

Working Together: Organizational Conditions, Teacher Teams,  
and Learning Opportunities Created Through Teacher Collaboration

By

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Dissertation

Submitted to the Faculty of the  
Graduate School of Vanderbilt University  
in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Leadership and Policy Studies

August 31, 2019

Nashville, Tennessee

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To my dad and in memory of my mom, who were my first and best teachers.

## ACKNOWLEDGEMENTS

Although my name is on the cover, this dissertation has been a thoroughly collaborative endeavor. I am extremely grateful to a horde of collaborators, both professional and personal, who have guided and supported me. First, I must thank twenty five years of teachers who nurtured my intellectual curiosity and encouraged me to become a thoughtful and conscientious learner. I particularly want to acknowledge my advisor at Vanderbilt, Ellen Goldring. Ellen, thank you for always holding me to high standards and for being extremely generous with your time and feedback. I also want to thank my committee members, Joanne Golann, Jason Grissom, and John Papay, for their guidance and encouragement throughout the dissertation process.

This dissertation received financial support through the Eugenia Kemble Research Grant program at the Albert Shanker Institute. Thank you for your support.

My peers at Vanderbilt have been phenomenal. I am particularly grateful for my Ph.D. cohort: C.J. Ryan, Jenna Kramer, Laura Rogers, Sarah Kabourek, Sy Doan, and Tuan Nguyen. Y'all are the main reason I believe in the power of collaborative learning. I especially want to thank Jenna for her kindness and warmth, Sy for his seemingly boundless knowledge and generosity, and Laura for her wit and determination (Laura, I wouldn't want to share a windowless closet with anyone else!).

Without my family, this could never have happened. I am extremely thankful for my parents, Meg Kemper and Michael Patrick, whose love and encouragement are truly infinite. Thank you to my brother, Will Patrick, for inspiring me to dream bigger. I also am grateful to my in-laws, Terri Schnorr and Paul Muller, for their support. Most importantly, I want to thank my wonderful spouse, Peter Muller, and my intrepid daughter, Maggie, for taking this journey with me. Peter, thank you for always seeing the best in everyone, me included, and for being my loudest (and tallest) cheerleader.

Finally, I must acknowledge the teachers of Tennessee. Without their voices and perspectives, this dissertation would not have been possible. Thank you.

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## CHAPTER I

### INTRODUCTION

Practitioners and policymakers agree that teachers and students can benefit when teachers spend more time working together. Increasing collaboration among teachers has been a hallmark of school improvement efforts for many decades (Bryk, Camburn, & Louis, 1999; Friend & Cook, 1990; Leithwood & Jantzi, 1990). Stronger collaboration is associated with higher levels of trust among colleagues (Pounder, 1999; Tschannen-Moran, 2001), increased collective responsibility for student learning (Lee & Smith, 1996), improved pedagogical and content knowledge among teachers (Brownell, Yeager, Rennells, & Riley, 1997; Louis & Marks, 1998), and higher student achievement (Goddard, Goddard, Sook Kim, & Miller, 2015; Goddard, Goddard, & Tschannen-Moran, 2007; Ronfeldt, Farmer, McQueen, & Grissom, 2015). Over 90 percent of teachers in a recent national survey reported that greater collaboration would have a major or moderate impact on student achievement (Markow & Pieteres, 2009).

Despite this general optimism about the power of collaboration to improve teaching, research on what teachers actually do together has found that the nature and productivity of collaboration varies widely (Little, 2003). National surveys of teachers find that regular and sustained collaborative time is far from universal (Gates Foundation, 2012; Johnston & Tsai, 2018; Markow & Pieteres, 2009). Even when teachers have time for collaboration, teachers often focus on the practical and urgent considerations of teaching or on fulfilling administrative mandates (Hargreaves, 2010; Horn, Garner, Kane, & Brasel, 2017; Talbert, 2010). Studies of how teachers spend their collaborative time regularly highlight the challenge of creating meaningful opportunities for learning and instructional improvement (Ball & Cohen, 1999; Hargreaves, 2000; Horn & Little, 2010; Little, 2003). Much more research, along

with greater nuance and conceptual clarity around the goals and nature of collaboration, is needed to understand for whom, how, and under what circumstances collaboration can support improvements in teaching.

With that goal in mind, my dissertation specifically examines variation in teachers' reports of their collaboration, the organizational conditions supporting and inhibiting these collaborative efforts, and associations between collaboration and teacher performance outcomes. My dissertation includes three papers, which I briefly describe below.

My first paper, presented in Chapter II as "Collaborating for Improvement? How Teachers Work Together in Targeted Teacher Partnerships" focuses on peer collaboration within the context of the Instructional Partnership Initiative (IPI), a voluntary, state-wide teacher development program in Tennessee. In this program, principals pair teachers in their schools based on their observation scores in specific domains of teaching practice as determined by the teacher evaluation rubric. Using interviews with 48 teachers participating in IPI, this qualitative analysis draws on goal-setting theory from the employee performance and management literature to explore the specificity of the goals embedded in collaborative work and teachers' commitment to those goals. This analysis highlights how goal specificity and commitment act as facilitating conditions for collaboration focused on teacher learning and improvement, and I specifically consider the individual, relational, and organizational factors that may encourage high levels of goal specificity and commitment.

My second and third papers take a broader view of collaboration. Presented as "Organizing Schools for Collaborative Learning: School Leaders, Peers, and Teachers' Engagement in Collaboration" in Chapter III, my second paper examines variation in the teacher-reported frequency and helpfulness of collaborative learning opportunities using a statewide survey of Tennessee teachers. Specifically, I assess whether certain organizational conditions are associated with more frequent or more helpful collaboration. I highlight how "professionally isolated" teachers—those teachers who are the only ones

in their school who teach their specific courses—engage much less frequently in collaborative learning opportunities, and I find that teachers’ ratings of the helpfulness of their collaboration are higher in schools in which their peers report stronger professional climate and leadership and less administrative oversight over collaborative activities.

Finally, my third paper—presented in Chapter IV as “Teaming Up: Examining the Relationship Between Teacher Collaboration and Performance—investigates collaboration within the context of grade-level and subject-area teams. In particular, I examine whether there are associations between the frequency of collaboration, the composition of teachers’ grade-level and subject-area teams, and teachers’ performance outcomes as measured by Tennessee’s teacher evaluation system. This analysis, which leverages differences in reported collaboration across teacher teams in the same school, finds suggestive evidence that the frequency of grade-level team collaboration is associated with growth in teacher observation scores and that this association varies by the prior performance of the peers on a teachers’ grade-level team.

Across all three papers, I define teacher collaboration as any ongoing endeavor in which two or more teachers work together as part of their professional relationship(s). This definition covers a broad range of activities, from “sporadic contacts and idiosyncratic affiliations among peers to joint work of a more rigorous and enduring sort” (Little, 1990, p. 513). To better understand the many ways in which teachers work together and how such work creates opportunities for professional learning, I adapt Opfer and Pedder's (2011) conceptualization of professional learning. Opfer and Pedder (2011) contend that assessments of professional learning opportunities must attend to the interplay of teacher background and knowledge, the school context, and the content and form of specific learning activities. Similarly, all three of my paper consider the specific ways in which teachers collaborate, the individual characteristics of the teachers involved, and the broader organizational conditions within which teachers work. Furthermore, I employ situated learning theory, which posits that learning occurs within

a "community of practice," (Lave & Wenger, 1991), to hypothesize how the collaborative work of specific teachers and teacher teams can create opportunities for on-the-job learning. Thus, my proposed studies assert that different types of collaboration vary in how they promote teacher learning and, as a result, may lead to differential outcomes in terms of teachers' instructional skills and, ultimately, student learning.

## CHAPTER II

### COLLABORATING FOR IMPROVEMENT? HOW TEACHERS WORK TOGETHER IN TARGETED TEACHER PARTNERSHIPS

#### Introduction

Teachers spend more time working together in recent decades than earlier in the twentieth century (Hargreaves, 2010; Johnson, Reinhorn, & Simon, 2017). Professional collaboration among teachers is now seen as a marker of effective schools (Blase & Blase, 1999; Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; Louis, Marks, & Kruse, 1996) and considered key to creating successful professional development and learning opportunities for teachers (Cochran-Smith & Lytle, 1999; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Desimone, 2009; McLaughlin & Talbert, 2006). Considerable resources, effort, and time have been invested in professional learning communities (Hord, 2004; Vescio, Ross, & Adams, 2008), peer coaching and observation programs (Goldstein, 2007; Jarvis et al., 2017; Papay & Johnson, 2012; Showers & Joyce, 1996), and many other mechanisms for encouraging collaboration around teaching and learning (Saunders, Goldenberg, & Gallimore, 2009; Supovitz, 2002; Vangrieken, Dochy, Raes, & Kyndt, 2015).

Despite this wide-spread support for collaboration, less is known about how collaboration leads to improvement and what explains variation in the nature of teachers' collaborative work. There is a general consensus that not all collaboration among teachers is equally productive (Ronfeldt et al., 2015) and that programs intended to foster collaboration may not always have the intended effects on teachers' practice (Datnow, 2011; Hargreaves, 2000; Talbert, 2010). Recent research on workgroup conversations among middle school math teachers found that collaboration often focuses on logistical matters and concludes that these types of conversations rarely create opportunities for meaningful

learning among teachers (Horn et al., 2017). Similarly, in assessing efforts to increase teacher collaboration through data-driven professional learning communities, Hargreaves (2010) argues that teachers today spend much more time working together, but these collaborative efforts “are pleasurable, but also hurried, technical, uncritical, and narrow” (p. 150).

What, then, characterizes collaboration that creates opportunities for teacher learning and instructional improvement? I address this question within the context of a specific initiative intended to create instructionally-focused partnerships between teachers. This program, the Instructional Partnership Initiative (IPI), is a voluntary, state-wide teacher development program in Tennessee. As part of IPI, principals pair teachers in their schools based on complimentary areas of strength and weakness in specific domains of teaching practice based upon indicator scores from their teacher evaluation rubric. Results from a pilot of IPI indicate that participation in IPI led to significant improvement in teaching practice and student performance (Papay, Taylor, Tyler, & Laski, 2016). IPI proposes targeted partnerships between two teachers, one of whom has demonstrated mastery in specific instructional domains in which the other teacher has not. While many collaborative efforts are intended to generally improve teaching and learning, teachers in IPI are paired for a specific goal—improvement in particular instructional domains—and this goal is linked to a measurable outcome that is part of the broader accountability structure of schools. In an effort to better understand how and why this type of collaboration may offer unique opportunities for instructional improvement, this study describes the nature of these collaborative partnerships using interview data with participating teachers.

In this paper, I draw on goal-setting theory from the organizational and management literatures (Klein, Wesson, Hollenbeck, & Alge, 1999; Locke & Latham, 1990, 2002) as well as prior research on improvement-focused teacher collaboration to explore how certain conditions within collaborative programs can support teacher improvement. Using the Instructional Partnership Initiative as an

instrumental case study, I examine how the specificity of teachers' goals for their collaborative work and their commitment to these goals and the associated collaborative work as a vehicle for improvement can hinder or facilitate learning. While exploring how collaborative partnerships unfold through this particular program, the theoretical constructs offered here could be applied to a broad range of collaborative activities.

### **Conceptual Framework**

Collaboration is typically considered a means rather than an end (DuFour, 2011) and, within schools, collaboration is often framed as a mechanism for teacher learning or school improvement (Friend & Cook, 1990; Hord, 2004; Horn et al., 2017; Johnson et al., 2017; Leithwood & Jantzi, 1990; Little, 2002; McLaughlin & Talbert, 2006; Supovitz & Christman, 2005). School leaders, teachers, and researchers offer many different reasons why teachers should engage in collaboration (Lavié, 2006), and particular goals are often embedded within programs meant to encourage collaboration. In this paper, I apply a conceptual framework for more closely examining the goals associated with collaboration. This framework connects two key concepts of goal-setting theory—goal specificity and commitment—to prior research on how teacher collaboration can support instructional improvement.

### **Organizational Theories Relating Goal Specificity, Commitment, and Employee Performance**

Specific, difficult goals lead to higher levels of employee performance for both individuals and teams across a wide range of organizational settings (Klein et al., 1999; Locke & Latham, 1990, 2002; Weldon & Weingart, 1993). Goal-setting theory is considered one of “the most scientifically valid and useful theories in organizational science” (Locke, Latham, & Erez, 1988, p. 23), and is fundamental to organizational research on employee motivation and improvement. Goals help improve performance by directing employees' attention to important aspects of their work, increasing effort and persistence, and



encouraging employees to seek out and activate relevant knowledge for goal-driven tasks (Locke & Latham, 2002). Specific goals are typically contrasted with supervisory encouragement to “do your best,” in which performance is defined in idiosyncratic or ambiguous terms (Klein et al., 1999; Locke & Latham, 1990). In contrast, specific goals clarify acceptable employee behavior and performance levels. Greater specificity may be particularly important in encouraging greater workgroup performance because vague goals among group members can create inconsistent expectations or confusion (O’Leary-Kelly, Martocchio, & Frink, 1994).

A key assumption within goal-setting theory is that the relationship between goal-setting and performance only holds true if an employee is committed to a goal. Goal commitment is typically defined as an employee’s determination to reach a goal or their willingness to expend effort over time towards achieving a goal (Hollenbeck & Klein, 1987; Locke et al., 1988). Individual employees or workgroups are typically more committed to goals when they believe goal attainment is important and that they are capable of attaining the goal (Locke & Latham, 2002). Organizational and psychological research on goal commitment offers inconclusive evidence about whether self-selected goals or goals assigned by supervisors are more effective (Locke et al., 1988). Self-selected goals may be more appropriate since employees typically know more about their jobs than their supervisors, and workers may be more motivated to achieve goals that they themselves identified. With assigned goals, employees are more likely to commit to goals set by supervisors who they judge to have legitimate authority (Locke et al., 1988) and when supervisors effectively communicate and support their employees’ goal attainment (Locke & Latham, 2002).

### **Applying Goal-Setting Theory to Instructional Improvement**

The design of teacher evaluation systems more broadly (Darling-Hammond, 2013) and the type of collaboration specifically studied in this analysis align with many of the key findings from goal-setting

research about how goal specificity can encourage improved performance. Evaluation systems create concrete and measurable standards of acceptable performance for teachers, highlight areas in which teachers excel or struggle, and create a framework on which performance goals, feedback, and incentives can be based (Danielson & McGreal, 2000; Hallinger, Heck, & Murphy, 2014). In Tennessee, as in many other states, evaluators and teachers regularly identify a specific area for reinforcement (i.e., what teachers are already doing well) and a specific area of refinement (i.e., what teachers need to improve). Within the Instructional Partnership Initiative, teachers are matched with peers in their school based on their performance in specific domains of instructional practice as identified through the evaluation process. While other programs meant to encourage collaboration among teachers often imply that this collaboration is meant to improve instruction, the explicit logic of the Instructional Partnership Initiative is to encourage teachers to focus the collaborative work of these strategic partnerships on specific areas of instructional practice in hopes of improving their performance in those areas. As such, this program offers a particularly fruitful opportunity for exploring whether the goal specificity and commitment engendered through collaborative programs are likely to lead to instructional improvement.

The broader literature on goal setting and performance also emphasizes that goal difficulty is associated with employee performance (Locke & Latham, 2002; Mento, Steel, & Karren, 1987). Much of the empirical research on goal difficulty focuses on controlled laboratory experiments or employees such as typists, factory workers, telephone operators, or loggers. In comparison, the work of teaching is highly complex and goals related to instructional improvement are almost always difficult. For this reason, this analysis does not consider goal difficulty. In situations in which all goals are difficult, goal commitment is expected to have an even stronger relationship with job performance (Klein et al., 1999).

## **Goal Specificity and Commitment in Prior Research on Teacher Collaboration**

Although goal-setting theory is rarely directly applied in research on teacher improvement (for notable expectations, see Seijts, Taylor, & Latham (1998) and Tomlinson (2001)), concepts similar to goal specificity and commitment emerge throughout the literature examining the conditions under which collaboration may support instructional improvement. Collaboration can take many forms, including storytelling among teachers, planning non-academic activities, or coordinating scheduling across classes (Horn et al., 2017; Little, 1990). Unlike these other forms of collaboration, *collaborating for improvement* is explicitly focused on developing or refining instructional practices. Most of the collaboration programs introduced in recent decades are explicitly intended to support instructional improvement among teachers (Datnow & Park, 2018; Goldstein, 2007; Hord, 2004; McLaughlin & Talbert, 2006; Saunders et al., 2009; Showers & Joyce, 1996; Supovitz, 2002; Vescio et al., 2008). In the following sections, I briefly review how concepts similar to goal specificity and commitment appear in research on improvement-oriented collaboration.

### **Specificity**

School improvement efforts intended to promote collaboration through professional learning communities (PLCs) emphasize that an essential feature of these communities is a “clear and consistent focus on student learning” (Vescio et al., 2008, p. 81), and studies of PLCs typically conclude that teachers benefit more when they dedicate collaborative time to close examinations of teaching and learning (Hord, 2008; Horn et al., 2017; Louis et al., 1996). Particular activities—including peer observations, co-creation of instructional materials and lesson planning, and analysis of student work—are particularly useful for promoting teacher learning and developing instructional practices (Darling-Hammond et al., 2009; Hord, 2004; Horn et al., 2017). These activities create opportunities for teachers to de-privatize their teaching practices and draw them in to discussions of specific problems of practice

(Little, 2003; Louis et al., 1996). Since teachers rarely teach together, peer observations allow teachers to see each other in action and can facilitate opportunities for reflection and feedback around particular instructional choices. In order to deeply engage issues related to teaching and learning in other forms of conversation, teachers must make their instructional practice visible to their peers through peer observation or through collaborative activities that illustrate their instructional practices. For example, teachers may engage in “replays,” in which they describe or re-enact a specific classroom event, or “rehearsals,” in which they practice what they will do in future classes (Horn, 2010). Certain activities, including those identified above, allow for the level of openness and specificity needed for teachers to develop a common language around instruction and refine or rethink their understanding of instructional practice (Horn et al., 2017; Little, 2003).

### **Commitment**

How teachers view the goals of their collaboration may influence the degree to which it creates meaningful opportunities for learning. Importantly, teachers, support staff, and school leaders may not always agree on the goals embedded within collaborative activities. Having a shared purpose is often used to distinguish collaboration (marked by interdependency) from situations in which teachers continue to work independently but share stories or ideas with each other (Kruse & Louis, 1993; Little, 1990). Studies have found that teachers more favorably assess collaboration in which they have a clear and meaningful goal and that school leaders play an outsized role in setting these goals (Charner-Laird et al., 2017; Johnson et al., 2017). However, collaboration that is overly prescribed through administrative mandates—with low levels of teacher commitment—can become oriented towards compliance rather than addressing genuine problems of practice (Hargreaves & Dawe, 1990; Kraft et al., 2015; Talbert, 2010). Reflecting on over a decade of work with professional learning communities, Talbert (2010) warns that “many teacher groups formed through mandates simply comply with the letter of the law

and fail to realize improved student achievement” (p. 555). Talbert differentiates top-down bureaucratic approaches to collaboration as marked by blanket policies mandating collaboration, top-down goals and team performance measures related to accountability system demands, and the formalization of collaborative roles. Teachers typically respond to these approaches by either “ritual enactment” of collaboration requirements or resistance that challenges the goals of collaborative initiatives. In contrast, professionalized approaches to building collaboration involve developing a shared vision of the goals, strategically using school resources and organizational structures to encourage and facilitate collaboration, and developing mutual accountability among teachers within the school. Talbert (2010) argues that these leadership approaches result in teachers that are more receptive to and enthusiastic about collaboration as a mechanism for improvement.

Goal specificity and commitment emerge as important components in organizational theories to explain the relationship between goals and performance, and serve as the conceptual basis for my analysis of collaborative partnerships created through the Instructional Partnership Initiative (IPI).

### **Context of This Study**

This study focuses on collaborative partnerships created through Tennessee’s Instructional Partnership Initiative (IPI), a teacher development program designed to pair teachers with low evaluation scores in certain domains of instructional practice with another teacher in their schools who has high scores in the same domain(s). Initially developed as a pilot program (Papay et al., 2016), IPI was first rolled out to schools across the state during the 2015-2016 academic year as part of a state-wide randomized control trial. Principals in treatment schools were given the option to implement IPI in their schools but it was not mandated by the state. As a result, only a small subset of schools offered IPI decided to implement the program. The data for this analysis are drawn from schools who decided to participate during the second year of program implementation (the 2016-2017 academic year).

The Tennessee Department of Education (TDOE) provided principals in treatment schools with suggested teacher partnerships based on an algorithm that accounts for teachers' scores from observation rubrics rating teachers' mastery of specific domains of instruction practice (e.g., presenting instructional content, questioning, managing student behavior). In particular, principals were provided with a list of teachers who had lower observation scores in specific domains within the observation rubric. For each identified teacher, the department provided a list of suggested partners drawn from other teachers in the school. The matching information also highlighted the specific domains on which the identified teachers were lower-scoring and indicated whether suggested partner teachers scored highly in that area. Importantly, this approach suggests partnerships based on domain-specific scores (i.e., pairing a teacher struggling with lesson structure and pacing with a teacher who demonstrated mastery in that area) rather than suggesting partnerships based on teachers' overall performance levels (i.e., pairing low-scoring teachers with high-scoring teachers).

As designed, the work of these teacher partnerships should focus on the certain domains of instructional practice for which one of the teachers has demonstrated mastery and the other teacher has struggled. TDOE provided teacher and principal guidebooks to implementing schools, and these materials included suggestions about how principals manage the program and the types of collaborative activities that partner teachers could do as part of IPI. In their guidebook, principals are encouraged to use their professional judgement in selecting partnerships within their school. The guidebook suggests that principals provide participating teachers with guidance about which specific instructional domains they should focus on, offer clear expectations for how partnered teachers work together, and provide ongoing support throughout the year. The teacher guidebook includes suggested partnership activities such as holding an introductory meeting to discuss expectations and norms, setting specific partnership goals, observing each other to provide feedback, and working together to create lesson plans. The guidebook also includes guiding questions and worksheets to accompany these suggested activities.

While IPI collaborative partnerships are designed to focus on instructional improvement in specific domains of instruction, what these partnerships looked like in practice varied substantially across participating schools. A broader research study focused on the implementation of the program found wide variation in how principals used the suggested pairing, how they explained the program to teachers, and how they managed and supported partnerships throughout the year. Similarly, this study observed that teachers' perceptions of the program and the actual activities that they reported doing varied considerably across and within schools. This variation created an analytic opportunity to explore whether certain factors explained the differences observed within and across schools. Grounded in how teachers themselves described their experience and building on the conceptual framework of goal specificity and commitment, this analysis explores this variation in order to examine how and why some collaborative partnerships appeared to create opportunities for learning while others did not.

## **Data and Methods**

### **Data**

I use interview data with teachers participating in the Instructional Partnership Initiative (IPI) to describe and categorize collaborative partnerships. Data for this study are drawn from a larger, multi-year study of the implementation of Tennessee's Instructional Partnership Initiative (IPI)<sup>1</sup>. As part of an analysis of the ongoing implementation of IPI in schools across the state, the research team purposefully sampled schools who had more robust implementation of IPI. These schools were identified based on recommendations from state officials as well as communication with schools in their second year of

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<sup>1</sup> The broader research project is supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305E150005.

implementing IPI. Of the approximately 90 schools implementing IPI across the state during the 2016-2017 academic year, the research team conducted fieldwork in 13 schools.

Within each school, the research team interviewed the principal and 4-8 participating teachers. Participating teachers were selected for interviews in consultation with the principal in hopes of purposefully selecting pairs that had been actively working together. In schools with more active pairs to choose from, we selected pairs to get representation across a number of specific cases, including pairs with teachers in the same subject/grade-level, pairs across subject/grade-level, and pairs who were in their second year of working together. Given that prior research suggests that collaboration focused on instructional improvement is not a common occurrence in schools, this purposive sample is well suited for this analysis because both schools and teachers have been selected for showing more engagement in a program that promotes collaboration around improvement.

Individual interviews with 72 participating teachers were conducted in April and May 2017 during visits to each of the 13 schools.<sup>2</sup> Researchers used a semi-structured interview protocol developed by the research team, in consultation with partners at the Tennessee Department of Education, to gather insight and feedback from teachers participating in IPI. The protocol included detailed questions about their overall experiences with IPI, their relationships with their IPI partner, the specific collaboration activities that teachers engaged in with their IPI partner, and how IPI collaboration differed from their collaboration with other teachers in their school. The interview protocol is included in Appendix A. Teacher interviews, which typically lasted between 30-45 minutes, were audio recorded with the permission of participating teachers and then transcribed.

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<sup>2</sup> I conducted 17 interviews myself as part of my work on the team researching the implementation of IPI. The remaining interviews were conducted by experienced qualitative researchers.



## Sample

For this analysis, I limited the interview sample in three ways. First, I only included regular classroom teachers<sup>3</sup> and only included partnerships in which both teachers were interviewed<sup>4</sup>. By focusing only on partnerships in which both teachers were interviewed, I am better able to triangulate information across interviews as well as explore the extent to which teachers' perceptions of their collaboration varied. Next, I dropped four teachers (representing two schools) from the analysis because their schools only had one partnership remaining after I applied the first inclusion rule. This decision was driven by my interest in exploring how organizational factors may engender goal specificity and commitment. Finally, I eliminated one school from the sample because their implementation of IPI varied substantially from the program as designed<sup>5</sup>.

Table 1 presents information about the school level, geographic context, teaching assignment, and teaching experience of the 48 teachers included in the analytic sample. These teachers teach across a wide range of subject-areas and grades, and they have varying levels of experiences. Importantly, this sample is not meant to be representative of all Tennessee teachers or of all teachers engaged in collaborative work through the Instructional Partnership Initiative.

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<sup>3</sup> In a few cases, IPI partnerships included instructional coaches, guidance counselors, librarians, or data specialists. Given my interest in whether teacher collaboration creates opportunities for instructional improvement, these partnerships seemed substantively different and were excluded. Of the 76 participants originally interviewed about IPI, 5 were dropped for this reason (7% of the original sample).

<sup>4</sup> While the research team attempted to interview teachers matched together, this did not always happen due to scheduling issues, miscommunication, or teacher absences. Of the 76 participants originally interviewed about IPI, 13 were dropped for this reason (17% of the original sample).

<sup>5</sup> In this school, IPI was offered as an alternative to required professional development and teachers were able to choose their partners.

## Initial Analysis

In the early stages of this project, I engaged an initial round of open coding grounded in the data (Corbin & Strauss, 2008) and informed by the conceptual constructs of collaboration focus, form, and purpose developed for my dissertation proposal. During this open coding phase, I completed line-by-line coding of the parts of the transcribed interview in which teachers talk about their collaboration with their IPI partner. I completed this coding for 20% of the interviews (10 of 48 teachers, randomly selected from the analytic sample). Next, I created a framework of focused codes based on the most significant and recurring codes from the first round of coding (Charmaz, 2014). This focused coding framework was originally intended to identify and categorize the purpose, form, and focus of IPI collaboration as described by teachers. Themes around the specificity of partnership goals and work and teachers' commitment emerged during the initial coding phase as important elements of collaborative partnerships that seemed to influence how teachers described their partnership work, their relationship with their partner, and their perceptions about whether their partnership had supported their learning and improvement. In developing the focused coding framework, I then created theoretically-driven codes based on prior research on goal-setting theory. I tested the focused coding framework on another 10% of the interviews (5 of 48 teachers, randomly selected from the analytic sample). Based on this testing phase, I made minor edits to the framework (such as clarifying code definitions, collapsing codes that were too similar, and adding sub-codes). The finalized focused coding framework, which can be found in Appendix B, includes codes about the program expectations and implementation, partnership goals and activities, relational dynamics among partners, and participant perceptions about whether and how the program has supported their professional learning and instructional improvement. I used this finalized coding framework to code the transcripts for all 48 teacher interviews. Finally, I wrote a brief analytic memo after coding each interview and then categorized each teacher along certain dimensions identified in the focused coding framework.

## **Categorizing Partnerships by Specificity and Commitment**

The 48 teachers in my analytic sample represent 24 collaborative partnerships and 10 schools participating in the Instructional Partnership Initiative (IPI). I first analyzed the interview data at the teacher level and then examined patterns at the partnership and school level. As explained below, I developed an analytic approach to capture the level of goal specificity and commitment as described by teachers.

**Specificity.** I noticed wide variation in the espoused goals of teachers' partnerships and the level of specificity of the collaborative work that teachers described doing with their partner. Within the organizational and management literature, specific goals are often contrasted with "do your best" encouragement or the absence of any goals (Locke & Latham, 1990; Tubbs, 1986). Within teachers' descriptions of the Instructional Partnership Initiative, almost all teachers associated some sort of goal with the initiative and most teachers explicitly described whether their partnership work was driven by any overarching goals or focus areas.

Specificity was first coded at the individual teacher level. I first qualitatively described the level of specificity associated with teachers' espoused goals and reported participation in IPI in an analytic memo that I wrote after closely reading and coding each interview. I then made a holistic determination of low specificity or high specificity for each teacher based on how they described their partnership. Table 2 includes the codebook descriptions for specificity and example quotes from teachers coded as having low or high specificity. For the 48 teachers included in the analytic sample, 42 teachers (88%) were originally coded as having the same level of specificity as their partner. For the remaining six teachers (representing three partnerships), I re-read the interviews to see if the difference in coding reflected actual differences in the teachers' descriptions of their partnerships or if it reflected differences in the information collected during the interview. In two cases, each teacher described the partnership similarly but the level of detail provided in the interview about specificity varied. In these

cases, I made a final designation based on both interviews and two of the teachers' original codes were changed. The discrepancy in the remaining pair (Pair W) seemed to reflect an actual difference in how each teacher described the specificity of their partnership work. Each teacher has retained their original designation but I decided to place this pair in the "High Specificity-High Commitment" category based on a holistic assessment of how both teachers described the goals of their partnership.

**Commitment.** Teachers varied considerably in how they talked about the program and the extent to which they viewed their collaborative partnership and its goals as a vehicle for their own professional learning and instructional improvement. Goal commitment is often measured directly by asking employees about whether they accept their performance goals or indirectly by gauging the extent to which employees express enthusiasm for the goals, examining how employees reflect on or explain their goals, and noting whether employees are resistant to change or reject the goals outright (Locke et al., 1988).

I first coded commitment at the individual teacher level in order to capture whether teachers view their partnership and its goals as a mechanism or means for professional learning or improvement (coded here as high level of commitment). For each teacher, I described teachers' commitment qualitatively in my analytic memos and then made a holistic determination for each teacher. Importantly, high and low commitment does not capture teachers' commitment to their own improvement or whether they believe that collaboration can help teacher improvement. Rather, this coding is meant to capture the extent to which they are committed to the specific goals and improvement processes embedded within their IPI partnership as implemented within their school. While specificity refers to the nature of the partnership itself (i.e., the focus or goals of partnership work), commitment refers to each individual teacher's personal orientation towards those goals. Table 2 includes the codebook descriptions for commitment and example quotes from teachers coded as having low or high commitment. Three teachers were coded as "Not Applicable/Mentoring" because they

framed the partnership work as exclusively supporting their partner's improvement but unrelated to their own professional learning.

In the analytic sample, 34 of 48 teachers (71%) were originally coded as having the same level of commitment as their partner. For the seven pairs with differing commitment, I re-read their interviews to gauge whether differences in their initial designations reflected actual differences in the teachers' espoused orientation towards their partnership goals or if it reflected differences in the information collected during their interviews. For six of these cases, the difference in coding reflected clear divergence in each teacher's commitment to their partnership and its goals as a mechanism for improvement. These pairs—defined here as “mixed” commitment—are further described in the results section. In one case (Pair G), each teacher described their orientation towards the partnership similarly but the level of follow-up from the interviewer varied. In this case, I changed the coding for one partner to reflect a low level of commitment.

Table 3 presents information about each teacher, including their school type (elementary or high), partnership type (whether paired within or across subject/grade), teaching assignments, assigned level of specificity, and assigned level of commitment.

**Reliability of coding.** To assess intrarater reliability, I double coded 10% of all interviews<sup>6</sup> and then compared my codes to confirm that I was consistent in my application of codes and holistic determinations of goal specificity and commitment for these teachers. My analytic memos for these five teachers were qualitatively similar and I categorized the level of specificity and commitment in the same way across all double-coded transcripts.

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<sup>6</sup> The second coding of these interviews occurred about six months after the initial coding.

## Results

In the first section, I describe and catalogue the level of goal specificity and commitment among interviewed teachers (Table 3), and then sort teacher partnerships into six distinct categories (Table 4). In the second section, I use four comparative cases to demonstrate how the collaborative partnerships unfolded differently in low-specificity/low-commitment partnerships and high-specificity/high specificity partnerships (Tables 5 and 6). In the final section, I explore factors that engendered high or low levels of goal specificity and commitment among teachers.

### **Describing and Categorizing Goal Specificity and Commitment**

**Goal specificity.** As designed, teachers paired through the Instructional Partnership Initiative are meant to set partnership goals and focus their collaborative work in specific instructional domains. All teachers within the analytic sample described the goals and purpose of the program as generally relating to teaching or instruction. However, when asked about the specific objectives or focus of their partnership work, teachers' reported level of specificity varied substantially. As Table 4 shows, 9 partnerships were identified as having low goal specificity while 15 partnerships were identified as having high goal specificity. Below, I illustrate the differences between low specificity and high specificity as described by teachers themselves.

**Low specificity.** Teachers in partnerships with low goal specificity described the goals of their partnerships as sharing ideas, swapping instructional strategies, or giving advice as needed by their partner. These teachers framed their partnership as more general collaboration among teachers. In this sample, low specificity seemed to manifest in two different ways. In most of these partnerships, teachers described having no particular goal or focus, and teachers often described their partnership work as checking in with their partner about what was happening in their classroom. For example, one teacher described her partnership work as talking about "just whatever was on our mind that we were

struggling with, that we needed advice on.” For those in low specificity partnerships who engaged in classroom observation of their partner, teachers explained their observations as “just watching” or “observing their routines, their procedures, their teaching strategies.” In a typical explanation for a teacher coded as low specificity, one teacher described her observation this way:

The big thing with me going in to watch her [was] to kind of see what that looked like, and just how she structured her class, like what the flow was, what the point of things were and how they led, one into the other.

In a few partnerships, teachers had a particular focus for every given partnership activity but there was no overarching goal or sustained focus. In one case (Pair B), both teachers described their partnership work in terms of “activities” and reported that they had discussed their evaluation scores, shared their lesson planning templates, brainstormed how to improve their time management, talked about their students’ progress during an academic intervention period, and co-taught a technology-focused lesson. While teachers described some of these activities as helpful for improvement, their partnership was not driven by any overarching goal.

**High specificity.** In contrast, teachers in partnerships with high goal specificity often name a specific goal or goals in their description of their partnership work and describe how that goal(s) guided their partnership work. In most cases, this specific goal was aligned with an area of instructional need—referred to as a teacher’s refinement area—as identified through their formal observation process. In a few cases, principals explicitly told teachers to focus on a certain area in their partnership work. For example, one teacher reported that their principal “highlighted some things that [my partner] needed to work on, just a couple of them – problem solving was one of them.” In most cases, principals suggested that their collaboration focus on teachers’ areas of refinement from their recent evaluation but gave teachers autonomy to decide themselves what they wanted to focus on. In her description of their first partnership meeting, one teacher described how they settled on their goals:

We basically just picked our refinement areas and told each other what our refinement was and why it was our refinement. Like my refinement was lesson structure and pacing because I teach

in 90-minute blocks and I have to do grammar, writing, and reading in one 90-minute block. And so [lesson structure and pacing is] always a problem.

In some partnerships, each teacher focused on their own area of refinement. In other partnerships, teachers decided collectively on one area to both focus on. Teachers in high specificity partnerships explained how observations, feedback, or conversations with their partner were often framed around their goal or focus area. For example, one teacher described how her observations of her partner focused specifically on questioning, which was her partner's area of refinement. She explained that, "when I came in, I was watching the whole lesson and watching her and watching the students, but my main focus was how many questions. Were they, you know, of higher order thinking versus the lower level?" This teacher described how she kept tallies of the number and level of the questions used by her partner during the observation, which she later shared and discussed with her partner. Other teachers within high specificity partnerships similarly report collecting and sharing feedback focused on certain instructional domains that had been identified as a specific area of focus for their partnership.

**Commitment.** As with any improvement program implemented within schools, teachers expressed varying degrees of commitment to the goals embedded within their partnership work. Overall, 7 partnerships were identified as having low commitment, 6 partnerships were identified as mixed commitment, and 11 partnerships were identified as high commitment (see Table 4). The following sections describe how teachers in low commitment, mixed commitment, and high commitment partnerships described their orientation towards their partnership goals.

**Low commitment.** Teachers in partnerships identified as low goal commitment often described their partnership work as "another thing to do" or explained that their partnership replicated the types of collaboration that they already do "just with paperwork." These teachers tended to frame their partnership work as compliance-oriented rather than focused on activities that will help them improve their practice. In describing her reaction to the program's introduction, one teacher explained how she "just added it to the list and moved on." Some teachers emphasized the paperwork associated with



their partnership work and suggested that much of their focus was on completing the necessary documentation. Many teachers within this group indicated that their partnership did not offer anything new or different from other forms of collaboration. As one teacher explained, "this was just another form that we fill out to go along with things we were already doing." Some of these teachers also mentioned that they felt their school leaders were being required to participate by the state department of education or district, but that there had been very little investment into making the partnerships successful. Notably, the majority of teachers within this group clarified that they believed collaboration with their peers can help them become better teachers but that this particular partnership was not structured in a way to support their learning or improvement.

**High commitment.** Teachers in high goal commitment partnership framed their partnership as a way for them to learn and improve. Multiple teachers explained how their partnerships goals and associated work offered them collaborative learning opportunities or supportive professional relationships that may not have been available otherwise. For example, one teacher explained how peer observation can be a powerful learning opportunity but it is not typically something that she's been able to do:

It's just about going in [to observe another teacher], because in the whole 14 years I've taught, that's the number one thing you always hear when it's just teachers together. Well, I know they're doing great and I hear great things. But how? Like I never get to go see it.

Similarly, another teacher described the program "as the opportunity that we all want to have, to go see another teacher who may do some things differently than we do." Other teachers highlighted the importance of having a peer with whom they can discuss their challenges or who can provide helpful feedback. Not all teachers coded as high commitment felt instantly excited about the program. For example, one teacher coded as high commitment described how "at first, I thought, ugh, something else to do" but that her mindset changed once matched "because I knew that I could learn a lot from her."

**Mixed commitment.** Finally, six pairs of teachers were identified as having mixed goal commitment. Half of the partnerships in this group reflect the same pattern. In these partnerships (Pairs H, I, and U), one teacher was clearly positioned as a mentor and one teacher was positioned as the mentee. For example, when asked to describe the goals of the program, one of these teachers explained “as a mentor, your goal is to tell the person that you’re working with some things that really helps you become a better teacher and in the end, attain better [observation] scores.” The mentor teacher in these three pairs viewed the partnership as something to help their partner but did not consider their partnership work as a mechanism to learn or improve themselves (these teachers are listed as “Not Applicable” in Table 3). Two additional partnerships in this group (Pairs K and T) also described their relationship in hierarchical terms. The hierarchical nature of these partnerships created tensions that seemed to differentially influence teachers’ commitment to their goals and partnership work. For example, one teacher who was considered a mentee explained that the program creates “like a stigma, saying that I need to work on these things... so if I’m a part of IPI but another grade-level teacher of mine is not, [it’s] like, oh, you must be doing really good. I must be doing something really bad.” Unlike high commitment partnerships, teachers in mixed partnerships did not consistently frame the goals of their partnership as something meant to help them both learn and grow professionally.

### **Comparative Cases**

To better illustrate how the experience of teachers varies based on goal specificity and commitment of their partnerships, I highlight four pairs of teachers from the broader sample. The nature of their partnerships unfolded differently based on school context and partnership type (i.e., whether teachers are paired with teachers within their own grade-level or subject-area). Thus, I have constructed two sets of comparative cases to illustrate differences between low-specificity/low-commitment and high-specificity/high-commitment partnerships. I focus specifically on low-

specificity/low-commitment and high-specificity/high-commitment partnerships because (1) the majority of pairs in the sample (13 of 24 pairs) fall into these two categories and (2) they provide the clearest contrast to illustrate how goal specificity and commitment can facilitate greater learning opportunities for teachers during collaborative partnerships. In both sets of cases, I have selected pairs of teachers who look similar “on paper” but whose partnership experiences diverge considerably.

**Comparative Case #1: Elementary teachers paired across grade-level.** In the first case, I compare the partnership of Sandra and Ashley (Pair V, coded as low-specificity/low-commitment and described in Panel A of Table 5) with the partnership of Jasmine and Meg (Pair S, coded as high-specificity/high-commitments and described in Panel B of Table 5). In both pairs, a self-contained second grade teacher was paired with a fifth or sixth grade teacher who is departmentalized. All four teachers discussed the large grade-level difference in their teaching assignments and questioned, at least initially, what they could learn from the partnership. In Sandra and Ashley’s school, the principal did not explain why teachers were matched and gave little guidance about the goals of the partnership work. Since their principal did not assign any goals related to the partnership, Sandra and Ashley were left on their own to figure out what their partnership should be about. Each teacher described the goals of the program in general terms (“to learn more about teaching”) and the focus of their partnership work—which mostly revolved around informal chats—as sharing ideas about teaching in their respective grade-level (“more on the general side of handling things in the opposite grade-level”). Neither Sandra nor Ashley described the program as supporting their own instructional improvement and clearly expressed their low commitment (Ashley described it as “another thing to do” while Sandra said “I didn’t put much thought into it”). Both teachers felt that their partnership was not a priority nor relevant to their instructional needs. Since their principal did not set any clear expectations and did not follow-up with them, they reported putting little effort into their partnership work.

Jasmine and Meg described their partnership experience much differently. Their principal explained that they were matched based on their observation scores and, specifically, because of their refinement areas. The principal asked that each pair determine an area of focus and then complete two sets of observations. Both teachers explained that they were a bit skeptical at first given the large difference in grade-levels (Jasmine recalls thinking “why in the world am I with fifth? I mean, you know, fifth grade, that’s a huge jump”). However, the rationale for their pairing and specific ways that they could help each other quickly became clear. As Meg explained, the principal’s specific guidance and focus on refinement areas helped teachers make sense of what they should be doing together:

Why am I paired with this person? But when [the principal] said reinforcement and refinement, it was pretty easy to understand. I could go pull out [my evaluation] and [the principal] looked at those and was able to say, well, this person needs [this]. I could see—after being in her class and she being in mine—it totally made sense.

As they began working together, both Meg and Jasmine quickly decided to set partnership goals based on a specific need that their partner was particularly well positioned to help them with. For example, Jasmine had recently switched to second grade from teaching Kindergarten, and she had struggled with teaching more advanced writing. Meg—a fifth grade English Language Arts teacher—could support her in this area. They planned Jasmine’s observations so that she could observe Meg doing lessons on writing (“So when I went down there, she would always show me different types of writings”). Similarly, Meg—who was focused on grouping and centers—explained that she was focused on observing how Jasmine managed her group work and centers. Jasmine and Meg both explained how their partnership created a supportive, collaborative relationship that they would never have sought out themselves but has really helped them improve in a specific area of instructional practice.

**Comparative Case #2: High school teachers in similar subjects.** The second case compares the partnership between Calvin and Graham (Pair N, coded as low-specificity/low-commitment and described in Panel A of Table 6) with the partnership of Victoria and Zion (Pair X, coded as high-specificity/high-commitments and described in Panel B of Table 6). Both pairs work in small rural high

schools in which they are the only teachers who teach their particular classes, and both partnerships are between teachers who teach in similar subjects. In Calvin and Graham's school, the principal encouraged them to observe each other but otherwise provided no rationale for why teachers were paired together or specific expectations for what teachers should focus on. Both teachers associated the partnerships with encouraging collaboration within their subject-area. For example, when asked to describe the goals of the program, Calvin explained "it would be [getting] any teacher in a certain discipline to work together... I know a lot of places, you would get like all the algebra teachers doing common assessments, but our school is so small, most of us teach things independently of the others." Although both Calvin and Graham appreciated being partnered with another math teacher, they questioned what their partnership work added to what they already did together. Calvin described IPI as replicating and documenting work that he has always done with Graham ("it's nothing different than what we've previously done"). Neither teacher identified any particular goal or focus for their partnership work and neither associated their partnership with improving instruction. In fact, both teachers expressed some reluctance to provide feedback to their partner after their observation. Calvin said that he did not feel like his role should include providing critical feedback to Graham ("as a professional, you don't want to get too [negative]"), and Graham similarly expressed hesitation about discussing any instructional weaknesses with Calvin.

In contrast, Victoria and Zion both enthusiastically described their partnership experience and hoped that they can continue it during the next school year. Although they work in different departments (Victoria teaches health and medical science electives in career and technical education while Zion teaches biology), both teachers described their subject matter as overlapping. In setting up the expectations of the program, their principal explained that they should identify a focus area based on their strengths and weaknesses, observe each other at least twice, and provide feedback through an observation template provided by the principal. Before each observation, they would meet and discuss

the goals for that observation (“as we met more, we go in, we critique, and then we reconvene and come up with goals for the next time that we observe”). Victoria and Zion differentiated their partnership work from other types of collaboration, and both teachers explained how their feedback from their partner was some of the best feedback that they had ever gotten on their teaching. Victoria said that they “openly talked about things that we needed to improve on” and explained how their partnership “built a platform for constructive criticism” that she really valued. Zion similarly explained that they had built a trusting relationship that encouraged constructive feedback.

For Jasmine and Meg and for Victoria and Zion, their partnership was focused on specific areas of instructional need (high specificity) and, in their words, offered them a way to improve their practice that they would not otherwise have had (high commitment). Their cases illustrate how these partnerships can create opportunities for learning.

### **Factors Associated With Specificity and Commitment**

In the final section, I explore individual, relational, and organizational factors that seemed to engender goal specificity and commitment. I use the four comparative cases outlined in the previous section to illustrate some of these factors as well as patterns that emerged from the full analytic sample. Goal specificity and commitment seemed to mutually reinforce one another, and some factors appeared to encourage high specificity and high commitment. Thus, I discuss these factors together and note if certain factors seem more strongly associated with specificity or commitment.

**Individual factors.** Teaching experience and teachers’ mindset about improvement seemed to shape their commitment to their partnership goals and associated collaborative work as a means for learning. The vast majority of teachers in the sample expressed support for the idea that teachers can learn throughout their careers and that collaboration can encourage learning. This mindset was especially prevalent among teachers in the sample with less experience. For example, a second year

teacher explained “I think I’m receptive to [IPI] because I know I’m new and I always need to grow, you know?” In a few cases, more experienced teachers rejected their partnership as a way to improve (demonstrating low commitment) because they did not feel it was appropriate for them to be included in this program as veteran teachers. In all of these cases, the program was described by teachers as a mentorship in which a mentor teacher was helping their mentee improve their evaluation scores (these pairs are captured in the “High Specificity/Low Commitment” and “High Specificity/High Commitment” boxes in Table 4). For example, one teacher who has seven years of experience explained her frustration about being selected to participate in a partnership, “I’m not a new teacher. I mean, I’m still not perfect but I’m not a new teacher. And so I guess in some ways I’m kind of like why [is my partner] still having to work with me.” Other teachers suggested that the partnerships may work better if it focused on pairing newer teachers with veteran teachers:

Did I learn anything? Honestly, I don't think I did. I mean, I know that's bad. I just – I wasn't fully in it. We did what we had to do to – to survive. And I know that's ugly. But I can see the benefit in this program, I really can, if it was partnered a one- to three-year teacher and veteran teacher that were similar in grade.

However, numerous veteran expressed their enthusiasm for the program as a way to continue to learn throughout their careers. While reflecting on what she has learned from her partnership, Meg explained that “you know, you think, I’ve done this 20 years, there’s nothing that I could learn from somebody” but that her experience working with Jasmine confirmed that she can still learn a lot. She explained “to me, that solidified in my mind that the program was really a good thing.” For these veteran teachers, they expressed an interest in continuing to learn and grow, and identified their partnership as a way to foster their learning.

**Relational factors.** As with any collaborative effort, interpersonal dynamics among teachers influenced how they worked together. While a few teachers explained that personality incompatibilities or personal conflicts made their partnerships less effective, the most important relational factor that seemed to encourage both goal specificity and commitment was teachers’ perceptions of their own

expertise and their partner's expertise. For many pairs, there seemed to be a reciprocal relationship between specificity, partnership type, and expertise. For partnerships matched within the same subject or grade-level, teachers easily recognized how their partner had relevant instructional expertise to share. For example, one teacher explained why he appreciated that he was matched with a fellow math teacher:

We kind of know what we're doing with each other – we can relate to each other as kind of the same background. Because it really wouldn't do much if I sit in on biology or English because it'd be hard for me to give them any feedback.

However, for some grade/subject partnerships without a specific focus, teachers had a hard time determining what they should be doing in their partnership beyond collaboration that already occurs within subject-area or grade-level teams. In their partnership, Calvin and Graham both questioned the goals of the partnership and what it was supposed to add to their ongoing collaboration within their math department. Joking that he and Graham were “pleasantly ambivalent” about the program, Calvin explained “so that's something we would've done anyway, you know, whether or not we were supposed to meet [for IPI] or not. It's just it helped us fulfill our requirements for this.” In contrast, all of the same-grade/same-subject partnerships coded as high levels of specificity also expressed high commitment to their partnership goals and work as a way to improve, likely because this increased specificity helped them differentiate IPI from their other grade-level or subject-area collaboration.

Expertise operated slightly differently for teachers matched across grades and subjects. Many of these teachers expressed initial reluctance or surprise about being partnered with a teacher in a different subject-area or grade-level (for example, remember that Meg and Jasmine were both hesitant about their pairing). For these teachers, having a particular focus or specific reason for being matched (i.e., high specificity) helped them understand how they could capitalize on the expertise of their partner. In contrast, for teachers like Sandra and Ashley, cross-grade teachers in low specificity partnerships felt that they had little to offer each other in terms of useful expertise. In three of the



elementary schools in the sample (Schools #7, 8, and 9), all teachers were intentionally paired across grade-level. Teachers in these schools could easily differentiate the goals of their partnership work from those of grade-level collaboration, and explained how the program had encouraged peer observations or supported vertical planning within the school. In reflecting on whether her partnership is more or less useful than other types of professional development, a teacher in School #8 explains how there are trade-offs in terms of what the cross-grade partnership can offer:

[IPI is] definitely more useful in helping the culture, the environment of our building, relationships, and more useful in me self-reflecting on my teaching... And a lot of us wouldn't do that without something like this, and it gives us a safe environment to do that...[It is] less useful in specific stuff for my subject-area because, you know, we've gotten ideas, but if I want specific stuff on the science standards, that's not where I'm going to get it.

For some teachers, the differences across content-area or grade-level created too much distance for the partnerships to be an effective vehicle for instructional improvement even when there was a specific focus.

**Organizational factors.** As illustrated in the four cases, IPI was introduced and supported quite differently across the schools in the sample. In particular, how the principal introduced and supported the program seemed to shape the goal specificity and commitment reported by teachers. In some schools, principals did not provide much detail about the goals of the program overall or set any expectations about how teachers should structure or focus their partnership work. For Sandra and Ashley, their principal provided them with the program guidebook but otherwise, as Ashley explained, “it was mostly just kind of up to the partners in the partnership.” Neither teacher knew why they were paired up although Ashley mentioned that her principal had told her that they were “randomly” selected to participate. Without any further guidance, they did not have any particular reason for working together (i.e., low specificity) and did not feel like it was meant to help them improve (i.e., low commitment). Across most of the schools in the sample, teachers in partnerships coded as high levels of specificity were explicitly told by their principals that their partnership was meant to focus on their areas

of refinement from their evaluation or that they should identify an instructional area of focus for their partnership. For many teachers, this specific focus differentiated their partnership from other types of collaborative work and oriented their partnership work around their own improvement. For example, one teacher reflected on how her partnership was much more individualized than other professional development opportunities:

I mean, I think that it's probably better than most [PD] because it's more individualized compared to like just a big general thing. It's more specified and more individualized... it's nice to have that one person that you can build a relationship with, like a bond that you know that, you know, hey, they know – they've seen me teach. They know my weaknesses, they know my strengths, and it's nice that you can have this conversation and I can get positive feedback and constructive criticism, you know.

Especially in schools in which principals encouraged and supported peer observations as part of IPI, teachers often embraced the opportunity to observe as a crucial learning opportunity that they would not normally get. For many teachers, this seemed to increase their commitment to the partnership as a mechanism for them to improve.

Finally, whether and how principals talked about the use of evaluation data in creating the partnerships sometimes influenced the goal specificity and commitment reported by teachers. In some schools, principals did not explain how teachers were matched and did not emphasize the use of evaluation data in selecting and placing teachers in partnerships<sup>7</sup> Teachers in these schools lacked clarity about exactly why they were matched with their partner. Although some teachers speculated that they were intentionally matched within subject-area or grade-level or partnered based on their personalities, these teachers were not sure how to focus their work with their partner. For example, one teacher who was paired with someone in her grade-level explained that she did not why she was matched and reflected that “clearer instructions would be good and maybe like why we're doing it... when you're

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<sup>7</sup> In one school (School #7), the principal reported that she made matches with little regard to evaluation scores and did not tell teachers that the program was associated with Tennessee Department of Education (she called it “peer-to-peer observations.” In this school, teachers made no association between partnerships and evaluation data.

paired with somebody across the hall and you talk all the time, it's just kind of strange." In other schools, principal told teachers explicitly that evaluation scores were used in matching teachers. In some cases, principals asked teachers to discuss their strengths and weaknesses and decide a goal for their observation ("she asked us to compare our evaluation scores and pick out a strength and a weakness"), provided information that illustrated how they were matched ("we had a piece of paper that showed where we were weak in areas and where our strengths were in areas"), or directly told teachers what they should focus on ("After our evaluations, she kind of focused us on areas that we needed to strengthen"). In all of these cases, teachers had a specific goal for their partnership work and explained how their partnership activities concentrated on these areas.

However, this explicit focus on evaluation caused a small number of teachers to reject the partnership as a mechanism for improvement (i.e., low commitment). Some teachers felt that matching lower- and higher-scoring teachers created tension that made it difficult for teachers to work together effectively. For example, Graham explained that he did not feel comfortable talking with Calvin about evaluation and explained "sometimes evaluations really don't have a good connotation behind it." Especially in schools in which the partnership was framed as a mentoring relationship, some teachers indicated that participating in IPI created a "stigma" or uncomfortable situation in which one teacher was positioned as the authority.

## **Discussion**

Through an analytic process grounded in how teachers actually talk about their collaboration, I explore how specificity and commitment can shape the ways in which the targeted collaborative partnerships promote learning opportunities for teachers. This analysis builds on prior work classifying collaboration (Hargreaves, 2000; Horn & Little, 2010; Little, 1990) by using theory from organizational and management studies on employee performance to examine the interplay among different

dimensions of collaboration (i.e., specificity and commitment). As posited by goal-setting theorists (Klein et al., 1999; Locke & Latham, 1990, 2002), teachers seemed to benefit the most from participating in the Instructional Partnership Initiative (IPI) when they had a specific goal and when they expressed commitment to that goal as a mechanism for their own improvement.

For participating teachers, having a specific goal gave them a reason to participate in IPI, made it easier to differentiate their IPI work from other collaboration they already did, and helped teachers plan targeted collaborative work focusing on specific instructional practices. While teachers without a specific focus sometimes described their partnership work as helpful or supportive of their professional development, the learning that happened in these partnerships often seemed to occur by chance. For example, teachers in low specificity matches explained how they happened to observe a particular instructional strategy that they thought would work in their own classroom or saw how their partner teacher managed a student who they struggled to work with. Teachers in high specificity partnership also described these accidental or peripheral learnings but more often explained how their partnership work helped them reflect on and develop their skills in a particular area. They typically organized their observations and other partnership work around these areas, and these teachers were more likely to describe getting and giving specific instructional feedback within their partnership. This is likely because the more targeted observations, conversations, and feedback encouraged teachers to move beyond simply swapping stories (Little, 1990) or offering up “tips and tricks” (Horn et al., 2017), and instead encouraged teachers to talk about their instructional practice in concrete, specific terms that are rooted in what they actually do in their classroom (Andrews-Larson, Wilson, & Larbi-Cherif, 2017; Levine & Marcus, 2010; Little, 2002).

Goal specificity alone, however, was not sufficient to create learning opportunities for teachers. Teachers’ commitment to the specific goals embedded in their partnership work also seemed an important condition to support learning. Teachers in low or mixed commitment partnerships often

expressed resistance to the program as implemented in their schools, and described their partnership work as a means to a bureaucratic end. These teachers were focused on getting in their hours, filling out the associated paperwork, and fulfilling the requirements of the program. Their language aligns with “contrived collegiality,” a term coined by Hargreaves and colleagues to describe collaborative work that is administratively mandated and heavily controlled by school leaders (Datnow, 2011; Hargreaves, 2000; Hargreaves & Dawe, 1990). In contrast, teachers in high commitment partnerships framed their collaboration as a means to learn or grow professionally, and they articulated ways in which their collaboration had provided an opportunity to reflect, to get targeted feedback, and to refine their instructional skills in a particular area. Victoria, one of the teachers from the high-specificity/high-commitment pair profiled in the high school comparative case, explicitly differentiated between collaborative opportunities oriented towards compliance versus oriented towards learning. She described her experience in IPI as “professional development at its best” and explains, “I mean, not professional development to have it written on paper, but you actually get to learn from one another.”

## **Limitations**

Before discussing the implications of these findings, I must acknowledge certain limitations of my analysis. My study draws exclusively on interviews in which teachers describe their collaborative partnerships through the Instructional Partnerships Initiative (IPI). One of the major limitations of this approach is that I rely on what teachers report doing rather than direct observation of IPI partnership work. What teachers report doing may be different from what they actually do for a multitude of reasons, including pressure to report certain activities, desire to please the interviewer, or hazy memories of collaborative activities completed early in the year. In order to mitigate against this limitation, I specifically examined the degree to which teachers in the same partnership describe engaging in similar activities. In almost all cases, I find that teachers report qualitatively similar

partnership activities. As described in the findings, teachers' personal commitment to their partnership as a mechanism for improvement do sometimes vary within partnerships.

Like many other studies of collaboration, this analysis only focuses on describing collaboration engendered by a specific program. Indeed, IPI differs somewhat from other, well-studied collaborative efforts (such as professional learning communities). While most collaboration entails groups of teachers brought together due to shared subject-area or grade-level (Vangrieken et al., 2015), IPI is designed to facilitate pairs of teachers, who are matched based on domain-specific teacher evaluation data, to collaborate around specific instructional practices. As a result, collaboration within this design makes use of teacher effectiveness data in hopes of driving improvement. In the following section, I discuss potential implications of using evaluation data to encourage collaboration among teachers. The particular nature of IPI means that the findings of this analysis are not broadly generalizable to all types of teacher collaboration. However, the conceptual framework presented here—how goal specificity and commitment can be used to evaluate the purpose and work of collaborative teacher partnerships—may be applicable to other forms of collaboration.

## **Implications**

My findings have implications for school leaders implementing programs meant to encourage instructionally-focused teacher collaboration as well as the broader research base on teacher collaboration. First, the findings reinforce how certain collaborative activities may be particularly fruitful sites for collaborative learning among teachers. Teachers in this sample reiterate the value of peer observation as a way to make their teaching visible to their peers, reflect on instructional choices, and develop a shared language of teaching (Horn, 2010; Little, 2003). Especially in peer observations in high specificity partnerships, teachers focused their attention on specific instructional moves or choices related to their own or their partner's area of refinement. Some principals further supported these

targeted observations by adopting peer observation templates that aligned with this specific focus. Furthermore, this higher level of specificity in observation seemed to create more space for dialogue and constructive criticism from peers. As illustrated in the case of Calvin and Graham, teachers who engaged in peer observation in low specificity partnerships expressed reluctance at providing any critique or negative comments about their partner’s teaching. The particular focus built into observations in high specificity matches facilitated more constructive conversations about *the teaching* rather than *the teacher*.

The analysis also speaks to the possibilities and pitfalls of using teacher evaluation data to structure instructionally-focused partnerships among teachers. Like Tennessee, other states and districts across the country have invested heavily in developing new teacher evaluation systems but have struggled to use these new systems to support improvement (Darling-Hammond, 2013). Most of the teachers in this analysis described the broader goals of IPI using the language of instructional improvement, but varied in how closely they associated the program with evaluation. Teachers who focused their collaborative work on instructional domains as defined by the observation rubric (i.e., high specificity) more easily differentiated their IPI partnership from other forms of collaboration that focused on standards, content, or students. However, the explicit use of evaluation data sometimes provoked greater resistance from teachers and engendered lower commitment. Some teachers felt that partnering higher- and lower-scoring teachers created tensions within the school and impeded partners from creating trusting relationships. In addition, some teachers expressed reluctance to speak frankly with peers about their weaknesses and instead engaged in surface-level conversations or congratulatory praise for what their partners did well. Especially among teachers in low-specificity/low-commitment partnerships, this “persistence of privacy”—identified by Little (1990) as a normative feature of schools that hampers collaborative learning among teachers—meant that teachers did not feel comfortable engaging in improvement-oriented collaboration.

Finally, this analysis reiterates the important role played by school leaders in facilitating collaboration that can support teacher learning (Bryk et al., 2010; Charner-Laird et al., 2017; Louis, Leithwood, Wahlstrom, & Anderson, 2010; Rigby, Andrews-Larson, & Chen, 2019; Talbert, 2010). Across all 10 schools in this analysis, how principals introduced and supported partnerships seemed to have a strong influence on the specificity of teachers' partnerships goals and teachers' commitment to those goals. Principals introducing IPI in their schools faced numerous dilemmas in how to implement the program in their school. First, principals had to decide how to describe the use of evaluation data in selecting teachers and creating partnerships. Although IPI is designed to target teachers who have lower observation scores in particular instructional domains and match them with teachers in their school who demonstrate mastery in those domains, most principals in this sample did not describe the program in this way. For those that did, some teachers expressed resistance to the idea of creating hierarchical or mentoring relationships based on evaluation data meant to support the learning of just one partner (i.e., low commitment). Another dilemma facing principals is whether to direct teachers to work on specific areas of refinement from their prior evaluations or allow teachers greater autonomy in choosing the goals of their partnership. In some schools, principals provided very little guidance and teachers were unclear about why they were paired together and how they should focus their partnership work (i.e., low specificity). Most principals in this sample explained the program as matching teachers based on strengths or weaknesses, and encouraged teachers to discuss and select an area to focus on in their partnership work. While this explanation seemed to prompt greater commitment among teachers to the espoused goals of the program, it meant that teachers had less information on why they were specifically matched. Finally, a few principals gave teachers very explicit directions about how to focus their collaborative work through IPI. While this approach promoted higher goal specificity, it did not always encourage greater commitment among teachers if they did not agree with their principal's chosen area of focus.



Within the goal-setting literature, the debate continues about whether self-selected goals are more effective than goals assigned by supervisors (Locke & Latham, 2015). The potential benefits of self-selected goals are both cognitive—employees know more about their jobs than their supervisors—and motivational—employees will be more motivated if they select their own goals (Locke & Latham, 2002). While some teachers in this sample appreciated when they were given autonomy by their principals to set their own goals or focus areas for their partnership work, many teachers desired more guidance and support from their principals in understanding the aims and expectations of the program. In reconciling how their experiments about assigned goals led to different results, goal-setting theorists Gary Latham and Miriam Erez concluded that assigned goals are just as effective as self-selected goals when supervisors take a “Tell and Sell” approach to assigning goals (Locke et al., 1988). In this approach, supervisors provide additional information for the employees about the importance of goal attainment rather than just telling them the goals. Similarly, within the context of this study, teachers repeatedly expressed frustration when principals required them to participate in partnerships but gave little insight into how they were matched and whether their partnership work should focus on specific areas of instructional practice.

In conclusion, my analysis illustrates that—even in a program designed to create targeted partnerships focused on specific domains of instructional practice—collaboration among teachers varies widely in the extent to which teachers report it supports their professional learning. Goal-setting theory provides a valuable framework to explore the goals embedded within collaborative programs and identify conditions under which teachers are more likely to report collaborating around and for instructional improvement. Given the limited time that most teachers have to participate in collaboration with peers (Gates Foundation, 2012; Johnston & Tsai, 2018) and the increased focus on collaboration as a professional expectation of teaching (Hargreaves, 2010; Johnson et al., 2017), it is ever more important that school leaders and researchers understand these facilitating conditions.

## Appendix

**Table 1. Descriptive Information About Teachers in Analytic Sample**

	<b>N. of teachers (% of sample)</b>
<b>School Level</b>	
Elementary	32 (67%)
High	16 (33%)
<b>Geographic Context</b>	
Rural/Town	30 (63%)
Suburban	10 (21%)
Urban	8 (17%)
<b>Teaching Assignments</b>	
Elementary (Self-Contained)	19 (37%)
English Language Arts	5 (10%)
Math	9 (18%)
Science	8 (15%)
Social Studies	5 (10%)
Special Education	2 (4%)
Electives (Arts, CTE, PE, etc.)	3 (6%)
<b>Years of Experience</b>	
0-5 years	10 (21%)
6-10 years	17 (36%)
11-20 years	15 (32%)
More than 20 years	5 (11%)
<b>TOTAL</b>	<b>48 teachers (100%)</b>

Note: Not all subtotals add up to total because there are a few teachers with multiple assignments and one teacher who is missing data on experience

**Table 2. Coding Description and Example Quotes**

<b>Code</b>	<b>Description</b>	<b>Exemplar quotes from teachers in this category</b>
<b>Specificity</b>	How teachers describe the focus or emphasis of their partnership work. The extent to which partnership work focuses on specific instructional domains or other particular teaching needs.	
Low	Teachers who describe that they have no focus in their partnership work or that they have talked about many different things but not focused in any given area.	<p>“I think our [partnership] this year was more on checking in.”</p> <p>“we talked to each other and we figured out, okay, you know, how can we help each other with it, which was one of the things that was on the little checklist thing that we got. Because when we first started off, we talked to each other, because she’s a newer teacher than I am. She was asking me how I teach and how I do it and everything”</p>
High	Teachers who describe a particular and concrete focus for their partnership work. Can include instructional areas of refinement from evaluation, specific problems of practice, or content/standards.	<p>“Questioning because she mentioned questioning before... I really made sure that I had questioning [when she observed me]. I always do but I made sure that that was the focal point. I was making sure that I got to my exit ticket so she could see that.”</p> <p>“Grouping, and how to group every student together and have the small grouping, and that was my area of refinement. So when [my partner] came and observed me, he gave me different strategies on, okay, well, maybe do table work together...”</p>
<b>Commitment</b>	The extent to which teachers describe IPI as a way to improve or learn.	
Low	Teachers who do IPI because it is mandated or required. This includes teachers who describe the purpose of IPI as “getting hours” or “just another thing” to do. Teachers do not describe IPI as a way to learn or improve.	<p>“We’re all trying to reinvent the wheel. I mean, it’s just me and him [have] already talked about it. I’d already done this one before, the teaching strategy he gave me. I was like, I’ve already done that before... but [IPI] will be gone in a couple years. Or they’ll just change the name of it.”</p> <p>“I think it’s a good thing if you have new teachers coming in. Not so much if I’ve almost been here 20 years.... I remember just feeling like it’s something I had to do”</p>
High	Teachers who describe the goals of IPI as related to learning, improving, or strengthening an area of weakness. This can include learning about teaching or instructional strategies but also other things that teachers see as important or relevant.	<p>“But just that it was something that was not meant to judge us or critique us, that it was just a learning opportunity and to collaborate. And it also supports the vertical planning that we’ve been doing as well”</p> <p>“Our observations consisted of different lessons, but based on feedback from our first observation with one another, I think we constructed our lessons to build on growing in areas that we were weak in. So you know, we’ve been doing this since September up until now. So there’s been lots of room for growth and improvement.”</p>
Not Applicable/ Mentoring	Teachers who participate in IPI in order to help or support another teacher. IPI is not a way for them to improve or learn but to mentor another teacher.	<p>“I think I just was trying to help a friend... And I kind of feel like if I do it in a friendly way, if I just say, this is what helped for me, maybe it’ll help you.”</p> <p>“Her area that we worked on was an area that needed to improve, so it wasn’t really that different... I saw it as an act of service this time.”</p>

**Table 3. Teacher-Level Partnership Information**

Sch. ID	Sch. Level	Partnership			Tch. ID	Tch. Assignment	Level of Specificity	Level of Commitment
		Pair ID	Type					
1	Elementary	A	Same	A1	Self-contained (Kinder.)	Low	High	
1	Elementary	A	Same	A2	Self-contained (Kinder)	Low	High	
1	Elementary	B	Same	B1	Self-contained (1 <sup>st</sup> grade)	Low	Low	
1	Elementary	B	Same	B2	Self-contained (1 <sup>st</sup> grade)	Low	High	
2	High	C	Same	C1	English Language Arts	Low	Low	
2	High	C	Same	C2	English Language Arts	Low	Low	
2	High	D	Same	D1	Social Studies	Low	Low	
2	High	D	Same	D2	Social Studies	Low	Low	
3	Elementary	E	Same	E1	Special Education	High	High	
3	Elementary	E	Same	E2	Self-contained (2 <sup>nd</sup> grade)	High	High	
3	Elementary	F	Same	F1	Science/Social Studies	High	High	
3	Elementary	F	Same	F2	Science/Social Studies	High	High	
3	Elementary	G	Different	G1	Self-contained (3 <sup>rd</sup> grade)	High	Low	
3	Elementary	G	Different	G2	English Language Arts	High	Low	
4	Elementary	H	Different	H1	Self-contained (2 <sup>nd</sup> grade)	High	High	
4	Elementary	H	Different	H2	Self-contained (Kinder.)	High	N/A	
4	Elementary	I	Different	I1	Self-contained (1 <sup>st</sup> grade)	High	Low	
4	Elementary	I	Different	I2	Self-contained (3 <sup>rd</sup> grade)	High	N/A	
4	Elementary	J	Same	J1	Math	High	High	
4	Elementary	J	Same	J2	Math	High	High	
5	High	K	Different	K1	Career-Technical	High	Low	
5	High	K	Different	K2	Math	High	High	
5	High	L	Different	L1	Science	Low	Low	
5	High	L	Different	L2	Performing Arts	Low	Low	
6	High	M	Different	M1	Science	High	Low	
6	High	M	Different	M2	Math	High	Low	
6	High	N	Same	N1	Math	Low	Low	
6	High	N	Same	N2	Math	Low	Low	
7	Elementary	O	Different	O1	English Language Arts	Low	High	
7	Elementary	O	Different	O2	Special Education	Low	High	
7	Elementary	P	Different	P1	Self-contained (3 <sup>rd</sup> grade)	Low	High	
7	Elementary	P	Different	P2	Self-contained (Kinder.)	Low	High	
8	Elementary	Q	Different	Q1	Science/Social Studies	High	High	
8	Elementary	Q	Different	Q2	Self-contained (Kinder.)	High	High	
8	Elementary	R	Different	R1	Science	High	High	
8	Elementary	R	Different	R2	Self-contained (1 <sup>st</sup> grade)	High	High	
8	Elementary	S	Different	S1	Self-contained (2 <sup>nd</sup> grade)	High	High	
8	Elementary	S	Different	S2	English Language Arts	High	High	
9	Elementary	T	Different	T1	Self-contained (3 <sup>rd</sup> grade)	High	Low	
9	Elementary	T	Different	T2	Self-contained (5 <sup>th</sup> grade)	High	High	
9	Elementary	U	Different	U1	Self-contained (2 <sup>nd</sup> grade)	High	Low	
9	Elementary	U	Different	U2	Special Education	High	N/A	

9	Elementary	V	Different	V1	Self-contained (2 <sup>nd</sup> grade)	Low	Low
9	Elementary	V	Different	V2	Math	Low	Low
10	High	W	Same	W1	Math	High	High
10	High	W	Same	W2	Math	Low	High
10	High	X	Same	X1	Science	High	High
10	High	X	Same	X2	Career-Technical/Science	High	High

**Table 4. Partnerships Categorized by Specificity and Commitment**

	<b>Low Specificity</b>	<b>High Specificity</b>
Low Commitment	Pair C (Sch. #2)	
	Pair D (Sch. #2)	Pair G (Sch. #3)
	Pair L (Sch. #5)	Pair M (Sch. #6)
	Pair N (Sch. #6)	
	Pair V (Sch. #9)	
Mixed Commitment	Pair B (Sch. #1)	Pair H <sup>†</sup> (Sch. #4)
		Pair I <sup>†</sup> (Sch. #4)
		Pair K (Sch. #5)
		Pair T (Sch. #9)
		Pair U <sup>†</sup> (Sch. #9)
High Commitment	Pair A (Sch. #1)	Pair E (Sch. #3)
	Pair O (Sch. #7)	Pair F (Sch. #3)
	Pair P (Sch. #7)	Pair J (Sch. #4)
		Pair Q (Sch. #8)
		Pair R (Sch. #8)
		Pair S (Sch. #8)
		Pair W (Sch. #10)
	Pair X (Sch. #10)	

† Pairs in which one teacher's commitment is coded as "Not Applicable/Mentoring"

**Table 5. Case Comparison for Elementary School Teachers**

<p><b>Case Comparison #1:</b> Both pairs of teachers work in elementary schools located in small towns. Sandra and Ashley work in a school that enrolls about 450 students and is more racially diverse while Jasmine and Meg work in a school that enrolls about 300 students and is predominantly White. They were matched across grade-level so that they were working with someone who teaches a higher or lower grade than their class.</p>	
<p>Panel A: Low Specificity/Low Commitment</p> <p><b>Sandra and Ashley (Pair V)</b></p>	<p>Panel B: High Specificity/High Commitment</p> <p><b>Jasmine and Meg (Pair S)</b></p>
<p><b>Background.</b> Sandra teaches a self-contained second grade class, and she has been teaching for 18 years. Ashley has nine years of experience, and teaches 6<sup>th</sup> grade math.</p> <p><b>Description of Program.</b> Sandra describes the program as “teachers partnering and working together to learn more about teaching.” Ashley explained that it is “just to give you another person to talk to about things if you need assistance.” Their principal gave teachers a program guidebook, which lists suggested activities, but otherwise did not set any particular expectations about participation. When asked about the expectations provided by the principal, Sandra said “I remember just getting a booklet, just follow the booklet.” As Ashley explained, “it was mostly just kind of up to the partners in the partnership.” Their principal did not explain how they had been matched and did not give them any guidance about what to work on together.</p> <p><b>Partnership Activities and Feedback.</b> Both teachers said that they had a series of informal conversations throughout the year. Sandra said that they talked about “just whatever was on our mind that we were struggling with, that we needed advice on.” Both teachers had recently switched from an upper grade to a lower grade and vice versa so that was often something they discussed. Ashley explained that she would ask Sandra “what’d you do with this one last year in fifth because she had taught fifth last year” and described their conversation as “just kind of more on the general side of handling things in the opposite grade-levels.” Both teachers described the gap in grade-level as an impediment to working together because of their different content and different planning schedules. Ashley explained, “If you can have somebody that’s in your grade-level, it helps a lot just because you see a lot more of them.”</p> <p><b>Perceived Benefits.</b> Neither teacher felt that they benefitted much from participating in the program. Ashley said that she would have preferred to have worked with someone in a closer grade-level. She explained, “I’m teaching second grade, that’s what I’m focused on. So I needed more help with that because this is my first year teaching second.” Similarly, Sandra</p>	<p><b>Background.</b> Jasmine has 11 years of experience, and she teaches a self-contained second grade class. Meg teaches 5<sup>th</sup> grade English Language Arts and Social Studies, and she has been teaching for 17 years.</p> <p><b>Description of Program.</b> When asked how she would describe the program, Jasmine said “they’re going to pair you up with a teacher based on your strengths and weaknesses, and you’re going to work with them throughout the year.” In her explanation of the program, Meg emphasized how it “created an environment that we could trust each other and draw from each other ideas to help us implement things in our classroom that would make us better.” As Jasmine explained, their principal “told us that this year, we would be kind of choosing a goal and a focus to focus on with our partner, told us that we’d be doing at least two observations.” Meg said that their principal “told us we were paired based on our strengths and our refinement area.”</p> <p><b>Partnership Activities and Feedback.</b> Both teachers reported completing two sets of observations in addition to providing feedback and discussing their areas of focus. After an initial meeting, they decided to focus on specific areas “that we both felt was more beneficial in our individual classrooms.” Jasmine decided to focus on writing while Meg wanted to work on grouping and centers. Jasmine said that they would plan their observations in advance so that “when I went down there, she would always show me different types of writings.” Meg explained that she has always been a “stand and deliver” teacher and that she specifically observed how Jasmine does her centers. She said, “if a second-grade classroom can rotate like that and move and do their own thing, then I should be able to do that as well. Every time I went [to observe], that was what I was watching.”</p> <p><b>Perceived Benefits.</b> Both Jasmine and Meg emphasized how much they have learned. Jasmine said that she was initially skeptical about working with her partner but that she was surprised by how much she learned. She explained, “she just taught me a lot of [writing] strategies that I’d never heard of, and my kids really grew.” Meg echoed her partner’s sentiments and explained how she was able to take many of her</p>

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explained "It's kind of make it where it didn't seem as important because it wasn't really relevant to what I was doing now." Both teachers agreed that collaboration with other teachers can be helpful but this particular experience was not very helpful. Ashley and Sandra both said that they felt like it was not a priority and that they struggled to find time to make their partnership work happen.

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partner's strategies for centers and grouping and apply them in her classroom. In reflecting on her last evaluation with her principal, Meg said that her principal had noted a difference in Meg's teaching and Meg "explained to [her principal], I watched [Jasmine] do that, and if she could do it, I could do it. And so it was very much tied to my IPI partner."



**Table 6. Case Comparison for High School Teachers**

Case Comparison #2: Both pairs of teachers work in small, rural high schools. Both schools serve predominantly low-income communities, and enroll between 300-350 students. Teachers are all matched within similar subjects.	
Panel A: Low Specificity/Low Commitment <b>Calvin and Graham (Pair N):</b>	Panel B: High Specificity/High Commitment <b>Victoria and Zion (Pair X):</b>
<p><b>Background.</b> Calvin teaches geometry, pre-calculus, and calculus classes, and he has been teaching for about 20 years. Graham is in his seventh year of teaching and teaches algebra classes.</p> <p><b>Goals and Introduction of Program.</b> Calvin describes the goals of the program as two teachers working together to “bounce things off of each other, really more than anything.” Graham describes it as “the same thing teachers generally do anyway,” but “just with paperwork.” The principal provided teachers with the program guidebook and suggested that teachers observe each other. Teachers were not given any specific guidance about why they were paired together, how much they should work together, or what they should focus on during their partnership activities. When asked to describe the principal’s guidance around the program, Calvin summarized it as “show up, and do it, and then keep your eyes open and get something out of it, was basically it.”</p> <p><b>Partnership Activities and Feedback.</b> Both teachers reported observing their partner’s class once and then meeting casually to discuss ACT preparation, math standards, or other topics. Calvin and Graham both said that they did not have any particular focus. When describing his observation, Calvin explained, “I just went in the class. I had no expectations. I just wanted to watch how it unfolded without any kind of preconceived notions.” Calvin describes his feedback as “basically just congratulatory” and said that he shared a few observations about student engagement. Graham similarly noted that, when sharing after the observation, “most of the feedback wasn’t very specific on anything.” Both teachers expressed some reluctance about providing critical feedback or discussed weaknesses with their partner.</p> <p><b>Perceived Benefits.</b> Both teachers explain that they enjoy working together, but found it difficult to make their partnership work a priority. When asked about whether he’s learned from his partnership, Calvin said “it’s just one more thing that we have to do, you know. I was kind of rolling my eyes with it. I did like interacting with other teachers. However, if it means giving up instructional time to do so, I would rather not.” He goes on to explain that if the program had some “rhyme and</p>	<p><b>Background.</b> Victoria teaches health and medical science electives, and she has been teaching for five years. Zion is a third year teacher who teaches freshmen and A.P. biology classes. Although they are in different departments (Victoria in career and technical education and Zion in science), both teachers described their subject matter as overlapping.</p> <p><b>Goals and Introduction of Program.</b> Victoria explained the program as “an opportunity for me to grow as a teacher, to help somebody else grow as a teacher, and to work together to ultimately have positive outcomes on our students.” Zion described it as “two teachers sharing ideas, helping improve in weak areas, critiquing one another.” When introducing their partnership at the beginning of the year, their principal asked each partner to discuss their strengths and weaknesses, and then set a goal to work on together. The principal expected them to observe each other twice and provided an observation form for them to use in these observations. Victoria summarizes their principal’s expectations as “we were observing another teacher, but as we met more, we go in, we critique, and then we reconvene and come up with goals for the next time that we observe.”</p> <p><b>Partnership Activities and Feedback.</b> Both teachers described their partnership work as focusing on a series of three observation cycles in which they set a goal for each observation, observed, and then met to discuss the observations. Zion explained that he mentioned grouping as a particular weaknesses for him and that he shared that with Victoria at their first meeting. Both describes described their observation and feedback as focused in particular areas. As Zion explained, “it felt more like [the feedback] had a purpose. You know, we’re doing this intentionally through this program to help you [...] I think it was probably more valuable because you’re going in looking for something.” Victoria similarly described their observation as focused on areas of growth and explained “based on feedback from our first observation with one another, I think we constructed our lessons to build on growing in areas that we were weak in.”</p> <p><b>Perceived Benefits.</b> Both teachers mentioned how they built a close and trusting relationship, and described their partnership as very beneficial. Victoria explained</p>

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reason, then the benefits could offset some of the costs that we might have with it." Graham repeatedly described the program as replicating work they already do just with paperwork. He appreciated that they were matched within subject but explained that the lack of focus made it hard to know what you might learn from the experience: "it's kind of a hit-or-miss on who you go observe and what you can learn from them."

that she initially skeptical about the program and remembered thinking "Like is this just another thing to add to the list?" Her experience in the program has been much better than she anticipated. She described her partnership as "professional development at its best" and explains, "I mean, not professional development to have it written on paper, but you actually get to learn from one another." Zion mentioned that he felt like his feedback from Victoria is the best feedback he gets on his teaching and concluded his interview by saying "So I think it was great. I would do it again."

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## CHAPTER III

### ORGANIZATIONAL SCHOOLS FOR COLLABORATIVE LEARNING: SCHOOL LEADERS, PEERS, AND TEACHERS' ENGAGEMENT IN COLLABORATION

#### Introduction

When faced with a problem at work, many of us turn to our colleagues. As in other types of organizations, teachers in schools can consult their peers to get advice or discuss common problems of practice. Teachers regularly describe their colleagues as one of their most valuable resources (Drury & Baer, 2011; Wolman, 2010) and often request more time during the school day to spend working with colleagues (Johnston & Tsai, 2018). In particular, collaborative work focused on teaching and learning—in which teachers discuss specific instructional strategies, create instructional materials, analyze student data or work, observe each other, or provide feedback—create on-the-job learning opportunities that develop teachers' knowledge and instructional skills (Parise & Spillane, 2010; Penuel, Sun, Frank, & Gallagher, 2012) and appear to benefit their students' learning (Goddard, Goddard, Sook Kim, & Miller, 2015; Ronfeldt, Farmer, McQueen, & Grissom, 2015; Saunders, Goldenberg, & Gallimore, 2009). Research on instructional teams illustrate the potential of strong collaborative work to support teacher learning but also caution that collaboration can be unproductive, compliance-oriented, or focused on logistical coordination rather than teaching and learning (Charner-Laird et al., 2017; Hargreaves, 2000; Horn, Garner, Kane, & Brasel, 2017; McLaughlin & Talbert, 2006; Scribner, Cockrell, Cockrell, & Valentine, 1999; Supovitz, 2002).

How and how much teachers collaborate is likely shaped by their workplace conditions and the other professionals with whom they work. Contextual and organizational conditions of schools influence

how the school day is structured, with whom teachers can work, and common norms about the nature of collaboration among teachers. Prior research exploring variation in teacher-reported collaboration has illustrated how teachers' engagement in collaboration differs across contextual characteristics of schools such as school size, school level, and student demographics (Goddard et al., 2015; Johnston & Tsai, 2018; Ronfeldt et al., 2015). However, this research does not typically attend to organizational conditions of schools that can be shaped by school leaders and offers little guidance for leaders hoping to encourage collaborative learning among teachers in their school. Teachers' access to meaningful collaboration may depend on whether school leaders promote a positive professional climate (Bryk et al., 2010; Leithwood & Jantzi, 1990; Talbert, 2010), organize the school day to allow sufficient collaborative planning time (Scribner et al., 1999; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006), and provide oversight that creates shared purpose without overly prescribing how teachers work together (Charner-Laird et al., 2017; Horn, Kane, & Garner, 2018; McLaughlin & Talbert, 2006). In addition, whether and how teachers collaborate likely depend on how teachers are grouped within the school and whether teachers have access to peers who have relevant expertise. These conditions can determine the extent to which teachers can tap into the human and social capital in their schools through collaboration (Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; Little, 1982; Rosenholtz, 1989; Spillane, Hopkins, & Sweet, 2015).

Using survey and administrative data from teachers across the state of Tennessee, this study examines the extent to which teachers report engaging in collaborative learning opportunities and how these opportunities are distributed across and within schools. I focus on whether organizational conditions of schools influenced by school leaders and peer groups are associated with the teacher-reported frequency and helpfulness of collaborative learning opportunities. In particular, I find that having sufficient time set aside for collaborative planning and having access to peers who teach the same specific courses are both associated with how frequently teachers report engaging in collaboration

while teachers rate their collaboration as more helpful in schools with higher ratings of the professional climate and leadership and lower ratings of administrative oversight over collaboration. Given the potential of collaboration to support teacher learning, better understanding variation in these opportunities across and within schools has important practical and policy implications.

To better situate this analysis in the broader research on teacher learning, I begin by conceptualizing collaborative learning opportunities for teachers and then briefly reviewing prior research that examines how organizational conditions of schools influence collaboration. Next, I describe the data, sample, and methods used in this analysis. Then I explore the findings from this analysis and discuss their implications for practice and future research.

### **Conceptualizing Teachers' Collaborative Learning Opportunities**

While measuring students' opportunity to learn has been commonly used in educational research and policymaking for over 50 years (McDonnell, 1995), much less attention has been paid to conceptualizing and measuring the learning opportunities available for teachers. This may be due to assumptions commonly made about how teachers learn to teach. Conventional wisdom held that teacher learning occurs individually, as teachers gained knowledge through pre-service training, professional development seminars and experience in their classroom. These conceptions of teacher development that focus solely on the individual teacher often disregard the context within which they work (Johnson, 2012). Increasingly, those studying teacher learning argue that teachers have opportunities to learn that are embedded in their daily interactions with their colleagues and that the organizational conditions of schools can facilitate or inhibit these opportunities for learning (Ball & Cohen, 1999; Borko, 2004; Cochran-Smith & Lytle, 1999; Opfer & Pedder, 2011).

Much of this work draws on *situated* perspectives about learning (Lave & Wenger, 1991; Wenger, 1998). In this perspective, pioneered by Jean Lave and Etienne Wegner, learning is

conceptualized as a social process that happens as part of participation in communities of practice (e.g., groups of practitioners who work together on a shared domain of interest). Unlike traditional notions of abstract knowledge in which learning occurs internally, this perspective argues that learning and working are not distinct activities and that learning-while-working primarily happens through social interactions (Brown & Duguid, 1991). While learning can occur as teachers work independently in their classroom, this perspective holds that teachers' communities of practice shape how they interpret their experiences and view their work. Within the field of education, educators and researchers have taken up ideas about how to create structures to increase social interactions among teachers around instruction and create sustained, school-based learning communities (for example, see Hord, 2004; McLaughlin & Talbert, 2006; Supovitz, 2002).

Of particular interest to this analysis are learning opportunities embedded in the professional work of teachers (Little, 2002). Borrowing from prior work on how learning opportunities may shape instructional change, I define these collaborative learning opportunities as “interactions with colleagues around teaching and learning, including conversations about instruction, peer observation and feedback, and advice seeking about instruction” (Parise & Spillane, 2010, p. 324). I focus on common collaborative activities among teachers, including collaborative meetings within subject-area or grade-level teams, peer observation, common lesson-planning, and other ways in which teachers work together to get instructional ideas or provide feedback. These specific forms of collaboration have been identified as mechanisms for teachers to transfer helpful information, gain access to expertise and resources, take up new ideas or reforms, and discuss problems of practice (Coburn & Stein, 2006; Frank, Zhao, & Borman, 2004; Spillane, Kim, & Frank, 2012). These activities can create opportunities for teachers to “make visible” the aspects of their teaching practice typically only seen by students (Little, 2003) and encourage teachers to be more reflective and analytic in their instructional choices (Bryk et al., 1999; Horn et al., 2017). This conceptualization of collaborative learning opportunities focuses on

schools as the primary site of learning for teachers. While teachers may engage in learning opportunities as part of university-based training or off-site professional development, schools are “where the work of teaching and learning resides” and “where problems of practice take on a particular face, where pressures for achievement are most directly felt, and where investments in professional learning pay off or do not” (Little, 2006, p. 3).

Importantly, these forms of collaboration can create opportunities for learning but participating in collaboration does not necessarily lead to learning or instructional improvement. Access to collaborative activities is a necessary but not sufficient condition for learning. Teachers cannot learn from each other if they do not spend time together. The duration and frequency of these collaborative activities can serve as an important signal of teachers’ access to learning opportunities (Goddard et al., 2015) but the nature of their collaboration also plays a critical role in determining whether collaboration creates opportunities for learning (Charner-Laird et al., 2017; Horn et al., 2017; Little, 1990, 2002). Prior research on collaboration (and teachers’ professional learning more broadly) often warns that teachers’ collaborative time can become oriented towards logistics, compliance, or routines that are divorced from teachers’ instructional needs or students’ learning needs (Datnow & Park, 2018; Gates Foundation, 2014; Hargreaves, 2000; Talbert, 2010). To better capture the collaborative learning opportunities available for teachers, this analysis accounts for how frequently teachers report engaging in instructionally-focused collaboration but also the extent to which teachers rate those collaborative activities as helpful for making decisions about instruction.

### **Organizing Schools for Collaborative Learning**

In this section, I review research that specifically examines how the organizational conditions in schools influence whether and how teachers engage in collaborative learning opportunities. This review addresses two themes: (1) how schools leaders shape their school’s organizational conditions in ways

that can support or hinder collaborative learning and (2) how teachers' access to peers with relevant expertise likely influences whether they collaborate and the productivity of that collaboration.

### **Teacher Collaboration and School Leaders**

School leaders, most notably principals, play an important role in shaping whether the organizational conditions of schools facilitate collaborative learning opportunities (Goddard, Goddard, Sook Kim, & Miller, 2015; Horn, Kane, & Garner, 2018; Leithwood & Jantzi, 1990; Scribner et al., 2002; Stoll et al., 2006; Talbert, 2010). Specifically, principals can encourage a professional climate that encourages supportive relationships among teachers, structure the school day so that teachers have dedicated time to work together, and provide appropriate support and supervision to ensure that collaborative time is used effectively.

**Professional climate.** Collaboration is often embedded into discussions of how to restructure or reculture schools into organizations that emphasize teaching as a professional endeavor and student learning as the collective responsibility of all teachers (Lavié, 2006). Such efforts—referred to as professional community (Bryk et al., 1999; Louis et al., 1996), collaborative professionalism (Hargreaves & O'Connor, 2018), professional learning communities (Hord, 2004; Talbert, 2010), and collaborative cultures (Hargreaves & Dawe, 1990; Leithwood & Jantzi, 1990; Lieberman, 1990)—are often contrasted to traditional school cultures characterized by teacher isolation and autonomy. Collaboration, therefore, is a mechanism for professionalizing teaching by expanding teachers' roles beyond the classroom, offering time and space to build shared technical knowledge, and building professional norms that emphasize professional learning, innovation, and collective responsibility for student learning (Lavié, 2006; Leithwood & Jantzi, 1990; Little, 1982; Rosenholtz, 1989; Talbert, 2010).

This body of research indicates teachers may have more collaborative learning opportunities in professional climates that emphasize trust and collective responsibility for learning. Building trust



among colleagues may reduce teachers' anxiety about opening up their instructional practices for critique, increase motivation to collectively take up difficult challenges, and lower the risk for teachers to talk honestly about what's working and what's not in their classrooms (Bryk et al., 2010; Musanti & Pence, 2010; Tschannen-Moran, 2001). Teachers may be more interested in collaborative work in schools in which the faculty share a common belief that adults in the building are responsible for student learning. Collective responsibility for learning is characterized by greater teacher involvement in school-wide decision-making (Bryk et al., 1999), and may also encourage forms of collaboration that promote interdependence among teachers (Little, 1990). In contrast to superficial collaboration in which teachers swap stories or focus only on logistical or administrative tasks, "joint work" among teachers encourages collective action in which teachers rely on each other to make collective decisions about instructional practices and create more opportunities for teacher learning because teachers regularly discuss the what, how, and why of teaching (Horn et al., 2017; Little, 1990).

**Dedicated time.** Given the time constraints facing many teachers, teacher collaboration can often take the form of brief and irregular meetings that do not create opportunities for ongoing and meaningful conversations about teaching practice (Little, 1990; Vangrieken et al., 2015). Studies of teacher collaboration have highlighted the need for sustained interactions between colleagues, and regular time for teachers to collaborate is often listed as a critical facilitating conditions for successful collaboration (Bryk et al., 1999; Horn et al., 2018; Scribner et al., 2002; Stoll et al., 2006). Research on teacher working conditions regularly includes time to collaborate with colleagues as an important feature of schools that influences the professional experience and effectiveness of teachers (Johnson, 2006; Ladd, 2009). Teachers, however, typically have limited input into designing daily schedules at their schools. In contrast, principals often have the ability to structure the school schedule to build in time for teacher collaboration and to provide common planning time for teachers of the same subject and/or grade-level.

**Leadership expectations and supervision.** Due to their positional authority in a school, principals typically have the most power to set professional expectations within their schools about how teachers work together. Indeed, qualitative case studies of teacher communities often emphasize the important role of principals in setting meaningful and shared purposes for collaborative structures within schools (Charner-Laird et al., 2017; McLaughlin & Talbert, 2006; Scribner et al., 1999). Similarly, quantitative analyses find positive relationships between principals' instructional leadership and collaboration within their schools (Bryk et al., 1999; Goddard et al., 2015). However, direct supervision of collaboration itself may not be as beneficial. Numerous qualitative studies caution that certain leadership approaches can lead to collaborative time that is overly prescribed, narrowly focused on testing, or compliance-oriented (Charner-Laird et al., 2017; Hargreaves, 2000; Horn et al., 2018; Rigby, Andrews-Larson, & Chen, 2019; Talbert, 2010). Reflecting on ten years of working with schools and districts building professional learning communities (PLCs), Talbert (2010) attributes ineffective collaboration to leadership problems:

Rather than assessing student performance and collaborating to improve teaching and learning, many teacher groups formed through mandates simply comply with the letter of the law and fail to realize improved student achievement. This is because school administrators and leaders of change either fail to understand the deep principles that anchor PLC work or try to create them in ways that alienate teachers (p. 555).

Similarly, in their work with middle school math teachers, Horn and colleagues find that school leaders who took a "surveillance approach" to managing teachers' collaborative work limited teachers' learning opportunities by steering conversation away from meaningful problems of practice (Horn et al., 2018; Rigby et al., 2019).

### **Teacher Collaboration and Peers**

Collaboration is, by definition, a social and relational activity. Teachers' peers—and especially those who have similar teaching assignments or responsibilities—determine how and with whom they

collaborate. Teachers in the same grade-level or subject-area are likely to share common standards, assessments, curriculum, and/or materials, and many schools structure their school day so that these teachers have common planning time to facilitate greater collaboration. As a result, teachers are more likely to report working closely with teachers on their grade-level or subject-area teams (Bidwell & Yasumoto, 1999; Hargreaves, 1994; McLaughlin & Talbert, 2006; Siskin, 1994; Spillane et al., 2015, 2012). Given the importance of subject-specific knowledge for teaching (Hill, Rowan, & Ball, 2005; Little, 2006; Shulman, 1986), having access to colleagues with the same or similar teaching assignments may be particularly important for teachers to engage in collaboration that creates opportunities for professional learning. While prior research indicates that teachers are more likely to engage collaboratively with teachers in their same teaching assignment (e.g., grade-level or subject-area) than other teachers, there is little attention paid to what happens when teachers do not have colleagues in their school who share their teaching assignment.

In addition to having access to potential communities of practice, the expertise of a teacher's peers may also influence how they collaborate and the extent to which collaboration offers potential learning opportunities for teachers. In her seminal article on professional relations among teachers, Little (1990) argues that teachers' substantive expertise—and their ability to communicate that expertise to peers—strongly influences the extent to which collaboration may offer opportunities for learning. As she asks, “Bluntly put, do we have in teachers' collaborative work the creative development of well-informed choices, or the mutual reinforcement of poorly informed habit?” (p. 525). More recent research on peer effects among teachers similarly suggests that teachers (and their students) benefit when they work on grade-level teams with colleagues whose students exhibit more growth in standardized test scores (Jackson & Bruegmann, 2009; Sun, Loeb, & Grissom, 2017) or when other teachers in their professional network engage in professional development (Penuel et al., 2012). While none of these studies directly measure collaboration, they posit that teachers must learn from each

other through their collaborative work. An unexamined question is whether teachers find collaboration more instructionally helpful when they are able to work with highly effective colleagues in their subject-area or grade-level.

This analysis builds on this prior research by examining the extent to which teachers' reported collaborative learning opportunities are associated with organizational conditions shaped by school leaders and peers.

### **Research Questions**

Using data from teachers across the state of Tennessee, this paper examines the variation and distribution of collaborative learning opportunities reported by teachers. I define these collaborative learning opportunities based on prior research, and they include collaborative work within instructional teams (e.g., grade-level and subject-area teams), common lesson planning, collaborative discussions of student work or data, peer observation and feedback, and informal discussions among teachers in which teachers seek out advice or provide feedback on instructional issues (Goddard et al., 2015; Parise & Spillane, 2010; Ronfeldt et al., 2015; Supovitz, 2002). I address the following research questions:

1. To what extent do Tennessee teachers report engaging in collaborative learning opportunities?
2. How does this engagement in collaborative learning opportunities vary across and within schools?
3. To what extent do organizational conditions of schools predict the teacher-reported frequency and helpfulness of collaborative learning opportunities?

## Data and Methods

### Data

This analysis uses state-wide survey and administrative data collected through a partnership between the Tennessee Department of Education (TDOE) and the Tennessee Education Research Alliance (TERA). The administrative data about teachers includes demographic and experience information, school and course assignment, and teacher evaluation scores. I also included school-level measures drawn from administrative data to better capture the context within which teachers work. To measure collaboration and organizational conditions of schools, I used survey data collected from the Tennessee Educator Survey, a state-wide survey administered annually to all public school teachers to gather feedback about school climate, leadership, instruction, teacher evaluation, professional learning, and specific state initiatives. Teacher-level survey data is linked to administrative data using anonymized teacher identification numbers. This analysis focuses on the 2017-2018 academic year and also draws on data from the 2016-2017 academic year to establish teacher's tenure in their school and measure prior performance at the teacher- and school-level.

### Sample

I limited the analytic sample in this paper to a subset of Tennessee teachers who were randomly assigned to answer a survey module on professional learning as part of the 2018 Tennessee Educator Survey (TES). Across the state, 56% of teachers responded to the 2018 survey (N=35,693). All surveyed teachers responded to a core set of questions about school climate and leadership, instructional practice, teacher evaluation, and state initiatives. To reduce the overall survey length for each teacher, teachers are then randomly assigned to answer an additional set of survey questions. One of these modules—focused broadly on professional learning—included detailed questions about collaboration. I

constructed the key dependent variables from teachers' responses to these questions and, as such, my analytic sample is restricted to these teachers (N=11,039). Table 13 presents descriptive information about all public school teachers, the full survey sample, and the survey sub-sample assigned to answer questions on professional learning. Overall, the full survey sample and survey sub-sample appear descriptively similar to the full population of public school teachers. There are a few subgroups of teachers who are underrepresented in the sample. Most notably, male teachers, teachers of color, new teachers (defined here as being in first three years of teaching), high school teachers, and teachers in rural districts are all slightly underrepresented in the survey sample.

## **Measures**

In the following sections, I briefly describe the measures of interest in this analysis. More detail on the specific variables and related survey questions can be found in Appendix C. Table 14 presents descriptive statistics for all independent variables used in this analysis and Table 9 presents a correlation matrix of these variables.

**Measures of collaborative learning opportunities.** The dependent variables are measures of the frequency and helpfulness of collaborative learning opportunities as reported by teachers on the 2018 Tennessee Educator Survey. Teachers are asked to estimate how frequently during the 2017-2018 academic year they engage in a variety of collaborative activities, including seeking out another teacher for advice about teaching, meeting with a grade-level or subject-area team, observing another teacher's classroom, planning lessons with another teacher, providing or receiving instructional feedback, and reviewing student data to make instructional decisions. I created a frequency scale that captures a teacher-level average of 10 items on which teachers were asked to report the frequency of their

involvement (Cronbach's  $\alpha=0.78$ )<sup>8</sup>. Based on my prior conceptualization of learning as embedded in teachers' daily work with their colleagues, this scale is meant to capture the extent to which teachers frequently engage in a broad range of collaborative activities that could create opportunities for them to learn. Table 10 displays a full list of survey items and sample averages for each individual item.

I also examined the extent to which teachers rate specific collaborative activities as helpful in making instructional decisions. Teachers were asked to rate the extent to which certain collaborative activities were helpful when making decisions about the teaching activities or strategies used in their classrooms. The survey was designed so that teachers were only asked to rate the helpfulness of activities that they reported participating in at least once during the 2017-2018 year. I created a teacher-level average for the five collaborative activities for which teachers were asked to rate the helpfulness (Cronbach's  $\alpha=0.73$ ).<sup>9</sup> Table 10 lists the five helpfulness items and sample averages for each individual item.

**Organizational conditions of schools.** Five measures capture organizational conditions that may influence how teachers collaborate. The first three measures are created using teacher survey responses, and capture conditions that are likely influenced by school leaders. The first measure captures the overall professional climate and leadership within a school as rated by teachers. This scale is composed of a set of survey items from the core survey (answered by all survey respondents) in which teachers were asked to rate their overall satisfaction with their school, level of trust, teacher involvement in school affairs, and their evaluation of the leadership. This standardized scale includes 11

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<sup>8</sup> The original 5-point scale is presented in Table 9 and then the scale is standardized in the subsequent analyses to ease interpretation.

<sup>9</sup> Each teacher's scale score only includes their ratings for activities that they indicated participating in. As a result, most teachers' score do not include five ratings. For example, the majority of teachers indicated that they did not participate in a peer observation program during the 2017-2018 year and therefore did not rate the helpfulness of this program. The original 4-point scale is presented in Table 9 and then the scale is standardized in the subsequent analyses to ease interpretation.

items with a high degree of internal consistency (Cronbach's alpha=0.96).<sup>10</sup> The second measure captures the extent to which teachers within a school report having time for collaboration by aggregating teacher response to question on the core survey in which teachers are asked whether they have sufficient collaborative planning time. The third measure captures the estimated amount of administrative oversight within each school over teachers' collaborative activities. This was created by aggregating responses on the professional learning module (taken only by teachers in the analytic sample) to a question in which teachers are asked to estimate the percentage of collaborative activities determined by school and district leaders (on a 0-100% scale).

While intended to capture school-level phenomenon, each of these three measures is operationalized as a peer average. For each teacher in the analytic sample, I created a peer average for each measure that captures the aggregate response for all other teachers in the school who responded to the relevant survey questions (while excluding that teacher's response). I contend that these peer averages are better suited to capture school-level phenomenon than a given's teachers individual response. Since these three measures are taken from the same survey as my dependent variables, peer averages also mitigate the common source bias that can occur due to correlation among multiple variables measured by perceptual survey questions from the same respondent (Meier & O'Toole, 2013; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

The other two measures capture teachers' access to peers with relevant expertise and are created from administrative data. First, I include a measure meant to capture the instructional expertise of the other teachers in a given teacher's grade-level or subject-area team.<sup>11</sup> For self-contained

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<sup>10</sup> I had originally planned to create multiple measures rather than an omnibus scale. In earlier attempts, I examined whether these items could be divided into two scales, one measuring professional climate and another on evaluations of school leadership. In an exploratory factor analysis, all items loaded onto one factor (Eigenvalue= 7.39). When created separately, these two measures are highly correlated (0.86).

<sup>11</sup> In 2011, Tennessee implemented a new multiple-measure teacher evaluation system that requires that all public school teachers are observed at least once per year.



elementary teachers, this peer average represents the average prior observation score for all other self-contained teachers in their grade-level. For all other teachers, this peer average captures the average prior observation score for all other teachers with their same primary subject-area assignment (e.g., math, English Language Arts, science, social studies, special education, physical education/health, career and technical education, foreign language, creative arts). The second variable measures whether teachers have colleagues in their school who teach the same specific courses (e.g., self-contained Kindergarten, 7<sup>th</sup> grade Science, Algebra II, or Choir) that they teach. This “shared courses” measure is intended to capture whether teachers have colleagues in their school who could form a community of practice about teaching within a specific subject-area. To create this measure, I used the administrative course files—which list all of the specific courses taught by each teacher during the 2017-2018 year—to create a categorical variable that captures the extent to which teachers share course assignments with other teachers in their school (None; Some; All). Teachers with no shared courses, who I refer to as “professional isolated,” are those teachers who are the only teacher in their school who teach all of their assigned courses. In contrast, teachers with all shared courses—referred to as “professionally situated”—have at least one other teacher in their school teaching all of their courses.

**Teacher and contextual characteristics.** I also include teacher characteristics and contextual characteristics about schools and districts in these analyses. The teacher-level characteristics include gender, race/ethnicity, years of experience as a teacher, experience in the school, prior performance, and primary teaching assignment, all as reported in Tennessee’s administrative data. Prior performance is captured by teachers’ average observation score from all classroom observations from the prior school year. I have created a measure summarizing teachers’ primary teaching assignment by using student-level course files and identifying the modal subject-area taught by each teacher (e.g., math, self-contained, social studies, physical education/health). The contextual characteristics include school level (e.g., elementary, middle, high), an indicator for charter schools, faculty size, the percentage of faculty

who are new to the school, prior school-level performance, the percentage of students in the school who are economically disadvantaged, district size, and geographic context (e.g., city, suburb, town, rural).

### **Missing Data**

Beyond the sample restriction described in the Sample section, I further restricted my sample to teachers who are not missing data for the key independent and dependent variables (N=9,615). While most administrative data is available for all public schools teachers, a few administrative datasets do not include all teachers who appear in the survey sample. Most notably, approximately 10% of the survey sub-sample (N=1,089) does not appear in the course files that are used to determine teaching assignment and whether teachers have shared courses. Given the importance of these independent variables in this analysis, I have chosen to exclude these teachers from my analytic sample. While not necessarily representative of teachers statewide, teachers in the analytic sample represent 1523 schools and all 146 school districts in Tennessee.

Unfortunately, a design error in the 2018 survey led many teachers to inadvertently skip the questions asking them to rate the helpfulness of collaboration. As a result, the number of teachers in the helpful analysis is substantially smaller than the frequency analysis. Table A1 lists the number of respondents who responded to each helpfulness item compared to the number of teachers who should have responded based on the survey design. Table A2 includes descriptive information about teachers who answered all the helpfulness items, teachers who skipped at least one helpfulness items, and teachers who skipped all of the helpfulness items (both Tables are located in Appendix 4). Male teachers, teachers of color, and teachers in tested subjects are overrepresented among those teachers who skipped some or all of the helpfulness items. The helpfulness analyses should be interpreted with caution given this issue.

## Analytic Approach

To answer the first research question, I used descriptive approaches to illustrate the frequency and helpfulness of teachers' collaborative learning opportunities and report overall patterns in engagement. For the second research question, I examined the sources of variation in the teacher-reported frequency and helpfulness. I first estimated the intraclass correlations for the frequency and helpfulness measures of collaborative learning opportunities using an intercept-only, three-level nested model (teachers within schools within districts). I present intraclass correlations for each individual survey item (listed in Table 10) and the scales created from these items. All measures are treated as continuous variables. By estimating the intraclass correlations, I am able to decompose the source of variation of teacher-reported collaboration learning opportunities. Next, I examined descriptive differences in teacher-reported frequency and helpfulness across teacher and contextual characteristics. The goal of these tables and figures is to better understand how access to collaborative learning opportunities varies across the state and whether certain types of teachers or teachers in certain type of schools report participating in fewer or less helpful collaborative activities.

To answer the third question, I estimated the relationship between key organizational conditions of schools and the teacher-reported frequency or helpfulness of collaborative learning opportunities. I treat frequency and helpfulness as separate outcomes and present two sets of regression results. For both outcomes, my primary model is a three-level, multi-level regression model that accounts for the nested structure of teachers within schools within districts (Raudenbush & Bryk, 2002). The following equation summarizes the full three-level model:

$$Collab_{isd} = \beta_0 + \beta_1 orgcond_{isd} + \beta_2 teacher_{isd} + \beta_3 school_{sd} + \beta_4 district_d + \nu_d + \mu_{ds} + \varepsilon_{ids} \quad (1)$$
$$\nu_d \sim N(0, \sigma_{int:district}^2); \mu_{ds} \sim N(0, \sigma_{int:school}^2)$$

I model each measure of collaborative learning opportunities ( $Collab_{isd}$ ) for teacher  $i$  in school  $s$  in district  $d$ , as a function of a fixed intercept, a vector containing the organizational conditions of interest

( $orgcond_{isd}$ ), a vector of teacher characteristics ( $teacher_{isd}$ ), a vector of school characteristics ( $school_{sd}$ ), a vector of district characteristics ( $district_d$ ), and mutually independent random effects, associated with districts ( $v_d$ ), schools ( $\mu_{ds}$ ), and teachers ( $\varepsilon_{ids}$ ). When helpfulness is the dependent variable, all models include frequency as a predictor. Multiple models are presented in the results, some of which do not include the contextual covariates. In addition to the multi-level model, I present additional models which include school fixed effects and district fixed effects. The fixed effects models allow me to control for unobserved characteristics of schools or districts that are common to all teachers in a school or district, and provide additional evidence that the relationships estimated here are robust to multiple specifications. The three measures of organizational conditions captured using survey responses (professional climate/leadership, time for collaboration, administrative oversight) are measured as peer averages and intended to capture school-level phenomenon. As such, they are excluded from models including school fixed effects. Finally, I present two additional analyses which examine (1) whether administrative oversight should be modeled linearly or non-linearly and (2) whether the organizational conditions have differential associations with collaboration depending on school level.

## Results

### **To What Extent Do Tennessee Teachers Report Engaging in Collaborative Learning Opportunities?**

The vast majority of teachers in this state-wide sample report engaging in collaborative learning opportunities on a regular basis and rate these opportunities as helpful in making instructional decisions. Of the ten collaborative learning opportunities included in the frequency analysis (see Table 10 for a full list of these items), 93% of teachers report engaging in at least one of these activities at least monthly and 62% of teachers report engaging in at least one of these activities at least weekly.

Figure 1 illustrates the percentage of teachers in the analytic sample who report participating in specific activities at least monthly and at least weekly. Certain activities appear to be more common among the surveyed teachers. Most notably, 77% of teachers report engaging in a grade-level and/or subject-area team at least monthly, 62% of teachers report asking for advice about teaching at least monthly, and 58% report collaboratively reviewing student assessment data at least monthly. In contrast, only 12% of teachers report engaging in peer observation at least monthly and 39% report providing or receiving feedback about instructional practices or activities at least monthly. These frequencies are similar to those reported from the 2016 American Educator Panel, a nationally representative survey of teachers (Johnston & Tsai, 2018).

Teachers vary in the number of collaborative learning opportunities that they report regularly participating in (defined here as engaging a specific activity at least monthly). On average, teachers estimate participating in four of these activities at least monthly. Half of teachers report participating in two to five specific activities at least monthly while smaller percentages report participating in two or fewer specific activities (18%) or more than five specific activities (32%). Overall, these initial findings indicate that most, but not all, Tennessee teachers are regularly engaging in some collaborative activities hypothesized to support teacher learning.

Overall, surveyed teachers rated these collaborative learning opportunities as helpful for making decisions about the teaching activities or strategies used in their classroom. For all five collaborative learning opportunities included in the helpfulness analysis (listed in Table 10), the majority of teachers rated each specific activity as helping them “some” or “a lot” (between 69-90% of teachers depending on the specific activity). In general, teachers who engage more frequently in a specific collaborative activity tend to rate it as more helpful. Polychoric correlations between the frequency and helpfulness items for the five specific activities listed in Table 10 range between 0.31-0.55. However, there are a smaller subset of teachers (14%) who report regularly engaging in a specific activity but rate it as not

helpful or only helping them “a little bit.” In subsequent analyses, I try to disentangle how frequency and helpfulness vary based on individual teacher characteristics, organizational conditions, and contextual characteristics of schools.

### **How Does This Engagement in Collaborative Learning Opportunities Vary Across and Within Schools?**

Teachers’ engagement in collaborative learning opportunities varies more within schools than between schools. Table 11 presents the proportion of variance in measures of collaboration explained by differences between districts and between schools. After accounting for the proportion of variance explained by district-level and school-level differences, the remaining variance is therefore attributed to differences across teachers within the same school.<sup>12</sup> While only a small proportion of variation across all measures can be attributed to differences between school districts (0-6% of variation depending on the measure), there are some measures for which there is moderate proportion of the variation that can be attributed to differences between schools within the same district. The proportion of variance explained by differences between schools is highest for frequency measures of collaborative activities that are more likely to be formally facilitated (e.g., meeting with grade-level or subject-area teams, participating in peer observation, and reviewing student data).

To examine potential sources of variation, I examined descriptively whether frequency and helpfulness of collaborative learning opportunities varied across teacher, contextual, or organizational characteristics. Overall, frequency and helpfulness vary substantially across numerous characteristics. The greatest descriptive differences, especially in frequency, occur across teaching assignment. Self-contained elementary teachers report engaging more frequently in collaborative learning opportunities

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<sup>12</sup> Given that collaboration is measured here using self-reported survey data, it is likely that this “within-school” variation estimate is capturing a substantial amount of measurement error from the survey. As such, these estimates of the district-level and school-level variance could be considered conservative estimates.

and rate those opportunities as more helpful. The following section briefly reviews the descriptive differences across teacher, contextual, and organizational characteristics.

**Teacher characteristics.** Table 12 present conditional means of the frequency and helpfulness of collaborative learning opportunities across teacher characteristics. There are significant descriptive differences in frequency across all teacher characteristics and significant differences in helpfulness by gender or teaching assignment. The greatest mean differences occur across primary subject, with self-contained teachers reporting much more frequent and more helpful collaborative learning opportunities than teachers in other subjects (the mean differences in frequency range from 0.15-0.94 standard deviations while the mean differences in helpfulness range from 0.32-0.5 standard deviations). Across most teacher characteristics, the same patterns occur for frequency and helpfulness in that the types of teachers who report more frequent collaboration also tend to rate that collaboration as more helpful. One notable exception is teaching experience. While less experienced teachers tend to report engaging more frequently in collaboration, there are not strong descriptive patterns in helpfulness by experience levels.

**Contextual characteristics.** Table 13 presents conditional means of the frequency and helpfulness of collaborative learning opportunities across contextual characteristics of schools and districts. Significant differences in frequency occur across most contextual characteristics, and there are significant differences in helpfulness by school level (e.g., elementary, middle, high), school size, percentage of new teachers, and school prior performance. The most substantial differences occur by school level (e.g., elementary, middle, high), district size, and district context (e.g., rural, town, suburb, city). Elementary teachers report, on average, more frequent and more helpful collaboration than other teachers while high school teachers report less frequent and less helpful collaboration (the mean difference between elementary and high school teachers for both frequency and helpfulness is 0.47 standard deviations). Across district size and context, there are substantial differences in teacher-

reported frequency but much smaller mean differences in helpfulness. In particular, teachers in large and urban school districts report engaging in more frequent collaboration than teachers in small districts and rural districts (differences between 0.35-0.38 standard deviations).

**Organizational conditions.** Figure 2 illustrates the descriptive mean differences in frequency and helpfulness across the organizational conditions of schools that serve as my key independent measures for the third research question.<sup>13</sup> As Panel A illustrates, there are moderate descriptive differences in teacher-reported frequency based on whether teachers reported sufficient time for collaboration (0.23 standard deviations difference between the first and third terciles) and large descriptive differences in teacher-reported frequency (0.77 standard deviations) between teachers who are “professionally isolated” (e.g., teachers who are the only teachers in their school who teach their particular courses) and teachers who are “professionally situated” (e.g., teachers whose courses are all taught by other teachers in the school). As Panel B shows, there are moderate descriptive differences in teacher-reported helpfulness based on professional climate/leadership, time for collaboration, administrative oversight, peer effectiveness, and the extent to which teachers are professional isolated (ranging from mean differences of 0.10-0.29 standard deviations between the first and third terciles).

### **To What Extent Do Organizational Conditions of Schools Predict the Teacher-Reported Frequency and Helpfulness of Collaborative Learning Opportunities?**

To answer the final research question, I specifically examined whether certain organizational conditions driven by school leaders and peers predict frequency and helpfulness. Table 14 presents a set of regression models for the composite measures of frequency (Panel A) and helpfulness (Panel B). Table 14 only includes the organizational conditions described in the measures sections but these

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<sup>13</sup> The four continuous variables (professional climate/leadership, time for collaboration, administrative oversight, and peer effectiveness) have been re-coded into terciles for display purposes



models include teacher-level and school-level covariates. See Tables A3 and A4 in Appendix D for the full set of results. In this section, I separately describe the results of the frequency models and helpfulness models because different patterns of results emerge depending on whether frequency or helpfulness is the outcome. In other words, the measures analyzed here predict frequency or helpfulness but not both.

**Frequency of collaborative learning opportunities.** Time for collaboration and shared courses are both consistently and positively associated with teacher-reported frequency of collaborative learning opportunities. The estimated relationship between time for collaboration and teacher-reported frequency is relatively small. A one standard deviation increase in the peer average measure of sufficient collaborative time is associated with a 0.06-0.07 standard deviation increase in the teacher-reported frequency of collaborative learning opportunities. Whether a teacher has shared courses predicts a substantial difference in the frequency of collaborative learning activities. For example, the school fixed effects results (presented in Panel A, Column 3 of Table 14) predict that “professionally situated” participate much more frequently in collaborative learning opportunities than teachers in the same school who are “professionally isolated,” all else equal (+0.48 standard deviations). This standardized difference is the equivalent of 0.4 point difference on underlying 5-point scale. The finding from the school fixed effect model is telling given that “professionally isolated” teachers are more likely to be found in certain types of schools (e.g., K-8/K-12 schools, small schools, and schools in rural districts). Additional models that examine whether school level moderates the relationship between shared courses and the frequency of collaborative learning opportunities found that professionally situated teachers are predicted to engage in more frequent collaboration than professionally isolated teachers in elementary, middle, and high schools (see Table A5 in Appendix D for this analysis). Using the estimates from the full, three-level model that interacts shared courses and time for collaboration, Figure 3

illustrates the predicted frequency of collaborative learning opportunities for teachers who share all, some, or no courses across time for collaboration, with all other variables held at their means.

**Helpfulness of collaborative learning opportunities.** Professional climate/leadership and administrative oversight over collaboration are both consistent and significant predictors of the teacher-reported helpfulness of collaborative learning opportunities. While there is suggestive evidence of a small positive relationship between helpfulness and peer expertise, this relationship is not consistent across all models. As illustrated in Panel B of Table 14, the estimated relationship between professional climate/leadership and helpfulness is statistically significant and positive but the magnitude is relatively small. All else equal, a one standard deviation increase in the professional climate and leadership scale is associated with an estimated 0.04-0.06 standard deviation in teacher-reported helpfulness. In addition, all models find a consistently negative and relatively small association between administrative oversight over collaboration. On average, teachers in this study reported that school and district leaders determined 41% of their collaborative activities. The equivalent of a one standard deviation increase in administrative oversight (17%) is associated with a 0.03-0.05 standard deviation decrease in teacher-reported helpfulness when modeled as a linear relationship. Since prior research on collaboration suggests that leaders play an important role in setting expectations and providing shared purpose for collaborative times in their school (Charner-Laird et al., 2017; McLaughlin & Talbert, 2006; Scribner et al., 1999), this relationship between oversight and helpfulness may not be linear. To explore whether certain amounts of oversight are associated with helpfulness, I conducted a separate analysis in which administrative oversight is broken into 10 ordinal groups of equal size (these results can be found in Table A6 in Appendix D). Using estimates from the multi-level model from Tables 14 and A6, Figure 3 illustrates the predicted helpfulness of collaborative learning opportunities across levels of administrative oversight (modeled linearly and non-linearly), with all other variables held at their means. These results suggest that the negative relationship between administrative oversight and teacher-

reported helpfulness is driven by schools with the highest levels of administrative oversight (the 10<sup>th</sup> decile includes teachers whose peers report that more than 65% of collaborative activities are determined by school or district leaders). The estimated difference in teacher-reported helpfulness between teachers in the first and tenth deciles is 0.2 standard deviations, and there are no statistically significant differences in teacher-reported helpfulness between schools in the first five deciles.

### **Discussion**

Overall, the vast majority of teachers in this statewide sample report regularly participating in at least one collaborative activity. The frequency rates reported here are similar to those found in other large surveys of teacher collaboration (Johnston & Tsai, 2018; Ronfeldt et al., 2015) and support the conclusions of other researchers who argue that peer collaboration is increasingly becoming a universal expectation of teachers' professional practice (Hargreaves, 2010; Johnson, 2012). For many teachers, it appears that their professional experiences no longer mirror the traditional notion in which teachers work as sole practitioners behind closed doors in "egg crate" schools (Lortie, 1977; Tyack, 1974).

However, this analysis also shows that not all teachers engage as frequently in collaborative learning opportunities or rate that collaboration as helpful in making instructional decisions. Certain types of teachers—notably special education, creative arts, foreign language, and career and technical education teachers—and teachers in certain types of schools—including high schools and schools in small, rural districts—appear to engage in fewer collaborative learning opportunities. These teachers are largely ignored in the existing body of quantitative research on teacher collaboration. Most prior studies focus on elementary teachers, teachers in core tested subjects (English Language Arts, math, science, and social studies), or teachers in large, urban districts. Future research should consider the extent to which teachers across a broader range of teaching contexts have access to collaborative learning opportunities.

Certain organizational conditions influenced by school leaders and peers also appear related to teachers' engagement in collaboration. I find that "professionally isolated" teachers who are the only teacher in their school who teach their specific courses report engaging in much less frequently in collaborative learning opportunities than teachers who share all of their specific course assignments with at least one other teacher in their school ("professional situated"). In addition, I find that administrative oversight is negatively associated with helpfulness of collaborative learning opportunities, and the results suggest that teachers find their collaboration less helpful when school and district leaders are heavily involved in determining how teachers spend their collaborative time.

### **Limitations**

While my analysis offers suggestive evidence about how collaborative learning opportunities vary across the contextual and organizational conditions of schools, I must acknowledge certain limitations that influence the interpretation of these findings. First, I have intentionally framed my analysis around collaborative learning opportunities because I do not directly measure how and whether teachers learn from collaboration. Instead, I created two scales from survey items that ask teachers to report on the frequency and helpfulness of certain types of instructionally-focused collaboration hypothesized to support professional learning. These measures are unable to capture the nuances of how teacher engage in collaboration. However, I argue that these measures offer an important signal about the potential of their collaborative experiences to support teacher learning and are similar to measures used in prior quantitative work on collaboration (R. Goddard et al., 2015; Y. L. Goddard et al., 2007; Ronfeldt et al., 2015).

Second, there are limitations created by the data and sample that I use in this analysis. Although all public school teachers in the state are given the opportunity to complete the Tennessee Educator Survey, a substantial proportion of teachers chose not to complete the survey. As Table 13 illustrates,

there are small, observable differences between the sample of teachers who responded to the survey and all public school teachers in the state. It is possible that the survey sample is systematically different from teachers who did not respond to the survey, and the generalizability of my findings is limited to the sub-set of Tennessee teachers who responded to the survey. Peer averages of professional climate and leadership and time for collaboration only include the teachers within a school who responded to the survey. Concerns about the survey sample are compounded by the survey design used as part of the Tennessee Educator Survey. Only one-third of teachers who responded to the survey are randomly assigned to answer a set of questions related to collaborative learning opportunities. Especially in small schools, this could mean that only a handful of teachers have answered the questions that create the outcome measures of interest in this analysis. Similarly, the peer average of administrative oversight over collaboration is created only by those teachers in the school who responded to the survey module. While the broad sample of teachers included offers a better opportunity to understand variation across different school conditions and contexts, these limitations should be kept in mind when considering the implications of the findings.

Finally, my analysis is cross-sectional and correlational, and I am unable to determine the direction of the relationships estimated here. For example, a school's professional climate and leadership and teachers' access to peer expertise may encourage more helpful collaboration, but it is also possible that more helpful collaboration builds a more supportive professional climate and builds peer teachers' instructional expertise (these may also be reciprocal processes). Future analysis using longitudinal data would be better situated to disentangle these relationships.

## **Implications**

The implications from my findings may be most relevant for school and district leaders considering how to organize their schools to support collaborative learning among teachers. My findings

indicate that certain organizational conditions of schools—which school leaders can often directly or indirectly influence—may make a difference in terms of teachers’ engagement in collaborative learning opportunities. One-third of teachers in the analytic sample indicated that they did not have sufficient collaborative planning time in their school and time for collaboration is consistently and positively associated with how frequently teachers report engaging in collaborative learning opportunities. By state law, Tennessee districts are only required to provide teachers 2.5 hours of planning time per week and collaborative planning time is not required (Wright, 2012). Teachers’ time is a precious resource, and school and district leaders should consider how to build school schedules that allow teachers to regularly collaborate with their peers during the school day. For “professionally situated” teachers who have peers in their school with the same teaching assignment(s), common planning time offers a way for teachers to regularly discuss curriculum, materials, instructional strategies, and student learning in their content area.

My analysis highlights that “professionally isolated” teachers—who are the only teacher in their school who teach their specific courses—are much less likely to report engaging in collaborative learning opportunities, across all school contexts. School and district leaders should consider how to best support these teachers in organizing time and space for them to engage in collaborative learning. Emergent research on informal, online teacher communities indicates that professional isolated teachers may be able to productively engage collaboratively with colleagues in that way (Carpenter & Krutka, 2015; Macià & García, 2016; Manca & Ranieri, 2017). However, teachers are often left on their own to explore this form of collaborative learning on their own time, and lack of engagement and accountability are often cited as issues with these informal communities and networks (Manca & Ranieri, 2017). More structured and formal networks through online professional learning communities and regional learning networks for rural educators offer another avenue by which isolated teachers—especially those in small,

rural school districts—can engage in cross-school collaborations (Hargreaves & O’Connor, 2018; Parsley, 2018; Trust, Krutka, & Carpenter, 2016).

Given the limited time that teachers have to devote to collaborative activities, it is important to consider how to make the most of collaboration. The helpfulness analysis offer suggestive evidence about the organizational conditions of schools that are related to how helpful teachers rate their collaboration. My findings suggest that teachers may find collaboration more helpful when working in schools with stronger professional climate and leadership, when their subject-area or grade-level peers have more expertise, and when school and district leaders have less oversight in determining how teachers spend their collaborative time.

The patterns of results about the relationships between teacher-rated helpfulness and administrative oversight are particularly noteworthy given the mixed evidence from prior research about leadership involvement in teacher collaboration. On average, surveyed teachers estimated that school and district leaders determined 41% of their activities during collaborative time. Of the 1523 schools represented in this analysis, one-third of schools had an average administrative oversight of more than 50% of collaborative activities and about 10% of schools had an average administrative oversight of more than 65% of collaborative activities. Teachers in this latter group of schools rate their collaboration as being significantly less helpful than peers in schools in which teachers have greater autonomy over their collaboration. In these “high oversight” schools, leadership-driven collaboration may more closely resemble the “contrived collegiality” and “compliance-oriented” collaboration found in other research on collaboration (Hargreaves, 2000; Talbert, 2010). Interestingly, administrative oversight does not appear to be related to teacher-reported frequency. Teachers in “low oversight” schools appear to participate just as frequently in collaborative learning opportunities as teachers in “high oversight” schools. Overall, the pattern of results suggest that school and district leaders should be cautious in mandating how teachers spend large portions of their collaborative time. However, this

analysis is unable to examine *how* leaders influence teachers' collaborative work and whether certain types of oversight are helpful. Qualitative case studies of teacher workgroups suggest that different leadership approaches can influence whether teachers find collaboration productive and engaging (Charner-Laird et al., 2017; Horn et al., 2018; McLaughlin & Talbert, 2006; Scribner et al., 1999). Future analyses should consider more nuanced measures of administrative oversight or mixed methods approaches to further investigate how leadership approaches are associated with teachers' reported experiences with collaboration.

## **Conclusion**

In this analysis, I build on conceptions of teachers' collaborative learning opportunities used in prior research (Goddard et al., 2015; Parise & Spillane, 2010; Ronfeldt et al., 2015) to examine variation in teacher-reported frequency and helpfulness of collaborative learning opportunities using a broad, statewide sample of teachers from Tennessee. Taken together, my findings provide suggestive evidence about the conditions under which Tennessee teachers regularly engage in collaboration and rate that collaboration as helpful to making instructional decisions. I illustrate how engagement in collaborative learning opportunities varies across teacher and contextual conditions, and I specifically highlight that organizational conditions of schools—including whether teachers are professionally isolated and the extent to which administrators determine teachers' collaborative activities—may hinder teachers' engagement in collaborative learning opportunities. Indeed, it appears that not all teachers have equal access to learning opportunities created through collaboration. Given the potential for collaboration to support teacher learning, future work should further consider the extent to which all teachers have access to regular and relevant collaborative learning opportunities.



**Appendix**

**Table 7. Descriptive Comparison of All Tennessee Teachers, Full Survey Sample, and Professional Learning Survey Sub-Sample**

	All TN Teachers		Full Survey Sample		Survey Sub-sample	
	N	%	N	%	N	%
<b>Teacher Characteristics</b>						
Gender						
Female	50,628	79%	29,159	82%	9,011	82%
Male	13,627	21%	6,534	18%	1,986	18%
Race/Ethnicity						
Teacher of Color	8,324	13%	3,161	9%	877	8%
White Teacher	55,674	87%	32,540	91%	10,120	92%
Years of Teaching Experience						
0-3 years	15,477	24%	7,876	22%	2,369	22%
4-6 years	8,969	14%	4,814	13%	1,466	13%
7-10 years	8,896	14%	4,845	14%	1,507	14%
11-17 years	14,089	22%	8,085	23%	2,441	22%
18-25 years	10,588	16%	6,482	18%	2,053	19%
26 or more years	6,153	10%	3,646	10%	1,171	11%
Experience in School						
New to School	9,907	16%	5,664	16%	1,705	15%
Returners	53,011	84%	30,213	84%	9,314	85%
Primary Teaching Assignment						
Math	6,053	9%	3,533	10%	1,076	10%
ELA	7,231	11%	4,263	12%	1,349	12%
Science	4,741	7%	2,764	8%	848	8%
Social Studies	4,238	7%	2,264	6%	658	6%
Self-Contained	16,322	25%	9,555	27%	2,928	26%
SPED	4,204	7%	2,238	6%	701	6%
Foreign Language/Arts	4,429	7%	2,251	6%	685	6%
CTE/Health/PE	7,291	11%	3,752	10%	1,175	11%
Other/No Primary	10,090	16%	5,322	15%	1,650	15%
Tested Subject						
Tested	26,393	41%	15,625	43%	4,816	43%
Untested	38,227	59%	20,327	57%	6,258	57%
Tch. Prior Performance (Quartiles)						
Lowest Quartile	14,497	22%	7,925	22%	2,439	22%
Second Quartile	14,306	22%	8,255	23%	2,546	23%
Third Quartile	15,023	23%	8,617	24%	2,689	24%
Fourth Quartile	13,692	21%	7,815	22%	2,427	22%
Missing 2017 Score	7,102	11%	3,320	9%	973	9%

**School/District Characteristics**

School Level						
Elementary	27,395	43%	15,844	44%	4,870	44%
Middle	12,161	19%	6,694	19%	2,056	19%
High School	16,531	26%	8,331	23%	2,573	23%
K-8	5,289	8%	3,287	9%	1,015	9%
K-12	1,021	2%	572	2%	187	2%
Other	2,043	3%	1,118	3%	338	3%
School Type						
Charter	1,240	2%	337	1%	89	1%
Traditional	63,380	98%	35,615	99%	10,985	99%
Sch. Prior Performance						
Level 1 (Lowest)	18,153	28%	9,745	27%	2,984	27%
Level 2	4,127	6%	2,396	7%	723	7%
Level 3	8,257	13%	4,985	14%	1,543	14%
Level 4	4,925	8%	2,762	8%	881	8%
Level 5 (Highest)	22,800	35%	13,035	36%	4,021	36%
Missing TVAAS	6,358	10%	3,029	8%	922	8%
District Size						
Less than 10 schools	16,040	25%	10,519	29%	3,272	30%
10-20 schools	14,076	22%	8,984	25%	2,792	25%
21-50 schools	16,016	25%	8,273	23%	2,519	23%
More than 50 schools	18,488	29%	8,176	23%	2,491	22%
District Context						
Rural	19,403	30%	12,083	34%	3,775	34%
Town	8,770	14%	5,664	16%	1,725	16%
Suburb	15,066	23%	8,026	22%	2,485	22%
City	21,338	33%	10,168	28%	3,087	28%
<b>Total</b>	<b>64,440</b>	<b>100%</b>	<b>35,693</b>	<b>100%</b>	<b>11,039</b>	<b>100%</b>

**Table 8. Descriptive Statistics of Analytic Sample**

<b>Sample Averages of Continuous Variables</b>	<b>Mean</b>	<b>SD</b>
<b>Organizational Conditions</b>	0.02	0.97
Prof. Climate/Leadership (Std., Peer avg.)	0.01	0.97
Time for Collaboration (Std., Peer avg.)	41.47	17.31
Administrative Oversight (% Peer avg.)	-0.03	0.97
Peer Prior Observation Score (Std., Peer avg.)		
<b>Teacher Characteristics</b>	12.41	9.49
Years of Experience		
<b>School/District Characteristics</b>	48.49	25.56
School size (# of teachers)	33.58	19.02
% students economically disadvantaged	13.60	9.52
% teachers new to school	0.02	0.97
<b>Sample Frequencies of Categorical Variables</b>	<b>N</b>	<b>%</b>
<b>Organizational Conditions</b>		
Shared Courses		
None	1,643	17%
Some	1,958	20%
All	6,014	63%
<b>Teacher Characteristics</b>		
Gender		
Female	7,816	81%
Male	1,799	19%
Race/Ethnicity		
Teacher of Color	748	8%
White Teacher	8,867	92%
Experience in School		
New to school	1,324	14%
Returners	8,291	86%
Primary Subject		
Math	1,036	11%
ELA	1,300	14%
Science	827	9%
Social Studies	631	7%
Self-contained	2,825	29%
SPED	376	4%
Foreign Language/Creative Arts	638	7%
CTE/Health/PE	1,104	11%
Other/No Primary	878	9%
Tested Subject		
Tested	4,606	48%
Untested	5,009	52%
Prior Performance (2017 Avg. Obs. Score)		
Lowest Quartile	2,163	23%
Second Quartile	2,253	23%
Third Quartile	2,356	25%
Highest Quartile	2,106	22%

Missing Score	737	8%
<b>Contextual Characteristics</b>		
School Level		
Elementary	4,082	42%
Middle	1,820	19%
High School	2,391	25%
K-8/K-12	1,025	11%
Other	297	3%
School Type		
Charter	32	0%
Traditional	9,583	100%
School Prior Performance		
Level 1 (Lowest)	2,592	27%
Level 2	620	6%
Level 3	1,355	14%
Level 4	782	8%
Level 5 (Highest)	3,591	37%
Missing TVAAS	675	7%
District Size		
Less than 10 schools	2,827	29%
10-20 schools	2,460	26%
21-50 schools	2,207	23%
More than 50 schools	2,121	22%
District Context		
Rural	3,329	35%
Town	1,520	16%
Suburb	2,160	22%
City	2,606	27%
<b>Total</b>	<b>9,615</b>	<b>100%</b>

**Table 9. Correlation Matrix of Independent Variables**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Prof. Climate/Leadership	1																			
2. Time for Collaboration	0.47	1																		
3. Administrative Oversight	-0.19	-0.12	1																	
4. Peer Expertise	0.25	0.14	-0.06	1																
5. Shared Courses	0.00	0.04	-0.03	-0.01	1															
6. Tch. Gender	0.04	0.01	0.01	0.04	0.16	1														
7. Tch. of Color	-0.09	0.03	0.08	-0.07	0.01	-0.01	1													
8. Tch. Years of Experience	0.05	0.03	-0.01	0.09	-0.06	0.00	-0.03	1												
9. Tch. New to School	-0.06	-0.03	0.03	-0.06	0.00	0.00	0.08	-0.21	1											
10. Tch. Primary Subject	0.03	0.00	0.00	0.08	-0.22	-0.03	0.01	0.08	0.01	1										
11. Tch. Tested Subject	-0.01	0.00	0.00	-0.02	0.20	0.02	-0.02	-0.09	-0.01	-0.53	1									
12. Tch. Prior Observation Score	0.10	0.06	-0.01	0.29	0.00	0.04	0.02	0.05	0.27	0.02	-0.01	1								
13. Sch. Level	-0.04	-0.04	0.00	-0.02	-0.31	-0.23	-0.01	0.02	0.02	-0.08	0.07	0.00	1							
14. Sch. Type (Charter/Trad.)	-0.05	-0.06	0.08	-0.14	-0.05	-0.01	0.14	-0.11	0.26	-0.05	0.03	0.15	0.04	1						
15. Sch. Size	-0.08	0.05	-0.12	0.04	0.01	-0.17	-0.03	-0.02	-0.04	-0.04	-0.03	-0.01	0.27	-0.17	1					
16. Sch. Prior Performance Level	0.23	0.12	-0.09	0.12	0.05	0.07	-0.11	0.03	-0.02	0.04	-0.07	0.05	-0.14	-0.01	0.06	1				
17. Sch. % Econ. Disadvantaged	-0.21	-0.07	0.19	-0.23	0.01	0.05	0.32	-0.05	0.10	0.03	-0.03	-0.05	-0.13	0.18	-0.34	-0.21	1			
18. Sch. % New Teachers	-0.13	-0.06	0.07	-0.18	-0.03	-0.03	0.20	-0.14	0.41	-0.04	0.02	0.13	0.06	0.64	-0.10	-0.04	0.25	1		
19. District Context	0.12	0.06	-0.09	0.14	0.00	0.00	-0.27	0.07	-0.08	0.02	0.02	0.00	0.03	-0.16	0.04	0.07	-0.31	-0.20	1	
20. District Size	-0.16	-0.01	0.09	-0.13	0.04	0.00	0.43	-0.08	0.10	-0.01	-0.04	0.01	-0.08	0.18	0.03	-0.04	0.38	0.23	-0.53	1

**Table 10. Mean Responses to Survey Questions About Collaborative Learning Opportunities**

Overall Frequency Measure	Observations	M	SD	Min	Max
	9,615	2.59	0.78	1	5
Individual Frequency Items	Observations	M	SD	Min	Max
<b>“During the current school year, about how often have you participated in the following collaborative activities?” (1=Not this year; 2=Once or Twice a Semester; 3=About Once a Month; 4=Two or Three Times a Month; 5=Once a Week or More)</b>					
Ask another teacher for advice about your teaching	9,309	3.12	1.35	1	5
Meet with grade-level team (e.g., fourth grade team or ninth grade academy)	9,413	3.43	1.56	1	5
Meet with subject-area team (e.g., science department or literacy PLC)	9,377	3.11	1.47	1	5
Meet with informal group of teachers that gathers to address different areas of need	9,357	2.52	1.43	1	5
Observe another teacher’s classroom to get ideas for instruction or to offer feedback	9,310	1.65	0.89	1	5
Participate in peer observation/feedback program in which teachers observe and provide feedback to each other	9,401	1.55	0.92	1	5
Plan a lesson with another teacher	9,314	2.83	1.60	1	5
Provide or receive feedback about instructional practices or activities	9,245	2.49	1.21	1	5
Review student assessment data to make instructional decisions	9,289	2.91	1.21	1	5
Seek out another teacher to work on a particular issue	9,408	2.27	1.45	1	5
Overall Helpfulness Measure	Observations	M	SD	Min	Max
	5,866	3.12	0.69	1	4
Individual Helpfulness Items	Observations	M	SD	Min	Max
<b>“To what extent was [this activity] helpful when you were making decisions about the teaching activities or strategies used in your classroom?” (1=Not Helpful; 2=Helped Me a Little Bit; 3=Helped Me Some; 4=Helped Me a Lot)</b>					
Meet with grade-level team (e.g., fourth grade team or ninth grade academy)	4,659	3.16	0.88	1	4
Meet with subject-area team (e.g., science department or literacy PLC)	4,527	3.07	0.87	1	4
Meet with informal group of teachers that gathers to address different areas of need	3,579	3.13	0.79	1	4
Participate in peer observation/feedback program in which teachers observe and provide feedback to each other	1,856	2.87	0.87	1	4
Seek out another teacher to work on a particular issue	3,010	3.46	0.69	1	4

Note: Two reasons explain the difference in sample sizes between the frequency items and helpfulness items. First, only those teachers who indicated that they had participated in a specific activity were subsequently asked to rate its helpfulness. Second, an error in the survey formatting resulted in a subset of teachers skipping this question.

**Table 11. Intraclass Correlations From Three-Level Models**

Variable	District-level Variation	School-level variation
<b>Frequency measures:</b>		
Overall measures:		
Frequency Std. Scale	5%	13%
Individual items:		
Ask another teacher for advice about your teaching	1%	3%
Meet with grade-level team (e.g., fourth grade team or ninth grade academy)	3%	28%
Meet with subject-area team (e.g., science department or literacy PLC)	6%	13%
Meet with informal group of teachers that gathers to address different areas of need	1%	1%
Observe another teacher’s classroom to get ideas for instruction or to offer feedback	3%	14%
Participate in peer observation/feedback program in which teachers observe and provide feedback to each other	2%	8%
Plan a lesson with another teacher	6%	16%
Provide or receive feedback about instructional practices or activities	2%	5%
Review student assessment data to make instructional decisions	4%	12%
Seek out another teacher to work on a particular issue	1%	2%
<b>Helpfulness measures:</b>		
Overall measures:		
Helpfulness Std. Scale	1%	7%
Individual Items		
Meet with grade-level team (e.g., fourth grade team or ninth grade academy)	1%	9%
Meet with subject-area team (e.g., science department or literacy PLC)	2%	7%
Meet with informal group of teachers that gathers to address different areas of need	0%	4%
Participate in peer observation/feedback program in which teachers observe and provide feedback to each other	1%	10%
Seek out another teacher to work on a particular issue	0%	3%

**Table 12. Conditional Means of Collaborative Learning Opportunities by Teacher Characteristics**

	Frequency Std. Scale			Helpfulness Std. Scale		
	Mean	SD	P-value	Mean	SD	P-value
<b>Teacher Characteristics</b>						
Gender						
Female	0.04	(0.99)		0.05	(0.98)	
Male	-0.18	(1.02)	<0.001	-0.29	(1.02)	<0.001
Race/Ethnicity						
Teacher of Color	0.34	(1.14)		0.10	(1.03)	
White Teacher	-0.03	(0.98)	<0.001	-0.01	(1.00)	0.07
Years of Teaching Experience						
0-3 years	0.17	(1.01)		0.03	(0.99)	
4-6 years	0.04	(0.98)		0.03	(0.99)	
7-10 years	-0.02	(0.96)		-0.05	(1.00)	
11-17 years	-0.01	(1.01)		-0.01	(1.02)	
18-25 years	-0.09	(0.98)		-0.05	(1.00)	
26 or more years	-0.18	(1.01)	<0.001	0.05	(1.00)	0.08
Experience in School						
New to school	0.15	(1.03)		0.01	(0.99)	
Returners	-0.03	(0.99)	<0.001	-0.01	(1.00)	0.25
Primary Subject						
Math	-0.03	(0.96)		-0.18	(1.02)	
ELA	0.19	(0.94)		-0.05	(1.01)	
Science	0.03	(0.99)		-0.11	(1.02)	
Social Studies	-0.08	(0.98)		-0.20	(0.99)	
Self-contained	0.34	(0.92)		0.25	(0.92)	
SPED	-0.16	(1.03)		-0.07	(1.00)	
Foreign Language/Creative Arts	-0.62	(0.86)		-0.24	(1.05)	
CTE/Health/PE	-0.34	(1.02)	<0.001	-0.33	(0.96)	<0.001
Tested Subject						
Tested	0.12	(0.96)		-0.05	(1.00)	
Untested	-0.09	(1.02)	<0.001	0.04	(1.00)	<0.001
Prior Performance (2017 Avg. Obs. Score)						
Lowest Quartile	-0.04	(0.99)		-0.03	(1.01)	
Second Quartile	-0.05	(0.98)		-0.04	(0.98)	
Third Quartile	-0.03	(1.00)		-0.02	(1.00)	
Highest Quartile	0.04	(1.00)	<0.001	0.05	(1.00)	0.12
<b>Full Sample</b>	0.00	(1.00)		0.00	(1.00)	

Note: P-values estimated from t-statistics calculated using two-sample t-tests for binary variables and f-statistics calculated from one-way analysis of variance models.



**Table 13. Conditional Means of Collaborative Learning Opportunities by School/District Characteristics**

School/District Characteristics	Frequency Std. Scale			Helpfulness Std. Scale		
	Mean	SD	P-value	Mean	SD	P-value
<b>School Level</b>						
Elementary	0.18	0.98		0.19	0.96	
Middle	0.14	1.00		-0.09	0.96	
High School	-0.29	0.97		-0.28	1.03	
K-8/K-12	-0.26	0.91		-0.03	0.98	
Other	-0.25	0.95	<0.001	-0.19	1.07	<0.001
<b>School Type</b>						
Charter	0.31	1.08		-0.17	1.10	
Traditional	0.00	1.00	0.15	0.00	1.00	0.65
<b>School Prior Performance</b>						
Level 1 (Lowest)	0.00	1.03		-0.11	1.04	
Level 2	-0.09	0.99		-0.09	1.01	
Level 3	-0.06	0.96		0.05	0.96	
Level 4	-0.02	1.00		-0.05	1.01	
Level 5 (Highest)	0.02	0.99	0.07	0.04	0.98	<0.001
<b>School size (# of teachers)</b>						
Lowest Tercile	-0.06	1.00		0.05	0.99	
Middle Tercile	0.09	1.00		0.02	1.01	
Highest Tercile	-0.03	0.99	<0.001	-0.08	1.00	<0.001
<b>% students economically disadvantaged</b>						
Lowest Tercile	0.03	0.98		0.01	0.99	
Middle Tercile	-0.12	0.98		-0.07	1.01	
Highest Tercile	-0.03	0.97	<0.001	0.15	1.01	0.57
<b>% teachers new to school</b>						
Lowest Tercile	-0.05	0.99		0.05	1.00	
Middle Tercile	-0.02	1.01		0.00	0.98	
Highest Tercile	0.07	1.00	<0.001	-0.05	1.02	0.03
<b>District Size</b>						
Less than 10 schools	-0.13	0.98		0.04	0.99	
10-20 schools	-0.08	0.99		-0.08	1.03	
21-50 schools	0.04	0.99		0.04	0.98	
More than 50 schools	0.22	1.01	<0.001	0.00	1.00	0.35
<b>District Context</b>						
Rural	-0.18	0.97		-0.05	1.01	
Town	-0.07	1.01		0.01	1.00	
Suburb	0.08	0.98		0.02	0.97	
City	0.20	1.00	<0.001	0.02	1.00	0.08
<b>Full Sample</b>	0.00	(1.00)		0.00	(1.00)	

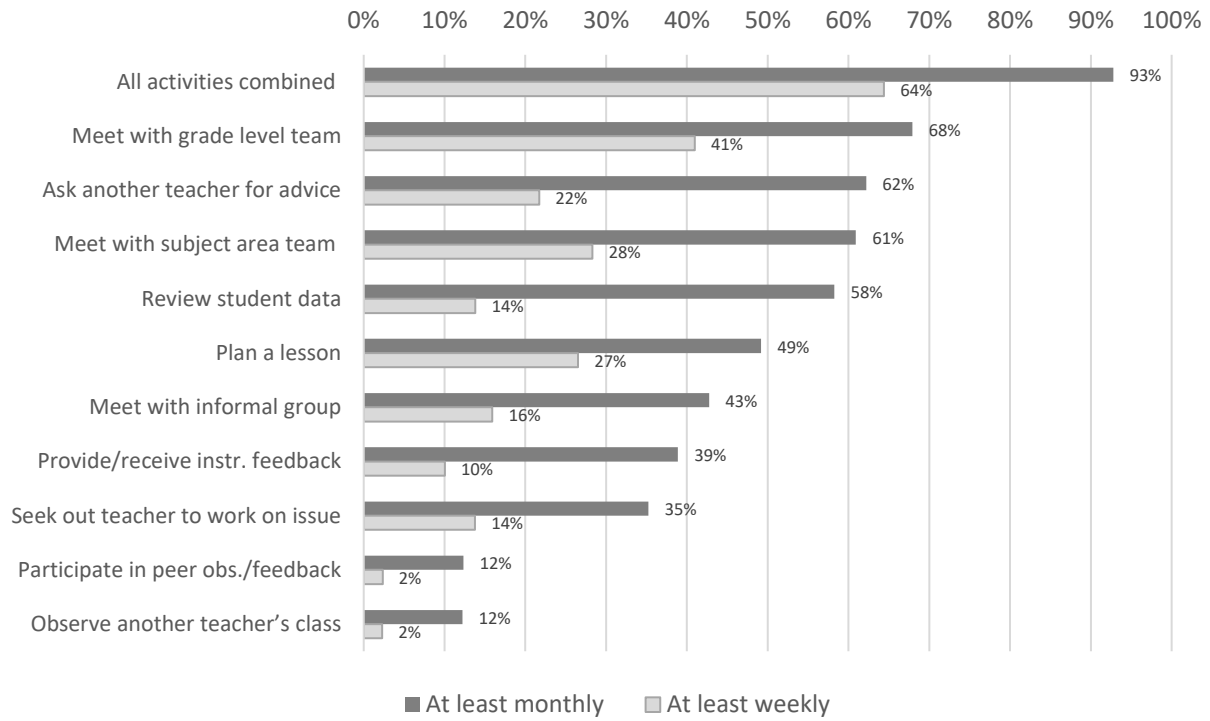
Note: P-values estimated from t-statistics calculated using two-sample t-tests for binary variables and f-statistics calculated from one-way analysis of variance models.

**Table 14. Regression Results for Organizational Conditions**

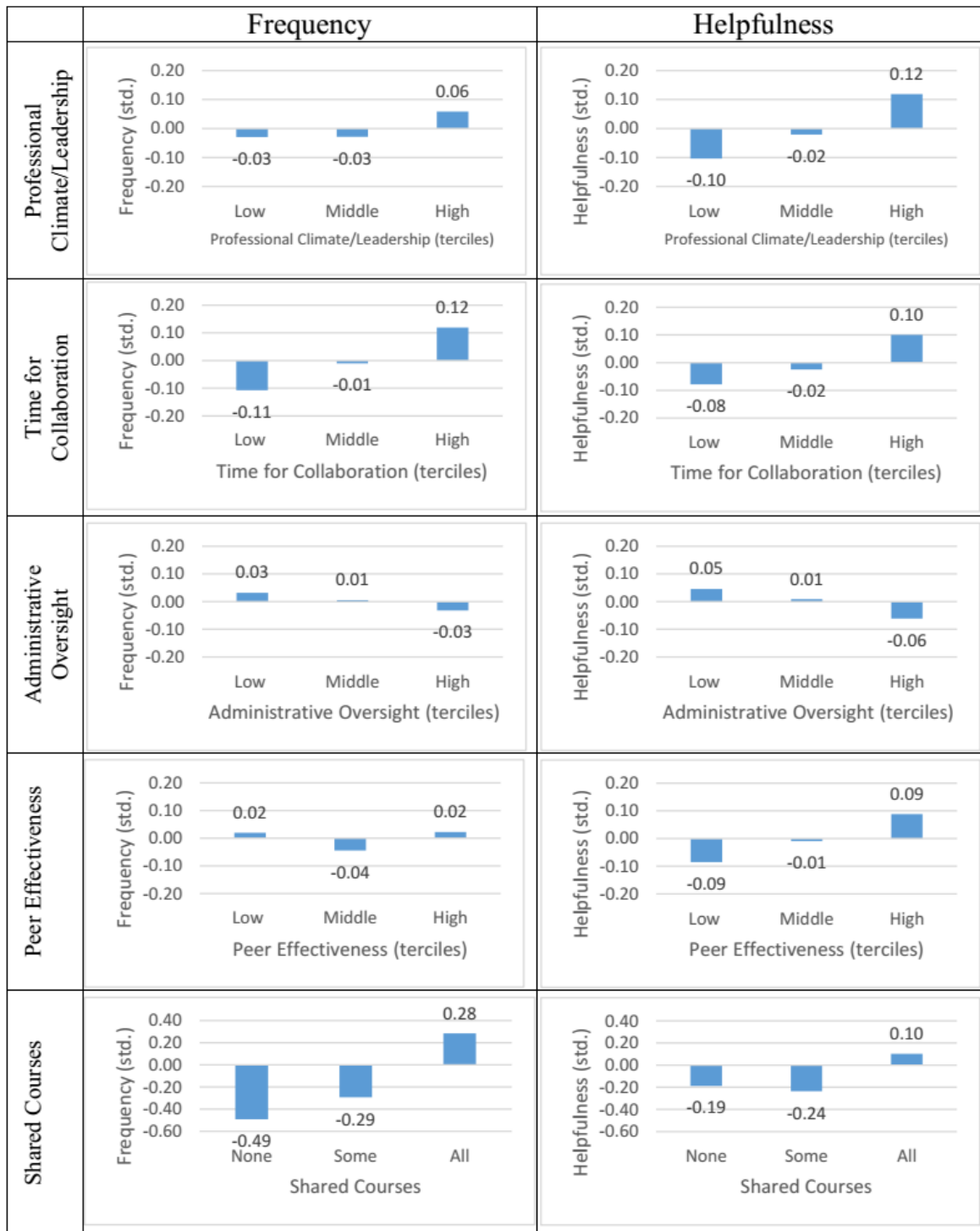
	Panel A: Frequency Std. Scale				Panel B: Helpfulness Std. Scale			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
<b>Organizational Conditions of Schools</b>								
Professional Climate & Leadership (Std.)	0.011 (0.013)	0.023 (0.013)		0.027 (0.014)	0.064*** (0.015)	0.056*** (0.016)		0.042** (0.015)
Time for Collaboration (Std.)	0.069*** (0.013)	0.066*** (0.013)		0.062*** (0.015)	0.013 (0.015)	0.010 (0.015)		0.012 (0.014)
Adm. Oversight over Collaboration (%)	-0.000 (0.001)	-0.000 (0.001)		-0.001 (0.001)	-0.002*** (0.001)	-0.003*** (0.001)		-0.002*** (0.001)
Peer Expertise (team avg. of prior year observation scores)	-0.004 (0.012)	-0.000 (0.012)	0.023 (0.016)	0.003 (0.010)	0.051*** (0.014)	0.040** (0.014)	0.023 (0.020)	0.036* (0.015)
Shared courses (compared to none)	0.128*** (0.031)	0.166*** (0.032)	0.198*** (0.039)	0.160*** (0.032)	-0.084* (0.042)	-0.039 (0.044)	-0.028 (0.056)	-0.037 (0.053)
Some shared courses								
All shared courses	0.516*** (0.030)	0.478*** (0.031)	0.479*** (0.037)	0.470*** (0.035)	-0.068 (0.039)	-0.066 (0.041)	-0.061 (0.054)	-0.050 (0.041)
Teacher-level Covariates	X	X	X	X	X	X	X	X
School and District Covariates		X	X	X		X	X	X
School Fixed Effects			X				X	
District Fixed Effects				X				X
<b>Observations</b>	<b>9615</b>	<b>9615</b>	<b>9615</b>	<b>9615</b>	<b>5866</b>	<b>5866</b>	<b>5866</b>	<b>5866</b>

Note: Standard errors in parentheses

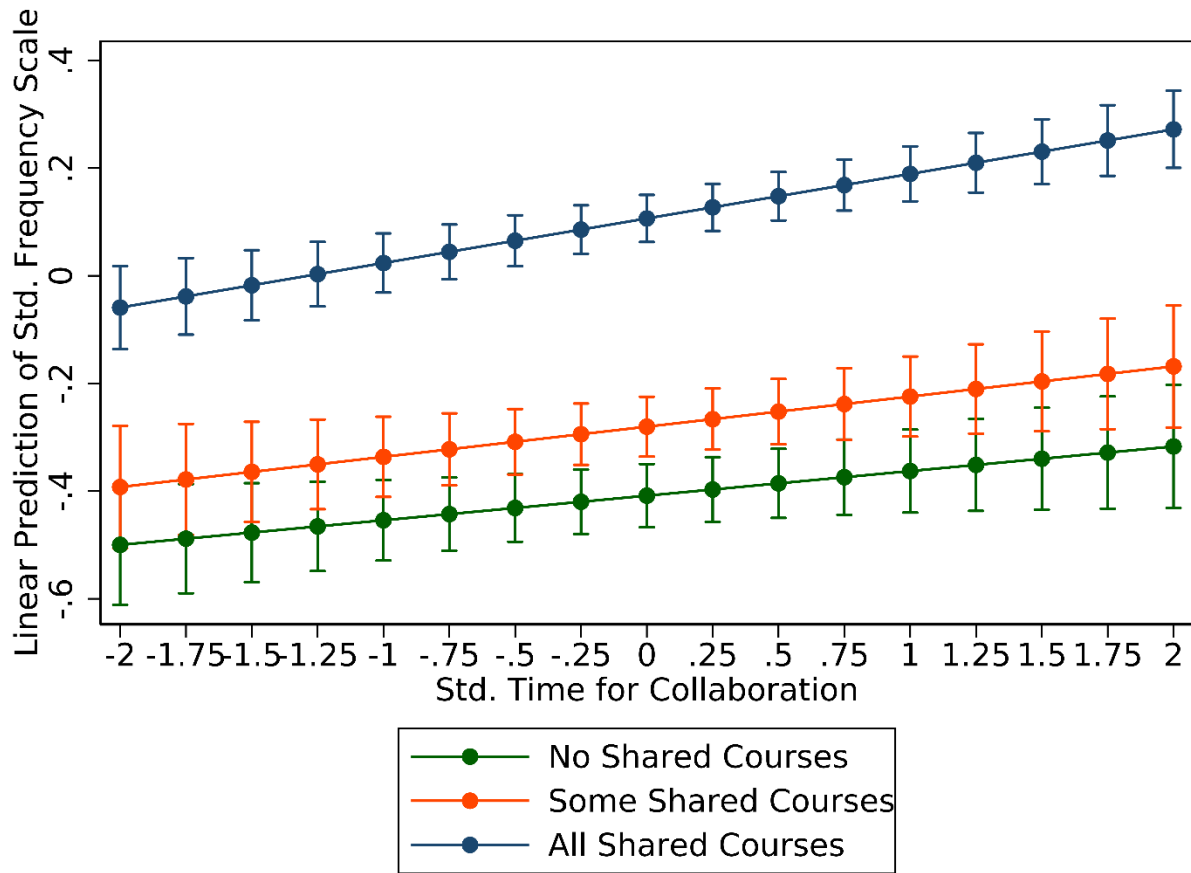
\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



**Figure 1. Sample Frequency by Specific Collaborative Activities**

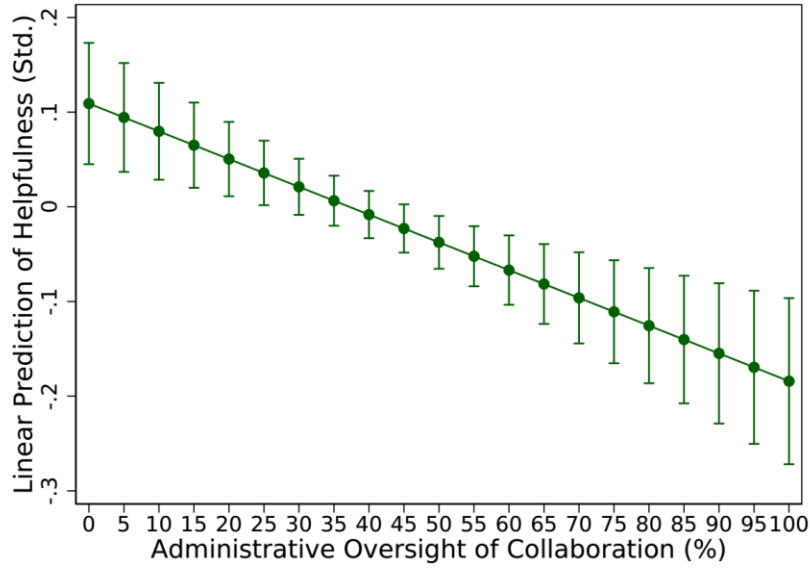


**Figure 2. Conditional Means of Collaborative Learning Opportunities by Organizational Conditions of Schools**

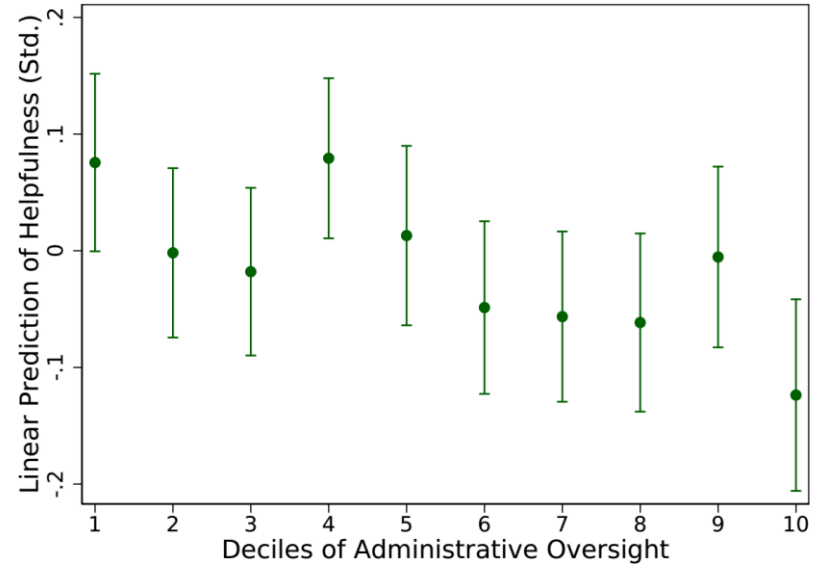


**Figure 3. Frequency of Collaborative Learning Opportunities by Shared Courses and Time for Collaboration**

Panel A. Linear Measure of Administrative Oversight



Panel B. Categorical Measure of Administrative Oversight



**Figure 4. Helpfulness of Collaborative Learning Opportunities by Administrative Oversight**

## CHAPTER IV

### TEAMING UP: EXAMINING THE RELATIONSHIP BETWEEN TEACHER COLLABORATION AND PERFORMANCE

#### Introduction

Teachers have long-term, lasting effects on their students' academic performance, social-emotional development, and even their adult lives (Blazar & Kraft, 2017; Chetty, Friedman, & Rockoff, 2014; Rivkin, Hanushek, & Kain, 2005; Rockoff, 2004). Policy makers and school leaders have spent considerable time and effort on supporting teacher development and encouraging quality teaching. These efforts include changing the pre-service qualifications required of teachers (Clotfelter, Ladd, & Vigdor, 2007; Darling-Hammond & Youngs, 2002), investing in new teacher evaluation systems (Danielson & McGreal, 2000; Darling-Hammond, 2013), and improving the quality of professional development offered to teachers (Borko, 2004; Desimone, 2011). While these policy approaches have focused primarily on an individual teacher as the unit of development, there is increasing recognition that development efforts should be embedded in teachers' daily work with their colleagues (Darling-Hammond, Hyler, Gardner, & Espinoza, 2017; Johnson, 2012; Opfer & Pedder, 2011).

Teachers regularly describe their colleagues as one of their most valuable resources (Drury & Baer, 2011; Johnston & Tsai, 2018; Markow & Pieteres, 2009; Wolman, 2010). In particular, teachers report seeking out other teachers who teach the same grade or subject in order to get advice about instruction (Frank, 2009; Spillane et al., 2015, 2012). These subject-area or grade-level teams became spaces "where people have concrete things to tell one another and concrete instructional help to provide one another, and where the arrangements of time, space, and common tasks are more likely to provide the necessary preconditions" for working together (Siskin, 1994, p. 90).

In the past three decades, an explosion of school improvement and teacher development efforts have focused on building collaborative teams among teachers (Darling-Hammond et al., 2017; McLaughlin & Talbert, 2006; Schleicher, 2016; Supovitz, 2002; Vescio et al., 2008). These teams, often organized around shared teaching assignments or common students, are intended to create opportunities for teachers to learn with each other and work collectively towards improving their instructional practices. These efforts have shifted the structures and norms of schools away from isolationism (in which teachers work as sole practitioners in their classrooms) towards more collective entities in which teachers are expected to work together (Hargreaves, 2010; Johnson et al., 2017). Quantitative evidence about peer effects among teachers suggest that teachers indirectly affect the achievement outcomes of students taught by other teachers on their grade-level team (Jackson & Bruegmann, 2009; Sun et al., 2017). While these analyses do not directly measure whether and how teachers work together, their authors posit that collaboration is the key mechanism by which teachers influence the achievement of their peers' students.

Additionally, there is growing evidence that teacher collaboration is directly and positively associated with student achievement, especially when those collaborative interactions are focused on instruction, curriculum, or students (R. Goddard et al., 2015; Y. L. Goddard et al., 2007; Ronfeldt et al., 2015; Supovitz, 2002; Vescio et al., 2008). While there are many examples of how collaboration can create opportunities for teachers to learn from each other, teachers and those studying teachers repeatedly caution against assuming that all collaboration supports teacher development and performance (Achinstein, 2002; Gates Foundation, 2014; Hargreaves, 2000; I. S. Horn et al., 2017; Judith Warren Little, 1990; Talbert, 2010). It is important to better understand whether and to what extent collaboration is associated with teacher performance as well as whether these relationships vary based on the characteristics of their peers on their grade-level or subject-area teams.



Drawing on statewide administration and survey data from public school teachers in Tennessee, this analysis examines the relationship between collaboration and teacher performance as measured by classroom observations and value-added scores. In particular, I focus on collaboration among instructional teams, specifically those organized around grade-level and subject-area. While past research has either focused on whether collaboration is associated with performance outcomes (Goddard et al., 2015; Ronfeldt et al., 2015) or whether there are performance benefits based on the composition of teacher's instructional teams (Jackson & Bruegmann, 2009; Sun et al., 2017), this analysis considers both how often teachers collaborate and who they are most likely to collaborate with. In particular, this analysis estimates the relationships between collaboration, team characteristics, and performance outcomes by leveraging within-school differences across teams of teachers in order to estimate the effects of collaboration. Given that collaboration can be shaped by many structural and normative conditions at the school level that could also influence teachers' effectiveness, this approach may better isolate the relationship between collaboration itself and teacher performance.

Before describing my analysis, I first review prior research measuring the relationship between collaboration and teacher performance. I then discuss teacher teams as the collaborative group that may be most important to teachers' learning and growth. I then describe the data and methods of this study, present the results, and discuss the implications of the findings.

### **Measuring the Relationship Between Collaboration and Performance**

A broad range of research has focused on understanding how teachers work together and how, if at all, this collaboration influences teachers' classroom practice and student learning (for example, see Vangrieken et al. (2015) for a systemic review on teacher collaboration). Most studies examine specific programs intended to increase collaboration or engender certain types of collaboration. For example, research has estimated the effects of implementing professional learning communities (Stoll et al., 2006;

Vescio et al., 2008), peer coaching (Bruce & Ross, 2008; Jarvis et al., 2017), and efforts facilitating the use of student data to inform practice (Datnow, Park, & Kennedy-Lewis, 2013; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006; Saunders et al., 2009).

How teacher collaboration is conceptualized and measured varies across empirical research studies. There is often disagreement about ‘what counts’ as collaboration and a need for greater clarity about the components of collaboration (DuFour, 2004). Research does agree, however, that collaboration is most likely to affect student learning when teachers’ collaborative work focuses on instruction. As part of an evaluation of an district-based effort to develop communities of instructional practice, Supovitz (2002) found that only a minority of teacher instructional teams regularly focused on instructional practices by engaging in such work as co-developing shared assessments, examining student work, and observing each other’s classrooms. While the evaluation found little evidence that schools implementing instructional teams had higher student achievement outcomes overall, there were consistently positive and significant associations between the degrees to which specific teacher teams focused on instructional practices and the achievement outcomes of students taught by teachers on that team. Similarly, Saunders et al. (2009) evaluated a five year effort to support grade-level teacher teams to focus directly on improving student learning and found that student achievement at participating schools improved at a faster rate than in comparison schools once teacher teams had a “consistent focus, planning, and time for academic topics, goals, and indicators” (p. 1019).

Most larger-scale studies examining the relationship between collaboration and outcomes include measures of how often or regularly teachers work together in instructionally-focused collaboration. In their analysis of relationships between collaboration, instructional leadership, teacher efficacy, and student achievement, Goddard and colleagues argue that frequency is key to understanding collaboration’s impact on instructional improvement because frequency is a measure of intensity and “if collaboration occurs but rarely, we would expect its impact on instructional

improvement to be substantively diminished” (Goddard et al., 2015, p. 506) Their analysis creates three distinct measures of collaboration to capture (1) frequency of collaboration, (2) the presence of formal structures to support collaboration, and (3) the extent to which teachers work to establish instructional policy. In their descriptive analysis, they find that these measures are positively correlated. Their final analysis, using structural equation modeling, combines these three measures of collaboration into one construct and finds that teacher collaboration influences reading and math achievement by increasing the collective efficacy of teachers (Goddard et al., 2015). Similarly, Ronfelt et al. (2015) combine measures of frequency with the extent to which teachers rate their collaborative activities as helpful. Their analysis uses this combined measure—which they describe as a proxy for “collaboration quality”—and finds that both schools and teachers that have higher rates of collaboration around instruction also have higher achievement gains in terms of student test scores.

### **Teacher Teams as Critical Sites for Collaboration**

Although broader school conditions are important to shaping the structure of and norms about collaboration (Leithwood & Jantzi, 1990; Lieberman, 1990; Rosenholtz, 1989), specific grade-level or subject-area teams may have the most direct impact on teachers’ instructional practice and professional learning (Bidwell & Yasumoto, 1999; Huberman, 1993; Siskin, 1991, 1994). In most cases, teachers from the same grade-level and/or subject-area share common standards, assessments, curriculum, and/or materials, and many schools structure their school day so that these teachers have common planning time to facilitate greater collaboration. Research on instructional ties among elementary teachers concludes that teachers in the same grade-level are much more likely to report providing or receiving instructional advice than cross-grade teachers (Spillane et al., 2015, 2012). Similarly, qualitative research in secondary schools often find that teachers are socialized into a particular discipline—and sometimes to a specific subculture of teachers within a school organized around that discipline—and argue that

subject-based departments are key to structuring teachers' professional lives and developing norms of practice (Bidwell & Yasumoto, 1999; Hargreaves, 1994; Siskin, 1994).

Case studies of how teachers work together consistently find that not all teacher teams are equally effectively in supporting teacher development and, in some cases, teams within the same school operate quite differently (Charner-Laird et al., 2017; I. S. Horn & Little, 2010; Levine & Marcus, 2010; Scribner, Sawyer, Watson, & Myers, 2007). An indirect approach to measuring whether collaboration affects teacher performance is to assess the experience or performance of the peers with whom teachers are most likely to collaborate. In an analysis of elementary teachers in North Carolina, Jackson and Bruegmann (2009) find that the "quality" of a teacher's grade-level peers explain up to 20% of a given teacher's effect on her own students' test scores. They measure peer quality in two ways: (1) observable measures of experience, licensure, and advanced degrees for teachers' peers in their same grade and (2) average value-added measures for teachers' peers in the same grade. Jackson and Bruegmann report that this effect persists over time, suggesting that teachers are learning to improve from their peers in ways that endure even when those peers change. Taking a similar methodological approach, Sun, Loeb, and Grissom (2017) examine cases in which elementary and middle school teachers switch schools to estimate the effect of the introduction of a new peer onto a grade-level team. Their analysis similarly finds peer effects among teachers, such that the introduction of a more effective teachers onto a grade-level team is associated with an increase in the achievement of students taught by other teachers on that team. These findings suggest that the effectiveness of teachers, at least as measured by student test scores, appears to be affected by other teachers with whom they work.

While both studies mention collaboration as the likely mechanism by which a teacher's peers influence their own students' achievement, neither Jackson and Bruegmann (2009) nor Sun et al. (2017) measure collaboration directly. In this analysis, I examine whether teacher performance outcomes are associated with the teacher-reported frequency of collaboration within teams or with the attributes of a

teacher's peers in their grade-level or subject-area team. In doing so, this analysis brings together research on the relationship between collaboration frequency and teacher performance outcomes and research on the particular importance of grade-level or subject-area peers in shaping how teachers work. Using statewide administration and survey data from Tennessee, I explore whether and under what conditions teacher collaboration is associated with teacher performance outcomes. In particular, I address the following research questions:

1. To what extent are grade-level or subject-area team characteristics associated with the frequency of collaboration?
2. To what extent is teacher-reported and team-reported frequency of collaboration associated with teacher performance outcomes?
3. How, if at all, do these associations vary by team characteristics and school level?

## **Data and Methods**

### **Data**

This study uses state-wide survey and administrative data collected through a partnership between the Tennessee Department of Education (TDOE) and the Tennessee Education Research Alliance (TERA). The administrative data includes demographic, enrollment, and performance data for teachers and students in all public schools within the state. The survey data comes from the Tennessee Educator Survey, a state-wide survey administered annually to all public school teachers to gather feedback about school climate, leadership, instruction, teacher evaluation and professional learning, and specific state initiatives. In 2018, 56% of all Tennessee teachers responded to the survey (N=35,693). I used administrative and survey data from the 2016-2017 and 2017-2018 academic years.

To place teachers on teams, I used the administrative course files—which list all of the specific courses taught by each teacher during the 2017-2018 year—to create teams based on teachers’ primary grade-level and subject-area assignment. Teachers were assigned to a grade-level team, subject-area team, or both depending on their specific teaching assignments. For example, a self-contained elementary teacher who teaches all subjects in second grade is assigned to the second grade team but not to a subject-area team. A middle school teacher who teaches seventh grade science is assigned to both the seventh grade and science teams. I analyzed grade-level and subject-area team collaboration separately.

## **Sample**

The analyses in this paper focus on a subset of teacher teams across Tennessee with sufficient data from the 2018 Tennessee Educator survey to construct measures of teacher-level and team-level collaboration. Detailed questions about collaboration appear only in one subset of the survey questions, called the professional learning module, which is given to a randomly selected subset of teachers who took the survey (N=11,039). I further limited the sample in this analysis to teachers for whom I can determine their primary grade and/or subject assignment (N=10,284).<sup>14</sup> Primary teaching assignments are necessary to define and operationalize subject-area or grade-level teams. Further, I limited the sample to grade-level and subject-area teams in which at least two teachers answered questions on the professional learning module (N= 8,765). Finally, I limited the sample to teachers who have prior-year observation scores (N=6,970) or value-added scores (N=2,341) from Tennessee’s evaluation system. This

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<sup>14</sup> A subset of teachers do not appear in the administrative course files and, therefore, I cannot determine their primary teaching assignments. In addition, a small proportion of teachers do not have a primary subject-area or grade-level assignments because (1) they do not have a modal subject-area or grade-level assignment or (2) the specific courses that they teach could not be assigned to a subject-area or grade-level.

restriction eliminated all first-year teachers, teachers who are in their first year of teaching in Tennessee public schools, or teachers who are otherwise missing observations or value-added scores.

Table 15 presents descriptive information about all public school teachers in Tennessee and the analytic sample for this analysis. While this sample still includes a broad range of Tennessee teachers (6,970 teachers representing 1,322 schools and 140 districts), this sample is not representative of all teachers in Tennessee. As Table 15 illustrates, and as expected given the ways in which I have limited the sample to address my specific research questions, certain types of teachers and schools are underrepresented in this sample, including teachers of color, new teachers, teachers of untested subjects, elementary teachers, and teachers in urban schools.

## Measures

In the following sections, I briefly describe the measures used in this analysis. More detail on the specific variables and related survey questions can be found in Appendix C. Tables 15, 16, and 17 present descriptive statistics for all variables used in this analysis and Table 18 presents a correlation matrix of these variables.

**Frequency of collaboration.** Teacher-level and team-level measures of the frequency of collaboration are the outcome variables in analyses answering the first research question and then the key independent variables to answer the second and third research questions. The teacher-level measures were constructed using teacher survey items asking teachers to estimate how frequently they engaged in instructionally-focused collaboration, such as meeting with a grade-level or subject-area team, observing another teacher's classroom, providing or receiving instructional feedback, or reviewing student data to make instructional decisions. I created a standardized frequency scale meant to capture how often teachers engage in 10 different collaborative activities focused on teaching and learning (Cronbach's  $\alpha=0.78$ ). Table 17 displays a list of the survey items and the sample averages for each

individual item. To specifically examine whether collaboration within teacher teams is associated with teacher improvement, I included the individual items asking teachers to rate the frequency of their grade-level and subject-area teams in a supplementary analysis.

I also created team-level measures of collaboration by aggregating the measures just described to the team-level. For the purposes of this analysis, team collaboration is defined as when teachers work with a group of teachers in their same school whose primary teaching assignment is in the same grade-level and/or subject-area. This definition mirrors conceptions of teacher teams commonly used in the literature on teacher collaboration (Vangrieken et al., 2015).

**Teacher performance.** The dependent variables for the second and third research questions capture teacher performance as measured by Tennessee’s accountability system. The first measure, annual average observation score, is drawn from classroom evaluations conducted during the 2017-2018 academic year. Observations are required for all public school teachers in Tennessee, and teachers are scored on a five-point scale in which 1 represents “significantly below expectations” and 5 represents “significantly above expectations.” All teachers are observed at least once per year, although the number of observations depends on the district, the teacher’s level of experience, and the teacher’s prior performance. For analyses involving observation scores, I included indicator variables for the specific evaluation system used and teachers’ average observation score from the prior academic year.

For a subset of teachers, additional analyses use teacher-level value-added measures calculated based on student growth on state-mandated standardized tests. Tennessee administers annual assessments in math, reading, social studies, and science to all students in grades 3-8 and end of course exams in certain secondary subjects (English I, English II, English III, Algebra I, Algebra II, Geometry, Biology, Chemistry, and U.S. History) for high school students. These test scores are used to construct teacher effectiveness scores as part of the Tennessee Value-Added Assessment System (TVAAS). In all analyses, I included teachers’ prior year value-added score as a control variable. Only 34% of the analytic



sample teach in tested subjects that allow for the calculation of a value-added measure. Table 16 shows the sample averages for the average observation and value-added scores for the 2017-2018 year as well as the prior year scores.<sup>15</sup>

**Compositions of teacher teams.** I have constructed measures separately for teachers' grade-level and subject-area teams. I include the number of teachers in a given team, a peer average of the teaching experience for all other teachers on the team, and a peer average of the prior year observation scores for all other teachers on the team with prior scores. Both peer experience and peer prior performance serve as a proxy of "peer quality" that has been studied in prior research on peer learning among teachers (Jackson & Bruegmann, 2009; Sun et al., 2017).

**Moderator variables.** To answer the third research question, I examined whether the relationship between collaboration and performance outcomes are moderated by the team measures capturing peer experience, the team measures capturing peer prior performance, and school level (elementary, middle, or high). For this analysis, teams have been split into terciles based on peer average experience and peer average prior performance. Instructional teams, especially grade-level teams, operate differently based on the level of the school. In particular, teachers within grade-level teams in elementary schools teach the same content while teachers within grade-level teams in middle and high schools teach the same students. As a result, grade-level collaboration may have a stronger relationship with performance outcomes for teachers in elementary schools and my moderation analysis examined this hypothesis.

**Control variables.** I include teacher-level and school-level control variables that have been identified in prior literature as contributing to teacher and student outcomes. Teacher characteristics include gender, race/ethnicity, years of teaching experience, an indicator for whether teachers are new to their school, teaching assignment, and an indicator for whether teachers teach any tested subjects.

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<sup>15</sup> Scores are presented in Table 16 in their original scale but then standardized for the regression analyses

Teaching assignment was created using the course files described previously and captures teachers' primary grade-level and subject-area assignment. Finally, school characteristics include school level (i.e., elementary, K-8/K-12, middle, high school, and other configurations), faculty size, the percentage of faculty who are new to school, geographic context (i.e., rural, town, suburb, city), student demographics (percentage of students of different race/ethnic backgrounds, percentage of students who are identified as special education, and the percentage of students identified as economically disadvantaged), faculty turnover, and overall school performance from the prior year as measured by Tennessee's accountability system.

### **Analytic Approach**

To answer the first question, I estimated the relationship between team characteristics and the three measures collaboration frequency described previously. The following equation summarizes the full model for the teacher-level frequency of collaboration:

$$Collab_{ims} = \beta_0 + \beta_1 team_{ms} + \beta_2 teacher_{ims} + \beta_3 school_s + \varepsilon_{ims} \quad (1)$$

I model each measure of the frequency of collaboration ( $Collab_{ims}$ ) for teacher  $i$  on team  $m$  in school  $s$ , as a function of a fixed intercept, a vector of team characteristics ( $team_{ms}$ ), a vector of teacher characteristics ( $teacher_{ims}$ ), a vector of school characteristics ( $school_s$ ), and an idiosyncratic error term. When examining what predicts frequency measured at the team level, I use the same model and replace the teacher-level measure of frequency ( $Collab_{ims}$ ) with a grade-level team measure ( $Grade\_Collab_{ms}$ ) or a subject-area team measure ( $Subject\_Collab_{ms}$ ). I also included models that have school fixed effects to examine which teacher-level and team-level characteristics predict the frequency of collaboration when controlling for unobserved characteristics that all teachers in a school have in common.

To answer the second research question, I used two different strategies to estimate whether collaboration is associated with teacher performance. I first examined whether the average frequency of collaboration reported by individual teachers is associated with teacher observation scores using the following general model:

$$Obs_{ims} = \beta_0 + \beta_1 PriorObs_{ims} + \beta_2 Collab_{ims} + \beta_3 Teacher_{ims} + \beta_4 Team_{ms} + \beta_5 School_s + \theta_{subject} + \theta_{grade} + \varepsilon_{ims} \quad (2)$$

$Obs_{ims}$  is the average observation score for teacher  $i$  on team  $m$  in school  $s$  for the 2017-2018 academic year.  $PriorObs_{ims}$  represents that teacher's average observation score from the 2016-2017 academic year. Therefore, this set of analyses only includes teachers who have classroom observation scores from both school years.  $Collab_{ims}$  is the key independent variable of interest and represents the frequency of collaboration reported by teacher  $i$  on team  $m$  in school  $s$ .  $Teacher_{ims}$ ,  $Team_{ms}$ , and  $School_s$  are vectors of teacher, team, and school characteristics. In this analysis, both subject-area and grade-level team characteristics are included (if applicable given a teacher's primary assignment). Finally, this model includes grade-level fixed effects, subject-area fixed effects, and an idiosyncratic error term. For the analyses of teacher value-added scores, I replaced the outcome measure and prior performance measure with value-added scores.

Next, I examined whether team-level measures of collaboration are associated with average observation scores by replacing the individual measure of collaboration in equation 2 with  $Collab_{ms}$ , the team average of frequency reported by teachers on team  $m$  in school  $s$ . For analyses focused on grade-level teams, all team variables are based on a given teacher's primary grade-level team. For analyses focused on subject-area teams, all team variables will be based on a given teacher's primary subject-area team.

To better isolate the relationship between frequency of collaboration and performance outcomes, I used school fixed effects in order to compare differences in reported collaboration across

teacher teams within the same school. To do so, I add a school fixed effect term to the above equations. All school-level variables are absorbed into these fixed effects, which control for all observed and unobserved features of schools that are common to all teachers.

To answer the final research question, I build on the models described above by adding interaction terms between *Collab<sub>ms</sub>* and the three moderator variables described above (peer experience on team, peer prior performance on teams, and school level). In these analyses, I added interactions between these variables and the frequency of collaboration within my preferred model specification, which are the team measures of collaboration in models with school fixed effects. Because school level (e.g., elementary, middle, high) is absorbed into the school fixed effects, I am not able to estimate the main effect of these school characteristics on outcomes. However, I can examine the interaction coefficients in order to determine whether the relationship between collaboration and outcomes seems to vary by school level. For all three moderators, I also performed additional analyses in which I ran separate regression models by the moderating variable (for example, running the models separately for elementary, middle, and high school teachers).

For each outcome measure (average observation score and value-added score), I performed separate analyses for subject-area teams and grade-level teams. For all models, I clustered standard errors at the school-level and standardize the teacher performance variables and frequency of collaboration variables to aid interpretation of the results.

## Results

## **To What Extent Are Grade-Level or Subject-Area Team Characteristics Associated With the Frequency of Collaboration?**

Results for the first research question indicate that collaboration frequency is positively associated with team size and negatively associated with the average peer experience on the team. Table 19 presents results from a series of models in which the teacher-level or team-level frequency of collaboration is regressed on team, teacher, and school characteristics. The outcome measure in Panel A is the standardized collaboration frequency scale when measured at the individual teacher level. The outcome measures in Panels B and C are the standardized collaboration frequency scales for grade-team and subject-area teams respectively. I am particularly interested in examining the degree to which team characteristics are associated with the frequency of collaboration. I briefly describe the results for the three team characteristics: team size, peer experience, and peer prior performance.

**Team size.** As shown in all three panels, team size is positively associated with the frequency of collaboration in all models. This association is small but statistically significant across most but not all models. An addition of one more teacher on a teacher's subject-area team is associated with 0.025-0.026 standard deviation increase in the frequency of collaboration across all models. An addition of five more teachers (the equivalent of a standard deviation increase) is associated with a 0.13 standard deviation increase in collaboration frequency. Given that team size is associated with school size, it is notable that the association between subject-area team size and collaboration frequency are very similar in models with or without school fixed effects.

**Peer experience.** In most models, the average experience of a teacher's peers in their grade-level and subject-area teams is negatively associated the frequency of collaboration. These estimated associations are small. The estimated relationships are always negative but only statistically significant in some models. For grade-level teams, a one year increase in the average peer experience of a team is associated with a 0.004-0.012 standard deviation decrease in the team-level frequency of collaboration.

A five year increase in average peer experience for grade-level teams (the equivalent of a one standard deviation increase) is associated with a 0.04 standard deviation increase in grade-level team collaboration frequency. This mirrors the negative relationship between individual teacher experience and frequency of collaboration as shown in the full regression results from Table 19 (shown in Table A7 in Appendix E).

**Peer prior performance.** The results do not find any evidence of either a positive or negative relationship between the average prior performance of a teacher’s peers and the frequency of collaboration.

Although this analysis focuses on how team characteristics predict the frequency of collaboration, it is worth noting a few other consistent associations between collaboration frequency and other teacher-level and school-level characteristics (shown in the full results in Table A7 in Appendix E). First, teachers with higher prior observation scores report engaging in slightly more frequent collaboration than teachers with lower prior scores, all else equal. Also, there are large and consistent associations between primary teaching assignment (i.e., grade-level and subject-area) and frequency of collaboration. Self-contained elementary school teachers report engaging in much more frequent collaboration than teachers in specific subject-areas and middle and high school teachers. The large differences illustrated in Table A7 reinforce the importance of including grade-level and subject-area fixed effects in the models for the second and third research question.

### **To What Extent is Teacher-Reported and Team-Reported Frequency of Collaboration Associated With Teacher Performance Outcomes?**

The results for the second research question are inconclusive. While there is some suggestive evidence that more frequent grade-level collaboration is associated with improved performance, none of the estimated relationships are consistent and statistically significant across all models. I present

regression results from models in which the frequency of collaboration is measured at the individual teacher level (Table 20), at the grade-level team level (Table 21), and at the subject-area team level (Table 22). In all three tables, Panel A presents results for standardized average observation scores for the full analytic sample and Panel B presents results for the subset of teachers who have a standardized value-added scores. Since all models include a teachers' prior year observation or value-added score, the coefficients can be interpreted as the estimated growth in either a teacher's average observation score or value-added score. Since patterns appear different for observation scores and value-added scores, I describe the patterns of results for each outcome measure separately.

**Observation scores.** For all three measures of the frequency of collaboration, there is little evidence to suggest a relationship between collaboration frequency and growth in observation scores in the models without school fixed effects. However, once school fixed effects are introduced in Model 3, the estimated coefficients increase substantially in magnitude (between two-fold and four-fold increases between Models 2 and 3) and—except in the case of subject-area team collaboration—become statistically significant. The school fixed effects models leverage differences between teachers or teams in the same school. As shown in Model 3 of Panel A in Table 21, a one standard deviation increase in the frequency of collaboration reported by teachers on the grade-level team is associated with a 0.03 standard deviation increase in annual observation score growth. Given that teachers in this sample, on average, only grew 0.07 standard deviations in their average observation scores between the 2016-2017 and 2017-2018 academic years, this estimated relationship is quite large. The estimated relationship between subject-area frequency of collaboration and observation score growth is slightly smaller and not statistically significant at conventional levels.

Tables 20, 21, and 22 also show the associations between observation score growth and the team characteristics discussed in the results for the first research question. There appears to be a small, positive association between the number of teachers on a team and observation score growth (the

estimated coefficients range from 0.001-0.011 standard deviations) but these findings are not consistent across models. In the models without school fixed effects (Models 1 and 2), there also appears to be a large, positive, and statistically significant association between the prior performance of a teacher's peers on their grade-level and subject-area teams and a teacher's growth in observation scores. These coefficients shrink considerably in magnitude and are no longer statistically significant in Model 3, which includes school fixed effects. This may suggest that the large positive associations estimated in the models without school fixed effects may be driven by how teachers are sorted in schools based on their prior performance.

**Value-added scores.** There are not consistent associations between the frequency of collaboration and growth in value-added scores. Across all three measures of collaboration, a similar pattern emerges. In Models 1 and 2, there are positive and relatively large associations between frequency of collaboration and growth in value-added scores (although these associations are not always statistically significant). For example, a one standard deviation increase in the frequency of collaboration reported by your grade-level team is associated with 0.06-0.07 standard deviation increase in annual value-added score growth. Given that teachers in this sample only experience 0.01 standard deviation annual growth on average, this is a very large estimated association. However, when school fixed effects are added in Model 3, the magnitude of this coefficient drops considerably and becomes statistically insignificant. This pattern could suggest that the collaboration measure in Models 1 and 2 is capturing other associated and unobserved characteristics of schools that are controlled for by the school fixed effects.

**Additional analyses.** To better understand what might be driving the patterns of results described above, I replaced the overall frequency scale with measures specifically capturing just the frequency of grade-level and subject-area meetings. In this series of regression models (not shown), I associate teacher-level and team-level measures of meeting frequency with teacher-level performance



in observation scores and value-added measures for both grade-level and subject-area teams. All of these models had insignificant results and inconsistent patterns. These results do not provide evidence that the relationship between collaboration and performance gains is driven by how often teachers meet with a grade-level or subject-area team.

### **How, If At All, Do These Associations Vary by Team Characteristics and School Level?**

To better understand for whom and under what conditions collaboration is associated with performance outcomes, I ran a series of regression models in which the collaboration measure is interacted with the hypothesized moderator variables (team peer experience, team peer prior performance, and school level). I find suggestive evidence that the frequency of grade-level team collaboration has a stronger relationship with observation scores for teachers in elementary schools and for teachers whose grade-level peers have higher prior performance. There are no significant interactions for subject-area teams, no significant interactions between grade-level team peer experience and frequency of team collaboration, and no significant results for interactions with value-added measures. The results for team peer experience and school level for grade-level teams are described below.

**Grade-level collaboration and peer experience.** Figure 5 illustrates the differing relationship between the frequency of grade-level collaboration and observation scores based on the prior performance of a teacher's peers (as measured by tercile categories). This regression analysis (not shown) separately estimated the relationship between the frequency of grade-level team collaboration and observation scores for each tercile as well as interacted frequency of grade-level team collaboration and terciles of peer experience. There is no significant relationship between collaboration and observation scores for teachers whose team members' prior observation scores place them in the lowest tercile of all grade-level teams in the analysis. In contrast, the estimated coefficient for frequency

of grade-level team collaboration is larger than the association estimated across the full sample, and it is statistically significant and practically meaningful ( $\beta=0.05$ ,  $p\text{-value}=0.024$ ). The moderating influence of peer prior performance is illustrated by the difference in slopes shown in Figure 5. As illustrated in the results for the first research question (Table 19), grade-level teams with higher prior performance do not collaborate significantly more frequently than other teams, all else equal. However, these results suggest that teachers in these grade-level teams may collaborate differently or may benefit more from their peer's expertise than teachers whose peers have lower prior performance.

**Grade-level collaboration and school level.** Figure 6 illustrates how school level (e.g., elementary, middle, high) moderates the relationship between the frequency of grade-level team collaboration and observation scores. The results suggest that the estimated relationship between the frequency of grade-level collaboration and observation scores found in fixed effects model in Table 20 are driven by teachers in elementary schools. In a regression analysis that examines whether the association between the frequency of grade-level collaboration and school level varies by school level (not shown), the estimated relationship between frequency of collaboration and observation scores is strongest for teachers in elementary schools ( $\beta=0.041$ ,  $p\text{-value}=0.013$ ) while this relationship is weaker and not statistically significant for middle school teachers ( $\beta=0.014$ ,  $p\text{-value}=0.676$ ) and high school teachers ( $\beta=0.023$ ,  $p\text{-value}=0.471$ ). These are illustrated in Figure 6 by the difference in the estimated slopes between the frequency of collaboration and observation scores by school level. These differences likely reflect how grade-level teams operate differently across school levels. As illustrated in Table 19, teachers in the higher grades report participating less frequently in all three measures of collaboration. Taken together, these findings suggest that high schools teachers may benefit less from engaging in more frequent collaboration, at least within their grade-level teams.

## Discussion

This analysis builds on prior work by examining the extent to which teacher collaboration is associated with performance outcomes (R. Goddard et al., 2015; Y. L. Goddard et al., 2007; Ronfeldt et al., 2015) and how the composition of teachers' instructional teams (Jackson & Bruegmann, 2009; Sun et al., 2017) are related to both the frequency of collaboration and performance outcomes. Given that prior research indicates that teachers are most likely to collaborate with teachers in their same grade-level or subject-area (Bidwell & Yasumoto, 1999; Siskin, 1994; Spillane et al., 2015, 2012), working within these teams is likely one of the primary ways that teachers collaborate. Indeed, 82% of the teachers in my analytic sample report meeting with a grade-level and/or subject-area team at least monthly and 50% report meeting with at least one of these teams on a weekly basis. Given that teachers typically only have limited time to engage in collaboration (Gates Foundation, 2012), better understanding whether this team-based collaboration supports teacher learning is very important. In this section, I review the major findings, consider the limitations of this analysis, and discuss implications for future work.

The findings for the first research question indicate that not all teachers or teacher teams engage equally in collaboration. Self-contained elementary teachers engage much more frequently in collaborative activities and higher performing teachers (as measured by prior year observation scores) also engage in slightly more collaboration. This positive association between prior performance and frequency of collaboration mirrors findings from prior work by Spillane and colleagues which finds that higher performing teachers report seeking out more instructional advice from colleagues than their lower performing peers (Spillane, Shirrell, & Adhikari, 2018). Team size is positively associated with frequency of collaboration even in models that compare team sizes within schools. This association likely reflects the fact that teachers who have larger grade-level or subject-area teams have more peers with whom they can work and more peers who share their specific teaching assignment or

responsibilities. Finally, teachers with more teaching experience themselves report engaging in less frequent collaboration and teachers whose grade-level or subject-area peers have more experience also appear to engage in slightly less frequent collaboration, all else equal. This negative association between experience and collaboration frequency could be attributed to the more structured opportunities for collaboration that are focused on early career teachers (such as mentoring programs) or to teachers seeking out less collaboration as they gain experience.

The results from the second and third research questions provide suggestive evidence about the conditions under which more frequent collaboration is associated with increased teacher performance. Overall, the relationships estimated in this analysis are suggestive but inconclusive. While the pattern of results are less conclusive for subject-area collaboration overall and for the relationship between grade-level collaboration and value-added scores, some suggestive patterns emerge in examining the relationship between the frequency of grade-level team collaboration and improvements in observation scores. Not surprisingly, more frequent collaboration among grade-level teams is positively associated with improved observation scores for elementary teachers but not for middle school or high school teachers. In addition, the relationship between collaboration frequency and observation scores appears to be moderated by the prior performance of a teacher's peers on their grade-level team. Teachers appear to benefit more from more frequent collaboration when they work with grade-level peers who are higher performing (as measured by prior year observation scores). This could suggest that teachers learn more from working with peers who have more instructional expertise or that teachers with more expertise collaborate differently in ways that benefit their teammates. These findings align with prior work on peer effects among teachers, which indicate that teachers (and their students) benefit when they are working with colleagues in their grade-level who have demonstrated higher performance (Jackson & Bruegmann, 2009; Sun et al., 2017). This finding also supports recommendations that teachers benefit the most from collaboration with colleagues who have more expertise and that school

leaders should create leadership and coaching positions in which teachers with high levels of content and pedagogical expertise support instructionally-focused collaboration among teachers (Horn et al., 2018; Horn & Kane, 2015; Little, 1990).

### **Limitations**

When interpreting the findings from this analysis, it is important to consider the limitations of the measures and data analyzed here. Most importantly, the specific measures of collaboration created for this analysis has numerous limitations. First, this measure relies on teachers' estimations about their participation in collaboration rather than direct observations of how they work with their instructional teams. As with most measures relying on self-reported survey items, my collaboration measures—especially those at the individual teacher level—likely include some amount of measurement error (Groves et al., 2009). Second, this measure only includes one year of data on teachers' engagement with collaboration. This makes it more difficult to isolate the relationship between collaboration and performance outcomes, and to determine the directionality of this relationship. Third, this measure only captures how often teachers estimate collaborating but does not capture the particular focus of collaboration or the nature of collaborative work. Teams of teachers may focus on many different topics and activities in their collaborative meeting time, from coordinating non-academic activities like field trips to in-depth conversations about instructional activities and student learning, and these differences are likely to influence how much teachers learn and develop through their collaborative work (Horn et al., 2017). A final limitation of this measure is that not all teachers from a given team have reported on their team collaboration. Instead, only those teachers who responded to the survey and who were randomly selected for the professional learning module were given the opportunity to report on team collaboration. Since teachers are randomly selected for the professional learning module once they begin the survey, the more important issue here is nonresponse on the survey itself. If teachers who do

not respond to the survey systematically differ in terms of how they engage in collaboration with their teams, then the measures presented here could be biased.

I further limit my sample to teachers who have teammates who also responded to survey questions and who have prior performance scores. While constructing this sample allows me to leverage within-school differences as part of my analytic strategy to estimate the effect of team collaboration, my results are likely not generalizable to all Tennessee teachers. In particular, teachers in schools with low survey response rates and with small team sizes are more likely to be removed from my analytic sample and, therefore, are not as well represented in my analytic sample.

### **Implications for Future Work**

My findings offer numerous suggestions for future analysis. My findings do not provide conclusive evidence about whether collaboration in subject-area teams is associated with improved performance. Much of the prior quantitative work on collaboration and on peer effects among teachers has focused on elementary or middle school teachers working in grade-level teams (Goddard et al., 2015; Jackson & Bruegmann, 2009; Ronfeldt et al., 2015; Spillane et al., 2015, 2012; Sun et al., 2017). Future work should consider closely examining how subject-specific teams and all teams in secondary schools operate and whether this collaboration is associated with increased performance. Future work should also explore more about how peer performance or expertise moderates the relationship between collaboration and teacher performance. This would be particularly powerful if researchers could track teacher teams over time to assess the frequency and nature of their collaborative work, the composition of their teams, and their instructional skills and performance. Given the increased prevalence of collaboration among teachers in the United States (Datnow, 2011; Hargreaves, 2010; Johnson, 2012; Johnston & Tsai, 2018), it is even more crucial to understand the conditions under which peer collaboration can help teachers improve their instructional practice.

**Appendix**

**Table 15. Descriptive Comparison of Tennessee Teachers and Analytic Sample**

	All TN Teachers		Analytic Sample	
	N	%	N	%
<b>Teacher Characteristics</b>				
Gender				
Female	50,628	79%	5,710	82%
Male	13,627	21%	1,260	18%
Race/Ethnicity				
Teacher of Color	8,324	13%	517	7%
White Teacher	55,674	87%	6,453	93%
Years of Teaching Experience				
0-3 years	15,477	24%	1,182	17%
4-6 years	8,969	14%	1,001	14%
7-10 years	8,896	14%	1,035	15%
11-17 years	14,089	22%	1,651	24%
18-25 years	10,588	16%	1,359	20%
26 or more years	6,153	10%	742	11%
Experience in School				
New to School	9,907	16%	489	7%
Returners	53,011	84%	6,481	93%
Primary Teaching Assignment				
Math	6,053	9%	770	11%
ELA	7,231	11%	957	14%
Science	4,741	7%	592	9%
Social Studies	4,238	7%	438	6%
Self-Contained	16,322	25%	2,359	34%
SPED	4,204	7%	222	3%
Foreign Language/Arts	4,429	7%	360	5%
CTE/Health/PE	7,291	11%	699	10%
Other/No Primary	10,090	16%	573	8%
Tested Subject				
Tested	26,393	41%	3,485	50%
Untested	38,227	59%	3,485	50%
Primary Grade				
Pre-Kindergarten	1,416	3%	116	2%
Kindergarten	4,268	8%	615	9%
First Grade	4,029	8%	587	8%
Second Grade	4,070	8%	550	8%
Third Grade	4,117	8%	583	8%
Fourth Grade	4,147	8%	527	8%
Fifth Grade	4,217	8%	505	7%

Sixth Grade	4,269	8%	561	8%
Seventh Grade	3,767	7%	477	7%
Eighth Grade	3,823	7%	516	7%
Ninth Grade	4,621	9%	564	8%
Tenth Grade	3,966	7%	466	7%
Eleventh Grade	3,332	6%	476	7%
Twelfth Grade	3,529	7%	416	6%
No Primary Grade	473	1%	11	<1%
<b>School Characteristics</b>				
School Level				
Elementary	27,395	43%	3,031	43%
Middle	12,161	19%	1,401	20%
High School	16,531	26%	1,770	25%
K-8/K-12	6,506	10%	586	8%
Other	2,043	3%	182	3%
Sch. Prior Performance				
Level 1 (Lowest)	18,153	28%	1,848	27%
Level 2	4,127	6%	408	6%
Level 3	8,257	13%	974	14%
Level 4	4,925	8%	554	8%
Level 5 (Highest)	22,800	35%	2,677	38%
Missing TVAAS	6,358	10%	509	7%
Geographic Context				
Rural	19,403	30%	2,371	34%
Town	8,770	14%	1,061	15%
Suburban	15,066	23%	1,648	24%
Urban	21,338	33%	1,890	27%
<b>Total</b>	<b>64,440</b>	<b>100%</b>	<b>6,970</b>	<b>100%</b>



**Table 16. Sample Means for Teacher, Team, and School Characteristics**

	Mean	SD	Min	Max
<b>Teacher Performance Metrics</b>				
Avg. Observation Scores				
Prior-year scores	4.04	0.57	1.00	5.00
Year-end scores	4.11	0.56	1.00	5.00
Valued-added Scores				
Prior-year scores	0.52	3.26	-11.91	16.23
Year-end scores	0.37	3.12	-17.37	18.34
<b>Grade-level Team Characteristics</b>				
Team Size	10.22	7.25	1.00	41.00
Peer Avg. Experience	12.00	4.80	0.50	47.00
Peer Avg. Prior Performance	4.03	0.40	1.97	5.00
<b>Subject-area Team Characteristics</b>				
Team Size	6.87	4.75	1.00	34.00
Peer Avg. Experience	11.93	4.79	0.00	39.00
Peer Avg. Prior Performance	4.03	0.42	1.00	5.00
<b>School Characteristics</b>				
% Teachers New to School	13.04	8.31	0.00	96.67
% Students Economically Disadvantaged	32.48	18.64	0.00	98.10
% Students Black	17.53	21.62	0.20	99.60
% Students Hispanic	9.02	10.39	0.20	76.10
% Students SPED Designation	14.28	5.05	1.10	100.00

Note: All measures are presented here in their original scales. In the regression models within this analysis, the outcome measures (year-end observation and value-added scores) and the peer measures of prior performance have been standardized to ease interpretation.

**Table 17. Sample Means for Frequency Measures of Collaboration**

<b>Variable</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
<b>Teacher-level measures:</b>				
Overall Frequency of Collaborative Activities (teacher-level average of 10 items listed below)	2.62	0.77	1	5
Individual Survey Items				
Ask another teacher for advice about your teaching	3.16	1.34	1	5
Meet with grade-level team (e.g., fourth grade team or ninth grade academy)	3.53	1.54	1	5
Meet with subject-area team (e.g., science department or literacy PLC)	3.19	1.48	1	5
Meet with informal group of teachers that gathers to address different areas of need	2.52	1.43	1	5
Observe another teacher's classroom to get ideas for instruction or to offer feedback	1.63	0.88	1	5
Participate in peer observation/feedback program	1.53	0.90	1	5
Plan a lesson with another teacher	2.94	1.60	1	5
Provide or receive feedback about instructional practices or activities	2.51	1.22	1	5
Review student assessment data to make instructional decisions	2.97	1.21	1	5
Seek out another teacher to work on a particular issue	2.24	1.45	1	5
<b>Grade-level team measures:</b>				
Team average of overall frequency of collaborative activities	2.62	0.59	1	5
Team average of individual item asking about meeting with grade-level team	3.51	1.28	1	5
<b>Subject-area team measures:</b>				
Team average of overall frequency of collaborative activities	2.62	0.59	1	5
Team average of individual item asking about meeting with subject- team	3.17	1.08	1	5

Note: All measures are presented here in their original scales. In the regression models within this analysis, the key independent variables (teacher-level overall frequency of collaborative activities and team averages) have been standardized to ease interpretation.

**Table 18. Correlation Matrix of All Study Measures**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1. Avg. Observation Score	1.00																												
2. Prior-year Avg. Observation Score	0.77	1.00																											
3. Value-added Score	0.31	0.27	1.00																										
4. Prior-year Value-added Score	0.40	0.31	0.48	1.00																									
5. Teacher-level Collaboration freq. scale	0.05	0.03	0.03	0.04	1.00																								
6. Grade-level collaboration freq. scale	0.03	0.02	0.02	0.02	0.75	1.00																							
7. Subject-area collaboration freq. scale	0.03	0.02	0.05	0.07	0.78	0.68	1.00																						
8. Tch. Sex	0.15	0.13	0.08	0.09	0.08	0.08	0.10	1.00																					
9. Tch. of Color	-0.01	0.02	-0.04	-0.04	0.14	0.15	0.16	0.04	1.00																				
10. Tch. New to School	-0.15	-0.16	-0.05	-0.08	0.04	0.04	0.04	-0.03	0.00	1.00																			
11. Tch. Years of Experience	0.15	0.24	0.02	0.04	-0.10	-0.09	-0.08	0.05	-0.01	-0.12	1.00																		
12. Tch. Tested Subject	0.06	0.07	0.04	0.06	-0.03	-0.03	-0.02	0.02	0.02	-0.04	0.05	1.00																	
13. Tch. Primary Grade	-0.06	-0.07	0.00	-0.07	-0.20	-0.28	-0.26	-0.21	-0.05	0.02	0.01	-0.05	1.00																
14. Tch. Primary Subject	0.06	0.07	-0.03	-0.02	0.06	0.08	0.05	0.03	0.02	-0.07	0.07	-0.02	-0.30	1.00															
15. Grade-level Team Size	0.00	-0.01	0.03	0.05	0.11	0.06	0.09	-0.05	-0.01	0.04	-0.02	-0.05	0.35	-0.18	1.00														
16. Grade-level Team Experience	0.09	0.08	0.02	0.03	-0.07	-0.12	-0.09	0.04	-0.02	-0.04	0.13	0.01	0.04	-0.01	-0.02	1.00													
17. Grade-level Team Prior Obs. Scores	0.45	0.48	0.07	0.13	0.03	0.04	0.03	0.03	0.01	-0.06	0.08	0.06	-0.11	0.14	-0.04	0.22	1.00												
18. Subject-area Team Size	0.07	0.04	0.06	0.09	0.10	0.05	0.09	0.02	-0.01	0.03	0.00	-0.02	0.24	0.03	0.61	-0.01	0.05	1.00											
19. Subject-area Team Experience	0.13	0.14	-0.01	0.00	-0.09	-0.11	-0.13	-0.01	-0.03	-0.06	0.11	0.00	0.04	0.06	-0.07	0.33	0.19	-0.04	1.00										
20. Subject-area Prior Obs. Scores	0.44	0.46	0.06	0.12	0.05	0.05	0.04	0.05	-0.02	-0.04	0.06	0.02	-0.15	0.08	-0.04	0.17	0.74	0.04	0.24	1.00									
21. Sch. Charter Indicator	0.01	0.01	0.05	0.10	0.03	0.03	0.06	0.01	0.05	-0.01	-0.02	-0.06	-0.02	0.00	-0.02	-0.05	-0.03	-0.02	-0.07	-0.02	1.00								
22. Sch. Geographic Context	0.11	0.11	0.00	0.06	-0.07	-0.09	-0.09	0.02	-0.16	-0.04	0.03	0.01	-0.06	0.04	-0.05	0.03	0.16	0.01	0.10	0.17	-0.04	1.00							
23. Sch. Percent New Teachers	-0.14	-0.16	-0.04	-0.04	0.07	0.09	0.10	-0.04	0.10	0.20	-0.07	-0.04	0.06	-0.03	0.03	-0.24	-0.22	-0.01	-0.24	-0.25	0.09	-0.09	1.00						
24. Sch. Total Faculty Size	0.05	0.03	0.04	0.07	0.03	0.00	0.01	-0.05	-0.01	0.03	-0.03	-0.02	0.41	-0.13	0.78	-0.05	0.04	0.69	-0.04	0.02	-0.02	-0.05	0.02	1.00					
25. Sch. Prior-year Performance	0.23	0.17	0.19	0.40	0.04	0.03	0.05	0.07	-0.12	-0.04	0.00	0.03	-0.07	0.03	0.11	0.04	0.24	0.12	0.02	0.22	0.01	0.11	-0.11	0.17	1.00				
26. Sch. % Students Econ. Disadvantaged	-0.19	-0.14	-0.08	-0.17	0.00	0.03	0.03	-0.03	0.22	0.02	-0.03	0.03	-0.17	0.03	-0.26	-0.10	-0.24	-0.24	-0.10	-0.23	0.05	-0.21	0.12	-0.31	-0.32	1.00			
27. Sch. % Students Black	-0.11	-0.09	-0.06	-0.08	0.18	0.24	0.24	0.01	0.42	0.09	-0.06	0.03	-0.05	0.00	0.02	-0.16	-0.14	0.00	-0.16	-0.17	0.04	-0.27	0.29	0.02	-0.21	0.48	1.00		
28. Sch. % Students Hispanic	-0.11	-0.07	-0.01	-0.02	0.13	0.16	0.16	0.01	0.16	0.03	-0.04	-0.04	-0.11	0.05	0.14	-0.16	-0.18	0.08	-0.18	-0.16	0.09	-0.21	0.18	0.14	-0.03	0.28	0.23	1.00	
29. Sch. Percent Special Education	-0.07	-0.04	-0.07	-0.06	-0.04	-0.03	-0.02	0.00	-0.03	-0.03	-0.01	0.01	-0.20	0.08	-0.27	-0.04	-0.08	-0.20	-0.01	-0.07	-0.05	0.06	-0.01	-0.30	-0.15	0.40	-0.02	-0.05	1.00

**Table 19. Regression Results for Frequency of Collaboration**

	Panel A: Teacher-level frequency of collaboration		Panel B: Grade team-level frequency of collaboration		Panel C: Subject-area team-level frequency of collaboration	
	(1) OLS	(2) Sch. Fixed Effects	(1) OLS	(2) Sch. Fixed Effects	(1) OLS	(2) Sch. Fixed Effects
<b>Team Characteristics</b>						
Grade-level team size (# of teachers)	0.015** (0.003)	0.008 (0.005)	0.012** (0.003)	0.000 (0.005)		
Grade-level peer experience	-0.008** (0.003)	-0.004 (0.003)	-0.012** (0.003)	-0.007* (0.003)		
Grade-level peer prior performance	-0.006 (0.047)	0.030 (0.062)	0.027 (0.032)	0.060 (0.054)		
Subject-area team size (# of teachers)	0.026** (0.004)	0.026** (0.005)			0.025** (0.006)	0.026** (0.008)
Subject-area peer experience	-0.005+ (0.003)	-0.001 (0.003)			-0.007* (0.003)	-0.006+ (0.003)
Subject-area peer prior performance	0.018 (0.045)	0.052 (0.050)			0.042 (0.042)	0.090 (0.062)
Teacher and School-level Controls	X	X	X	X	X	X
Grade & Subject Fixed Effects	X	X	X	X	X	X
School Fixed Effects		X		X		X
Observations	6970	6970	6959	6959	4038	4038
Adjusted $R^2$	0.143	0.064	0.170	0.029	0.193	0.124

Notes: Standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$

**Table 20. Teacher-Level Collaboration Regression Results for Teacher Performance Outcomes**

	Panel A: Standardized Avg. Observation Score Outcome			Panel B: Standardized Value-added Score Outcome		
	(1)	(2)	(3)	(1)	(2)	(3)
<b>Collaboration Measure</b>						
Standardized Frequency Scale (teacher-level)	0.012	0.012	0.025**	0.036	0.039+	-0.016
	-0.008	-0.008	-0.008	-0.024	-0.024	-0.027
<b>Team Measures</b>						
Grade-level team size (# of teachers)	0.004*	0.001	0.007*	-0.011*	-0.010+	0.003
	-0.002	-0.002	-0.003	-0.005	-0.005	-0.009
Grade-level peer experience	-0.002	-0.003+	-0.004*	0.001	-0.002	-0.013
	-0.002	-0.002	-0.002	-0.005	-0.005	-0.008
Grade-level peer prior performance	0.182**	0.148**	0.034	0.047	0.059	-0.191
	-0.036	-0.037	-0.044	-0.083	-0.086	-0.145
Subject-area team size (# of teachers)	0.005+	0.003	0.002	0.006	0.01	0.008
	-0.003	-0.003	-0.003	-0.007	-0.008	-0.011
Subject-area peer experience	0.002	0.001	0.002	-0.001	-0.001	-0.007
	-0.002	-0.002	-0.002	-0.006	-0.006	-0.008
Subject-area peer prior performance	0.097**	0.087**	0.021	-0.001	0.009	-0.243*
	-0.033	-0.032	-0.036	-0.082	-0.082	-0.121
Teacher Controls	X	X	X	X	X	X
Grade & Subject Fixed Effects	X	X	X	X	X	X
School Controls		X			X	
School Fixed Effects			X			X
Observations	6970	6970	6970	2404	2404	2404
Adjusted R <sup>2</sup>	0.609	0.616	0.491	0.23	0.234	0.267

**Table 21. Grade-Level Team Collaboration Regression Results for Teacher Performance Outcomes**

	Panel A: Standardized Avg. Observation Score Outcome			Panel B: Standardized Value-added Score Outcome		
	(1)	(2)	(3)	(1)	(2)	(3)
<b>Collaboration Measure</b>						
Standardized Frequency Scale (team-level)	0.008 (0.011)	0.008 (0.011)	0.031* (0.012)	0.057* (0.033)	0.067* (0.034)	-0.028 (0.051)
<b>Team Measures</b>						
Grade-level team size (# of teachers)	0.006** (0.002)	0.001 (0.002)	0.007* (0.003)	-0.009* (0.004)	-0.009 (0.005)	0.004 (0.009)
Grade-level peer experience	-0.001 (0.002)	-0.003 (0.002)	-0.004* (0.002)	0.001 (0.005)	-0.002 (0.005)	-0.012 (0.008)
Grade-level peer prior performance	0.265** (0.029)	0.231** (0.029)	0.044 (0.040)	0.045 (0.060)	0.060 (0.064)	-0.222 (0.145)
Teacher Controls	X	X	X	X	X	X
Grade & Subject Fixed Effects	X	X	X	X	X	X
School Controls		X			X	
School Fixed Effects			X			X
Observations	6959	6959	6959	2404	2404	2404
Adjusted R <sup>2</sup>	0.608	0.615	0.491	0.231	0.234	0.264

Notes: Standard errors in parentheses

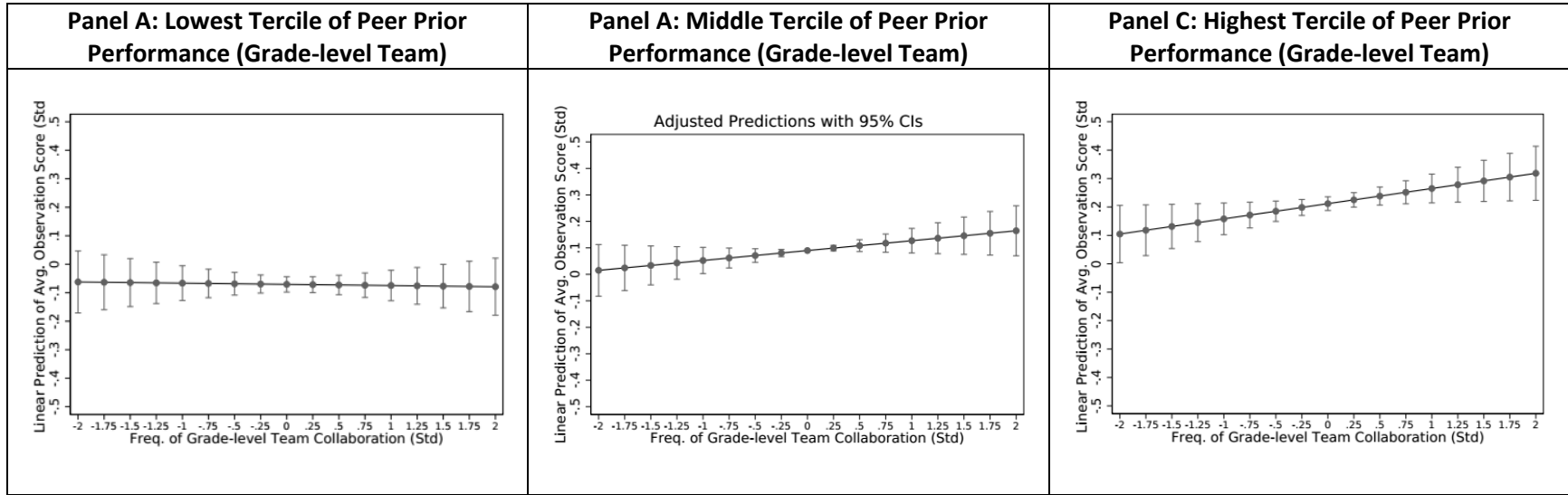
+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$

**Table 22. Subject-Area Team Collaboration Regression Results for Teacher Performance Outcomes**

	Panel A: Standardized Avg. Observation Score Outcome			Panel B: Standardized Value-added Score Outcome		
	(1)	(2)	(3)	(1)	(2)	(3)
<b>Collaboration Measure</b>						
Standardized Frequency Scale (team-level)	0.001 (0.013)	0.004 (0.013)	0.015 (0.017)	0.050 (0.034)	0.063+ (0.034)	-0.025 (0.047)
<b>Team Measures</b>						
Subject-area team size (# of teachers)	0.011** (0.003)	0.007+ (0.004)	0.009* (0.004)	-0.015* (0.007)	-0.009 (0.009)	0.017 (0.016)
Subject-area peer experience	-0.000 (0.002)	-0.001 (0.002)	0.001 (0.002)	0.002 (0.006)	0.001 (0.006)	-0.002 (0.008)
Subject-area peer prior performance	0.278** (0.034)	0.240** (0.034)	0.045 (0.048)	0.031 (0.070)	0.042 (0.073)	-0.311* (0.142)
Teacher Controls	X	X	X	X	X	X
Grade & Subject Fixed Effects	X	X	X	X	X	X
School Controls		X			X	
School Fixed Effects			X			X
Observations	4038	4038	4038	1955	1955	1955
Adjusted R <sup>2</sup>	0.617	0.624	0.490	0.234	0.240	0.288

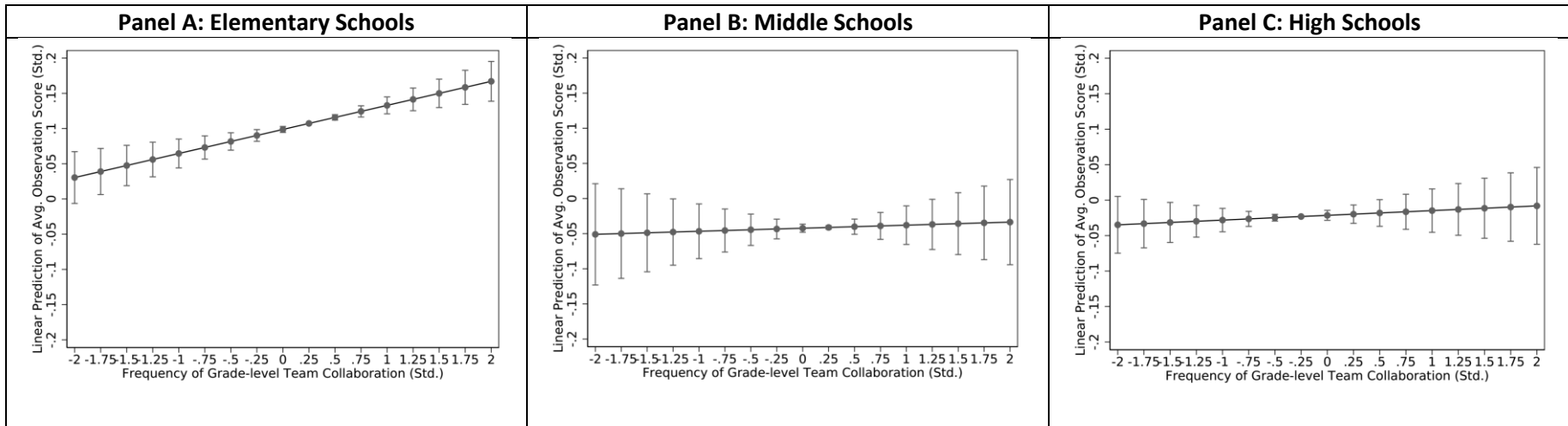
Notes: Standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$



**Figure 5. Predicted Relationship Between Observation Scores and Frequency of Grade-Level Team Collaboration, by Terciles of Peer Prior Performance**





**Figure 6. Predicted Observation Scores by Frequency of Grade-Level Team Collaboration and School Level**

## CHAPTER V

### CONCLUSION

Much has been written about the “optimistic premise” of teacher collaboration (Little, 2003). Increasing and supporting collaboration among teachers has been framed as a strategy for school improvement (Bryk et al., 2010), a mechanism by which leaders can support instructional improvement (Leithwood & Jantzi, 1990; Louis et al., 2010), a component of effective professional development (Ball & Cohen, 1999; Desimone, 2011), an opportunity to promote professionalism and leadership among teachers (Hargreaves & O’Connor, 2018), a way for teachers to marshal social and emotional support (Datnow & Park, 2018), and a school-based approach to promote teacher learning and growth (Horn & Little, 2010; Little, 2002; Supovitz, 2002). While teachers, leaders, and researchers typically agree that teacher collaboration *can* work towards these ends, there is clear evidence that collaboration as enacted in schools often falls short of its lofty ambitions (Gates Foundation, 2014; Hargreaves, 2000; Horn et al., 2017; Rigby et al., 2019; Scribner et al., 1999; Supovitz, 2002; Talbert, 2010).

How, then, can collaboration support school and teacher improvement? My dissertation papers address this question by examining different facets of collaboration and, in particular, exploring how, for whom, and under what conditions collaboration appears to support teachers. In this concluding section, I briefly discuss overarching themes that emerge across my three papers that speak to this broader question.

First, all three papers suggest that teachers—at least in the three samples of Tennessee teachers studied here—are spending considerable time collaborating with their peers. As the descriptive analyses in the second and third paper demonstrate, the vast majority of teachers report regularly engaging in many different collaborative activities. These collaborative activities include formal collaborative

structures typically organized by school leaders (such as the Instructional Partnership Initiative and team-based professional communities) as well as more informal ways in which teachers share instructional strategies, co-develop curriculum and materials, and seek out advice from their peers. While most teachers across all three papers report engaging in collaboration, these analyses also demonstrate the wide variation in how teachers collaborate and whether teachers believe this collaboration supports their learning and instructional decision-making. As illustrated by how teachers themselves discuss their collaborative partnerships through the Instructional Partnership Initiative in the first paper, collaboration can be a powerful opportunity for personal and professional growth but also can simply be another administrative mandate that teachers check off their ever-growing list of responsibilities. Similarly, the second paper highlights that many factors may explain these differences in the frequency and helpfulness of collaboration, including teachers' specific teaching assignments, school level, teachers' access to peers with relevant expertise, and organizational factors such as professional climate and administrative oversight over collaboration.

Second, these papers identify facilitating conditions that encourage collaboration with greater potential to support teacher learning and growth. Reading across all three papers, two common themes emerge: (1) school leaders should figure out ways to support collaboration while not over prescribing how teachers work together and (2) collaboration appears to work best when teachers have colleagues in their school with relevant expertise.

School leaders typically have the most power within the school building to create structures that afford teachers time and space to work together, to develop shared purpose and norms for collaboration, and to focus teachers' collaborative work on meaningful problems of practice. The first paper illustrates that how principals introduced and supported the Instructional Partnership Initiative influenced whether teachers identified specific goals for their collaborative partnerships and the extent to which teachers were committed to their partnership as a mechanism for improving their teaching.

Teachers expressed frustration when their principals provided little or no guidance about the intended goals of the program and the specific ways that teachers should work together as part of their partnership. Teachers in these schools were more likely to engage in surface-level collaboration with their IPI partner that was meant to ensure their compliance with their principal's directive. However, the findings from the second paper would caution that too much oversight from school and district leaders may backfire. Overall, teachers in the analytic sample for the second paper estimated that school and district leaders determined about 40% of their collaborative activities. The amount of administrative oversight was not significantly associated with the frequency of collaborative learning opportunities but was negatively associated with how helpful teachers rated these opportunities. This negative relationship appeared to be driven by teachers in schools where administrators had the highest levels of oversight over collaboration. All told, these findings suggest that leaders must find a balance between setting clear expectations and support for collaboration while still giving teachers sufficient autonomy to engage in collaboration aligned with their own professional needs.

Finally, teachers appear to benefit most from collaboration when they can work with peers who have relevant expertise. Notions of expertise emerged in the first paper as an important relational factor that explained whether teachers identified specific goals for their partnership work and felt committed to their partnership as a mechanism for improvement. While interviewed teachers typically referred to their grade-level or subject-area peers as those teachers who could offer the most relevant collaborative support, cross-grade or cross-grade partnerships were successful if teachers could identify specific ways that they could help each other that related to each partner's particular expertise. The third paper provides suggestive evidence that teachers may benefit more from collaboration (at least as measured by growth in observation scores from the teacher evaluation system) when their grade-level peers are themselves higher performing. These findings suggest that more frequent collaboration may only pay off in certain circumstances, and school and district leaders should consider how to create opportunities for

teachers to collaborate with effective colleagues. Finally, my analysis highlights the particular challenge facing teachers who are “professionally isolated” in their schools. These teachers—who are more likely to be found in small schools, rural districts, or non-tested subjects—are largely ignored in previous research on collaboration. These teachers often do not have colleagues in their schools with expertise that is relevant to their specific teaching assignment and may be left out of the formal structures encouraging collaboration among instructional teams. Since collaboration is increasingly becoming a professional expectation for the work of teaching, future research should consider whether and how schools, districts, and other professional organizations can encourage relevant collaborative experiences that support all teachers.

## APPENDIX

### Appendix A. Semi-Structured Interview Protocol for Teachers Participating in IPI

Principal Investigator: Dr. Ellen Goldring

Revision Date: March 10, 2017

Study Title: Using Teacher Evaluation Data to Drive Instructional Improvement

Institution/Hospital: Peabody College, Vanderbilt University

#### Partnership Teacher Interview Guide

##### Introduction

- Thanks for taking the time to talk to us. We'd like to talk about the Instructional Partnership Initiative in your school.
  - There are no right or wrong answers. We are interested in your own experience with this initiative and the thoughts you have on it.
  - Nothing from this interview will be used in any way that could identify you, your school or colleagues. We are not sharing what you say with your principal, partner teacher, or others in the school or district. As we talk, you can decline to answer any question or stop the interview at any time. Nothing in this interview will be used as part of your teacher evaluation or any evaluation of your school.
1. To begin, can you tell us a bit about your background in teaching?
    - a. Length at school, time teaching total, current assignment (level, subject)
      - i. Were you matched in an IPI partnership last year?
        - a. [If so] Is your partner different this year from last?
        - b. [If new partner] Do you know why you have a different partner? Did you ask for that change or did the principal make that decision?
          - i. If requested to keep same partner or to change, probe why
          - ii. If not, do you know why you are matched again?

#### [Perceptions of IPI goals]

*Before getting into the details on how you and your partner work together, I'd like to hear a little about how the IPI was introduced to you and your first impressions.*

2. How would you describe IPI to someone who doesn't know anything about it?
3. [Teachers new to IPI] Did you hear anything about IPI last year? What?
4. How and when did you learn about the Instructional Partner Initiative (IPI) this year?
  - a. Who introduced the initiative to you? How?
  - b. What kind of information was initially provided to you about IPI? (Probe for teacher guidebook and other materials)
    - i. Was this information helpful?
    - ii. [Returning teachers] Was the information you were given different this year?
    - iii. What kind of information would be most helpful to you to learn about what IPI is?
  - c. How did you learn who you were matched with?
    - i. Why were you matched with this person?

- ii. Did you have any input in the decision of who you would be matched with?
  - iii. [Returning teachers] was this different this year from last?
- 5. [Teachers new to IPI] What were your initial reactions when you were first invited to participate in IPI?
  - a. Did you hesitate at all? What concerns did you have?
  - b. Why did you decide to participate in IPI?
    - i. Did you feel like you had a choice?
- 6. What type of guidance did your principal [or other school leader] provide about the type of activities you should do with your IPI partner?
  - a. Were you asked to work on any specific indicators on the teacher evaluation rubric?
    - i. If so, why do you think your principal highlighted those instructional indicators?
    - ii. To what extent do you think these were appropriate indicators for the principal to highlight?
    - iii. Are there other areas you would prefer to focus on?
  - b. Did your principal suggest specific activities you could or should do with your partner?
  - c. Did your principal set any formal expectations about how often you should meet?
  - d. [Returning teachers] How would you compare the guidance you were given this year to last that which you were provided last year? [probe indicator focus, activities, expectations for meeting]

**[Effective Teacher Partnerships]**

- 7. I want to learn more about your work with your IPI partner now.
  - a. Tell me about the first time you met with your IPI partner this year.
    - i. When was it?
    - ii. What did you do in that first meeting?
  - b. How often do you two meet?
    - i. When do you find time to work with your IPI partner (probe for common planning time, time to meet, and time to observe)
  - c. What influences how often you meet?
    - i. [Returning teachers ] how would you compare the frequency of your meetings to your IPI work last year?
    - ii. What resources, if any, has the administration made available to help you two find time to meet together?
      - a. Substitutes/class coverage to observe each other?
      - b. Time off to plan or meet together?
      - c. Anything else? (If so, what?)
  - d. Do you teach the same subject/grade-level/students as your partner? If no, has your partner ever taught your grade/subject?
    - i. How, if at all, does having/not having a common subject/grade impact the ways in which you engage in IPI?
  - e. Can you describe the types of activities you have done as a part of your IPI partnership?
    - i. (Probe for observing, discussing evaluation scores, lesson planning together, co-teaching, discussing student data, talking through how they think about or do things, or other activities)
    - ii. To what degree did the focus of your work align with the original instructions your principal gave you regarding IPI?
    - iii. For each activity that teacher describes:

- i. When you engaged in this activity, to what extent did you focus on particular instructional indicators?
      - 1. If yes: Do you think it's helpful to focus on specific indicators? Why/why not?
      - 2. In what ways did these activities result in you changing your teaching in some way?
    - ii. Was this activity something you already did with your IPI partner or other teachers prior to be matched in IPI?
      - 1. If yes: Are there any differences between how you do this activity with your IPI partner and how you do it with other teachers?
      - 2. To what extent is IPI work (and its focus on indicators) being integrated into these pre-existing activities?
    - iv. How did you decide upon the activities you and your partner would do?
  - f. Do you ever talk with other IPI participants about what they are doing with their partners?
    - i. If so, is this informal or formal?
    - ii. Have these conversations influenced anything about how you engaged in IPI with your partner?
  - g. [Returning teachers] can you compare your partnership this year to last?
    - i. Probe: frequency of meetings and time spent; activities; indicator focus; degree to which your teaching changed as a result
  - h. Have you been asked to log your activities?
    - i. Probe whether this for accountability, PD credit
- 8. Are there any barriers that have interfered with your participation in the initiative? If so, tell me about that.
  - i. Were there any activities you wanted to do, but weren't able to?

**[Perceived outcomes]**

- 9. To what extent did you learn anything from your participation in IPI? (give example)
  - a. To what extent do you feel your partner learned anything from participation in IPI?
  - b. Do you think participating in the partnership led to changes that improved your teaching or your partner's teaching? In what ways? Can you give me a specific example?
    - i. (If changes made) how difficult was it to make that change?
- 10. What other benefits did you get from participating in IPI?
  - a. Do you enjoy participating in the initiative? Why or why not?
  - b. Did you receive anything for participating in IPI (i.e., PD credits, points on professionalism rubric)?
  - c. On a scale of one to ten, is this an effective use of your time, or just another thing you have to do? (1 being just another thing I have to do, 10 being very effective use of time).
- 11. We know there are always tradeoffs with initiatives. Does IPI take away from other things you would be doing or is the partnership folded in to what you are already doing (like lesson planning)?
  - a. Are there any other downsides for participating in IPI? (e.g., stigma for being singled out)
- 12. [Returning teachers] Overall, when you think about your IPI participation this year compared to last, would you say it has been more or less positive or useful to you?
  - a. Can you explain to me some of the reasons why?



- i. [probe: partnership – match, subject alignment, opportunities to meet, better understanding, more or less support from principal, more or fewer teachers participating this year]

**[Principal Leadership]**

13. Other than introducing you to this initiative, what else has your principal done to support or direct the work you are doing with your partner?
- a. How helpful has this support been?

Listen for specifics, such as:

- a. Has your administration reached out to you or your partner since introducing the initiative?
- b. If so, how did these interactions go? Was it useful?
- c. How often has the administration checked in with you about what you are doing with your partner?
- d. To what extent do you think your administration has a good understanding of what you two have done?
- e. To what extent has the administration provided additional guidance about what you two should be focusing on?
- f. Would you prefer to have more (less) support from your principal? Why?

**[Support for Instructional Improvement]**

*I have a few questions about how teachers in your school are supported to improve their teaching practice. I will ask some general questions about feedback, evaluation, and professional development and will also ask you to compare IPI to these other forms of support.*

14. We know that teachers vary in how much feedback they get on their teaching. What do you consider to be valuable feedback?
- a. To what extent do you feel you get valuable feedback?
    - i. Who does it come from (administrators, colleagues, etc.)?
    - ii. How does the feedback process unfold? Is it after an observation or other interaction?
    - iii. What is the purpose of this feedback?
  - b. To what extent do you get valuable feedback about your teaching as a result of the evaluation observation?
    - i. How does feedback that you get from your administrator compare to feedback you get from colleagues?
    - ii. How does feedback for evaluation compare to feedback for improvement?
    - iii. To what extent do you get valuable feedback on SPECIFIC indicators that are in the evaluation rubric?
  - c. What do you think needs to happen to ensure that you get more valuable feedback on your teaching?
  - d. What do teachers in this school do with the feedback they receive?
15. [If respondent indicated their principal asked them to focus on a specific indicator] Does your principal (or others that provide feedback) focus feedback on the specific indicator you have been asked to work on with your partner teacher?
16. To what extent do you feel the feedback and advice you've received on your teaching through this partnership is different than what you've received in the past?

17. To what extent do you think the observation scores you receive are an accurate reflection of your teaching?
  - a. Do you find that your scores on specific indicators accurately reflect your teaching strengths and weakness? [probe for example]
  - b. Do you ever share these observation results with your partner teacher? With other teachers in the school? Why/why not?
  - c. Has the feedback from observations shaped the work you do with you IPI partner? In what ways?
  
18. Which forms of professional development/learning are most likely to help you make changes that improve your teaching?
  - a. Who decides the content of professional development/learning opportunities offered at your school?
  - b. How, if at all, is professional development/learning tailored to your needs as a teacher?
  - c. Who provides the professional development/learning opportunities offered at your school? (Administrator, instructional coach, district staff, other teachers, etc.)
  - d. Have you found IPI to be more or less effective/useful than other forms of professional development in helping you improve your teaching?
  - e. Are there instances where you combine IPI-related work with other professional learning activities? If so, can you please describe that for me?

**[School collaborative culture]**

19. To what extent is IPI different from other collaborations in your schools?
  - a. (Be specific, PLCs, mentoring) Can you give an example?
    - i. Are some forms of collaboration more useful for improving your teaching?
  - b. Have other forms of collaboration shifted as a result of IPI?

**[Suggestions for the future]**

20. Given your experience with this initiative this year, what advice would you give to improve the initiative in the future?
  
21. Is there anything about your experience with this initiative that is important for us to know that we haven't already talked about?

## Appendix B. Focused Coding Framework for Paper #1

### Coding Directions:

1. For each interview, I will use the following coding framework to code the text of each teacher.
2. After reading each interview, I will:
  - a. Write a brief memo summarizing focus, form, purpose, relational, and usefulness. Be sure to note the following in the memo:
    - i. Focus:
      1. Determine primary, secondary, tertiary, etc. (include explanation)
      2. Label goal specificity as high or low (see descriptions below)
    - ii. Form:
      1. Determine primary, secondary, tertiary, etc. (include explanation)
      2. Label amount as NONE, MINIMAL, MODERATE, SUBSTANTIAL
    - iii. Purpose:
      1. Determine primary, secondary, tertiary, etc. (include explanation)
      2. Label commitment as high, low, or N/A
  - b. Use descriptors to capture:
    - i. Primary Focus, Form, and Purpose
    - ii. Whole school matched vs. select few matched
    - iii. Same grade/subject partner vs. diff. grade/subject partner

### Focused Codes:

**Teacher-driven:** Capturing components of IPI that are determined by the participating teachers or discussions of teacher autonomy in IPI partnerships. Should be double coded with form, focus, and purpose to capture whether these factors are teacher-driven (vs. administrator-driven).

**Administrator-driven:** Capturing components of IPI that are determined by administrators/leaders. See below for various mechanisms by which IPI work can be influenced by administrators. Should be double coded with form, focus, and purpose to capture whether these factors are administrator-driven (vs. teacher-driven).

- **Expectations:** how administrators/leaders at the school set expectations for IPI participation in ways that influence the focus, form, and purpose of IPI.
- **Materials:** how materials provided at the school level (or by the principal) influence the focus, form, and purpose of IPI. This particularly includes the IPI guidebook or any other materials that administrators have provided to IPI teachers.

**Focus:** what teachers collaborate about. These codes are intended to categorize the primary focus of teachers' IPI work. I will code each interview with as many focus codes as are relevant but then select a primary focus code (and, if applicable, a secondary and tertiary focus code). I will also assign one of the two specificity codes.

- **Lacking focus:** when teachers describe that they have no focus or that they have talked about many different things. This can include a "general" focus if teachers do not describe focusing on any of the foci identified below.
- **Teaching:** when teachers focus on teaching, including specific teaching strategies, classroom management, or knowledge about pedagogy. This can include discussing problems of practice, learning/teaching about specific practices, or reflecting on their teaching.
  - **Discussing or improving on evaluation indicators:** when teachers focus on a certain aspect of teaching as identified by the evaluation rubric.
  - **Managing behavior:** when teachers specifically focus on classroom management

- **Students/families:** when teachers focus on discussing the needs of students or families or working together to support specific students. These conversations are not directly related to instruction or learning.
- **Subject/Content/Materials:** when teachers focus on a specific subject or materials but without connecting this to teaching/instruction. This may include sharing particular materials or resources connected to a specific subject/content.

**Form:** how teachers collaborate. Form is defined here as the collaborative activities done as part of an IPI partnership and the amount of time dedicated to those activities (duration/frequency). This code is intended to categorize the primary form(s) of teachers' IPI work. I will code each interview with as many form codes as relevant but then select a primary (and, if applicable, a secondary and tertiary form).

- **Activity:** the activities that teachers report doing as part of IPI
  - **Sharing/Talking about ideas:** when partners discuss, ask questions, or chat. This includes sharing ideas and giving feedback unrelated to observation. This can include texting, emailing, or communicating in other ways.
    - **Sharing resources:** when partners find and share resources. Distinct from talking in that the main point is the sharing (e.g., "we email each other website links") and not sharing ideas and/or discussing these resources (e.g., "we talked about how we each use Google Classroom")
  - **Observing:** when partners observe each other's classrooms
    - **Observing with follow-up:** when partners meet after an observation to discuss what they observed (including asking questions, giving feedback, etc)
  - **Creating instructional materials:** when partners create lessons or classroom materials together. Distinct for simply sharing or discussing what they use – partners have to actually make materials together.
  - **Looking at data:** when partners look at student data or teacher evaluation scores
  - **Co-teaching:** when partners teach together

**Purpose:** why teachers collaborate or how teachers describe the goals of IPI. This code is intended to categorize the primary purpose(s) of teachers' IPI work. This can include the explicit goals of IPI (what principals presented as the intended outcomes of IPI) or the more personal reasons that teachers give for participating. I will code each interview with as many purpose codes as relevant but then select a primary (and, if applicable, a secondary and tertiary purpose).

- **Complying:** teachers do IPI because it is mandated or required (or they feel they must do it to please principal). This includes teachers who describe the purpose of IPI as "getting hours" or "just another thing" to do.
- **Learning:** teachers who describe the goals of IPI as related to learning, improving, or strengthening an area of weakness. This can include learning about teaching but also other things that teachers see as important/relevant to their professional learning.
  - **Improving evaluation:** teachers who describe IPI as related to improving their evaluation scores or better understanding the evaluation rubric but not necessarily relate this to learning or improving their practice.
- **Mentoring/Helping out:** teachers who participate in IPI in order to help or support another teacher.
- **Building relationship:** teachers who believe the goals of IPI are to help teachers building relationships and connections with another teacher. This can include teachers who see these relationships are purely friendship and not necessarily related to professional improvement.
- **Supporting school goals, norms, and culture:** teachers who describe the purpose of IPI as supporting school-wide goals, norms, or culture. This can include teachers who describe IPI as supporting an ongoing school initiative or a new goal (such as strengthening collaborative culture or vertical planning in the school).

**Usefulness/Benefits:** how teachers describe the outcome/results of their IPI partnership. This could include descriptions of what teachers learn (or didn't learn) from working with their partner, how they felt about their participation (e.g., "a waste of time" or "I really enjoyed it"), and assessments of how it went. This will include when teachers talk about unintended consequences of IPI (e.g., feeling like it's punishment or appreciating how they have reflected more on their practice through IPI). I will further analyze this data in the third round of analysis.

**Relational:** how teachers describe their relationship with their IPI partner. This can include more affective aspects of their relationship (e.g., personality, level of comfort, shared interests) as well as more professional/technical ones (e.g., expertise, professional experience, etc.). In my conceptual model of collaboration, I consider these characteristics in the middle circle.

- **Matching:** how teachers describe the matching/selection process for IPI or the reasons why they were matched with their particular partner.
- **Expertise:** how teachers describe the expertise of their partner. This could include information about their prior teaching experience, their particular skills or knowledge, or familiarity with certain subjects, grades, or even students/families.
- **Hierarchy:** how teachers describe the hierarchy (if any) in their IPI partnership. This often includes descriptions of whether teacher view their partnership as a mentoring relationship (one teacher learning from another) or equal partnership (teachers learning from each other).
  - **Equal partnership:** when teachers explicitly describe their partnership as equal or egalitarian.
  - **Mentoring:** when teachers explicitly describe their partnership in hierarchical terms in which one teacher is mentoring/teaching/supporting the other teacher.
- **Feedback:** how teachers describe the process of giving feedback, including the type of feedback they have given and received as part of IPI, how teachers feel about giving feedback, and when/under what circumstances teacher give feedback. This can also include teachers discussing how they discuss/share their needs and weaknesses with their IPI partner.

**Structures:** how teachers describe school-level features or structures that influence their IPI partnership. These can include actions of the principal as well as features of the school environment. In my conceptual model of collaboration, I consider these in the outer circle.

- **Time:** how time is structured at school and the ways in which this affects IPI work.
- **School culture:** how teachers discuss the existing school culture and how it influences IPI work. This could include discussions of the existing culture around collaboration, evaluation, or improvement in teaching.
- **Accountability:** mechanisms by which teachers are held accountable for participation in IPI. This includes more formal mechanisms (turning in paperwork) or informal mechanisms (principal asking them about their IPI work).
- **Support/Follow-up:** how administrators/leaders at the school support or follow-up with teachers related to IPI work. This could include resources provided to support IPI work (such as aides to cover classes) or follow-up meetings between leaders and participating teachers.

**Significance:** the degree to which teachers deem IPI a significant or valuable component of their professional work.

- **Priority:** how teachers describe whether IPI is a priority (e.g., "it's the last thing on my mind" or "I'm happy to make the time for this.")
- **Formality:** the level of formality or officialness that teachers attribute to IPI (e.g., "just checking in" vs. "scheduling a meeting")

## Descriptors:

**Specificity:** descriptors to capture the level of specificity of teachers' goals and focal area(s) of partnership work. A holistic judgment based on entire teacher interview. After reading teacher interview and writing memo, determine category for each teacher individually.

- **High:** Teachers who describe a particular and concrete focus for their partnership work. Can include instructional areas of refinement from evaluation, specific problems of practice, or content/standards (e.g., "questioning," "guided reading groups," "procedures for changing classes," etc.)
- **Low:** Teachers who describe that they have no focus in their partnership work or that they have talked about many different things but not focused in any given area (e.g., "checking in," "what we're teaching," "ideas about math instruction.")

**Commitment:** descriptors to capture whether teachers are committed to IPI as a means to improve their instructional practice. After reading teacher interview and writing memo, determine category for each teacher individually.

- **High:** Teachers who describe the goals of IPI as related to learning, improving, or strengthening an area of weakness. This can include learning about teaching or instructional strategies but also other things that teachers see as important or relevant.
- **Low:** Teachers who do IPI because it is mandated or required. This includes teachers who describe the purpose of IPI as "getting hours" or "just another thing" to do. Teachers do not describe IPI as a way to learn or improve.
- **Not Applicable/Mentoring:** Teachers who participate in IPI in order to help or support another teacher. IPI is not a way for them to improve or learn but to mentor another teacher.

**Amount:** a set of descriptors meant to capture the amount of time that teachers spent doing IPI (intended to capture the frequency and duration of collaborative activities). After reading teacher interview and writing memo, determine category for each teacher individually.

- **Minimal:** when partners engaged in no IPI work or only engage in 1-2 discrete activities (meeting, conversations, etc.) and/or spent less than two hours working together during the course of the year. The intent of this code is to capture partnerships with minimal participation ("we met a couple times") or with very concentrated engagement ("one and done"). This could also include pairs that met repeatedly throughout the year but for very short chats (5-10 minutes).
- **Moderate:** when partners engage in approximately 3-7 discrete activities and/or spent 2-5 hours working together during the course of the year. The intent of this code is to capture partnerships with moderate participation, in that partners met more than a few times but did not meet regularly and/or for significant amounts of time throughout the course of the year.
- **Substantial:** when partners engaged in approximately 8 or more discrete activities and/or spent more than 5 hours working together during the course of the year. The intent of this code is to capture partnerships that met regularly (at least once a month) or worked intensively for a shorter period of time.

**Partnership Type:** a set of descriptors meant to capture whether teachers are paired across subject/grade or within subject/grade. After reading teacher interview and writing memo for both teachers, determine category for each pair.

- **Same grade/subject:** when a teacher reports that their partner teaches the same grade/subject. For elementary teachers, this includes self-contained teachers who teach the same grade and departmentalized teachers who teach the same subject. Among secondary school teachers, subject refers to general area (e.g., English, Fine Arts, Math) and not particular course. Special education teachers can be considered “same grade/subject” if they teach the same content/level as their partner but only with special education students.
- **Different grade/subject:** when a teacher reports that their partner teaches a different grade/subject. For elementary teachers, this includes self-contained teachers who teach different grades or departmentalized teachers who teach different subjects. Among secondary school teachers, this includes teachers who teach different general areas (e.g., English, Fine Arts, Math)

**Structures:** This set of descriptors captures whether IPI was implemented as a school-wide program. After reading teacher interview and writing memo for all teachers in school, determine category for each school.

- **Whole school matched:** all teachers in the school are matched as part of IPI
- **Select few:** just a subset of teachers are matched in the school as part of IPI

### Appendix C. Description of Measures for Chapters III and IV

Category	Specific Measure	Description	Used in:
Collaboration Measures	Teacher-level Frequency of Collaborative Learning Opportunities	<p>This frequency scale is created using teacher survey response from the 2018 Tennessee Educator Survey (TES). Teachers were asked to estimate how frequently they engage in a variety of collaborative activities during the 2017-2018 academic year using a five-point scale (Not this year; Once or twice a semester; About once a month; 2-3 times a month; Once a week or more). I created a teacher-level average of 10 survey items listed below on which teachers were asked to report the frequency of their involvement (Cronbach's alpha=0.78).</p> <p><b>Questions (Professional Learning Module)</b></p> <p>During the 2017-18 year, how often have you met with another educator to participate in the following types of one-on-one professional relationships?</p> <ul style="list-style-type: none"> <li>• Peer observation/feedback program in which teachers observe and provide feedback to each other</li> <li>• An informal partnership in which I sought out another teacher to work on a particular issue</li> </ul> <p>During the 2017-18 year, how often did you meet with each type of collaborative team?</p> <ul style="list-style-type: none"> <li>• Grade-level team (e.g. fourth grade team or ninth grade academy)</li> <li>• Subject-area team (e.g. science department or literacy PLC)</li> <li>• Informal group of teachers that gathers to address different areas of need</li> </ul> <p>During the current school year, about how often have you participated in the following collaborative activities?</p> <ul style="list-style-type: none"> <li>• Review student assessment data to make instructional decisions</li> <li>• Observe another teacher's classroom to get ideas for instruction or to offer feedback</li> <li>• Plan a lesson with another teacher</li> <li>• Provide or receive feedback about instructional practices or activities</li> <li>• Ask another teacher for advice about your teaching</li> </ul>	Chapters III and IV
	Team-level frequency of collaboration	This frequency measure represents a team-level mean of the above frequency scale based on the responses for all teachers on a given grade-level or subject-area team (see below for explanation of how teachers placed into teams) who responded to the professional learning module of the TES.	Chapter IV



Teacher-level helpfulness of collaborative learning opportunities	<p>This helpfulness scale is created using teacher survey responses from the 2018 TES. Teachers were asked to rate the extent to which specific collaborative activities were helpful when making decisions about the teaching activities or strategies used in their classrooms. The survey was designed so that teachers were only asked to rate the helpfulness of activities that they reported participating in at least once during the 2017-2018 year. Teachers rated the helpfulness of each activity on a four-point scale (Not helpful; Helped me a little bit; Helped me some; Helped me a lot). Due to length restrictions on the survey, teachers were not asked to rate the helpfulness of all collaborative learning activities. I created a teacher-level average for the five collaborative activities for which teachers were asked to rate the helpfulness (Cronbach’s alpha=0.73). See below the five specific helpfulness items.</p> <p>Unfortunately, a design error in the survey led many teachers to inadvertently skip the helpfulness question. As a result, the number of teachers in the helpful analysis is substantially smaller than the frequency analysis. See Appendix D, Table A5 for further information on this missingness.</p> <p><b>Questions (Professional Learning Module):</b></p> <p>To what extent were these one-on-one relationships helpful when you were making decisions about the teaching activities or strategies used in your classroom?</p> <ul style="list-style-type: none"> <li>• Peer observation/feedback program in which teachers observe and provide feedback to each other</li> <li>• An informal partnership in which I sought out another teacher to work on a particular issue</li> </ul> <p>To what extent was collaborating with these teams helpful when you were making decisions about the teaching activities or strategies used in your classroom?</p> <ul style="list-style-type: none"> <li>• Grade-level team (e.g. fourth grade team or ninth grade academy)</li> <li>• Subject-area team (e.g. science department or literacy PLC)</li> <li>• Informal group of teachers that gathers to address different areas of need</li> </ul>	Chapter III	
Teacher Performance Measures	Prior teacher-level observation scores	<p>This measure, drawn from administrative data, is a continuous variable that captures teachers’ average observation score from the prior year. Annual observations are required for all public school teachers in Tennessee, and teachers are scored on a five-point scale in which 1 represents “significantly below expectations” and 5 represents “significantly above expectations.” All teachers are observed at least once per year, although the number of observations depends on the district, the teacher’s level of experience, and the teacher’s prior performance.</p>	Chapter III and IV

	Prior teacher-level value-added scores	<p>This measure, drawn from administrative data, is a continuous variable that captures teachers' individual value-added score from the prior year. I use the continuous variable rather than the categorical levels and then standardize this continuous variable by year to ease interpretation.</p> <p>Value-added measures are calculated based on student growth on state-mandated standardized tests. Tennessee administers annual assessments in math, reading, social studies, and science to all students in grades 3-8 and end of course exams in certain secondary subjects (English I, English II, English III, Algebra I, Algebra II, Geometry, Biology, Chemistry, and U.S. History) for high school students. These test scores are used to construct teacher effectiveness scores as part of the Tennessee Value-Added Assessment System (TVAAS) for those teachers who teach tested subjects.</p>	Chapter IV
	Observation score	<p>This measure, drawn from administrative data, is a continuous variable that captures teachers' average observation scores for the 2017-2018 academic year. This variable is originally scaled from 1-5 (see description above) but is standardized when included in regression analyses. For analyses involving observation scores as an outcome measure, I include indicator variables for the specific evaluation system used and teachers' average observation score from the prior academic year.</p>	Chapter IV
	Value-added score	<p>This measure, drawn from administrative data, is a continuous variable that captures teachers' value-added score for the 2017-2018 academic year. I use the continuous variable rather than the categorical levels and then standardize this continuous variable by year to ease interpretation.</p>	Chapter IV
Organizational Conditions	Professional Climate and Leadership Scale	<p>This measure, drawn from survey data, is meant to capture overall satisfaction of teachers with the professional climate and leadership of their school. It is calculated by averaging the responses of a given teacher's peers on a scale that includes 11 items with a high degree of internal consistency (Cronbach's alpha=0.96). On average, 21 teachers per school responded to these survey items.</p> <p><b>Questions (Core Survey):</b>  Please indicate the extent to which you agree or disagree with the following statements regarding your school (Response options included 1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree)</p> <ul style="list-style-type: none"> <li>• There is an atmosphere of trust and mutual respect within this school.</li> <li>• Staff at this school have an effective process for making group decisions to solve problems.</li> <li>• Teachers are encouraged to participate in school leadership roles.</li> <li>• The staff at this school like being here; I would describe us as a satisfied group.</li> </ul>	Chapter III

- I feel appreciated for the job that I am doing.
- I am generally satisfied with being a teacher in this school.

Please indicate the extent to which you agree or disagree with the following statements regarding school leadership in your school (Response options included 1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree)

- The principal at my school communicates a clear vision for this school.
- The staff feels comfortable raising issues and concerns that are important to them with school leaders.
- I like the way things are run at this school.

How often do each of the following take place within your school (Response options included 1=Never; 2=Rarely; 3=Sometimes; 4=Almost Always)

- School leadership is visible and available to address staff/student needs.
- School leadership proactively seeks to understand the needs of teachers and staff.

**Note:** I had originally planned to create multiple measures rather than an omnibus scale. In earlier attempts, I examined whether these items could be divided into two scales, one measuring professional climate and another on evaluations of school leadership. In an exploratory factor analysis, all items loaded onto one factor (Eigenvalue= 7.39). When created separately, these two measures are highly correlated (0.86).

Time for Collaboration	This measure, drawn from survey data, is meant to capture the extent to which teachers have sufficient time available for collaboration. It is calculated by averaging the responses of a given teacher’s peers on the core survey question asking about time for collaboration (see below). On average, 21 teachers per school responded to these survey items.	Chapter III
<p><b>Question (Core Survey):</b> Please indicate the degree to which you agree or disagree with the following statement regarding your school (Response options included 1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree)</p> <ul style="list-style-type: none"> <li>• The collaborative planning time provided for teachers in my school is sufficient.</li> </ul>		
Administrative Oversight	This mean, drawn from survey data, is meant to capture the extent to which administrators (defined here as school and district leaders) determine how teachers spend their collaborative time. It is calculated by averaging the response of a given teacher’s peers on the professional learning module asking about who determines activities done during collaborative time (see below). On average, 6 teachers per school responded to this survey item.	Chapter III

**Question (Professional Learning Module):**

Who determines what occurs during your collaborative time? What percentage of the activities were determined by the following people? (Number Entry) Please make sure that your combined responses add up to 100%.

- \_\_\_\_ % Participating teachers
- \_\_\_\_ % Designated team leaders
- \_\_\_\_ % A school administrator and/or district leaders
- \_\_\_\_ Total (must add to 100%)

Peer and Team Composition Measures	Shared Courses	This measure, drawn from administrative data, captures the extent to which a teacher has peers in their school who teach the same specific courses that they teach.	Chapter III
	Peer Prior Performance	This measure, drawn from administrative data, represents a peer average of prior observation scores (described above) for all other teachers on a given teacher's subject-area or grade-level team.	Chapters III and IV
	Peer Group Size	All three of the team composition measures captures information about a teacher's peers on their grade-level or subject-area team. Teachers are placed on teams using the teaching assignment variables described below. These measures are calculated separately for grade-level teams and subject-area teams	Chapter IV
	Peer Experience	This measure, drawn from administrative data, captures the number of other teachers on a given teacher's subject-area or grade-level team.	Chapter IV
Individual Teacher Characteristics	Female	This measure, drawn from administrative data, captures whether a teacher is identified as female (=1) or male(=0)	Chapters III and IV
	Teacher of Color	This measure, drawn from administrative data, captures whether a teacher is identified as a teacher of color (=1) or a White teacher (=0). Teacher of color includes teachers identified as Asian, Black, Hispanic, or another race/ethnic background that is not White.	Chapters III and IV
	Years of Experience	This measure, drawn from administrative data, is a continuous variable that captures how many years a teacher has been working as a teacher in Tennessee schools. In all regression models, this a squared experience term is also included.	Chapters III and IV
	New to School	This measure, drawn from administrative data, is a binary variable indicating whether a teacher is in her first year in her current school (=1) or taught in her school during the prior school year.	Chapters III and IV
	Tested Subject	This measure, drawn from administrative data, is a binary variable indicating whether a teacher teaches at least one class in a subject that is tested under Tennessee's accountability policy (=1) or whether a teacher teaches all untested classes (=0)	Chapters III and IV

Primary grade-level assignment	<p>This measure, created using the administrative course files, captures a teacher’s primary grade-level assignment for the 2017-2018 year (grades Pre-K through 12). I used a multi-step process to determine this grade-level assignment:</p> <ol style="list-style-type: none"> <li>1. For every course listed in the course file, I first identified the modal grade of the students in that course.</li> <li>2. For every teacher, I examined the modal grade for all of their listed courses. I assigned a primary grade to represent the grade for which they had the most classes.</li> <li>3. For teachers who were evenly split across grades, I then examined the number of students that teachers taught in each grade and assigned their primary grade based on the grade with more students. A small subset of teachers were evenly split across both of these metrics and they are categorized as “No Primary.” These “No Primary” teachers are dropped from the analyses in Chapter IV.</li> </ol>	Chapters III and IV
Primary subject-area assignment	<p>This measure, created using the administrative course files, captures a teacher’s primary subject-area assignment for the 2017-2018 year. These subject-areas were defined as:</p> <ul style="list-style-type: none"> <li>• Math</li> <li>• English Language Arts</li> <li>• Science</li> <li>• Social Studies</li> <li>• Self-contained (teachers who taught all four subjects above)</li> <li>• Foreign Language</li> <li>• Creative Arts</li> <li>• Career and Technical Education</li> <li>• Health/Physical Education</li> <li>• Special Education</li> <li>• Other</li> </ul> <p>I used a multi-step process to identify teachers’ primary subject:</p> <ol style="list-style-type: none"> <li>1. I categorized all of the individual course names in the course file based on the categories listed above.</li> <li>2. I identified self-contained teachers using a variety of methods (course files are not consistent in how these teachers are listed and how their courses are named).</li> <li>3. For all remaining teachers, I determined the modal subject of the courses that they taught.</li> <li>4. For teachers who were evenly split across subjects, I identified how many students they taught in each subject-area and then identified their primary subject based on this metric.</li> </ol>	Chapters III and IV

		5. For a subset of teachers who were evenly split across both metrics, I identified these teachers are “No Primary.” These “No Primary” teachers were dropped from the analyses in Chapter IV.	
School Contextual Characteristics	School Level	This measure, drawn from administrative data, is a categorical variable indicating the level/configuration of a school (i.e., elementary, middle, K-8, K-12, high school, or other).	Chapters III and IV
	Charter	This measure, drawn from administrative data, is a binary indicator to capture whether a school is a charter school (=1) or a traditional public school (=0). After the exclusion criteria applied for the sample in Chapter IV, only a handful of teachers in charter schools remained. Because of this, I dropped this variable from the analysis in Chapter IV.	Chapter III
	Faculty size	This measure, drawn from administrative data, is a continuous measure of the number of full-time teachers in a school during the 2017-2018 academic year.	Chapters III and IV
	Percent of faculty new to school	This measure, drawn from administrative data, is a school-level average of the “New to School” measure described above. This measure captures the percentage of teachers who are listed as teaching in a school for the 2017-2018 academic year who were not listed as teaching in the school in the prior year.	Chapters III and IV
	Percent of students who are economically disadvantaged	This measure, drawn from administrative data, is the percent of students enrolled in the school who are identified as economically disadvantaged because they qualify for free or reduced price lunch.	Chapters III and IV
	Percent of students who are Black	These measures, drawn from administrative data, are the percents of students enrolled in the school who are identified as Black and Hispanic respectively. Given the racial demographics in Tennessee, percent of students who are White is dropped due to multicollinearity.	Chapter IV
	Percent of students who are Hispanic		
	Percent of students who receive special education services	This measure, drawn from administrative data, is the percent of students enrolled in a school who received special education services during the 2017-2018 academic year.	Chapter IV
	Prior school-level performance	This measure, drawn from administrative data, captures the school-wide TVAAS category assigned to each school during the prior school year. Level 1 indicates the lowest performing schools and Level 5 indicates the highest performing schools. I also include a category for school that are missing a school-level TVAAS performance metric for the 2016-2017 academic year.	Chapter III and IV
	District size	This measure, drawn from administrative data, is a categorical variable that captures district size in four distinct categories (Less than 10 schools, 10-20 schools, 21-50 schools, and more than 50 schools)	Chapter III and IV
Geographic context	This measure, created using school locale information provided by the National Center for Education Statistics, captures the geographic context of each district. I have collapsed the locale codes into four broad categories (rural, town, suburb, city).	Chapter III and IV	

**Appendix D. Additional Tables for Chapter III Analysis**

**Table A1. Missingness in Helpfulness Questions within Analytic Sample**

<b>Individual Helpfulness Items</b>	<b># actual respondents to Helpfulness Item</b>	<b># respondents who should have responded</b>	<b>Percent missing</b>
Meet with grade-level team (e.g., fourth grade team or ninth grade academy)	4,659	7,709	40%
Meet with subject-area team (e.g., science department or literacy PLC)	4,527	7,729	41%
Meet with informal group of teachers that gathers to address different areas of need	3,579	6,354	44%
Participate in peer observation/feedback program in which teachers observe and provide feedback to each other	1,856	3,323	44%
Seek out another teacher to work on a particular issue	3,010	5,156	42%

**Table A2. Comparing Respondents in Analytic Sample Based on Missingness in Helpfulness Items**

	No Missingness on Helpfulness Items		Missing Some Helpfulness Items		Missing All Helpfulness Items	
	N	%	N	%	N	%
<b>Teacher Characteristics</b>						
<b>Gender</b>						
Female	4,229	83%	3,461	82%	689	74%
Male	888	17%	763	18%	243	26%
<b>Race/Ethnicity</b>						
Teacher of Color	345	7%	336	8%	138	15%
White Teacher	4,772	93%	3,891	92%	787	85%
<b>Years of Teaching Experience</b>						
0-3 years	1,217	24%	758	18%	189	20%
4-6 years	763	15%	525	12%	98	11%
7-10 years	759	15%	559	13%	98	11%
11-17 years	1,111	22%	943	22%	235	25%
18-25 years	851	17%	874	21%	190	20%
26 or more years	416	8%	570	14%	119	13%
<b>Experience in School</b>						
New to School	4,362	85%	3,629	86%	769	83%
Returners	755	15%	563	13%	154	17%
<b>Primary Teaching Assignment</b>						
Math	615	12%	359	9%	72	8%
ELA	700	14%	522	12%	102	11%
Science	420	8%	345	8%	70	8%
Social Studies	331	7%	237	6%	73	8%
Self-Contained	1,540	30%	1,108	26%	214	23%
SPED	191	4%	255	6%	73	8%
Foreign Language/Arts	349	7%	275	7%	42	5%
CTE/Health/PE	516	10%	463	11%	152	16%
Other/No Primary	455	9%	642	15%	152	14%
<b>Tested Subject</b>						
Tested	2,608	51%	2,434	57%	536	58%
Untested	2,509	49%	1,774	42%	293	42%
<b>Tch. Prior Performance (Quartiles)</b>						
Lowest Quartile	1,171	23%	926	22%	175	19%
Second Quartile	1,207	24%	970	23%	203	22%
Third Quartile	1,244	24%	1,028	24%	224	24%
Fourth Quartile	1,077	22%	969	23%	221	24%
Missing 2017 Score	418	8%	314	7%	105	11%
Observations	5,117	100%	4,237	100%	935	100%



**Table A3. Complete Regression Table for Panel A in Table 14**

	Panel A: Frequency Std. Scale			
	(1)	(2)	(3)	(4)
<b>Organizational Conditions of Schools</b>				
Professional Climate & Leadership (Std.)	0.011 (0.013)	0.023 (0.013)		0.027 (0.014)
Time for Collaboration (Std.)	0.069*** (0.013)	0.066*** (0.013)		0.062*** (0.015)
Adm. Oversight over Collaboration (%)	-0.000 (0.001)	-0.000 (0.001)		-0.001 (0.001)
Peer Expertise (Std.)	-0.004 (0.012)	-0.000 (0.012)	0.023 (0.016)	0.003 (0.010)
Shared courses (compared to none)				
Some shared courses	0.128*** (0.031)	0.166*** (0.032)	0.198*** (0.039)	0.160*** (0.032)
All shared courses	0.516*** (0.030)	0.478*** (0.031)	0.479*** (0.037)	0.470*** (0.035)
<b>Teacher Characteristics</b>				
Female	0.009 (0.026)	-0.004 (0.026)	-0.013 (0.028)	-0.005 (0.025)
Teacher of Color	0.148*** (0.038)	0.132*** (0.038)	0.106* (0.048)	0.118 (0.061)
New to School	0.087* (0.035)	0.068 (0.035)	0.096* (0.039)	0.062 (0.038)
Years of Experience	-0.014*** (0.003)	-0.014*** (0.003)	-0.011** (0.003)	-0.014*** (0.003)
Sq. Years of Experience	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)	0.000* (0.000)
Tested Subject	0.075** (0.024)	0.058* (0.024)	0.068* (0.028)	0.061** (0.023)
Tch. Prior Performance (compared to lowest quartile)				
Second Quartile	0.031 (0.028)	0.035 (0.028)	0.050 (0.030)	0.038 (0.033)
Third Quartile	0.071* (0.029)	0.074* (0.029)	0.075* (0.032)	0.074* (0.035)
Highest Quartile	0.132*** (0.031)	0.130*** (0.031)	0.135*** (0.036)	0.128** (0.042)
Missing Prior Year Score	0.108* (0.047)	0.112* (0.047)	0.115* (0.055)	0.121* (0.058)

Primary Subject (compared to self-contained)				
Math	-0.215*** (0.038)	-0.156*** (0.042)	-0.192*** (0.049)	-0.147** (0.049)
English Language Arts	-0.092** (0.035)	-0.040 (0.038)	-0.062 (0.043)	-0.036 (0.041)
Science	-0.183*** (0.040)	-0.137** (0.044)	-0.160** (0.050)	-0.125* (0.054)
Social Studies	-0.244*** (0.044)	-0.204*** (0.047)	-0.223*** (0.053)	-0.201*** (0.056)
Special Education	-0.210*** (0.052)	-0.208*** (0.054)	-0.250*** (0.067)	-0.208*** (0.057)
Foreign Language/Creative Arts	-0.577*** (0.045)	-0.556*** (0.047)	-0.587*** (0.053)	-0.555*** (0.044)
CTE/Health/PE	-0.286*** (0.038)	-0.249*** (0.042)	-0.280*** (0.051)	-0.245*** (0.049)
Other/No Primary	-0.208*** (0.038)	-0.174*** (0.039)	-0.195*** (0.048)	-0.178*** (0.043)
<b>Contextual Characteristics</b>				
School Tier (compared to elementary)				
Middle		-0.007 (0.035)		-0.001 (0.038)
High		-0.223*** (0.041)		-0.185*** (0.042)
K-8/K-12		-0.221*** (0.040)		-0.210*** (0.048)
Other		-0.178** (0.066)		-0.153* (0.072)
School Size (# of teachers)				
Charter		0.001 (0.001)		0.000 (0.001)
District Geographic Context (compared to city)				
Rural		-0.138* (0.061)		
Suburb		-0.002 (0.066)		
Town		-0.113 (0.066)		

School Prior Performance (compared to Level 1)				
Level 2		-0.055 (0.045)		-0.056 (0.045)
Level 3		-0.057 (0.035)		-0.061 (0.031)
Level 4		-0.001 (0.042)		-0.008 (0.049)
Level 5		-0.044 (0.029)		-0.052 (0.034)
Missing Prior Performance		-0.040 (0.049)		-0.041 (0.080)
% of students economically disadvantaged		0.001 (0.001)		0.002 (0.001)
% of teachers new to school		0.003* (0.001)		0.002 (0.001)
District Size (compared to Less than 10 schools)				
10-20 schools		0.036 (0.039)		
21-50 schools		0.040 (0.054)		
More than 50 schools		0.162 (0.084)		
Constant	-0.239*** (0.059)	-0.123 (0.096)	-0.180** (0.057)	-0.105 (0.072)
Ins1_1_1 Constant	-1.748*** (0.101)	-2.054*** (0.135)		
Ins2_1_1 Constant	-1.785*** (0.108)	-1.896*** (0.126)		
Insig_e Constant	-0.127*** (0.008)	-0.128*** (0.008)		
Observations	9615	9615	9615	9615

Notes: Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table A4. Complete Regression Table for Panel B in Table 14**

	Panel B: Helpfulness Std. Scale			
	(1)	(2)	(3)	(4)
Std. Frequency Scale	0.411*** (0.014)	0.412*** (0.014)	0.417*** (0.017)	0.418*** (0.017)
<b>Organizational Conditions of Schools</b>				
Professional Climate & Leadership (Std.)	0.064*** (0.015)	0.056*** (0.016)		0.042** (0.015)
Time for Collaboration (Std.)	0.013 (0.015)	0.010 (0.015)		0.012 (0.014)
Adm. Oversight over Collaboration (%)	-0.002*** (0.001)	-0.003*** (0.001)		-0.002*** (0.001)
Peer Expertise (Std.)	0.051*** (0.014)	0.040** (0.014)	0.023 (0.020)	0.036* (0.015)
Shared courses (compared to none)				
Some shared courses	-0.084* (0.042)	-0.039 (0.044)	-0.028 (0.056)	-0.037 (0.053)
All shared courses	-0.068 (0.039)	-0.066 (0.041)	-0.061 (0.054)	-0.050 (0.041)
<b>Teacher Characteristics</b>				
Female	0.129*** (0.034)	0.108** (0.034)	0.150*** (0.040)	0.104** (0.034)
Teacher of Color	0.016 (0.050)	0.035 (0.051)	0.073 (0.057)	0.064 (0.074)
New to School	-0.018 (0.043)	-0.004 (0.044)	-0.039 (0.049)	0.002 (0.042)
Years of Experience	-0.005 (0.004)	-0.006 (0.004)	-0.009 (0.005)	-0.006 (0.004)
Sq. Years of Experience	0.000* (0.000)	0.000* (0.000)	0.000** (0.000)	0.000* (0.000)
Tested Subject	-0.090** (0.030)	-0.095** (0.031)	-0.078* (0.037)	-0.089** (0.031)
Tch. Prior Performance (compared to lowest quartile)				
Second Quartile	-0.018 (0.035)	-0.022 (0.035)	-0.032 (0.039)	-0.033 (0.033)
Third Quartile	-0.066 (0.037)	-0.072 (0.037)	-0.106* (0.044)	-0.079* (0.034)

Highest Quartile	-0.052 (0.040)	-0.061 (0.040)	-0.047 (0.049)	-0.059 (0.044)
Missing Prior Year Score	-0.001 (0.058)	-0.012 (0.058)	0.008 (0.068)	-0.031 (0.064)
<b>Primary Subject (compared to self-contained)</b>				
Math	-0.207*** (0.046)	-0.125* (0.052)	-0.141* (0.065)	-0.133** (0.050)
English Language Arts	-0.191*** (0.043)	-0.124** (0.048)	-0.133* (0.058)	-0.131** (0.050)
Science	-0.177*** (0.051)	-0.110* (0.055)	-0.129 (0.070)	-0.124* (0.048)
Social Studies	-0.196*** (0.056)	-0.118 (0.061)	-0.134 (0.077)	-0.134* (0.065)
Special Education	-0.041 (0.071)	-0.001 (0.073)	0.034 (0.084)	-0.006 (0.068)
Foreign Language/Creative Arts	-0.166** (0.058)	-0.094 (0.062)	-0.047 (0.074)	-0.093 (0.065)
CTE/Health/PE	-0.293*** (0.051)	-0.217*** (0.056)	-0.159* (0.067)	-0.213*** (0.054)
Other/No Primary	-0.037 (0.047)	-0.010 (0.048)	0.015 (0.060)	0.003 (0.047)
<b>Contextual Characteristics</b>				
<b>School Tier (compared to elementary)</b>				
Middle		-0.089* (0.042)		-0.097* (0.048)
High		-0.201*** (0.049)		-0.185*** (0.042)
K-8/K-12		-0.002 (0.046)		0.056 (0.049)
Other		-0.072 (0.081)		-0.024 (0.060)
School Size (# of teachers)		0.001 (0.001)		0.001 (0.001)
Charter		-0.015 (0.198)		-0.005 (0.188)
<b>District Geographic Context (compared to city)</b>				

Rural		0.032 (0.044)		
Suburb		-0.027 (0.042)		
Town		0.035 (0.049)		
School Prior Performance (compared to Level 1)				
Level 2		0.027 (0.053)		0.034 (0.054)
Level 3		0.088* (0.041)		0.076 (0.039)
Level 4		-0.008 (0.050)		-0.026 (0.044)
Level 5		0.047 (0.034)		0.016 (0.029)
Missing Prior Performance		0.055 (0.055)		0.039 (0.053)
% of students economically disadvantaged		-0.000 (0.001)		-0.000 (0.001)
% of teachers new to school		-0.000 (0.001)		-0.000 (0.002)
District Size (compared to Less than 10 schools)				
10-20 schools		-0.103** (0.034)		
21-50 schools		-0.069 (0.040)		
More than 50 schools		-0.125* (0.049)		
Constant	0.212** (0.071)	0.229* (0.100)	0.034 (0.080)	0.164 (0.100)
Ins1_1_1 Constant	-2.685*** (0.351)	-3.545* (1.638)		
Ins2_1_1 Constant	-2.302*** (0.381)	-2.460*** (0.525)		
Insig_e Constant	-0.117*** (0.010)	-0.117*** (0.010)		
Observations	5866	5866	5866	5866

Notes: Standard errors in parentheses.

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

**Table A5. Regression Models by School Level (Elementary, Middle, High)**

	Panel A: Frequency Std. Scale			Panel B: Helpfulness Std. Scale		
	Elem. (2)	Middle (2)	High (2)	Elem. (2)	Middle (2)	High (2)
<b>Organizational Conditions of Schools</b>						
Professional Climate & Leadership (Std.)	0.037 (0.020)	0.041 (0.029)	-0.015 (0.029)	0.018 (0.023)	0.066* (0.032)	0.034 (0.039)
Time for Collaboration (Std.)	0.066** (0.020)	0.023 (0.027)	0.097*** (0.026)	0.032 (0.023)	0.032 (0.029)	-0.029 (0.035)
Adm. Oversight over Collaboration (%)	0.001 (0.001)	-0.003* (0.001)	-0.000 (0.001)	-0.003** (0.001)	-0.002 (0.002)	-0.001 (0.002)
<b>Access to Peer Expertise</b>						
Peer Expertise (team avg. of prior year observation scores)	-0.019 (0.017)	0.018 (0.027)	-0.036 (0.027)	0.027 (0.020)	0.041 (0.031)	0.058 (0.035)
Shared courses (compared to none)						
Some shared courses	0.087 (0.078)	0.301** (0.095)	0.238*** (0.052)	-0.011 (0.102)	-0.028 (0.114)	-0.012 (0.076)
All shared courses	0.434*** (0.053)	0.643*** (0.081)	0.474*** (0.062)	-0.066 (0.068)	-0.119 (0.102)	-0.035 (0.087)
Teacher-level Covariates	X	X	X	X	X	X
School and District Covariates	X	X	X	X	X	X
Observations	4082	1820	2391	2600	1126	1388

Notes: Standard errors in parentheses.

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

**Table A6. Administrative Oversight in Deciles**

	Helpfulness Std. Scale	
	(2)	(4)
Adm. Oversight over Collaboration (Deciles)		
Second Decile	-0.077 (0.053)	-0.067 (0.059)
Third Decile	-0.094 (0.053)	-0.105 (0.059)
Fourth Decile	0.004 (0.052)	-0.003 (0.060)
Fifth Decile	-0.063 (0.055)	-0.064 (0.057)
Sixth Decile	-0.124* (0.054)	-0.108* (0.053)
Seventh Decile	-0.132* (0.054)	-0.111 (0.063)
Eighth Decile	-0.137* (0.055)	-0.117* (0.057)
Ninth Decile	-0.081 (0.056)	-0.054 (0.055)
Tenth Decile	-0.199*** (0.057)	-0.170** (0.057)
Teacher-level Covariates	X	X
School and District Covariates	X	X
School Fixed Effects		
District Fixed Effects		X
Observations	5866	5866

Notes: Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



**Table A6. Regression Models by School Level (Elementary, Middle, High)**

	Panel A: Frequency Std. Scale			Panel B: Helpfulness Std. Scale		
	Elem. (2)	Middle (2)	High (2)	Elem. (2)	Middle (2)	High (2)
<b>Organizational Conditions of Schools</b>						
Professional Climate & Leadership (Std.)	0.037 (0.020)	0.041 (0.029)	-0.015 (0.029)	0.018 (0.023)	0.066* (0.032)	0.034 (0.039)
Time for Collaboration (Std.)	0.066** (0.020)	0.023 (0.027)	0.097*** (0.026)	0.032 (0.023)	0.032 (0.029)	-0.029 (0.035)
Adm. Oversight over Collaboration (%)	0.001 (0.001)	-0.003* (0.001)	-0.000 (0.001)	-0.003** (0.001)	-0.002 (0.002)	-0.001 (0.002)
<b>Access to Peer Expertise</b>						
Peer Expertise (team avg. of prior year observation scores)	-0.019 (0.017)	0.018 (0.027)	-0.036 (0.027)	0.027 (0.020)	0.041 (0.031)	0.058 (0.035)
Shared courses (compared to none)						
Some shared courses	0.087 (0.078)	0.301** (0.095)	0.238*** (0.052)	-0.011 (0.102)	-0.028 (0.114)	-0.012 (0.076)
All shared courses	0.434*** (0.053)	0.643*** (0.081)	0.474*** (0.062)	-0.066 (0.068)	-0.119 (0.102)	-0.035 (0.087)
Teacher-level Covariates	X	X	X	X	X	X
School and District Covariates	X	X	X	X	X	X
Observations	4082	1820	2391	2600	1126	1388

**Appendix E. Additional Tables for Chapter IV Analysis**

**Table A7. Full Regression Results for Table 19 (Frequency of Collaboration)**

	Panel A: Teacher-level frequency of collaboration		Panel B: Grade team-level frequency of collaboration		Panel C: Subject-area team-level frequency of collaboration	
	(1)	(2)	(1)	(2)	(1)	(2)
	OLS	Sch. Fixed Effects	OLS	Sch. Fixed Effects	OLS	Sch. Fixed Effects
<b>Team Characteristics</b>						
Grade-level team size (# of teachers)	0.015** (0.003)	0.008 (0.005)	0.012** (0.003)	0.000 (0.005)		
Grade-level peer experience	-0.008** (0.003)	-0.004 (0.003)	-0.012** (0.003)	-0.007* (0.003)		
Grade-level peer prior performance	-0.006 (0.047)	0.030 (0.062)	0.027 (0.032)	0.060 (0.054)		
Subject-area team size (# of teachers)	0.026** (0.004)	0.026** (0.005)			0.024** (0.006)	0.022** (0.007)
Subject-area peer experience	-0.005+ (0.003)	-0.001 (0.003)			-0.010** (0.003)	-0.005 (0.003)
Subject-area peer prior performance	0.018 (0.045)	0.052 (0.050)			0.017 (0.029)	0.039 (0.034)
<b>Teacher Characteristics</b>						
Female	0.022 (0.031)	0.009 (0.033)	0.023 (0.022)	0.013 (0.019)	0.035 (0.025)	0.018 (0.025)
Teacher of Color	0.179** (0.054)	0.129* (0.056)	0.106** (0.040)	0.042 (0.034)	0.128** (0.041)	0.064* (0.036)
New to School	0.038 (0.044)	0.115* (0.048)	0.004 (0.033)	0.069* (0.032)	-0.004 (0.031)	0.063* (0.028)

Years of Experience	-0.015** (0.004)	-0.012** (0.004)	-0.009** (0.003)	-0.005+ (0.003)	-0.008** (0.003)	-0.004 (0.003)
Years of Experience Squared	0.000* (0.000)	0.000+ (0.000)	0.000+ (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Prior-year Avg. Observation Score	0.037** (0.013)	0.038* (0.015)	0.023* (0.010)	0.016+ (0.009)	0.023* (0.011)	0.013 (0.010)
Primary Subject (Self-contained is reference)						
Math	-0.269** (0.058)	-0.249** (0.066)	-0.163** (0.048)	-0.128** (0.046)	-0.280** (0.057)	-0.235** (0.063)
English Language Arts	-0.146** (0.052)	-0.120* (0.060)	-0.084+ (0.044)	-0.058 (0.044)	-0.168** (0.050)	-0.117* (0.057)
Science	-0.252** (0.057)	-0.240** (0.066)	-0.135** (0.046)	-0.105* (0.046)	-0.268** (0.057)	-0.250** (0.064)
Social Studies	-0.304** (0.063)	-0.264** (0.071)	-0.223** (0.050)	-0.170** (0.047)	-0.355** (0.062)	-0.330** (0.069)
Foreign Language	-0.493** (0.110)	-0.434** (0.125)	-0.332** (0.080)	-0.216** (0.073)	-0.586** (0.105)	-0.547** (0.116)
Career and Technical	-0.598** (0.072)	-0.563** (0.083)	-0.292** (0.052)	-0.208** (0.050)	-0.690** (0.069)	-0.662** (0.078)
Creative Arts	-0.791** (0.070)	-0.755** (0.081)	-0.432** (0.052)	-0.283** (0.049)	-0.860** (0.069)	-0.862** (0.079)
Health/PE	-0.065 (0.086)	-0.091 (0.095)	-0.141* (0.056)	-0.134** (0.050)	-0.143+ (0.086)	-0.196* (0.095)
Special Education	-0.372** (0.084)	-0.386** (0.092)	-0.180** (0.061)	-0.143* (0.058)	-0.456** (0.079)	-0.489** (0.085)

Other/No Primary	-0.383** (0.056)	-0.348** (0.066)	-0.169** (0.050)	-0.129** (0.049)		
Tested Subject	0.120** (0.043)	0.135** (0.048)	0.001 (0.029)	0.007 (0.026)	0.011 (0.036)	0.001 (0.037)
Primary Grade (First grade is reference)						
Pre-Kindergarten	-0.219+ (0.115)	-0.192 (0.126)	-0.299** (0.113)	-0.269* (0.124)	-0.057 (0.064)	0.014 (0.036)
Kindergarten	0.037 (0.054)	0.018 (0.060)	0.032 (0.054)	0.033 (0.059)	0.013 (0.032)	-0.018 (0.018)
Second Grade	0.051 (0.056)	0.038 (0.061)	0.036 (0.056)	0.030 (0.060)	0.015 (0.032)	-0.014 (0.019)
Third Grade	-0.074 (0.068)	-0.113 (0.074)	0.003 (0.059)	-0.015 (0.061)	0.026 (0.052)	0.014 (0.044)
Fourth Grade	-0.061 (0.071)	-0.091 (0.082)	-0.028 (0.061)	-0.042 (0.068)	0.037 (0.057)	0.009 (0.055)
Fifth Grade	-0.128+ (0.071)	-0.194* (0.079)	-0.108+ (0.063)	-0.159* (0.067)	0.025 (0.057)	0.007 (0.052)
Sixth Grade	-0.145+ (0.078)	-0.308** (0.105)	-0.114 (0.070)	-0.259** (0.095)	0.086 (0.069)	-0.058 (0.080)
Seventh Grade	-0.115 (0.084)	-0.335** (0.108)	-0.106 (0.075)	-0.314** (0.097)	0.098 (0.075)	-0.102 (0.083)
Eighth Grade	-0.160* (0.081)	-0.363** (0.112)	-0.140+ (0.071)	-0.336** (0.101)	0.078 (0.071)	-0.090 (0.082)
Ninth Grade	-0.489** (0.081)	-0.582** (0.164)	-0.535** (0.074)	-0.537** (0.158)	-0.289** (0.071)	-0.178+ (0.106)
Tenth Grade	-0.467** (0.089)	-0.538** (0.167)	-0.513** (0.079)	-0.508** (0.157)	-0.308** (0.078)	-0.149 (0.109)

Eleventh Grade	-0.546** (0.083)	-0.660** (0.163)	-0.586** (0.075)	-0.620** (0.156)	-0.377** (0.075)	-0.231* (0.107)
Twelfth Grade	-0.465** (0.079)	-0.605** (0.161)	-0.548** (0.074)	-0.620** (0.157)	-0.302** (0.072)	-0.175+ (0.106)
No Primary	0.048 (0.252)	-0.146 (0.331)			0.201 (0.242)	0.132 (0.292)
<b>School Characteristics</b>						
School Size (# of teachers)	-0.004** (0.001)		-0.000 (0.001)		-0.001 (0.001)	
Geographic Location (city is reference)						
Rural	-0.144** (0.041)		-0.117** (0.041)		-0.144** (0.042)	
Town	-0.120** (0.046)		-0.078+ (0.046)		-0.113* (0.048)	
Suburb	-0.036 (0.040)		-0.025 (0.041)		-0.031 (0.041)	
Prior-year Sch. Performance (Level 1 is reference)						
Level 2	-0.044 (0.058)		-0.053 (0.056)		-0.067 (0.064)	
Level 3	-0.024 (0.044)		-0.044 (0.042)		-0.011 (0.044)	
Level 4	0.042 (0.053)		0.030 (0.054)		0.057 (0.054)	
Level 5	-0.007 (0.036)		-0.008 (0.036)		0.007 (0.037)	
Missing Performance Level	-0.095 (0.059)		-0.091 (0.059)		-0.059 (0.059)	

Sch. % New Teachers	0.002 (0.002)		0.003* (0.002)		0.003+ (0.002)	
Sch. % Students Economically Disadvantaged	-0.002+ (0.001)		-0.002* (0.001)		-0.002* (0.001)	
Sch. % Students Black	0.004** (0.001)		0.005** (0.001)		0.004** (0.001)	
Sch. % Students Hispanic	0.000 (0.001)		0.001 (0.001)		0.001 (0.002)	
Sch. % Students in Special Education	-0.005+ (0.003)		-0.005+ (0.002)		-0.001 (0.003)	
Constant	0.557** (0.175)	-0.005 (0.268)	0.415** (0.156)	0.251 (0.233)	0.331* (0.147)	0.109 (0.153)
Observations	6970	6970	6959	6959	6397	6397
Adjusted $R^2$	0.143	0.064	0.170	0.029	0.230	0.136

Notes: Standard errors in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$

**Table A8. Full Regression Results for Table 20 (Teacher-Level Frequency)**

	Panel A: Standardized Avg. Observation Score Outcome			Panel B: Standardized Value-added Score Outcome		
	(1)	(2)	(3)	(1)	(2)	(3)
<b>Collaboration Measure</b>						
Standardized Frequency Scale (teacher-level)	0.012	0.012	0.025**	0.036	0.039+	-0.016
	-0.008	-0.008	-0.008	-0.024	-0.024	-0.027
<b>Team Measures</b>						
Grade-level team size (# of teachers)	0.004*	0.001	0.007*	-0.011*	-0.010+	0.003
	-0.002	-0.002	-0.003	-0.005	-0.005	-0.009
Grade-level peer experience	-0.002	-0.003+	-0.004*	0.001	-0.002	-0.013
	-0.002	-0.002	-0.002	-0.005	-0.005	-0.008
Grade-level peer prior performance	0.182**	0.148**	0.034	0.047	0.059	-0.191
	-0.036	-0.037	-0.044	-0.083	-0.086	-0.145
Subject-area team size (# of teachers)	0.005+	0.003	0.002	0.006	0.01	0.008
	-0.003	-0.003	-0.003	-0.007	-0.008	-0.011
Subject-area peer experience	0.002	0.001	0.002	-0.001	-0.001	-0.007
	-0.002	-0.002	-0.002	-0.006	-0.006	-0.008
Subject-area peer prior performance	0.097**	0.087**	0.021	-0.001	0.009	-0.243*
	-0.033	-0.032	-0.036	-0.082	-0.082	-0.121
<b>Teacher Controls</b>						
Female	0.111**	0.110**	0.102**	0.097+	0.105+	0.113+
	(0.022)	(0.022)	(0.023)	(0.056)	(0.056)	(0.059)
Teacher of Color	-0.059	-0.030	-0.012	-0.090	-0.079	0.069
	(0.036)	(0.037)	(0.040)	(0.079)	(0.089)	(0.103)
New to School	-0.062	-0.064	-0.084+	-0.054	-0.047	0.012
	(0.042)	(0.043)	(0.044)	(0.077)	(0.079)	(0.090)
Years of Experience	-0.006*	-0.007**	-0.007**	-0.003	-0.002	-0.005
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.007)

Years of Experience Squared	0.000 (0.000)	0.000 <sup>+</sup> (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Prior-year Avg. Observation Score/TVAAS (Std.)	0.690** (0.012)	0.685** (0.012)	0.663** (0.014)	0.507** (0.025)	0.507** (0.026)	0.556** (0.029)
Primary Subject (English Language Arts is reference)						
Math	-0.037 (0.029)	-0.036 (0.028)	-0.013 (0.030)	-0.042 (0.049)	-0.050 (0.049)	-0.016 (0.055)
Science	-0.002 (0.031)	0.002 (0.031)	0.008 (0.032)	-0.013 (0.068)	0.002 (0.068)	0.008 (0.077)
Social Studies	-0.013 (0.039)	-0.005 (0.038)	-0.015 (0.039)	0.110 (0.126)	0.109 (0.127)	0.226* (0.114)
Self-contained	-0.010 (0.032)	-0.007 (0.032)	-0.027 (0.036)	0.017 (0.093)	-0.005 (0.098)	0.002 (0.163)
Foreign Language	-0.051 (0.073)	-0.055 (0.072)	-0.082 (0.075)			
Career and Technical	-0.039 (0.041)	-0.013 (0.040)	0.007 (0.041)	-0.095 (0.118)	-0.085 (0.120)	0.069 (0.181)
Creative Arts	-0.000 (0.048)	0.002 (0.047)	-0.001 (0.052)	-0.129 (0.145)	0.033 (0.206)	0.609 (0.556)
Health/PE	0.022 (0.049)	0.025 (0.049)	0.026 (0.052)	0.847** (0.140)	0.887** (0.263)	0.676** (0.245)
Special Education	-0.033 (0.054)	-0.008 (0.053)	-0.012 (0.054)	0.017 (0.149)	0.035 (0.152)	0.130 (0.192)
Other/No Primary	-0.042 (0.036)	-0.025 (0.036)	-0.019 (0.038)	-0.087 (0.093)	-0.118 (0.093)	-0.218* (0.125)
Tested Subject	-0.006 (0.027)	-0.005 (0.027)	0.009 (0.028)	0.059 (0.098)	0.054 (0.093)	0.099 (0.121)



Primary Grade (First grade is reference)

Pre-Kindergarten	0.008 (0.060)	0.018 (0.058)	0.055 (0.057)			
Kindergarten	-0.049 (0.037)	-0.048 (0.037)	-0.046 (0.035)			
Second Grade	-0.112** (0.038)	-0.105** (0.037)	-0.077* (0.038)			
Third Grade	-0.032 (0.044)	-0.038 (0.044)	-0.046 (0.044)	-0.199 (0.153)	-0.208 (0.162)	-0.373 (0.328)
Fourth Grade	-0.034 (0.046)	-0.039 (0.046)	-0.036 (0.049)	-0.212 (0.148)	-0.264+ (0.157)	-0.282 (0.315)
Fifth Grade	-0.055 (0.048)	-0.049 (0.048)	-0.075 (0.049)	-0.141 (0.103)	-0.165 (0.108)	-0.128 (0.249)
Sixth Grade	-0.034 (0.052)	-0.016 (0.052)	-0.030 (0.065)	-0.043 (0.090)	-0.095 (0.096)	-0.005 (0.216)
Seventh Grade	-0.132* (0.053)	-0.112* (0.053)	-0.104 (0.068)	-0.050 (0.097)	-0.109 (0.101)	-0.097 (0.219)
Eighth Grade	-0.072 (0.052)	-0.059 (0.052)	-0.079 (0.070)	-0.025 (0.088)	-0.072 (0.092)	-0.003 (0.206)
Ninth Grade	-0.117* (0.054)	-0.116* (0.055)	-0.099 (0.114)	0.274** (0.096)	0.246* (0.097)	0.051 (0.120)
Tenth Grade	-0.114* (0.057)	-0.121* (0.058)	-0.098 (0.117)	0.161+ (0.087)	0.144 (0.090)	-0.041 (0.106)
Eleventh Grade	-0.053 (0.052)	-0.062 (0.053)	-0.017 (0.117)	-0.083 (0.092)	-0.102 (0.092)	-0.104 (0.102)
Twelfth Grade	-0.047 (0.055)	-0.045 (0.057)	-0.002 (0.121)			

No Primary Grade	0.368* (0.156)	0.330* (0.149)	0.231 (0.191)
<b>School Characteristics</b>			
School Size (# of teachers)		0.001 (0.001)	-0.002 (0.002)
Geographic Location (city is reference)			
Rural		-0.043 (0.032)	-0.125 (0.085)
Town		-0.075* (0.030)	-0.072 (0.078)
Suburb		-0.016 (0.035)	-0.142 (0.091)
Prior-year Sch. Performance (Level 1 is reference)			
Level 2		0.010 (0.051)	0.147 (0.094)
Level 3		0.026 (0.032)	0.041 (0.072)
Level 4		0.088* (0.035)	-0.085 (0.084)
Level 5		0.146** (0.026)	0.025 (0.066)
Missing Performance Level		0.125** (0.039)	0.569** (0.181)
Sch. % New Teachers		0.001 (0.001)	-0.002 (0.003)
Sch. % Students Economically Disadvantaged		-0.000 (0.001)	0.005* (0.002)

Sch. % Students Black		-0.001 <sup>+</sup> (0.001)			-0.004 <sup>*</sup> (0.002)	
Sch. % Students Hispanic		-0.003 <sup>*</sup> (0.001)			-0.001 (0.003)	
Sch. % Students in Special Education		-0.007 <sup>**</sup> (0.002)			-0.020 <sup>*</sup> (0.008)	
Evaluation Model (Coach is reference)						
TAP		0.093 (0.097)				
TEAM		0.029 (0.052)				
TEM		0.114 (0.078)				
TIGER		-0.046 (0.072)				
Grade & Subject Fixed Effects	X	X	X	X	X	X
School Controls		X			X	
School Fixed Effects			X			X
Observations	6970	6970	6970	2404	2404	2404
Adjusted R <sup>2</sup>	0.609	0.616	0.491	0.23	0.234	0.267

**Table A9. Robustness Check for Tables 21-22 Based on Sample Size**

Variable of Interest	Reported School FE Coefficient	Alternative Sample A School FE Coefficient	Alternative Sample B School FE Coefficient
<b>Observation Scores (Panel A)</b>			
Grade-level standardized frequency Scale (Table 21, Model 3)	0.033** (0.012) N=7160	0.078* (0.031) N=3,245	0.141** (0.047) N=1,834
Subject-area standardized frequency Scale (Table 22, Model 3)	0.021 (0.014) N=7160	0.079 (0.044) N=3,762	0.022 (0.050) N=2,443
<b>TVAAS Scores (Panel B)</b>			
Grade-level standardized frequency Scale (Table 21, Model 3)	-0.032 (0.051) N=2436	-0.087 (0.101) N=1,307	-0.088 (0.147) N=807
Subject-area standardized frequency Scale (Table 22, Model 3)	-0.024 (0.044) N=2434	0.055 (0.119) N=1,119	0.171 (0.323) N=603

Note: These regression results are intended to capture how sensitive the reported coefficients estimating the relationship between the frequency of collaboration and growth in observation scores are to changes in sample size. The sample for alternative A is limited to teachers who had at least 2 colleagues report on their frequency of collaboration and the sample for alternative B is limited to teachers who had at least 3 colleagues report on their frequency of collaboration.

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