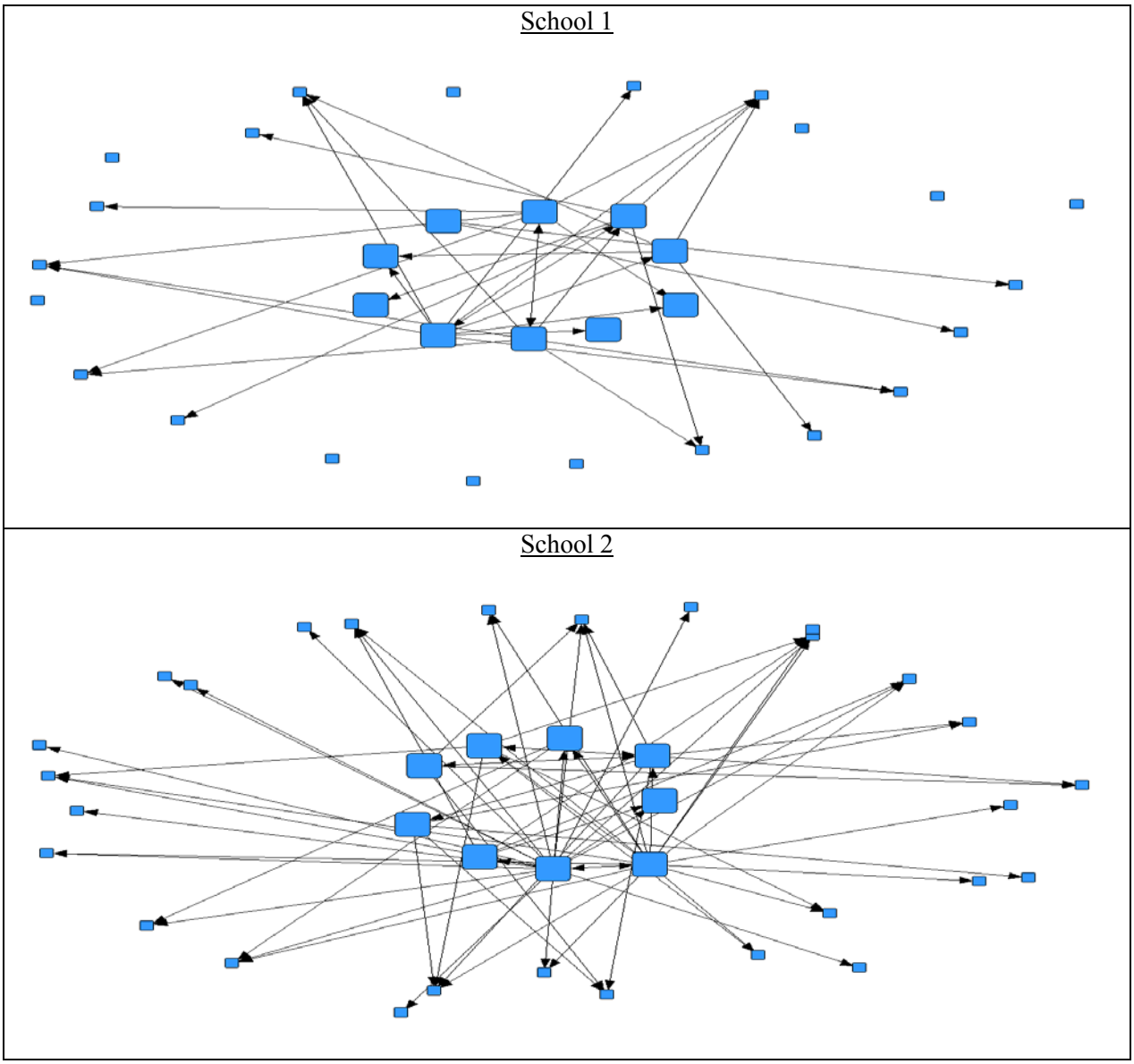


*Figure 2.* Network graphs of strong informal collaboration ties at Schools 1 and 2.

**Qualitative findings.** Qualitative analyses examined the open-ended responses focused on formal (or school-required) and informal (or voluntary) collaboration. A clear theme emerged with formal (or school-required) collaboration in regard to what teachers did not comment on. The data indicated a complete lack of direct discussion about the three collaboration behaviors of sharing information, planning, or problem-solving in relationship to formal teacher collaboration.

A theme regarding informal collaboration emerged from the data. In the data, 65% of teachers associated informal collaboration with *sharing information and knowledge*. For example, when asked to share an example of informal collaboration (that occurred outside of the school's formal groups), one teacher stated, "If somebody is an expert in something, then he/she shares that knowledge with others" (T 2-9). In contrast, however, both *planning* and *problem-solving* were mentioned by only one teacher (7%) each in relation to informal collaboration. Several potential themes also emerged regarding informal collaboration. First, 43% of the teachers indicated that informal (or voluntary) collaboration took place in informal settings. Four specific settings for this type of collaboration were mentioned: during recess, after school, in the teacher's lounge, and off school grounds. Second, 36% of teachers indicated that informal collaboration was essential or important. For example, when asked if they had anything else to say on informal (or voluntary) collaboration, one teacher stated, "You can't go on without it [informal collaboration]" (T 1-4). Third, 29% of the teachers made positive comments about informal collaboration and how much they enjoyed it. For example, when asked to describe voluntary collaboration, another teacher stated, "When it is done voluntarily, it is not forced. In other words, it is more meaningful and more fun" (T 1-1).

In terms of formal collaboration, two potential themes emerged. First, 36% of the teachers indicated that formal (or school-required) collaboration was a *necessary* part of school. For example, one teacher stated that school-required collaboration "is essential for the function of the school" (T 1-10). Second, 36% of the teachers indicated that formal (or school-required) collaboration was related to their non-instructional activities. As one teacher stated,

> School-required collaboration is not necessarily directed to my teaching, but mostly for overall subjects or various projects or happenings. School-required collaboration is

> mainly in a teamwork setting where team meetings and union-related subjects are discussed. (T 1-6)

Lastly, only 16% of teachers mentioned formal collaboration in relationship to a teacher's *subject* or content portion of their teacher and teaching practice.

**Finnish Teacher Learning and Collaboration**

Addressing the third research question, qualitative analyses examined whether Finnish teachers experienced learning through teacher collaboration. In doing so, we relied on Darling-Hammond and Richardson's (2009) measures of teacher learning; namely, a change in practice or pedagogy or an increase in knowledge of content or practice. While we had anticipated finding clear results relating teacher collaboration and teacher learning, largely due to its prominence in the literature, this finding did not occur. Rather, learning due to collaboration only emerged as a potential theme, with only some of the teachers (21%) directly indicating that collaboration caused them to change their practice or to increase their knowledge of teacher or teaching practice. These discussions of collaboration and learning represented longer responses than most of the open-ended responses. Teacher comments that mentioned learning due to collaboration were clear, such as one teacher who commented, "I got help in music from a music teacher when I was making a rap. They suggested how to make the background sound without particular instruments or ready-made beat" (T 1-7).

However, even without explicit teacher comments about collaboration resulting in learning, the data does suggest that such teacher learning could be taking place among these Finnish teacher respondents. Many of the qualitative questions asked teachers to provide examples of how teacher collaboration in its various forms had helped *improve their teaching*.

Given that improved teaching infers that some degree of change must take place, their responses provide more data for the analysis of potential teacher learning from collaboration.

A majority of teachers (93%) provided examples of how teacher collaboration *improved* their teaching practice when asked directly. Specifically, 64% of the teachers provided examples that reflected how *sharing information* with a colleague improved their teaching. For example, when asked to share an example of how another teacher had helped improve their practice, one teacher described, "Another teacher gave me an example in the teacher's lounge about an experiment, which I could implement easily in my classroom (which doesn't have normal physics equipment)" (T 2-4). In addition, 57% of the teachers provided examples of how *planning* with other teachers had improved their teaching. For example, in response to the most helpful or useful ways that *planning* helped improve their teaching practice, one teacher responded with, "Discussion, time for discussion and *planning*, making it happen" (T 1-7). Finally, 43% of the teachers shared examples of how *problem-solving* had improved their teaching. For example, when asked to share an experience about *problem-solving* with other teachers to improve their practice, one teacher stated, "Discussing, asking how the colleague would act in a different situation or would teach a certain subject" (T 1-6). These findings clearly related the three specific types of collaborative behaviors to teacher learning.

Two additional findings emerged regarding collaboration and the improvement of teaching. First, the theme emerged (71%) that discussion with other teachers was an important part of the collaboration that improved their practice. As a potential theme, 36% of the teachers commented that observing the teaching of other teachers, also known as deprivatized practice (Bryk, Camburn, & Louis, 1999; Kruse, Louis, & Bryk, 1994), was a form of collaboration that had helped them improve their practice.

Despite the lack of teacher comments directly indicating that they changed practice or pedagogy or increased their knowledge of content or practice as a result of collaboration, these references to collaboration behaviors *improving* their teaching practice suggests teacher learning. The Oxford dictionary ("Improve," 2016) states that one definition for *improve* means to "develop or increase in mental capacity by education or experience." A development or increase in one's mental capacity can be considered learning. Given that the findings show teachers improved their teaching practice due to collaboration, we suggest that this is a measure of teacher learning even if it does not explicitly match the desired measures (a change in practice or pedagogy or an increase in knowledge of content or practice) elaborated by Darling-Hammond and Richardson (2009).

## Discussion

### Nature of Finnish Teacher Collaboration

This research supports the assertion (Darling-Hammond, 2010) that Finnish teachers clearly collaborate. More specifically, this study provides three new insights to the nature of the collaboration practiced by teachers in Finnish comprehensive schools. First, this data supports the development of the construct of collaboration behaviors; namely that teacher collaboration includes three behaviors: *sharing information and knowledge*, *planning*, and *problem-solving*. Nearly all of the teachers (95%) indicated that they engaged in the three collaboration behaviors with other teachers at their school when formality was not considered. This finding is important not only to clarify how Finnish teachers collaborate but also to help make collaboration, which is often seen as vague phenomenon (Vangrieken et al., 2015), more measurable and concrete. Understanding such nuance regarding Finnish teacher collaboration is also instructive for teacher

collaboration beyond Finnish schools because it provides both researchers and educational leaders with a refined vocabulary for analyzing and identifying aspects of teacher collaboration.

Second, this data highlights the complexity between the three collaboration behaviors. Finnish teachers engaged the most in collaboration behaviors of *sharing information and knowledge*. The second and third most-used behaviors varied between *problem-solving* and *planning* depending on the school and the nature of the formal and informal structures. This particular hierarchy of collaboration behaviors seems logical given that the *sharing of knowledge and information* is the least difficult of the three behaviors, while both *problem-solving* and *planning* can take more time. A clear of degree of overlap also exists between the *sharing information and knowledge* behavior and the other two behaviors. While the purpose of this study was not to examine the interplay or connectedness of the behaviors, the data suggests that there is more to learn regarding how these behaviors interact with and enhance each other and whether there are potential contexts or relationships that enhance whether a teacher engages in one or more of these behaviors when collaborating with a colleague. In addition, the data does not highlight the particular benefits of one behavior over another in relationship to teacher or school outcomes. Further research is needed to assess these aspects of collaboration behaviors as well to investigate how these collaboration behaviors are utilized similarly and/or differently for teachers in U.S. and other contexts.

Third, this study highlights the scale of collaboration that takes place among teachers in Finnish comprehensive schools. Simply stated, Finnish teachers collaborate with a majority of the teachers in their school, not just with teachers who teach the same subjects or the same grades. Previous research suggested that Finnish teachers collaborated (Darling-Hammond, 2010) but did not articulate the scale or the magnitude of the collaboration. Specific comparison

points are not available in this study to compare the scale of collaboration in Finnish and U.S. schools. However, based on the primary researcher's own experience working in U.S. schools, the findings suggest that Finnish teachers may collaborate with many more of their colleagues than U.S. teachers. The teachers in this study collaborated with 71% of teachers in their school and had strong collaboration ties with 34% of the teachers in the school. How many U.S. educational leaders can state that the teachers in their schools collaborate with over two-thirds of the teachers at their schools and have strong collaboration ties with one-third of the teachers at their schools? This finding, in part, may be attributed to Finnish schools' lack of having standardized test scores drive teacher and school improvement. In systems like the U.S., where the pressure to improve student achievement plays an important role in teachers' school lives, it would be natural for teachers to seek collaboration with just those teachers who teach similar subjects or grade levels. Even though teachers receive some compensation for collaborating three hours a week beyond their contract (Sahlberg, 2015), not one teacher in this study mentioned financial compensation in relationship to teacher collaboration or as motive for collaborating with colleagues. In addition, cultural aspects unique to the Finnish education system may also play a role in Finnish teachers collaborating with so many members of their school staff. Sahlberg (2014) indicates that Finnish schools create equitable results for students as well receive high degrees of trust from their communities. Such high degrees of trust and a focus on equality could roll over to the professional working relationships of the Finnish teachers and impact Finnish teachers' collaboration strategies, which in turn could increase the number of their collaboration relationships in the school.

Lastly, even though utilization of deprivatized practice was only commented on by a handful of teachers, this concept is noteworthy in the context of Finnish teachers. Deprivatized practice is defined as

> Teachers share, observe, and discuss each other's teaching methods and philosophies; for example, through peer coaching. By sharing practice "in public," teachers learn new ways to talk about what they do, and the discussions kindle new relationships between the participants. (Kruse et al., 1994, p. 4)

Research (Bryk et al., 1999) indicates that among its benefits, deprivatized practice enables teachers to enter one another'sclassroom to engage in collaboration that allows

> opening up of one's practice to scrutiny also encourages teachers to ask questions about their practice and to view it in a more analytic fashion. In this way, teachers also come to know each other's strengths, and can therefore more easily find "expert advice" from colleagues. (p. 3)

The Finnish teachers in this study, engaging in this type of collaboration, indicated that it improved their teaching, as suggested by Bryk et al. (1997). Again, this result may stem from high levels of trust within the Finnish education system, which may extend to teachers' relationships with their colleagues. Achieving deprivatized practice is a desirable outcome in any education system because of the levels of reflection and learning teachers can achieve from such practices. Further study of Finnish teacher collaboration that specifically looks for the utilization of deprivatized practice in teacher collaboration would inform both how prevalent it is among Finnish teachers as well as its causes and benefits.

**Finnish Formal and Informal Teacher Collaboration**

This study suggests two key points regarding formal and informal collaboration networkstructures. This study supports Sawyer's (2007) and other researchers' distinctions between collaboration based on formality; namely, that both formal (or school-required) and informal (or voluntary) collaboration structures exist as collaboration network structures. All of the Finnish teachers in this study engaged in both collaboration structures (formal and informal), but there was variability in both which collaboration behaviors were engaged in each structure. Also, there were differences in network and qualitative data regarding what teachers reported on the collaboration behaviors in these structures. In addition, for some Finnish teachers, formal and informal collaboration structures were both perceived as vital parts of a Finnish teacher's practice. Speaking of both formal and informal collaboration, two teachers from School 1 stated it best: "They complement each other" (T 1-4) and "School-required collaboration is for the function of school, whereas voluntary collaboration helps teachers function for the benefit of the school" (T 1-10). Similar to the three collaboration behaviors, an understanding and utilization of both formal and informal collaboration structures adds nuance and clarity to our understanding of teacher collaboration for Finnish teachers, and may inform teacher collaboration in the U.S. and other contexts.

The second point regarding formal and informal collaboration networks at Finnish comprehensive schools is that these network structures do differ from each other. This finding may be a reflection of the autonomy that Finnish teachers and schools enjoy, but the variability is interesting when considered in the context of some U.S. school reforms. Many school districts and educational leaders in the U.S. attempt to create more systematic (or formal) structures of teacher collaboration in their schools. Even though we do not have any student achievement data

for individual Finnish comprehensive schools, such as those in this study, research (Darling-Hammond, 2010; OECD, 2011; Sahlberg, 2014) suggests that Finnish schools produce equitable student achievement outcomes across all schools. If that is true for these schools, then this study may suggest that schools can vary in their formal and informal collaboration network structures and still achieve equitable student achievement outcomes. The findings of this study also reflect a lingering question regarding how the nature of formal and informal collaboration differs. Vangrieken et al. (2015) indicated that collaboration provides positive outcomes at the student, teacher, and school levels. While this research did not investigate all outcomes at these levels, it is possible that the differences between the qualitative and network data on formal (or school-required) collaboration may stem from these different outcomes. Further research is needed to tease out the potential outcomes of formal collaboration at various levels of analysis so that we might better understand how formal collaboration benefits Finnish students, teachers, and schools.

Future research is also merited on the processes of both formal and informal collaboration. Given that all of the teachers acknowledged engaging in both forms of collaboration and that they viewed both structures favorably, a better understanding of the nature, purposes, outcomes, and benefits of both formal and informal collaboration is warranted. In addition, more qualitative and network data should be collected to investigate to better understand the key collaboration behaviors' relationship to formal and informal collaboration structures. Future research should also examine whether and how formal and informal collaboration are viewed differently or function differently in the U.S. or in other national contexts. Continuing to develop an understanding of and how and why teachers use each type of collaboration structure (formal and informal) across a range of educational contexts can inform

educational leaders and teacher leaders in both Finland and other national settings on how to more effectively use teacher collaboration to achieve their desired educational outcomes or reforms. Comparing such data to other Finnish schools, U.S. schools, and other national contexts would help educators better understand the role formality plays in effective collaboration and educational outcomes.

**Finnish Collaboration and Teacher Learning**

Improving and maintaining high teacher quality is a primary goal of educational leaders. This study suggests that Finnish teacher collaboration led to teacher learning. Nearly all of the Finnish teachers attributed teacher collaboration to the improvement of their teacher practice. Their collaboration included both formal (or school required) and informal (or voluntary) teacher collaboration. However, additional research investigating teacher learning outcomes in the context of teacher collaboration among Finnish teachers is also merited. Richer qualitative data is needed to better understand Finnish teacher collaboration's relationship to teacher learning. Finland has high-quality teachers (Darling-Hammond, 2010; OECD, 2011; Sahlberg, 2014), and it is possible that teacher collaboration assists in maintaining and improving that quality through teacher learning. However, other factors may also contribute to how Finnish teachers maintain their teacher quality. In addition, and in relationship to the previous discussion of formal and informal collaboration, more research is needed to examine potential differences in teacher learning based on collaboration structure.

**Limitations**

Given the network perspective, a clear limitation to this study was the partial sampling of teachers at each school and the high number of nonresponses. While the study initially aimed to include the full census of teachers from each school to support analysis of each school as a whole

organizational network, lower teacher response than expected did not support this level of analysis. Another limitation in this study was the inability to interview the teachers in person at each school. As a result of not being able to interview the teachers in person, the original episodic interview questions were revised into open-ended survey questions. This adaptation limited the depth and richness of the qualitative responses, whereas an interview could have solicited lengthier and more detailed responses to these questions. An additional limitation comes out of the network data. The survey included nine primary network collaboration items addressing the research questions. Three questions addressed the three types of collaboration behaviors (*sharing information and knowledge*, *planning*, *and problem-solving*). Three more questions addressed these behaviors in the context of an informal collaboration setting. This pattern should have been replicated with formal collaboration. Lastly, we believe the length of the survey created a barrier in obtaining a larger sample of teachers at each school. Despite these limitations, the available data does provide important insights into Finnish teacher collaboration and suggests further questions to guide future research.

## Conclusion

Our research poses potential questions for educational leaders and teachers in the U.S. and other countries about how they approach and facilitate collaboration in their schools or within existing formal and informal collaboration networks. Are teachers engaging in collaboration that allows them to *share information and knowledge*, to *plan*, and to *problem-solve*? Does teacher collaboration afford them the ability to learn or improve their teaching practice? And, finally, are teachers able to participate in both formal (or school-required) and informal (or voluntary) collaboration?

Finnish teachers collaborate in a variety of ways and for different purposes and with a majority of their colleagues. They collaborate in both formal teams and informally with colleagues. In their collaboration relationships, they *share information and knowledge* with most of their colleagues. Teachers also *plan* and *problem-solve* about their teaching practice in collaboration relationships, although to a much lesser extent. They also improve their teaching practice and, therefore, learn from teacher collaboration.

Sahlberg (2014) indicated that the possible lesson for other educational systems, like the U.S., is not that such systems should mimic everything the Finns are doing in their schools. Instead, just as Finland has learned, adapted, and incorporated principles and practices into their system from other countries, U.S. educational leaders, policy makers, and educators can do likewise with the Finnish system. This research not only provides a snapshot into how Finnish teachers collaborate but also provides additional nuance and specifics in terms of the formality of teacher collaboration and the structures of teacher collaboration networks. The lessons learned from this study are applicable and helpful not only for understanding Finnish teacher collaboration but for informing teacher collaboration generally.

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## APPENDIX A: Extended Literature Review

### Teacher Collaboration in Schools

Unlike other areas of educational research, teacher collaboration does not have one body or canon of research but finds its way into discussions ranging across the topics of teacher learning, school reform or change, professional development, teacher education, and teacher networking. This variety of research contexts and purposes makes the subject amorphous and challenging, with the result that varied answers are given to the question, *What constitutes teacher collaboration?*

The topic of teacher collaboration is found in many diverse areas of study in a variety of disciplines and philosophical perspectives. This section intends to synthesize these different strains in the hope of helping the reader more fully understand what constitutes teacher collaboration. It is important to note that most studies and discourses that discuss teacher collaboration do not provide explicit definitions of characteristics or a clear construct of the behaviors that constitute teacher collaboration. As Lavie (2006) has suggested, there are multiple theoretical constructs of teacher collaboration. However, reflected in this literature review is the author's definition of teacher collaboration (Barott & Raybould, 1998; Sawyer & Rimm-Kaufman, 2007; West, 1990): two or more teachers *sharing information and knowledge*, *planning*, *and problem-solving* in regards to teacher practice.

Based on the author's reading of the literature, he has chosen to narrow the study of teacher collaboration to three areas of desired outcome: student achievement, teacher learning, and school reform. These three desired outcomes are continually discussed and tested by researchers interested in teacher collaboration and also relate directly to the argument that U.S. schools can learn from countries like Finland (Darling-Hammond, 2010; OECD, 2011). In

addition, given the accountability and school reform climate the United States has been experiencing over the last decade with the passage of the No Child Left Behind Act of 2001, these three topics are clearly relevant to the study of teacher collaboration.

The author has organized this literature review into 10 sections. Section one is a historical review of the seminal works related to teacher collaboration research. Section two looks at teacher learning as a product of teacher collaboration. Section three highlights how teacher collaboration can connect to student achievement through teacher quality. Section four comments on the impact of teacher learning on teacher quality. Section five looks at the relationship between teacher quality and student achievement. Section six discusses teacher collaboration and professional learning communities as factors in school reform efforts. Section seven further investigates the relationship between teacher collaboration and student achievement. Section eight examines informal and formal teacher collaboration. Section nine examines the network theory and how teacher collaboration is an important form of networking. Finally, section 10 discusses Finnish schools as a model of teacher collaboration.

**Historical Review of Teacher Collaboration Research**

One of the earliest studies of teacher collaboration comes from Little (1982) and her research on teacher collegiality. In her ethnography, she observed and interviewed 105 teachers and 14 administrators to assess workplace characteristics that made a school successful. According to Little, a successful school includes a teaching staff that is collegial or collaborates with each other. She maintains that teachers and administrators in successful schools interact frequently and in various ways, including discussing, *planning*, and observing instruction. Schools in the study that had a collaborative culture had better standardized achievement data than the schools with less collegiality.

Little's (1982) study highlighted an organizational perspective of schools by viewing the *school as a workplace* and by focusing on the role of the *organizational setting* or culture of a school in helping educators change and learn through collaborative staff development. However, even though it was clear that teacher learning was the core aim of the participating schools, Little acknowledged that both formal and informal teacher interaction took place, making it less clear whether the collaborative staff development was formally sponsored by the school or informally generated given the culture. Lastly, Little's qualitative examination of teacher collaboration and student achievement suggests that such a theoretical relationship may exist or at least should be further studied. This possible relationship is important because much of the research that follows Little's is an attempt to study the relationship between these two constructs.

Little's (1982) work on teacher collaboration is a foundational reference source cited by West (1990) in his theoretical development of how to structure schools and educators for collaboration. West used Little's work and that of others to suggest some definitions for educational collaboration and also to indicate how schools should be structured to promote collaboration. According to West, collaboration had been used to define various activities including consultation, *problem-solving*, talk or interactions focused on teaching practice, and *planning*. He also provided a general definition that educational collaboration "is an interactive planning or problem-solving process involving two or more members" (p. 29). He provided greater specificity by suggesting that collaboration can include such steps as "1. goal setting, 2. data collection, 3. problem identification/analysis, 4. alternative solutions development, 5. action plan development, 6. action plan implementation, 7. evaluation/follow-up, 8. re-design" (p. 29).

West's (1990) definition of teacher collaboration is useful for this discussion because it highlighted an important aspect of the author's definition of teacher collaboration. Collaboration,

at its core, is about two or more people *planning* and *problem-solving* together. A teacher who is seeking out information regarding curriculum or instruction from a colleague is trying to *solve a problem*. Together, through *problem-solving* and *information-sharing*, the teacher and colleague *share and exchange knowledge and/or skills*. Additionally, seeking out curriculum or instructional strategies may also be part of the *planning* a teacher needs to implement a lesson or unit in the future. Teachers operating within a Professional Learning Community, for example, engage not only in the steps West outlined but are also attempting to use the members of a group to *problem-solve* gaps in student instruction and plan ways to address these gaps. West's general definition needs only the addition of an acknowledgment that such *planning* and *problem-solving* is related to teaching practice and not to personal issues.

In a later theory piece, Little (1990) added further foundational insights to the discussion of teacher collaboration. Little again suggested that students benefit from teacher collaboration. She discussed the link to student learning explicitly and highlighted that collegial work involves two or more teachers *sharing information*, *planning*, and *problem-solving* regarding teaching practice. She also asserted that collegial teacher relationships benefit both veteran and newly hired teachers as well as the school as a whole. The forms of teacher collaboration she outlined fall within a continuum of interactions that begins with teachers independently sharing with one another and that ends with teachers reaching greater levels of interdependence as they work together. As the teacher grows and perfects his or her craft, all the aforementioned groups reap the benefits. (Little described many benefits from collegial interactions, like student behavior and teacher motivation, that will not be further discussed in this paper.)

Other researchers—including Lave, Wenger, Senge, Friend, Cook, Hargreaves, Dawe, Lieberman, Grolnick, and Miller—added further foundational research on teacher collaboration

in the 1990s. Some of this research is directly situated in schools, and some provided theoretical frameworks from other disciplines regarding collaboration that educational researchers later used to support and inform teacher collaboration research. Lave and Wenger's (1991) theoretical discussions of *situated learning* and *legitimate peripheral participation* stemmed from sociocultural theories of learning and advocated for master- or mentor-like relationships with apprentice colleagues, focusing on the development and learning as the primary outcome. Ideas about apprenticeship and mentoring are not new; Lave and Wenger recognized that professions like midwifery and tailoring have long utilized such models of learning.

In the early 1990s, Lave and Wenger's (1991) work drew the attention of researchers and educators by highlighting how mentoring and apprenticeship forms of learning are situated within a *community of practice*, a particular form or model that is frequently cited within teacher collaboration research as well as research on collaboration in other work contexts. They define a community of practice as a group that reflects relationships between the participants, the work, other communities connected to it, and the greater context of the world. For the participant, then, learning is not restricted to the context of the work but is also situated in macro contexts of world, power, and culture. This socio-culturally based theory of learning remains a critical element in the discussion of teacher collaboration when teacher learning is the desired outcome.

In a later study, Wenger (1998) further elaborated the idea of *communities of practice*. He suggested that everyone lives, works, and plays in a variety of communities of practice in which they learn from social interactions. In his development of this theory of a learning community, Wenger attempted to define and solidify how such collaborative groups operate so they can be replicated within organizations. In this work, the focus moves from participant level toward the organizational level as Wenger suggested that the development and fostering of a

community or communities of practice within an organization leads to greater innovation, success, and effectiveness and that such communities are, overall, valuable assets to the organization.

In Wenger, McDermott, and Synder's (2002) discussion, they suggested that the successes and innovations of automotive companies, the tech businesses of Silicon Valley, and other large, globally connected organizations stem in part from their ability to manage and disseminate knowledge through communities of practice. According to Wenger et al. (2002), communities of practice are a key to success for organizations operating in a global economy. For schools, this means that not only do Lave and Wenger's (1991) ideas about collaborative learning benefit the teacher, but they also can be a force of school reform and organizational change.

The work of Senge (1990) provided another perspective that researchers interested in teacher collaboration have utilized. His work results from business, organizational, and leadership discourses but is basically a synthesis of the contributions of Little, Lave, and Wenger. Like Little (1982), Senge focused on the organizational level of analysis and, like Lave and Wenger (1991), also concentrated on issues related to learning. Senge's theoretical work on learning organizations and the leader's role in fostering learning became an additional foundation for current discussions of teacher collaboration. In particular, the theory of the learning organization is central to the Professional Learning Community (PLC) (DuFour, 1997, 2004; DuFour et al., 2006), a popular collaboration model approach to school reform among educational leaders. Like Senge (1990), the focus of the PLC is on improving the organization through creating a collaborative learning system with emphasis on student-achievement

outcomes as a measure of reform efforts. Again, we see how teacher-collaboration outcomes can be interconnected.

The work of Friend and Cook (1990) in special education provides yet another foundational piece for collaboration research and provides work that focuses on a different model for school reform. In addition, they provided a definition of this nebulous topic of teacher collaboration that highlights the key characteristics of the author's own definition: "Collaboration is a style for interaction between at least two co-equal parties voluntarily engaged in shared decision-making as they work toward a common goal" (p. 72). They claimed that for educators to implement this style of interaction, certain conditions must be in place: "a) a mutual goal, b) parity among participants, c) shared participation, d) shared accountability, e) shared resources, and f) voluntariness" (p. 72). The inclusion of voluntariness as a characteristic of collaboration provided additional insights into the formality of teacher collaboration and suggests the relevance of further investigation of the distinction between informal and formal teacher collaboration. Finally, they also indicated that three characteristics must be found among the collaboration participants: a) an ideology that values collaboration, b) trust, and c) a sense of community. Trust is a concept that connects this research on teacher collaboration to learning and social network theory (Finnigan & Daly, 2012; Levin & Cross, 2004; Tschannen-Moran & Hoy, 2000) and will be discussed further in the later discussion of networks.

Friend and Cook (1990) then applied their framework in suggesting the role that collaboration may play in three areas of school reform: a) professionalism, b) empowerment, and c) restructured schools. In addition to providing detailed descriptors and characteristics for understanding collaboration, Friend and Cook's theoretical contribution reflects the key topics that have become a large portion of the current discourse on teacher collaboration: school reform

and professional development. After finishing a discussion of seminal research on teacher collaboration, this literature review will discuss collaboration as a kind of school reform as it relates to professional development.

Hargreaves and Dawe (1990) provided a different take on teacher collaboration and, more particularly, collaboration related to their professional development. Their perspective is instructive in both how we historically analyze and currently assess teacher collaboration. Their discussion of teacher collaboration and professional development focused on peer coaching, specifically *technical coaching*. They advised administrators and educators that technical-coaching systems can create two types of teacher collaboration: contrived collegiality or a collaborative culture. The former can generate a negative outcome when collaboration becomes a required, top-down approach to professionally developing a teaching staff. A school with a collaborative culture, on the other hand, is marked by greater trust, openness, support, and a sense of community among the participants. Grounded in cultural norms and values, a collaborative culture suggests the voluntary nature of collaboration and, again, highlights the potential relevance of investigating and distinguishing between degrees of formality in teacher collaboration.

Additional primary research on professional development and school reform that focuses on the development of teacher networks was conducted around the same time (Lieberman & Grolnick, 1996; Lieberman & Miller, 1990). This work, though not a focus in the proposed research, is frequently cited in relationship to teacher-collaboration discussions. These studies looked at the interactions in which teachers engage outside of the school in interorganizational forms of collaboration. Lieberman and Miller (1990) discussed such teacher networks in theoretical terms as potentially beneficial forms of staff development. Lieberman and Grolnick

(1996), on the other hand, studied sixteen different teacher networks. The use of the term *networks* by these researchers is to not to be confused with that as used within social network theory and methods. In their research, the term *networks* was merely used to signify a group of teachers. The groups varied in purpose, how they met (face-to-face or via electronic means), size, and geography (local, regional, or national). Despite those variations, all had the following similarities: (a) flexible structures, (b) inquiry- or *problem-solving*-based teacher learning, (c) opportunities for teachers to take on leadership roles, (d) opportunities for teacher collaboration, and (e) the potential to become *continuing learning communities*.

The seminal works discussed have each played a part in current research topics of professional learning communities or teacher learning communities (Clausen et al., 2009; Giles & Hargreaves, 2006; Tonso et al., 2006), communities of practice (Gajda & Koliba, 2008; Levine & Marcus, 2007; Niesz, 2007; Wood, 2007), or improving student achievement through teacher collaboration (Colbert, Brown, Choi, & Thomas, 2008; Goddard et al., 2007; York-Barr, Ghere, & Sommerness, 2007). These seminal teacher collaboration pieces provide the grounding for the definition of collaboration for this research and have played an important role in narrowing the outcomes of teacher collaboration research to teacher learning, student achievement, and school reform.

**Teacher Learning: A Product of Teacher Collaboration**

Teacher collaboration plays a role in school reform targeted at improving teacher skills and knowledge through teacher learning (Abbate-Vaughn, 2004; Crow & Pounder, 2000; Hindin, Morocco, Mott, & Aguilar, 2007; Little, 2003; Meirink, Meijer, & Verloop, 2007). In Abbate-Vaughn's (2004) work, situated in an urban high school with a highly culturally and linguistically diverse student population, teachers were required by district policy to work in a

*teacher professional community* (TPC). Her ethnography of nine teachers in this high school highlighted how teacher ideologies in collaborative communities can impact teacher learning.

Crow and Pounder (2000) drew on a group-effectiveness model to analyze teams of teachers in a suburban middle school; they discovered that teams varied in their effectiveness and outcomes, including outcomes of teacher learning. They suggested that the size of the teams, the work focus, the level of training and skills in working as a team, and the structure of the teams all play a role in how effective the groups are and, thus, can impact teacher learning.

Hindin et al. (2007) organized three urban middle schools in a research-learning community focused on the development of literacy skills. They found that as teachers collaborated and learned within a research group, they transferred their learning into practice. Similarly, Little's (2003) study of two professional learning high school departments highlighted the complexity and challenges of generating learning from formal collaborative interactions. In her case study, she discussed the language teachers used in describing their practice, the traditions and habits situated to their practice, and the enticement of innovating. All of these factors of collaboration within the departments mediated whether teacher learning happened.

Meirink, Meijer, and Verloop (2007) worked with five Dutch secondary teachers to better understand the learning process that teachers experience when working collaboratively. Their case study found four categories of collaborative teacher learning: (a) experimenting, (b) reflecting, (c) learning from others without interaction, and (d) learning from others through interaction. They found that teacher learning began with familiarizing oneself with another teacher's teaching pedagogy and curriculum. Learning from interactions with another teacher was more likely to change not only a teacher's cognition but the teacher's behavior. They also

found that the learning typically confirmed one's pedagogical approach. Thus, this research again suggested that teacher collaboration can have an impact on teacher learning.

**The Impact of Teacher Learning on Teacher Quality**

A possible relationship between teacher collaboration and student achievement can also be made by looking at research on how teacher learning impacts teacher quality. The previous discussion highlighted research showing that teacher collaboration is related to teacher learning (Abbate-Vaughn, 2004; Crow & Pounder, 2000; Hindin et al., 2007; Little, 2003; Meirink et al., 2007). Studies from professional development research also show that teacher learning is related to teacher quality (Borko, 2004; Borko et al., 2000; Darling-Hammond & Richardson, 2009; Dierking & Fox, 2013; Kennedy & Shiel, 2010).

Certainly, however, definitions and measures of *teacher quality* vary. Educational and legislative policies like the No Child Left Behind Act (2002) define *teacher quality* based on a teacher's education and teaching credentials. Rice's (2003) review of teacher quality and effectiveness made similar claims but operationalized a credential- or education-based measure of teacher quality into the following five attributes: (a) teacher experience, (b) teacher preparation programs and degrees, (c) teacher certification, (d) teacher coursework, and (e) teacher test scores. Finland uses a similar way of characterizing teacher quality by credentials and education. Among the factors attributed to the high level of teacher quality in Finland is the quality of the nation's teacher preparation programs and the requirement that all Finnish teachers have a master's degree (Sahlberg, 2014). However, credential- and education-based measures are not as useful when we are looking at teacher quality through the context of teacher collaboration, relationships, and networks.

Ingvarson and Rowe (2008) and Fenstermacher and Richardson (2005) provided better measures for measuring the quality of tenured teachers. Fenstermacher and Richardson (2005) suggested researchers and policymakers look at not only what teachers do but also at the task of teaching and at student learning outcomes as measured by student achievement. They suggested that by breaking up teacher quality into such a dichotomy, we are able to capture both *good teaching* as measured by the type of instruction and *successful teaching* as measured by student achievement.

Ingvarson and Rowe (2008) built on Fenstermacher and Richardson (2005) in a theoretical and policy piece where they argued for standards-based measures of teacher quality based on further separating good teaching, or what teachers do. They argued that teacher quality as defined by good teaching is both "what teachers should know (subject-matter knowledge) and be able to do (pedagogical skill)" (p. 5). This further segmentation is highly useful when analyzing the impact of teacher learning on teacher quality. It implies that if teachers increase their knowledge of curriculum and pedagogy, and/or if they change their teaching practice, they may have to some degree increased their effectiveness and quality of teaching. These standards support the initial measurement of the impact of teacher learning on teacher quality.

Darling-Hammond and Richardson (2009) further supported Fenstermacher and Richardson's (2005) findings. In Darling-Hammond and Richardson's review of teacher learning through high-quality professional development, they highlighted a variety of professional development studies demonstrating that teacher learning changed teacher practices or pedagogy and increased teacher knowledge of content and pedagogy. These findings are important because they provide additional evidence that teacher learning can be measured by an increase in knowledge of teacher practice or changes in teacher practice.

However, measuring teacher learning, just like measuring teacher quality, is not a precise science. In Darling-Hammond and Richardson's review, very little was stated about how learning was quantified. In one large national study reviewed by Darling-Hammond and Richardson, teacher learning was measured by teachers reporting changes in their knowledge and skills of teacher practice (Garet, Porter, Desimone, Birman, & Yoon, 2001). This study suggested that teachers' self-reported learning in either surveys or interviews may be a reasonable method to measure teacher learning.

Finally, Darling-Hammond and Richardson's (2009) review is also important to this discussion because, among other things, they reviewed teacher learning communities. They indicated that the collaboration within these learning communities led to changes in practice and acquisition of knowledge of teaching and content. Therefore, this discussion further supports the notion that teacher collaboration is related to teacher learning.

Borko et al. (2000) saw similar results in a study of a statewide professional development reform implemented by the state of Kentucky. In the four schools they studied, they found that learning through professional development led to increases in the quality of teachers' knowledge and skills. Dierking and Fox's (2012) research on the impact of professional development from the National Writing Project further showed that teacher learning in this context led to increased teacher quality in terms of knowledge of writing, knowledge of their profession, and the ability to impact students. This research has further relevance specifically to teacher collaboration because Lieberman (2000) showed that the National Writing Project functions as a formal teacher collaboration network.

In addition, Kennedy & Shiel's (2010) case study of an urban, highly impacted Irish elementary school provided additional support to how teacher learning improves teacher practice

and builds content knowledge, thus improving teacher quality. This case study followed an elementary school where the student population came from areas of high unemployment, above-average numbers of single-parent homes, and high levels of substance abuse and criminal behavior. According to Kennedy and Shiel, each of these factors negatively impacted the literacy skills of the student population. Teachers at this school were organized into learning communities by university facilitators for prolonged professional development focused on literacy instruction and interventions. Similar to the other studies cited, teacher knowledge and understanding increased, as did effective instructional practices. This increase in teacher quality and effectiveness was not the only gain found in the study. Student achievement in reading measures also increased at this school. This connection between teacher quality and student achievement is important and has been supported by research.

**The Impact of Teacher Quality on Student Achievement**

Teacher quality (or teacher effectiveness) is an important factor in the discussion of teacher work and its impact. The largest piece of education policy in the United States in three decades is the No Child Left Behind Act (2002); the "most significant departure from existing policy was the federal mandate that all children be taught by a 'highly qualified teacher'" (Hess & Petrilli, 2006, p. 63).

Variation in teacher quality is among many factors contributing to inequity in American schools (Darling-Hammond, 2010). Like student achievement, teacher quality is one of the key indicators assessed with school reform efforts. The connection between teacher quality and student achievement has been thoroughly researched in the past three decades. Greenwald et al. (1996) did a meta-analysis of 60 primary research studies on districts and schools. Some of these studies controlled for socioeconomic status; others were designed as longitudinal studies.

They investigated the relationship of a variety of school resources or inputs on student achievement. Among the inputs that had a positive impact on student achievement was teacher quality, as measured by "teacher ability, teacher education, and teacher experience" (p. 384). As discussed earlier, these measures are very commonly used indicators of teacher quality. Darling-Hammond (2000) found a similar positive relationship in her 1990s case study across all 50 states in the United States. Her findings suggest that teacher preparation and certification strongly correlate with student achievement in reading and math.

Despite findings like these, some disagreement still exists regarding the effect of teacher quality on student achievement. Much of this disagreement stems from the work of economist Eric Hanushek. His seminal study (1971) of teacher characteristics and their impact on student achievement found that teaching experience and graduate education did not contribute to student achievement. This finding is further substantiated in Hanushek's (1989) review of teacher expenditures, in which he again found that teacher experience and education did not impact teacher quality. In a later review of input-based policies within an American and international education context, Hanushek (2003) took a different approach to measuring teacher quality: When measured as an output-based measure, he said, teacher quality did positively impact student achievement. According to this model, quality teachers are identified by the high performance of their students. In addition, Hanushek found in his review of the research at that time that a quality teacher can help compensate for disadvantages in a student's home.

The following year, Rockoff (2004) attempted to respond to Hanushek's earlier findings. Rockoff stated that research like that of Hanunshek (1971) and others who suggest that there is no connection between teacher quality and student achievement may stem from the quality of their data. He stated that "teacher effects cannot be separated from classroom-specific factors in

several of these studies because teachers were only observed with one class of students" (p. 247). To overcome this design impairment, he used panel data on student achievement and teacher assignment from two districts in New Jersey. This panel data enabled him to assess the differences in achievement of the same student with differing teachers. The data spanned 10 years and included nearly 10,000 students and 300 teachers. His data showed that teaching experience did have a positive impact on improving student achievement in math and reading during a teacher's early years of teaching. The size of the effect on reading improved over the course of the teacher's career but remained stagnant for math concepts after the initial gains and decreased for math computation skills over time.

Rockoff's (2004) response to Hanushek (2003), as well as Hanushek's earlier research, highlighted the complexity of identifying what teacher quality is and how it impacts student achievement. The research of Greenwald et al. (1996), Darling-Hammond (2000), Hanushek (2003), and Rockoff (2004) suggested that teacher quality could play some role in improving student achievement. This assumption is further substantiated by more current research. Hanushek (2011) again revisited the issue of teacher quality and its impact in a further review of the research. He not only indicated that teacher quality or effectiveness has a positive relationship with student achievement, but primarily focused on quantifying the economic impact in dollars that an above-average teacher has on the earning potential of a student and on the U.S. economy as a whole.

Montt (2011) performed a cross-national study of 50 countries and their school systems to investigate factors that can reverse achievement inequality. Achievement data from the 2003 Programme for International Student Assessment (PISA) was used for Montt's research. Montt's findings both supported and contrasted other research findings on teacher quality. He found that

student achievement increased in contexts where teacher quality was more equal and tracking was eliminated.

In summary, teacher quality as measured by teacher education attainment not only had a positive impact on student achievement but should be considered by policymakers as an input worth considering when working to overcome educational achievement inequality. Again, despite the disagreement and the differences in measures to calculate it, research does suggest that teacher quality has a positive impact on student achievement.

**Teacher Collaboration, Professional Learning Communities, and School Reform**

Among the various forms or models of teacher collaboration, professional learning communities (PLCs) are currently receiving attention as a potential input school leaders can use to reform schools both inside the United States (Clausen et al., 2009; DuFour, 1997, 2004; Nelson & Slavit, 2008; Schechter, 2010; Tonso et al., 2006) and abroad (Bezzina, 2006; Giles & Hargreaves, 2006; Stoll et al., 2006; Webb et al., 2009). DuFour (DuFour, 1995, 1997, 2004; DuFour et al., 2006) is among one of the key reformers in advocating PLCs. Much of his work originated within the context of his supervision at Adlai Stevenson High School in Illinois, where a collaborative culture focused on student academic improvement (DuFour, 1995). Teachers learned from each other as they engaged in inquiry-based learning from common student data (DuFour, 1997, 2004; DuFour et al., 2006). At Adlai Stevenson High School, collaboration took place in teams or departments (DuFour, 1997), and administrators played an essential role in the organizing and supervising of PLCs (DuFour et al., 2006).

The purposes, structures, and outcomes of PLCs vary from context to context, especially since not all PLC models are built primarily on the framework espoused by DuFour (2004, 2006). But even iterations of PLCs that are not directly linked to DuFour's research demonstrate

similar characteristics. As one example, Stoll et al. (2006) provided an international review of a PLC model utilized in English schools; like the DuFour model, teacher and organizational learning took place through collaborative structures organized and managed by educational leaders who were focused on student outcomes (Stoll et al., 2006).

PLCs highlight the relationship between teacher collaboration and teacher learning. For example, Nelson and Slavit (2008) investigated how teachers in a secondary science and math reform program used a PLC structure to support teacher learning through inquiry. The participants in this study were part of a structured reform program that had both administrator and facilitator oversight. Teacher collaboration in this case was designed from the outset to meet a particular reform agenda related to math and science curriculum within a secondary context by educational leaders. PLCs in this context helped teachers learn through teacher inquiry processes.

The ethnography of an American urban middle school provided a unique illustration of how PLCs can impact teacher learning. Tonso et al. (2006) followed the urban middle school through a significant restructuring. When their study began, the school was a university-operated charter school characterized as a "textbook case of a professional learning community" (p. 1). The school's principal organized the schedule and the teachers into teams focused on a collaborative culture and on student progress. PLC groups included not only teachers but also community, parent, and university partners. During this phase, teachers learned from each other and from the other school stakeholders. Later, the school lost its charter designation and was combined with a neighborhood school from a local district. This shift created a change in teaching staff, administration, and teaming structures and resulted in the loss of university and community partners. The original PLC model was no longer followed, and teacher learning

decreased significantly. The researchers acknowledged that the magnitude of changes to this school made it challenging to determine how each individual change impacted the staff, students, and school. Nonetheless, given the impact PLCs have on teacher learning, it is logical to consider that the removal of the PLC model played a role in the reduction in teacher learning.

Hargreaves (2009) provided a cautionary comment about PLCs that is relevant to this study's investigation of collaboration. Hargreaves pointed out that in high-stakes standardized test-focused systems, the work of PLCs can be narrowed to just doing a form of fast-paced *problem-solving* from spreadsheets of student data. This impact of and emphasis on standardized testing is among the differences between schools in the United States and Finland. Finnish students, teachers, and schools receive far less pressure to perform on standardized tests because they do not have the kind of annual standardized tests used in American schools (OECD, 2011; Sahlberg, 2007, 2014). These factors could have implications not only on the collaborative networks of Finnish teachers but also in the steps or measures educational leaders take regarding teacher collaboration in their schools.

**Student Achievement**

The history of American education is a story of battles over changes and reforms (Ravitch, 2000; Tyack & Cuban, 1995). Reform constitutes deliberate measures initiated by actors within or outside of schools with the goal of correcting "social and educational problems" (Tyack & Cuban, 1995, p. 4). Current educational problems include, but are not limited to, student achievement/learning and teacher quality/learning. Each of these outcomes is subsumed into a discussion of school reform.

Student learning is one of the, if not the primary, desired outcomes of a teacher's work. Ideological and policy debates rage over how to measure student learning. Despite such

conflicts, students in the United States are measured throughout the year through a variety of formative and summative assessments. For better or ill, standardized assessments are currently one of the primary measures of student achievement and, by extension, student learning.

Research suggests a link between teacher collaboration and student learning/achievement (Colbert et al., 2008; Goddard et al., 2007; Kennedy & Shiel, 2010; Levine & Marcus, 2007; Lomos, Hofman, & Bosker, 2012; Strahan, 2003; Supovitz, 2002; Wood, 2007; York-Barr et al., 2007). Colbert et al. (2008) found that K–12 California teachers reported improved student achievement after participating in a teacher network based on improving content knowledge and pedagogy. Gajda and Koliba (2008) found increased student achievement in the data and in teacher reports of improvement among secondary schools in Vermont that sought to improve teacher collaboration through the creation of communities of practice.

The relationship between student learning/achievement and teacher collaboration is typically suggested based on evidence similar to that of Colbert et al. (2008). For example, using hierarchal linear modeling, Goddard, Goddard, and Tschannen-Moran (2007) tested the impact of teacher collaboration on fourth-grade students in a large, urban, Midwestern school district. They found that the reading and math achievement of fourth-graders was higher in schools where there was greater teacher collaboration. Unfortunately, such strictly empirical studies are in the minority. In another example, York-Barr et al. (2007) found that teacher collaboration between general and English Language Learners (ELL) teachers improved the achievement of urban elementary ELL students. Levine and Marcus's (2007) case study of six teachers in a California high school demonstrated that districts and teachers believe that teacher collaboration may be a useful input for impacting student achievement. Even though the study doesn't directly support

this finding, both the researchers and the teachers involved suggested that teacher collaboration may help reduce the achievement gap between minority students and their Caucasian peers.

While the above studies seem to show that student learning is positively affected by increased teacher collaboration, Wood (2007) provided a cautionary story of teacher collaboration illustrating that the way in which collaboration is initiated helps determine how successful it is. She studied an urban school district in which teacher-collaborative learning communities were required by district policy and by administrators; collaboration in that case did not lead to improved student learning or achievement. Supovitz (2002) conducted a four-year evaluation of an urban district and likewise found that communities of practice required by administration did not alone improve student learning and achievement.

**Informal Teacher Collaboration**

As has been highlighted earlier, a subset of research regarding teacher collaboration exists that attempts to distinguish formality as a characteristic of teacher collaboration. Within that discussion, researchers make distinctions between collaboration that is formal and informal (Ben-Peretz & Schonmann, 2000; Jarzabkowski, 2002; Leonard & Leonard, 1999; Mawhinney, 2010; Parise & Spillane, 2010; Stevenson, 2004, 2008; Van Wessum, 1999; Williams, Prestage, & Bedwar, 2001). The key or most consistently cited factor that determines whether teacher collaboration is formal or informal is whether the collaboration is voluntary or mandatory (Leonard & Leonard, 1999; Sawyer, 2007; Stevenson, 2004, 2008; Williams et al., 2001). This is not the only characteristic cited or discussed, but it is widely used and also easier to measure than other characteristics such as spontaneity (Leonard & Leonard, 1999; Mawhinney, 2010; Sawyer, 2007; Stevenson, 2004; Williams et al., 2001) or the formality of the setting (Mawhinney, 2010; Praise & Spilliane, 2010; Stevenson, 2008; Sawyer, 2007). Additional

factors and aspects of the discussion of collaboration formality are touched on in the following review of this research.

Van Wessum's (1999) research investigated Dutch secondary-teacher collaboration and found that not only did teachers collaborate in both informal and formal ways, but that informal collaboration was "more satisfactory and worthwhile than formal collaboration" (p. 7). Leonard and Leonard (1999) found similar results in their investigation of three urban Canadian schools in which leadership was redesigned as professional learning communities. Their study specifically sought to understand who influenced teachers within the schools; their survey results suggest that teachers considered their informal work to be more important than their formal endeavors. They went as far as to state,

> In its purest form, collaboration should first and foremost be spontaneous, voluntary, and founded in a shared commitment to the task at hand. Scheduled meetings and specified groupings are both desirable and necessary for school functioning, but they are not the only means of effective collaboration. (p. 241)

Finally, Stevenson (2004) used qualitative methods to study forms of collaboration used by elementary school teachers who utilized technology in their classes. She found that teachers preferred informal collaboration, considering it to be a more effective form of professional development in this context.

The work of Ben-Peretz and Schonmann (2000) highlighted where informal collaboration takes place and what its outcomes are. Their qualitative work was situated in Israeli schools, and they focused on the interactions of 26 teachers in a faculty lounge. They found that teachers did collaborate in informal interactions in spaces like the faculty lounge and that this interaction can lead to meaningful learning for the teachers involved. In addition, Jarzabkowski's (2002) case

study of a suburban Catholic private school in Australia examined the role that informal social interactions between teachers played in their work. She suggested that these interactions "promote better working relationships, which in the longer term may improve the quality of teaching and learning" (p. 1). She also found that such interactions helped teachers manage stress and resulted in reduced burnout. She acknowledged that the informal collegial interactions she studied are not to be equated with teacher collaboration but that such collegiality is a necessary precursor for teacher collaboration, particularly "teacher-initiated collaboration" (p. 16). Despite the fact that Jarzabkowski tried to make a distinction between collegiality and collaboration, the collegiality behaviors described in the study and the fact that she acknowledged that collaboration is a subset of collegiality makes this research finding relevant to this research on teacher collaboration.

A follow-up study by Stevenson (2008), again involving elementary teachers who used technology, provides greater understanding of how and with whom a teacher decides to collaborate informally. She discovered that factors like personality, friendship, having the same teaching assignment, and having similar ideologies about curriculum mediated the use and success of informal collaborative learning opportunities regarding technology. Mawhinney (2010) also found that teacher interactions in the teachers' lounge and in other spaces where teachers congregate, like the copy room, fostered teacher learning and an increased knowledge base. This ethnography investigated the impact interactions, which included spontaneous collaboration, in congregational spaces had on teachers. The researcher acknowledged that some interactions she observed were not forms of collaboration but that teacher collaboration did occur in other interactions and that these instances contributed to the teacher's understanding and knowledge of teaching practice. In addition, this collaboration took place in these casual or

informal contexts. Williams et al. (2001) studied induction programs in England. They found that newly qualified teachers and school cultures that were spontaneously collaborative versus structurally collaborative were more beneficial than those that were structurally collaborative.

Lastly, Parise and Spillane (2010) conducted research of 30 elementary schools in an urban U.S. school district. Particularly, they were seeking to understand the connections between what they distinguished as formal professional development, on-the-job learning, and instructional change. As defined by Parise and Spillane, on-the-job learning has some of the characteristics of informal teacher collaboration in that it takes place in casual settings, like in the hallways. On-the-job learning interactions are focused on teaching practice and instruction. Even though the authors did not identify this particular form of learning as informal, they made it clear that on-the-job learning is structurally different and should be contrasted with what they identify as formal learning opportunities. These formal interactions were described as professional development that included coursework focused on math and English and that took place in the school and as part of out-of-school collaborative networks. They found that both professional development and on-the-job interactions led to teacher learning and changes in instructional practices regarding math and English content.

In summary, given there is a research basis to consider distinctions in collaboration type based on whether the teacher collaboration is voluntary or required, this study seeks to consider constructs of informal and formal collaboration. Finnish teacher collaboration as whole remains the focal construct of interest, but this study will attempt to investigate to what extent, if any, Finnish teachers perceive any of the teacher collaboration or collaborative groups they engage in as being voluntary (informal) or required (formal).

**Social Network Theory and Education**

The concept of a network is important within the context of understanding teacher collaboration. The term *network* has been used by some researchers (Lieberman, 2000; Lieberman & Grolnick, 1996) to label and characterize teachers' collaborative structures. More importantly for this discussion, the concept of a network within a social network theory perspective (Borgatti et al., 2013; Scott, 2001) provides additional measures to assess teacher collaboration, a theoretical lens that contextualizes the relational nature of collaboration, as well as relevant research regarding related topics such as learning, informal and formal groups, and trust. According to Scott (2001), social network analysis developed through various strands, including socio-metric analysts investigating small groups, research out of Harvard in the 1930s looking at interpersonal relations and cliques, and anthropologists from Manchester studying tribal and village community relations. This work provided the foundation for two of the classic network studies by Lee (1969) and Granovetter (1973).

Lee's (1969) research sought to discover where women living in areas where abortion was illegal obtained information on abortions. Lee mapped out the average number of contacts women used as well as the nature of these relationships as women sought information on doctors who would perform an illegal abortion. The advice networks Lee discovered and the nature of these networks were foundational to social network theory and analysis. Granovetter (1973) investigated how individuals use informal social networks to obtain information regarding job opportunities. He found that information regarding job opportunities was not found through strong ties, such as close friends and family; instead, it was through weak ties, such as acquaintances, that the most useful information came.

Social network theory is widely used outside of education and is becoming increasingly more utilized as a theoretical lens for understanding relationships between actors in schools and as methodology for collecting data in schools (Carolan, 2014; Daly, 2010b). Social network research views the interaction of individuals or actors in an organization through relational ties and structures (Borgatti et al., 2013; Borgatti & Ofem, 2010; Carolan, 2014). Carolan (2014) states that a social network has "three essential elements: 1) a set of actors; 2) each actor has a set of individual attributes; and 3) a set of ties that defines at least one relation among the actors" (p. 7). Therefore, teachers interacting within a collaborative dyad or within a larger collaborative grade-level team are operating within a social network.

Networks are made up of individuals, classified as *nodes*, who have characteristics or attributes that connect or tie them to other individuals within an organization (Borgatti et al., 2013). A tie between two people is a dyadic network. Combining a set of ties creates a larger structure of ties, or a larger network. Allen, James, and Gamlen (2007) suggested that informal and formal networks within organizations are structures in which individuals communicate and transmit knowledge. Formal networks "are prescribed and forcibly generated by management, usually directed according to corporate strategy and mission" (p. 181). In contrast, informal networks "are unsanctioned and ungoverned organic structures" (p. 181). Even though educational research has not historically used the terms *formal networks* and *informal networks* to explain teacher collaboration, such definitions become a useful way of operationalizing and organizing the broad and multi-faceted topic of teacher collaboration.

Studies utilizing social network analysis as a theoretical lens or a method highlight its usefulness for this study because they touch on the key issues related to this study's research questions. Moolenaar (2012) provides a review of social network research as it relates to teacher

collaboration. In this review, she states that social network analysis has enabled researchers to show the impact of a teacher's social relations on teacher collaboration. This in turn has added to understanding how teacher collaboration takes place and how it contributes to teacher learning, changes in practice, and school reform implementation.

Other studies further highlight how a social network perspective and methods can be used to understand teacher collaboration within both its formal and informal structures. For example, Penuel, Riel, and Krause (2009) used a social network approach to analyze formal and informal interactions related to implementing school instructional reform in two California elementary schools. They used social capital theory (Penuel et al., 2009), which is very relevant and connected to social network theory, to identify the impact of social capital in the network on the flow of resources and teacher learning. Among their findings, they found that a teacher's social capital impacted their own learning or a change in their own teaching practice. Penuel, Riel, Joshi, Pearlman, Kim, and Frank (2010) also used social network analysis to investigate how the informal and formal aspects of a school's networks align to meet the outcomes of school reform. Studying two elementary schools in California, they found that the formal and informal structures, processes, and leaders differed from each other and that the interplay of these factors both helped and hindered school reform agendas. They acknowledge that

> a school's social context can be only partly influenced by formal initiatives to promote teacher collaboration. In both schools, sharing a collegial tie or informal subgroup membership with another teacher was a strong influence on who interacted with whom regarding their school's initiative. (p. 89)

Moolenaar et al. (2012) utilized social network theory methods to collect data from 53 Dutch elementary schools for the purpose of understanding the relationship between teacher

networks, collective efficacy, and student achievement. According to Moolenaar et al., collective efficacy is related to both teacher collaboration and student achievement and is a "group-level phenomenon that links learning and functioning of groups" (p. 253). They found in their study that teacher advice networks were indirectly related to student achievement through increased collective efficacy beliefs by teachers.

Spillane and Hopkins (2013) used social network methods to understand what role subject matter plays in mediating the outcome of advice networks in schools. They used network surveys in one school district and assessed how elementary teacher learning in literacy, math, and science instruction flowed through networks. They found that the flow of advice between teachers differed based on subject matter and that learning regarding literacy was more abundant. The differences are suggested to be attributed, in part, to the differing network structures and resources flows available for each content area.

The social network data from this currently proposed study will provide the ability to analyze the Finnish school case study from both a whole network lens and an egocentric network lens. A *whole network* or a *complete network* is a group of individuals connected or bound into a particular group (Borgatti et al., 2013; Carolan, 2014). For example, all of the teachers or staff in a school, all of the employees of a corporation, or all of the players on a team would constitute a whole network. In contrast, an egocentric network looks at an individual person, also known as an *actor*, the people with whom he or she has a direct relationship, people known as *alters,* and the relationships between the alters (Borgatti et al., 2013; Carolan, 2014). In this research, identifying with whom a teacher collaborates (the alters) indicates the collaboration relations that make up the teacher's direct collaboration network; including the relations between the teacher's alters creates the teacher's egocentric network.

Both whole and egocentric networks are of interest in this study. If collaborative networks like grade-level teams or content-level departments exist, these will also be analyzed as whole networks. In addition, analyzing teachers' egocentric networks will be useful for understanding voluntary collaboration, since teachers will have to self-select or identify with whom they collaborate in such ways.

When analyzing a whole network, several measures will be instructive for investigating teacher collaboration. The first measure is *reciprocity*. This measure looks at the degree to which actors in a directed network indicate that they have a tie with each other (Carolan, 2014). In addition, it is also an indicator of the stability of the network. In terms of teacher collaboration networks, reciprocity measures the degree to which teachers indicate that they collaborate with others in the network. For example, teachers on a grade-level team can have higher or lower levels of reciprocity within their collaboration relationships. A stable teacher collaboration network would include most of the network members exchanging knowledge about teaching practice and curriculum with each other. Second, the measures of *diameter* and *distance* of a whole network indicate how well resources travel from one part of the network to another and reflect the cohesiveness of the network (Carolan, 2014). For example, it would be a point of concern if knowledge and learning transmitted through teacher collaboration must travel a significant distance within the network. Third, *centralization* is a measure that is also worth highlighting. In networks with high centralization, one or a few actors are at the center of all relations, something that impacts the way in which resources move through the network (Carolan, 2014). This helps us understand if one or more teachers are at the center of all teacher collaboration within the network. Finally, *density* is connected to network size and is the number of ties as a proportion of the possible total ties (Carolan, 2014). The density of both whole and

egocentric networks also reflects network cohesion and is related to both stronger relationships and ease of resource access.

In an egocentric network, measures of density, distance, and diameter are again of interest because, as in a whole network, they seek to investigate issues of stability and cohesion (Carolan, 2014). In addition, the measures of tie strength, centrality, and brokerage are also relevant to this study. *Tie strength* measures how strong an actor and alter are connected. Weak ties typically are more important for work-related advice, while strong ties are more integral to advice on personal matters (Carolan, 2014). Identifying the strength of ties within collaborative structures will be instructive in understanding the nature of teacher collaboration. In addition, measuring the strength of the tie or the degree of a tie's connection provides for further forms of analysis— particularly, an analysis of *relational embeddedness* (Granovetter, 1992; Hite, 2003; Uzzi, 1996). Relational embeddedness reflects the impact that ties may have on the exchange of resources between two people at the dyadic, egocentric, and whole network levels (Hite, 2003; Uzzi, 1996).

Similar to the whole network analysis, the measure of *centrality* is essential to understanding how central an actor is within their egocentric network (Carolan, 2014). Related to centrality is the measure of *brokerage*. To assess brokerage, an egocentric actor must also be part of a larger whole network, and the degree to which he or she acts as a broker between others within the whole network is assessed (Carolan, 2014). Actors who broker resources or knowledge within the network can take on roles like coordinator, consultant, gatekeeper, and representative (Carolan, 2014). Investigating this measure in the context of teacher collaboration may show how teachers who collaborate informally impact the larger formal network.

Social network analysis is additionally useful for discussions of collaboration because of how trust and learning are conceptualized within its research domain. Rotter (1967) defined *interpersonal trust* as the expectation an individual or a group holds that the word, promise, or statement of another can be relied on or trusted. He went on to state that "much formal and informal learning that human beings acquire is based on the verbal and written statements of others" (p. 652). Tschannen-Moran and Hoy (2000) reviewed the literature on trust and its influence on schools. They suggested that trust not only plays a determinative role in a teacher's willingness to collaborate but also that the "social network can exert both formal and informal control that encourages people to act in a trustworthy manner" (p. 548). Levine and Cross (2004) provided further evidence of the role trust plays within social networks and knowledge transfer. They found that different types of trust played roles in the transfer of knowledge in both weak and strong ties. In addition, trust, teacher collaboration, and teacher learning have connections to student performance (Finnigan & Daly, 2012; N. M. Moolenaar et al., 2012). Using social network methods, Finnigan and Daly (2012) investigated urban schools that were under sanctions. Even though they did not directly make connections between student achievement and trust, teacher collaboration, and teacher learning, the schools obtained sanctions in part because of their underperformance. Therefore, their findings regarding low trust in some of the schools and a lack of organizational learning and innovation is worth further investigation, even if not directly related to student achievement. In contrast, as has been already stated, Moolenaar et al. (2012) found a connection between student achievement and well-connected teacher networks. In addition, they cite high levels of trust and innovation or learning climates as important aspects of connected teacher networks.

**Finnish Schools**

Finally, a review of the Finnish education system will help provide understanding for the proposed context for research of this paper. The Finnish government enacted major education reforms in the 1960s and 1970s, including the creation of a nine-year comprehensive school system that roughly compares to American schools' first through ninth grades. Following completion of the nine years of education, students attend one of two types of secondary schools that then lead them to vocational training or university study.

As Finns have continued to refine their education system, they have focused on providing equity over competition (Sahlberg, 2014). Schools provide equal levels of social and educational services across the country, including equally high levels of quality teachers. All teachers engage in extensive graduate-level training (Darling-Hammond, 2010; OECD, 2011; Sahlberg, 2014). Schools provide teachers with time to collaborate (Darling-Hammond, 2010) and the autonomy to develop assessment and curriculum that meets the needs of their particular students (Sahlberg, 2014). Teachers and students do not have the pressure to perform on standardized tests like other school systems because they take only one test at the end of comprehensive coursework (Sahlberg, 2011).

Research on Finnish schools acknowledges the high degree of autonomy that Finnish teachers enjoy in curriculum, pedagogy development, assessment, and *problem-solving* (Sahlberg, 2007, 2014; Webb et al., 2004) and that such development takes place in team structures (OECD, 2011). However, the context and structure of these teams is not fully understood. The work of Webb et al. (2009) highlights that Professional Learning Community (PLC) collaborative groups are found in Finnish schools. Their study compared PLCs in Finnish and English schools; researchers acknowledge that while the term *PLC* was not used by the

participants, the school and teacher interactions were characterized by PLC traits. Their research showed that for schools in both Finland and England, the primary purpose was to assist in student learning, but of equal importance was aiding teacher learning and teacher satisfaction. One of the major differences was that Finnish teachers had greater autonomy and opportunities to participate in reforming the school, whereas English teachers were more constrained by accountability and student performance pressures.

One study by Kärkkäinen (2000) looked at Finnish elementary teams through a network lens and tried to understand how teacher teams build contacts within and outside the school. This study is particularly relevant to this research because of the differences between the cases of two teams (the 1993 team and the 1994 team) and Kärkkäinen's findings. The 1993 team could fit within an informal context because it was voluntarily created by teachers. In contrast, the 1994 team was organized by an administrative official who also set the goals for the team's work. Kärkkäinen further characterized the work and interactions within the teams differently, stating that the 1993 team was focused on *cooperation* and *collaboration* while the 1994 team centered on *coordination*. These distinctions further support the use of the collaborative behaviors (*sharing information and knowledge*, *planning*, *and problem-solving)*, in that these behaviors are reflected in the actions described by Kärkkäinen. *Coordination*, according to Kärkkäinen, includes such activities as asking for and/or giving help, information, or resources as well as coordinating units, while *cooperation* is planning and doing work together, discussing, negotiating, and disagreeing. Even though this study primarily investigated network building, bridging, and contact generation, the way in which Kärkkäinen distinguishes these teams suggests potential differences between Finnish teaching networks. Twenty years later, this distinction between types of teams may have further evolved.

Finally, research needs to make a distinction between informal collaboration and informal interaction within the context of Finnish schools. Researchers have used network analysis to investigate informal interactions within a teacher's egocentric network and a whole school network (Ryymin et al., 2008; Tuomainen et al., 2010). However, the informal interactions in each of these cases were distinguished as being different from informal collaboration, which is characterized by knowledge sharing. Thus, these informal interactions are inherently different from the types of informal collaboration that are discussed in this research. This research seeks to go beyond informal interactions to explore, describe, and explain both informal and formal collaboration in the context of Finnish schools.

**Literature Review Conclusion**

The literature shows that a majority of discussions regarding teacher collaboration situate teachers' collaborative interactions as either a form of teacher learning or professional development or discuss it as an input to improve achievement and/or schools. As has been suggested, teacher collaboration is not a uniform input or type of staff development. Teachers can *plan* and *problem-solve* issues related to curriculum, pedagogy, assessments, or an individual student in a variety of ways that may or not be voluntary. Teacher learning, though, seems to be an output to consider because of the role it can play in increasing teacher quality and in turn improving student achievement.

Using the theoretical framework of social network theory to examine teacher collaboration in highly effective schools, such as those in Finland, can provide additional information about teacher collaboration—especially when that investigation takes into account the various ways teachers collaborate. A meeting among teachers can be part of a school reform strategy, required by administrators, to use collaboration in the hope of improving student

achievement, or it may be a teacher-initiated request made to learn more about his/her craft from a colleague. Given that the reasoning and methods may vary, examining these differences is important for understanding varying outcomes of teacher collaboration.

This research seeks to provide greater understanding about how Finnish teachers collaborate and will use both network and qualitative measures and focus on answering the following research questions:

1. What is the nature of teacher collaboration among Finnish teachers at a comprehensive school in terms of three key teacher collaboration behaviors (*sharing information and knowledge*, *planning*, *and problem-solving*) an in the context of teacher practice?
2. What is the nature of formal (school-required) or informal (voluntary) teacher collaboration for Finnish teachers at a comprehensive school?
3. To what extent and how do Finnish teachers at a comprehensive school attribute teacher learning to teacher collaboration?

## APPENDIX B: Detailed Methods

This study drew on both social network and qualitative research methods. Both the social network lens and methods are well suited for this research for several reasons. First, the primary distinction of social network theory and methods, compared to other lenses and modes of research, is its attention to relational data (Borgatti et al., 2013; Carolan, 2014; Scott, 2001). Teachers working in collaborative structures are situated in dyads (a two-person network tie), triads (a three-person network), or a bounded whole network. As Carolan (2014) stated, a "social network is a group of individuals and the relation or relations defined on them" (p. 4). As the research from the literature review has shown, teachers in the United States and globally are operating in collaborative groups. Such groups can be defined as social networks by their collaborative nature and are either formally bounded because they are required by school administration or are voluntary bounded by the teachers who create them.

Secondly, social networks have an impact on learning (Carolan, 2014). In particular, Carolan stated that "networks play a key role in shaping opinions, beliefs, and understandings and ultimately in shaping behaviors" (p. 15). This shaping or learning can occur given that "knowledge, innovation, or any number of resources can flow through channels between actors" (Daly, 2010a, p. 4). This connection between social networks and learning is useful because, as the literature has shown, teacher collaboration is connected to teacher learning.

The types of learning Daly (2010) and Carolan (2014) described also mesh with Darling-Hammond and Richardson's (2009) characterization of teacher learning—namely, that it takes place when teachers change practices or pedagogy and/or increase their knowledge of content or pedagogy. This is not to say that any teacher within a collaboration network will experience a form of teacher learning by virtue of the network structure; it does indicate that such learning is

possible through networks and that network research can be useful in identifying where learning may occur as a result of the exchange of resources like knowledge or innovation. In addition, given that one characteristic of teacher collaboration is the sharing of knowledge or information about teaching practice, network research has the ability to attend to identifying potential knowledge sharing or transfer (Levin & Cross, 2004). Thus, social network methods are both suitable and informative for this study.

In addition to utilizing a social network perspective and methods, this study used qualitative case study methods to collect and analyze data. Flick (2007) pointed out that qualitative research "starts from the notion of the social construction of realities under study, is interested in the perspectives of participants, in everyday practices and everyday knowledge referring to the issue under study" (p. 2). This qualitative perspective aligns effectively with the aims of this study. The research proposes to better understand the nature and context of Finnish teacher collaboration, the structure and characteristics of collaboration networks in which Finnish teachers operate, as well as consider the differences, if present at all, between teacher collaboration groups that are voluntary (informal) or required (formal). Miles, Huberman, and Saldaña (2014) stated that one of the strengths of qualitative data is that it focuses "on naturally occurring, ordinary events in natural settings, so that we have a strong handle on what 'real life' is like" (p. 11). This research seeks the same end, investigating the existing collaborative relationships among Finnish teachers so that more can be known about these real-life teacher interactions and their impact on teacher learning. A case study "offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon. Anchored in real-life situations, this results in a rich and holistic account of a phenomenon" (Merriam, 1998, p. 41). The ways in which teachers engage in teacher

collaboration, teacher collaboration networks, and formal and informal collaboration groups stand to reflect complex *social* units. The author has illustrated how each of these are bounded, a practice consistent with case study research (Merriam, 1998). In addition, the investigation of these various types and structures of Finnish teacher collaboration follows Miles et al.'s (2014) suggestion to include multiple cases within case study research in the hopes of providing "even deeper understanding of the processes and outcomes of the cases" (p. 30).

**Sampling**

The sampling method used in this study entails the use of purposive sampling. Most forms of qualitative sampling are purposively driven (Flick, 2007; Miles & Huberman, 1994; Miles et al., 2014). In addition, Miles et al. (2014) acknowledge two considerations that may be part of purposive or strategic sampling decisions: namely, role convenience sampling and reputational case selection (basing the selection of a case study on the recommendation of an expert). Both factors play a role in this study.

The case study began with the reputational case selection of Finnish comprehensives schools by experts on the Finnish educational system from Brigham Young University's (BYU) Kennedy Center for International Studies. The possibility of a blended school acknowledges a cultural difference in the structure of some Finnish schools. In Finland, first through ninth grade are part of what Finland classifies as comprehensive schools. First through sixth grades are similarly structured like U.S. elementary schools with a class teacher; lower-secondary grades seven through nine are divided into subjects, as are those in the United States. Some schools in Finland house both elementary and lower-secondary grades in the same school building or on the same school campus. Regardless, the site for this study will be an example of a reputational case selection because specific employees of the Kennedy Center who are very familiar with and

knowledgeable about Finland's education system assisted in identifying the schools. In addition, convenience sampling occurred given that an invitation for the principal and school staff to participate in this study was first extended. Miles et al. (2014) acknowledged that such convenience sampling is at times a part of qualitative sampling because "there are times when we select a case to study because it is accessible to us geographically and immediately" (p. 32). Once the schools were identified, the author contacted the principal of the school and performed a site visit and interview to seek permission for the study and to learn about the teaching staff, collaboration behaviors in the school, existing school-required (formal) collaborative groups, and other relevant school culture and archival data information. This information was collected in an interview with the principal. Two comprehensive schools were identified in this process and further permission from the Kommune was granted for the research. A census list of teachers was then collected from the principal to facilitate the administration of an online network survey to each teacher in the school. Gathering this information from the principal represented the first phase of data collection.

Census list–based surveys are a hallmark of whole network research (Borgatti et al., 2013; Carolan, 2014). By surveying each participant within the network, the researcher collects data that enables him or her to begin analyzing the structure and characteristics of the network. The network survey questions will provide the basis for the egocentric and whole network analyses that will follow. As Borgatti et al. (2013) and Carolan (2014) stated, whole network data, such as a survey based on a census list, can also be used to identify egocentric networks within the greater whole network.

The next stage of sampling was to be a purposive sample (Miles et al., 2014; Teddlie & Yu, 2007) for teacher interviews, but delays in receiving permission from the Kommune and

other logistical complications made conducting interviews overly challenging. Interview questions were revised and included in the survey as open-ended questions.

**Data Collection**

Data collection first began with the site visits to the two schools and interviews of the two principals. Second, an online network survey was administered through Qualtrics (2013). This survey collected teacher demographics and the teacher collaboration ties including the informal and formal collaboration network ties within the school. It also included qualitative, open-ended questions regarding teacher collaboration and the nature of the teachers' collaborative ties, including their relational embeddedness.

Relational embeddedness was measured using survey items from the Typology of Relational Embeddedness Network Data Survey (TRENDS) (Hite, Wakkee, J., Sudweeks, & Smith, 2011). Relational embeddedness network ties enmeshed within social relationships can influence actions and decision-making of the two actors (Granovetter, 1985; Hite, 2003; Moran, 2005; Uzzi, 1996). The data in this study is based on the extent of three social components of the relationship between two people—personal relationship, dyadic interaction, and social capital—each of which is related to a different type of trust (Hite, 2003, 2005). Thus, based on the typology (Hite, 2003), the different potential combinations of these three social components within the network ties provide both eight *types* and three *degrees* of relational embeddedness. The *type* and *degree* of relational embeddedness within a tie reflect the tie's social nature, the potential trust within the tie, and the impact that the tie may have on the exchange of resources between the two respective teachers, as well as on resource flows at their related egocentric and whole network levels (Hite, 2003; Uzzi, 1996). The network data was used to identify the

structures of the general teacher collaboration network of the school, the formal and informal collaboration networks, and each teacher's position within these three networks.

The third stage of data collection was to be episodic interviews (Flick, 2008) with the purposeful sample of teacher participants, but these questions were included in the survey and analyzed separately. The questions focused on eliciting descriptive narratives of teacher collaboration as well as formal and informal instances if they were relevant to that teacher's experience. Following Flick's (2007) episodic model, the interview questions sought to have teachers highlight and describe specific instances and episodes in which they engaged in both forms of collaboration. In addition, for each type of collaboration, attention was given to soliciting descriptions and evaluations of teacher learning within the context of formal and informal collaboration. Finally, evaluative and comparative questions were also included to generate data that reflects their understanding of and perspectives on collaboration as well as whether they may have any preference in type of collaboration and, if so, why.

**Data Analysis**

The discussion of analyzing the data was framed around the research instruments and the research questions this study seeks to answer—namely,

1. What is the nature of teacher collaboration among Finnish teachers at a comprehensive school in terms of three key teacher collaboration behaviors (*sharing information and knowledge*, *planning*, *and problem-solving)* and in the context of teacher practice?
2. What is the nature of formal (school-required) or informal (voluntary) teacher collaboration for Finnish teachers at a comprehensive school?
3. To what extent and how do Finnish teachers at a comprehensive school attribute teacher learning to teacher collaboration?

The research survey has been crafted to specifically attend to these research questions as well as different aspects of teacher collaboration. For example, survey questions specifically related to teacher learning or establishing network ties based on homophily are present to make data analysis more efficient. Each research question identified in this section illustrate how the data for these constructs will be analyzed.

**Research question #1.** This question has both a network, or structural, element to it as well as a qualitative or descriptive element. This question was, therefore, addressed and analyzed using both methods. In regard to the network element, this question directly considers the network structure and ties. Analysis of the network data began by analyzing the number of ties, their strength and density, and calculating counts of teacher ties and averages. In addition, diagramming the network structures was performed for each of the three teacher collaboration behaviors. The online network survey administered using Qualtrics (2013) generated the raw network data that was reviewed in spreadsheet form and converted and uploaded into UCINet network software (Borgatti et al., 2002). UCINet facilitated both quantitative identification of ties and graphical network analyses to identify the network characteristics. Simple statistics (mean, SD, number counts, percentages, etc.) were also computed using the raw data spreadsheets.

In regard to the qualitative or descriptive elements to this research question, most of these descriptive characteristics were be collected and analyzed from the survey's open-ended questions. These questions were crafted to solicit narratives from the subjects regarding these issues. The open-ended data was imported into NVivo 11 (QSR, 2015) for coding and analysis.

The goal of data analysis was to support and confirm the collaboration network structures of the Finnish teachers, to provide theoretical explanations regarding the relationship of the formal and informal collaboration networks to teacher learning, and to determine how the teachers utilized and viewed the three primary teacher collaboration behaviors (*share information*, *planning*, *and problem-solving*). One of the goals of this research is to create knowledge about how teachers collaborate, formally and informally, in a context that is not yet fully understood—a Finnish school. Therefore, questions like those adapted from the interview are crucial, as they provide the opportunity for teachers to describe how, when, where, and why collaboration happens. These questions also provided the teacher perspectives on the value they associated with these interactions and their explanations regarding how they learned through these collaborative networks. In addition to the data from questions, the researcher created additional data by continually generating memos and notes during the analysis and recording his reflections—such as ideas, themes, and patterns that manifest—in a research journal. This form of reflective note taking, according to Miles and Huberman (1994), is appropriate in this type of qualitative analysis. These field notes were imported into NVivo 11 (QSR, 2015), along with the interview data, for further coding and analysis.

The initial qualitative analysis work was the open coding phase (Gibbs, 2007). This phase, which included reflective memo writing, is primarily a process of sifting the data into hierarchical categories and identifying themes that emerge from the data. For example, the researcher placed data into similar categories. These categories included inductive categories as the data from participants began to emerge as well as some deductive categories from the literature. This first step of coding dealt with identifying and organizing themes that emerged from the data, using an initial teacher case threshold of 50%. During the second phase of

qualitative analysis, axial coding (Gibbs, 2007), the data analysis focused on identifying patterns among the themes within the data and how these patterns might address the research questions. For example, patterns from the data could highlight how teachers informally collaborate or attributes of informal collaborative dyads. Lastly, the selective coding phase drew attention to the patterns of descriptions, definitions, relationships, or narratives that are most central to addressing the research questions (Gibbs, 2007). The goal of data analysis was to support theoretical development, in the context of Finnish teachers, of the construct of teacher collaboration as three key behaviors (*sharing information and knowledge*, *planning*, *and problem-solving*) as well understanding both formal and informal forms and to provide theoretical explanations regarding its relationship to teacher learning.

**Research question #2.** This study seeks to investigate, if present, both formal and informal collaboration, at both the egocentric and whole network levels, that take place within the case of a Finnish school. Daly (2010a) stated that it is typically assumed that knowledge transfers in predictable and logical ways through formal learning mechanisms like professional development. However, network theory highlights that the roles of network structure and the nature of the collaborative network ties can also influence the effectiveness of knowledge transfer. Therefore, the use of both network and qualitative analysis methods provided a robust framework for analyzing the complexity and outcomes of teacher collaboration. The methods outlined for this research question include analyzing network relational ties and also qualitative open-ended responses were used to investigate the data related to this question.

**Research question #3.** This question, like the descriptive or qualitative elements of the first research question, relied on interview data to investigate the relationship between teacher learning and teacher collaboration. Questions in the open-ended section survey have been

created to solicit narrative learning through teacher collaboration and evaluations of how teachers learn through teacher collaboration. Responses to these questions were imported into NVivo 11 (QSR, 2015) and analyzed using the same coding process that was followed in analyzing the first research question.

## APPENDIX C: Survey Items

Section One: Demographics

| # | Question |
|---|---|
| D1 | What is your gender? |
| D2 | What is your age in years? |
| D3 | How many years have you worked as a teacher? |
| D4 | How many years have you worked at your current school? |
| D5 | What is the highest level of education you have obtained?<br>• Bachelor's degree<br>• Master's degree<br>• Doctorate degree |
| D6 | What grades do you teach? If you teach more than one grade, please indicate each grade you teach. (Select all that apply.)<br>• 1st grade<br>• 2nd grade<br>• 3rd grade<br>• 4th grade<br>• 5th grade<br>• 6th grade<br>• 7th grade<br>• 8th grade<br>• 9th grade |
| D7 | Which specific subjects do you teach? (Select all that apply.) Leave answers blank if these subjects do not apply to you.<br>*(Since actual subjects differed from school to school, each school had a list of the subjects provided by that school's principal.)* |
| D8 | What specialty roles or jobs do you have in the school? (Select all that apply.) Leave answers blank if this subject doesn't apply to you.<br>*Since actual roles may differ, these are just place holders until the school has been selected.*<br>• Class teacher *(similar to elementary teacher)*<br>• Subject teacher *(similar to secondary/middle school teacher)*<br>• Special education teacher<br>• Administrator |

Section Two: Formal and Informal Collaboration Questions

| | | |
|---|---|---|
| D9 | Please indicate the collaboration group(s) or teams in which you participate with other teachers at your school. (Select all that apply.)<br>*(Since actual groups differed from school to school, each school had a list of the formal teams provided by that school's principal.)* | |
| D10 | Please answer the following question about each collaboration group in which you participate. If you do not participate in a given type of group, please leave the responses blank. | |
| | *(Each group for each school is listed in this column)*<br><br>*Exp. Group*<br>*Exp. Group*<br>*Exp. Group* | Select if "yes"<br>Is participation in this collaboration required by the school?<br>O<br>O<br>O |
| D11 | Do you voluntarily collaborate with teachers in your school that is not required by the school? Definition: Collaboration means sharing information and knowledge, planning, or problem-solving regarding teacher practice.<br>• Yes<br>• No | |

Section Three: Network Collaboration Questions—Each question was asked about every teacher at a school

| # | Question |
|---|---|
| | Collaboration Relation (agree/disagree)<br>not descriptive, somewhat descriptive, moderately descriptive, very descriptive |
| N1 | We share information and knowledge regarding teaching practice. |
| N2 | We plan teaching practice together. |
| N3 | We problem-solve issues related to teaching practice together. |
| | Formal Collaboration Relation (extent) |
| N4 | To what extent do you participate together in school-required collaboration groups or teams? |
| N5 | To what extent do you collaborate together in the same school-required group or team? |
| N6 | To what extent do you collaborate because you work together in the same school team or group? |
| | Informal Collaboration Relation (extent) |
| N7 | To what extent do share knowledge or information about teacher practice together outside of school-required collaboration? |
| N8 | To what extent do you plan teacher practice together outside of school-required collaboration? |
| N9 | To what extent do you problem-solve about teacher practice together outside of school-required collaboration? |

Section Four: Open-ended questions

| Qualitative Open-Ended Questions | |
|---|---|
| # | Question |
| Perspective of teacher collaboration | |
| QO1 | What does teacher collaboration look like at your school? |
| QO2 | To what extent do you see some collaboration as school-required and other collaboration as voluntary? |
| QO3 | How would you describe school-required collaboration? |
| QO4 | How would you describe voluntary collaboration? |
| QO5 | What is your primary way of collaborating with other teachers to improve your teaching? |
| Sharing information and knowledge about practice | |
| QO6 | Can you share some examples of when another teacher shared knowledge or information about teaching practice with you that helped improve your teaching? |
| Planning teaching practice | |
| QO7 | Can you share some examples of when you planned with one or more teachers regarding teaching practice and it helped improve your teaching? |
| Problem-solving teaching practice | |
| QO8 | Can you share some examples of when you problem-solved with one or more teachers regarding teaching practice and it helped improve your teaching? |
| FORMAL COLLABORATION | |
| QO9 | Can you share examples of other types of collaborations that may be required by the school for other teachers to improve their teaching? |
| QO10 | How typical is this type of collaboration among other teachers? |
| INFORMAL COLLABORATION | |
| QO11 | Can you share examples of different types of teacher collaborations that occur to improve teaching—outside of the school's formal groups? |
| QO12 | How typical is this type of collaboration among other teachers? |
| REVISIT DEFINITION | |
| QO13 | For you, what are the most helpful or useful ways of collaborating with other teachers to improve your teaching? |
| QO14 | If you were to compare "school-required collaboration" and "nonschool-required or voluntary collaboration," what would you say? How are they different and what are the main differences? |
| QO15 | Is there anything you would like to say on the topic of teacher collaboration in general, or on school-required and/or voluntary collaboration? |

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