How Leaders Agree with Teachers in Schools on Measures of Leadership Practice: A Two-Level Latent Class Analysis of the Comprehensive Assessment of Leadership for Learning[1,2]

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ABSTRACT:

Background: Across the recent research on school leadership, leadership for learning has emerged as a strong framework for integrating current theories, such as instructional, transformational, and distributed leadership as well as effective human resource practices, instructional evaluation, and resource allocation. Yet, questions remain as to how, and to what extent teachers and leaders practice the skills and tasks that are known to be associated with effective school leadership, and to what extent do teachers and leaders agree that these practices are taking place in their school.

Purpose of the Study: We examine these issues through applying a congruency-typology model to the validation sample of the Comprehensive Assessment of Leadership for Learning (CALL), (117 schools across the US, including 3,367 teachers and their school leaders) to examine the extent to which there may be significantly different subgroups of teacher and leader responders to the survey, how these subgroups may cluster non-randomly in schools, and to what extent the subgroups of teachers and principals are aligned or not on their perception that the skills and practices of leadership for learning take place in their school.

Research Design: We used multilevel latent class analysis (LCA) to identify significantly different types of teacher and leader responders to CALL, including a cross-level interaction to examine the extent to which there is a typology model of teacher responders across schools and the extent to which the teacher subgroup responses align with the leader of the school.

Findings: We find that there are three statistically significant different subgroups of teacher responders to CALL, Low (31.4%), Moderate (43.3%), and High (25.4%). In addition, these subgroups cluster non-randomly across three different types of schools: schools with low leadership for learning (40.2%), moderate leadership for learning (47.0%), and the smallest subgroup, schools with high leadership for learning (12.8%).

Conclusions: Our findings suggest that a congruency-typology model of leadership for learning is useful for understanding the context of practice, as schools may be on a continuum of practice in which there is strong alignment between teacher and leader responder types in the low and high schools – indicating problematic or beneficial contexts – but that leaders in the moderate type may be working to move their school towards instructional improvement through leadership for learning. As a quantitative phenomenology, this study provides a rich contextual analysis of the relationship between teachers and leaders on a multisource feedback survey of leadership for learning in schools.

Keywords: School Leadership, Leadership for Learning, Leadership Styles, Instructional Leadership, Transformational Leadership, Latent Class Analysis, Mixture Modeling, Multivariate Methods, Multisource Feedback, Survey Research, Online Surveys, Teacher Leadership, Principals

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EXECUTIVE SUMMARY:

Research on school leadership over the last decade has seen the emergence of Leadership for Learning as a central framework for integrating the current theories for how to lead instructional and professional improvement in schools. This framework integrates the current research on theories of school leadership, such as shared instructional, transformational and distributed leadership perspectives, along with issues on effective human resource practices, instructional evaluation and resource allocation. The Leadership for Learning framework brings together this research through the five central domains of 1) a focus on learning, 2) monitoring teaching and learning, 3) building nested learning communities, 4) acquiring and allocating resources, and 5) maintaining a safe and effective learning environment. Yet, questions remain across this research domain as to how, and to what extent teachers and leaders practice the skills and tasks that are known to be associated with effective school leadership, and to what extent do teachers and leaders agree that these practices are taking place in their school. Examining the alignment or misalignment of the perception between teachers and leaders in a school of the frequency that the practices of leadership for learning are enacted would provide a useful means to examine the rich complexity of school leadership and practice contexts, and how these may lead to school improvement.

In this study, we articulate a Congruency-Typology model of Leadership for Learning. Recent school leadership research has shown strong evidence that teachers and leaders enact multidimensional styles of leadership, in which high transformational leadership is a necessary but insufficient condition for high shared instructional leadership, and as such school personnel enact a continuum of practices across these multiple dimensions. Additionally, recent multisource organizational feedback research (known also as 360 degree feedback research) has demonstrated that teachers and school leaders may have very different conceptions of each other's practice. Our purpose in the present study is to examine the extent of alignment and misalignment of teacher and leader perceptions of the extent of leadership for learning practices and skills in their schools. Through a Congruency-Typology model, we posit that teachers are on a continuum of practice for leadership for learning, from low to high, as are leaders. Thus, together, the school context for leadership for learning may be low for teachers and leaders, high for both, or low for one and high for the other. In contexts in which there is alignment between teachers and leaders, either the school has a very problematic context for leading instructional improvement (in which the responses align and are low for both), or the teachers and leaders agree that leadership for learning is taking place regularly. Moreover, schools that may be misaligned, in which leaders perceive that leadership for learning is taking place regularly but teachers

do not, or the reverse in which teachers' perceptions are higher than leaders', would present very interesting contexts to understand the complexities of how the multiple facets of Leadership for Learning are enacted or inhibited on a regular basis in schools. Currently the extent that these skills are practiced in schools, the extent that there is alignment or misalignment, and the proportion of teachers, leaders and schools across these subgroups is unknown.

To study these issues, we draw upon a unique dataset, the validation sample of the Comprehensive Assessment of Leadership for Learning (CALL). CALL is a recently validated comprehensive survey of Leadership for Learning, including 200 survey questions, filled out online by a school's teachers and leaders, which focuses on the practices, skills and knowledge needed to enact leadership for learning. CALL is designed to be a formative assessment, helping to shift teachers and leaders to stronger instructional, transformational and distributed leadership capacities intended to develop the skills and knowledge known to be associated with instructional improvement. The CALL validation sample consists of 117 schools across the US, including 3,367 teachers and their school leaders. We examined the Congruency-Typology model through an analysis of this dataset using multilevel Latent Class Analysis (LCA) to identify significantly different types of teacher and leader responders to CALL, including a cross-level interaction to examine the extent to which there is a typology model of teacher responders across schools and the extent to which the teacher subgroup responses align with the leader of the school or not.

Our results demonstrate evidence for the Congruency-Typology model of Leadership for Learning. We find that there are three statistically significant different subgroups of teacher responders to CALL, Low (31.4%), Moderate (43.3%), and High (25.4%). In addition, these subgroups cluster non-randomly across three different types of schools: schools with low leadership for learning (40.2%), moderate leadership for learning (47.0%), and the smallest subgroup, schools with high leadership for learning (12.8%). We find that the least experienced leaders have low perceptions of leadership for learning in their schools which agrees with the majority of the teachers in their school, who are more often veteran teachers. Conversely, the smallest subgroup of schools, the high leadership for learning schools, had leaders who were the most experienced and who agreed with the majority of their teachers, who were the least experienced teachers, that the skills and practices for leadership for learning took place often in their schools. We identified one other type of school, in which the leader perceptions were higher than the majority of the teachers, demonstrating misalignment. We were unable to identify the fourth postulated school in the Congruency-Typology model, a school with teacher perceptions that outpaced the leaders'.

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Our findings suggest that a Congruency-Typology model of leadership for learning is useful for understanding the context of practice, as schools may be on a continuum of practice in which there is strong alignment between teacher and leader responder types in the low and high schools – indicating problematic or beneficial contexts – but that leaders in the moderate type may be working to move their school towards instructional improvement through leadership for learning. As a quantitative phenomenology, this study provides a rich contextual analysis of the relationship between teachers and leaders on a multisource feedback survey of leadership for learning in schools.

INTRODUCTION

The purpose of this study is threefold: (1) to bring together multiple models from the literature on examining school instructional leadership, (2) articulate a model of teacher and leader congruence and alignment around the tasks and actions required for strong leadership for learning, and then (3) test the model. The model draws on a unique dataset of surveys of teachers and leaders, the Comprehensive Assessment of Leadership for Learning (CALL), and assesses the extent to which teachers and leaders respond to the survey in similar ways. In addition, the model examines the extent to which significantly different schools can be identified through a description of the congruence and alignment between different types of leader and teacher responders.

The current era of education policy has required school leaders to be agents of change in their schools by focusing more directly on improving teaching and learning (Corcoran, Peck, & Reitzug, 2013; Murphy, Elliott, Goldring, & Porter, 2007; Murphy, Hallinger, & Heck, 2013). Effective school leadership has been widely recognized as a significant factor to advance student learning (Krüger & Scheerens, 2012; Leithwood & Louis, 2011; Marzano, Waters, & McNulty, 2005), especially in the areas of instructional leadership and leadership for learning (Boyce & Bowers, 2013; Murphy, et al., 2007). While state and district leaders have sought to assess leadership performance to hold principals accountable, they have utilized tools that have mostly focused on individuals rather than on the work of leaders that would result in the desired change. Multiple approaches exist to examine school leadership (Condon & Clifford, 2012; Goldring, Porter, Murphy, Elliott, & Cravens, 2009), but ultimately the most appropriate form of leadership assessment involves multiple raters and a focus on student learning (Murphy, et al., 2007), including the voices and perceptions of both teachers and leaders rooted within the individual contexts of their schools (Goldring, et al., 2009; Kelley & Halverson, 2012). However, to date across the research much of the literature on school leadership has examined either teachers or leader perspectives separately.

Towards Understanding the Multiple Teacher and Leader Perspectives of Leadership for Learning
A focus exclusively on the teacher level ignores the multilevel nested nature of the difficult work of teaching and learning within a larger system (Hallinger & Heck, 1996, 2011a; Raudenbush & Bryk, 2002) and does not take into account the influence of the principal's own perception of the work of the school (Leithwood & Jantzi, 2008; Urick & Bowers, 2011, 2014a). Alternatively a focus on the school leadership level excludes the perceptions of teachers and their valuable information as to their perceptions of their work in classrooms with students and other teachers (Hallinger & Heck, 1996, 2011a; Heck & Hallinger, 2009, 2014). As noted recently in the research on school leadership, both teachers and leaders need to be included within models of school leadership processes, using current methods in multilevel modeling to capture the rich complexities of the work of teaching and leading in schools (Boyce & Bowers, 2015; Hallinger & Heck, 2011a; Urick & Bowers, 2014b). Nevertheless, while the past three decades have seen a wider use of multilevel models to appropriately nest teachers within schools (Scheerens, 2012) much of the research to date has relied on methods that fit entire samples to single best fit regression lines, such as with hierarchical linear modeling. This assumption in the models ignores the possibility that there may be significantly different types of teachers, schools and leaders across a wide constellation of behaviors and perceptions.

Overly relying on fitting teachers or leaders to single line "best fit" regression models is problematic for three main reasons. First, an emerging set of research has shown that rather than consider school leaders and effective leadership as conforming to specific leadership styles, such as adaptive, transformational, or instructional (Krüger & Scheerens, 2012), recent research has shown that there are statistically significantly distinctive types of leadership in schools in which principals are distributed across multiple leadership styles. One of the first studies in this domain was Marks and Printy (2003), in which they showed across 24 restructured schools that leadership in the schools was a combination of two dimensions, transformational leadership and shared instructional leadership. They provided a four quadrant model in which schools could have 1) low transformational leadership and low shared instructional leadership, 2) high in both styles, or 3 & 4) low in one but high in the other. They found no schools in the low transformational leadership and high shared instructional leadership quadrant, articulating a model that transformational leadership may be necessary but insufficient for high shared instructional leadership (Marks & Printy, 2003). For schools in the high/high quadrant, these schools demonstrated strong instructional leadership while also providing an engaging and supportive context for teacher learning and professional development (Printy,

2010; Printy, Marks, & Bowers, 2009). Recently, the four quadrant model was replicated using a large nationally generalizable sample of 7,650 schools, finding three significantly different types of school principals based on their own perceptions of the transformational and instructional leadership in the school (Urick & Bowers, 2014c). These studies provide some of the first large-scale evidence of a typology model of school leaders, in which principals are not distributed across single "best fit" linear measurement scales of leadership, but rather exist within homogenous subgroups of principals across heterogeneous datasets which are identified to help understand the qualitatively different contexts in which school leadership is enacted. In essence these studies examine the social context of a situation using large datasets and statistical models that are designed to more thoroughly capture and summarize complex sociological systems (Heck & Hallinger, 2014), rather than fit all participants to single best fit regression lines (Bowers & White, 2014).

The second major issue stemming from these past models of school leadership is that emerging research is showing that teachers and principals significantly differ on their perceptions of the leadership in their schools. As noted recently by Goldring et al (2015) "principals and teachers have different perceptions of leadership concepts" (p.177). This assertion stems from comparing the survey responses of principals and teachers across 36 schools on the Vanderbilt Assessment of Leadership in Education (VAL-ED), which focuses on evaluating instructional and learning-centered leadership (Goldring, Cravens, Porter, Murphy, & Elliott, 2015). These authors found that principals consistently rated their average performance higher than teachers rated the principals, but that interestingly the teachers conflated multiple dimensions of leadership behaviors, such as rating principals similarly on instructional leadership and emotional traits while the principals differentiated between these measures (Goldring, Cravens, et al., 2015). This finding confirms recent large national and transnationally generalizable studies of the difference between principal and teacher conceptions of instructional leadership (Boyce & Bowers, 2015; Urick & Bowers, 2014b). As an example, recent multilevel factor analyses of 69,000 teachers in 4,000 schools across 20 countries on the OECD TALIS survey of school instructional leadership found that while school leaders see a three factor model of leadership focusing on supervision of curriculum and instruction, leading teacher professional development, and setting the vision and mission of the organization, teachers perceive a single factor model of leadership in their schools, with their school leader represented along a single distribution of high to low instructional leadership, with a low correlation to the leader factors (Urick & Bowers, 2014b). In short, this emerging research shows that school leaders conceive of leadership in

their school as a complex multidimensional task, whereas teachers perceive their leaders as either good or bad along a single dimension of "leadership". Thus, taken together, these studies indicate that teachers and school leaders perceive the work of instructional and learning centered leadership differently in their schools, and that these differences should be taken into account in descriptions of the leadership context and climate in a school.

The third major issue is that past models of examining the leadership in a school do not take into account multi-source feedback that describes the interrelationship of teacher and leader perceptions in a school. While it is extensively used in private sector organizations as "360-degree feedback" (Atwater, Ostroff, Yammarino, & Fleenor, 1998; Ghorpade, 2000) and has gained attention in the multilevel modeling literature (Mahlke et al., 2015), multi-source feedback research in school leadership studies has recently emerged as an attractive means to examine these rich and complex interactions between teachers and leaders around instructional leadership tasks, in which teachers and leaders provide responses on surveys that reflect their perception of each other's work (Goff, Goldring, & Bickman, 2014; Goldring, Cravens, et al., 2015; Goldring, Mavrogordato, & Haynes, 2015; Halverson, 2010; Kelley & Halverson, 2012). As noted recently "the motivation behind multi-source feedback is that more information regarding leadership efficacy resides within the shared experiences of these individuals than from any one source alone" (p.191) (Goldring, Cravens, et al., 2015). In these studies, multisource feedback is used to examine the difference between teacher and leader perceptions of instructional leadership (Goldring, Cravens, et al., 2015), the positive motivation to change practices caused by misalignment between leader and teacher perceptions (Goldring, Mavrogordato, et al., 2015), and importantly for the present study, examining the extent of conceptual congruence, alignment and misalignment between teacher and leader perceptions of instructional leadership as a means to describe the qualitatively different leadership contexts of schools (Goff, et al., 2014; Urick & Bowers, 2014b). In examining perceptual congruence on the VAL-ED between 76 principals and 2,100 teachers, Goff et al. (2014) were able to show large gaps between teachers and principals in their perceptions of the instructional leadership in the school. The study showed that in schools with large gaps in perception there was a misalignment between the expectations and perceptions of the work between teachers and principals. Alternatively, in schools with strong alignment and congruence around high responses by both teachers and principals on an instructional leadership survey, these schools provided a stronger context for leadership for learning (Goff, et al., 2014).
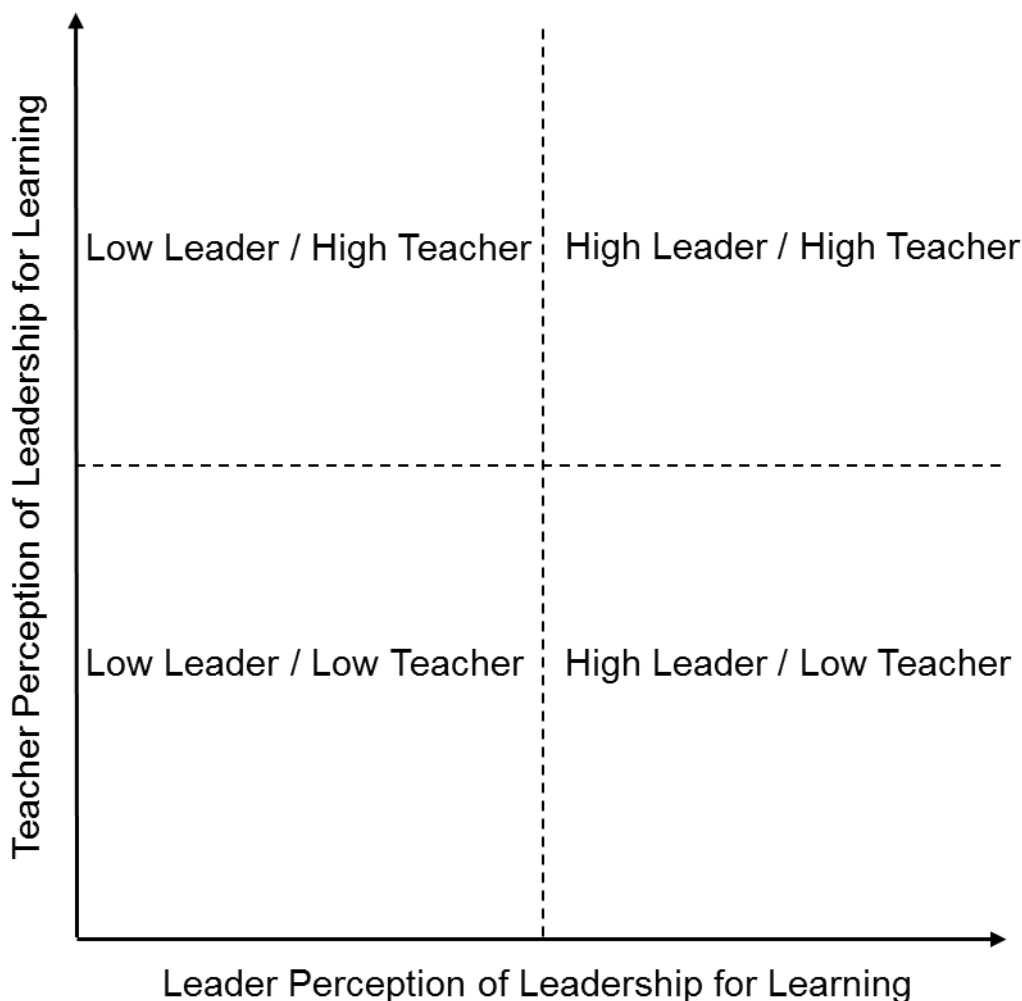
Figure 1: A Four Quadrant Congruency Model of School Leader and Teacher Perceptions of Leadership for Learning.

A Congruency-Typology Model of Leadership for Learning
Hence, in synthesizing this recent research as a means to inform theory as it relates to the practice of instructional leadership by teachers and school leaders, we postulate a "congruency-typology" model of leadership for learning. Our congruency-typology model of leadership for learning draws on the three main themes from this literature of 1) a hierarchical multilevel nested structure of teacher and principal perceptions within schools, 2) a typology perspective that rather than assuming a homogenous single "best fit" linear model, there most likely are significantly different homogenous subgroups of teachers and principals within large heterogeneous samples of survey respondents, and 3) examining the congruency and alignment or misalignment of these subgroups of teachers and leaders helps to describe important school instructional climates and contexts. Figure 1 provides a synthesis of the congruency-typology model, with leader perception of leadership for learning on the x-axis and teacher perception on the y-axis.

This figure mirrors the findings from Marks and Printy (2003) and Urick and Bowers (2014a) in that the upper right quadrant of high/high perceptions by principals and teachers represents strong instructional leadership and leadership for learning contexts that are known to be linked to organizational and instructional improvement (Murphy, et al., 2007; Printy, et al., 2009; Robinson, Lloyd, & Rowe, 2008). Schools on the lower left would also be congruent and aligned, but around agreement about the problematic context of the school and the low levels of leadership for learning. Schools on the upper left would be misaligned with groups of teachers who perceive higher levels of practices linked to effective leadership than the principal, while on the lower right the misalignment would be due to leaders having higher perceptions of leadership for learning activities than the teachers. Indeed, while the research domain has begun to examine these issues, we provide this model as a means to synthesize this literature and provide a

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framework in which to examine to what extent the model describes actual school contexts. Overall, this conceptual congruency-typology model provides a means to examine the instructional and leadership for learning contexts of schools in a way that captures the rich complexity of leadership and teaching that much of the recent research in education leadership has called for (Hallinger & Heck, 2011a). In the present study we draw on this model to inform our analysis of a unique dataset from a recent administration of the Comprehensive Assessment of Leadership for Learning (CALL) survey.

The CALL Survey
In 2009, researchers from the University of Wisconsin-Madison began the process of developing a formative assessment of school leadership that utilizes a distributed leadership framework and draws on data/responses from multiple informants (Blitz, Salisbury, & Kelley, 2014; Halverson, Kelley, & Shaw, 2014; Kelley & Halverson, 2012). The resulting instrument, the Comprehensive Assessment of Leadership for Learning (CALL) measures specific leadership practices that occur across the school. In developing CALL, researchers conducted a validation study in which 120 schools across the country administered the CALL survey, resulting in over 4,500 survey records. The present study draws on this data to determine the presence of significantly different subgroups of teacher and leader responses. In doing so, we are able to identify a typology of schools based on ratings of leadership practices. Effective school leadership has been widely recognized as a significant factor to advance student learning (Leithwood & Louis, 2011; Marzano, et al., 2005). A typology of schools based on effective leadership practices would further reveal the relationship between leadership and school success.

The following section first presents the CALL instrument by exploring its distributed leadership framework and its focus on practices rather than individual leadership traits then second, presents the constructs of CALL that serve as the primary units of analysis for this study. Third, we then outline the framework of the study through the need to examine multilevel latent class analysis models that help to capture the reality of different types of leadership styles enacted within a typology of school and teacher contexts. We then conclude the framing for the study through presenting the argument for examining the interaction between the multiple different enacted types of teachers and leaders around the extent of leadership for learning in their schools as evidenced by their responses to the CALL survey.

In an era of high stakes accountability, school leaders have justifiably relied on data to inform local decision-making processes (Halverson & Thomas, 2007; Leithwood, 2013). Data-driven instructional leadership is becoming common place for school leaders (Coburn & Turner, 2012; Corcoran, et al., 2013; Halverson, 2010; Mandinach & Gummer, 2013; Piety, 2013; Turner & Coburn, 2012; Wayman, Cho, Jimerson, & Spikes, 2012); this fact has led researchers to examine the type of data that leaders utilize (Bowers, 2007, 2009; Bowers, Shoho, & Barnett, 2014; Brocato, Willis, & Dechert, 2014; Halverson, 2014; Wayman & Stringfield, 2006). Anderson, Leithwood, and Strauss (2010) examined how school leaders utilize data and found that student test scores and trait-based surveys illuminate areas of organizational strength and weakness, but that they do not provide school leaders the information on the work necessary to make improvements in those areas. As a result, they call for additional research to identify how systematically collected data about professional practice could be used by schools to advance school improvement efforts (Anderson, Leithwood, & Strauss, 2010). The Comprehensive Assessment of Leadership for Learning (CALL) works to capture that information, focusing on the work of formal leaders, teacher leaders, and informal leaders in a given school. It is this approach that makes CALL a useful instrument for measuring leadership effectiveness.

Distributed Leadership
The CALL framework utilizes a distributed leadership model. Distributed leadership provides a lens with which to understand and analyze leadership rather than support a specific approach to leadership (Spillane, 2006; Spillane, Halverson, & Diamond, 2004). Specifically, distributed leadership refocuses the study of leadership from an individual and into the realm of understanding the actions or tasks that leaders engage in to accomplish their work. Spillane and colleagues posit that leadership tasks are inherently distributed or stretched across an organization; as a result, leadership is best understood as the interaction among leaders, followers, and the situations in which leadership occurs. By focusing research on, or assessment of, school leadership on the tasks of leadership as opposed to leaders, distributed leadership allows researchers to gain a more complex and complete understanding of leadership activity across an organization.

Spillane, Halverson and Diamond (2004) also propose that distributed leadership practice is composed of macro- and micro-tasks. Macro-tasks refer to the broader tasks within an organization such as teacher supervision, building professional learning communities, and allocating resources. These macro-tasks are actually comprised of micro-tasks that reflect the daily work of school leaders. Assessing school leadership at the macro-level does not provide school leaders with actionable data on how to improve professional practice and fails to provide researchers with knowledge about the daily activities of successful leaders. Whereas assessing school leadership according to these micro-tasks provides leaders and researchers with a more detailed picture of the daily leadership activities or tasks that enable

a school to implement and hone research-centered school improvement plans that are tailored to their individual context.

Understanding the work of leadership practice is paramount in educational leadership research (Drago-Severson, 2012; Robinson, et al., 2008). Researchers can obtain this information in a number of ways; however, the framework utilized in research greatly impacts the findings. Focusing on the individual leader will yield certain data, while conducting a distributed leadership analysis may yield other data. As Spillane, Halverson and Diamond (2004) maintained, "There is often a difference between what people do and what they say they do, a distinction that can be maintained without duplicitous intent" (p. 14). Therefore, it is important to examine not only how school leaders understand their practice (Leithwood & Jantzi, 2008; Urick & Bowers, 2011, 2014a), but to compare that to teacher and staff perceptions as well (Goff, et al., 2014; Goldring, Mavrogordato, et al., 2015; Heck & Hallinger, 2009; Marks & Printy, 2003).

The CALL theory of action, put into action by the CALL survey and formative feedback system, views school leadership as not limited to an individual (Halverson, et al., 2014). With a task-based approach to understanding school leadership, we are able to identify the actual work needed to fill the various domains, components (Goldring, et al., 2009), or buckets (Wilson, 2011) found in the proliferation of itemization and categorization in leadership theory.

Development of CALL
The CALL survey consists of five core domains of school leadership. Each Domain is comprised of four to five subdomains, which represent mico-level tasks that leaders engage in to promote student learning:
1. Focus on Learning
2. Monitoring Teaching and Learning
3. Building Nested Learning Communities
4. Acquiring and Allocating Resources
5. Maintaining a Safe and Effective Learning Environment

A brief description of the five domains and corresponding subdomains is below, for a more detailed explanation please see Halverson, Kelley and Shaw (2014), Kelley and Halverson (2012).

Domain 1: Focus on Learning
Subdomain 1.1: *Maintaining a school-wide focus on learning* focuses on leaders' prioritization of work that aims to promote improved teaching and learning (Waters & Marzano, 2006). Leaders work collaboratively with school staff to establish a shared vision of instruction (Hallinger, 2003) and use data to track school goals (Halverson, Kelley, & Kimball, 2004).

Subdomain 1.2: *Formal Leaders are Recognized as Instructional Leaders* focuses on the primary leader's role as the school principal. The principal should be recognized and respected as an instructional leader (Hallinger, 2005; Hallinger & Heck, 2002) and can accomplish that by visiting classrooms and conducting "learning walks" (Abrutyn, 2006; Biddle & Saha, 2006).

Subdomain 1.3: *Collaborative Design of an Integrated Learning Plan* focuses on how a school's instructional leaders use opportunities such as faculty meetings to address student learning needs (Scribner, Sawyer, Watson, & Myers, 2007) rather than for announcements. School staff use all-school meeting times for planning and developing strategies for school improvement (Leithwood, Seashore Louis, Anderson, & Wahlstrom, 2010).

Subdomain 1.4: *Providing Appropriate Services for Students who Traditionally Struggle* captures the work of teachers and teacher leaders to support all students by ensuring students are receiving equitable learning opportunities (Frattura & Capper, 2007) and integrating differentiating instruction into the classroom (Fuchs, Mock, Morgan, & Young, 2003).

Domain 2: Monitoring Teaching and Learning
Subdomain 2.1: *Formative Evaluation of Student Learning* focuses on the practice of consistently assessing student learning to inform classroom practice and school-wide strategic planning. School leaders ensure that teachers use formative assessments to shape instruction (Black & Wiliam, 2004; Hallinger & Heck, 1996). In addition, school leaders create structures and opportunities for teachers to discuss formative assessment data (Erickson, 2007).

Subdomain 2.2: *Summative Evaluation of Student Learning* addresses how schools work with and use standardized tests and the resulting data. More than for compliance purposes, school leaders use this summative data to set and evaluate school improvement goals (Hallinger & Heck, 2002; Halverson, 2004; Knapp, Copland, & Talbert, 2003; Marzano, et al., 2005). Furthermore, school leaders set aside time committed to reflect upon data with the entire school staff (Smylie & Wenzel, 2003).

Subdomain 2.3: *Formative Evaluation of Teaching* focuses the process for school leaders to provide consistent and meaningful feedback to teachers on their practice. Effective school leaders commit time to monitor classroom instruction (Leithwood & Jantzi, 1990; Marzano, et al., 2005) and provide feedback aimed to build capacity.

Subdomain 2.4: *Summative Evaluation of Teaching* measures leadership practices beyond what is mandated by the state or district. This construct measures the process of conducting the evaluation and also the degree to which these

Domains:	1: Focus on Learning	2: Monitoring Teaching and Learning	3:Building Nested Learning Communities	4: Acquiring and Allocating Resources	5: Maintaining and Safe and Effective Learning Environment
Subdomains	1.1 Maintaining a school-wide focus on learning (7 items)	2.1 Formative evaluation of student learning (10 items)	3.1 Collaborative school-wide focus on problems of teaching and learning (13 items)	4.1 Personnel practices (10 items)	5.1 Clear, consistent and enforced expectations for student behavior (18 items)
	1.2 Formal leaders are recognized as instructional leaders (5 items)	2.2 Summative evaluation of student learning (5 items)	3.2 Professional learning (4 items)	4.2 Structuring and maintaining time (6 items)	5.2 Safe learning environment (18 items)
	1.3 Collaborative design of integrated learning plan (4 items)	2.3 Formative evaluation of teaching (14 items)	3.3 Socially distributed leadership (12 items)	4.3 School resources are focused on student learning (7 items)	5.3 Student support services provide safe haven for students who traditionally struggle (19 items)
	1.4 Providing appropriate services for students who traditionally struggle (9 items)	2.4 Summative evaluation of teaching (9 items)	3.4 Coaching and mentoring (12 items)	4.4 Integrating external expertise into school instructional program (5 items)	5.4 Buffering the teaching environment (3 items)
				4.5 Coordinating and supervising relations with families and the external communities (7 items)	

Table 1

CALL Domains and Subdomains

evaluation practices contribute to improved teaching practice (Quint, Akey, Rappaport, & Willner, 2007). This construct also measures the extent to which the formal evaluation involves measures of student learning and is linked with the school and teacher's professional development plan (Leithwood & Montgomery, 1986; Wahlstrom & Louis, 2008).

Domain 3: Building Nested Learning Communities
Subdomain 3.1: *Collaborative School-Wide Focus on Problems of Teaching and Learning* focuses on school leaders' work to create opportunities for teachers to collaborate to discuss teaching and learning issues. Moreover, this construct also measures the extent to which teachers work together with the school leader to address teacher-centered issues (Printy, 2008; Waters & Marzano, 2006).

Subdomain 3.2: *Professional Learning* focuses on school leaders' work to design learning opportunities for professional growth in targeted instructional areas that provide individualized support to address teachers' needs in order to meet school-wide instructional goals (Marks, Louis, & Printy, 2002; Wahlstrom & Louis, 2008). How school leaders utilize teacher expertise (Desimone, Smith, & Phillips, 2007) and assess the impact of professional development activities (Malderez, Hobson, Tracey, & Kerr, 2007; Spillane et al., 2002; Waters & Marzano, 2006) comprise this construct as well.

Subdomain 3.3: *Socially Distributed Leadership* measures

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the extent to which teachers and staff participate in leadership activities (Pearce & Conger, 2003; Spillane, et al., 2002). In addition, this construct focuses on how school leaders cultivate instructional leadership capacity in teacher leaders (Lambert, 1998) as well as how school leaders achieve school-wide buy-in when implementing organizational changes (Deal & Peterson, 1999).

Subdomain 3.4: *Coaching and Mentoring* focuses on the presence and effectiveness of formal coaching and mentoring programs in schools (Hobson, Ashby, Malderez, & Tomlinson, 2009). This construct assesses the process of selecting staff for these roles and how school leaders ensure that these programs result in a positive impact on teaching (Smith & McLay, 2007).

Domain 4: Acquiring and Allocating Resources
Subdomain 4.1: *Personnel Practices* measures how school leaders work with teachers who demonstrate poor performance as well as how they promote effective teaching practice through incentives and induction programs (Darling-Hammond, 2009; Odden & Kelley, 2001). In additon, this construct examines the criteria used in assigning responsibilities (Darling-Hammond et al., 2001).

Subdomain 4.2: *Structuring and Maintaining Time* focuses on how school leaders cultivate time for various purposes such as creating opportunities for teachers to discuss student learning issues (Mertens & Flowers, 2006).Also, this area also focuses on the assignment of students to classes in an equitable fashion (Frattura & Capper, 2007).

Subdomain 4.3: *School Resources are Focused on Student Learning* focuses on acquiring monetary resources aimed to promote student learning (Odden et al., 2007). Given the challenge of acquiring funding and resources, school leaders must ensure that the funding they do procure is applied to student learning issues (Bowers, 2008; Goldring & Pasternack, 1994).

Subdomain 4.4: *Integrating External Expertise into School Instructional Program* examines how school leaders utilize experts from the district and external consultants to support school goals (Halverson & Thomas, 2007). School leaders must ensure that this external resource in aligned with established school goals (Cawelti & Protheroe, 2001).

Subdomain 4.5: *Coordinating and Supervising Relations with Families and the External Communities* focuses on the extent to which school leaders view the external community as a valuable resource. How schools communicate with families (Fan, 2001) and community members (Erickson, 2007) comprise the elements of this construct as well.

Domain 5: Maintaining a Safe and Effective Learning Environment
Subdomain 5.1: *Clear, Consistent and Enforced Expectations for Student Behavior* focuses on the policies in place for eliminating disruptive behavior and for promoting desired behavior in schools (Reynolds et al., 2008) Devine & Cohen, 2007). Furthermore, this construct examines school staff's perceptions of the school discipline policies and the extent to which they disproportionately impact students of color and students identified for special services (Losen, 2011; Skiba et al., 2011).

Subdomain 5.2: *Clean and Safe Learning Environment* examines the result of school leaders' efforts to create a learning environment conducive to learning. Students victimized by violence are more likely to suffer academically in the aftermath of such events and in the long-term as well (Macmillan & Hagan, 2004). Also, the appearance of an unsafe, disorderly, and sordid physical setting contributes to lowered teacher and student morale (Bowers & Urick, 2011; Deal & Peterson, 1999; Urick & Bowers, 2011, 2014a).

Subdomain 5.3: *Student Support Services Provide a Safe Haven for Students Who Traditionally Struggle* focuses on school leaders' work to ensure that all students are receiving the support services that they need. This construct contains items around the work to ensure that the process of identifying students for special services is accurate and thorough (Waitoller, Artiles, & Cheney, 2010) and that students feel supported in their academic and social lives in school (Steinberg, Allensworth, & Johnson, 2011).

Subdomain 5.4: *Buffering the Teaching Environment* focuses on the role of families in the school environment and how they are perceived and utilized by teachers and staff (Barnyak & McNelly, 2009).

These 21 subdomains are the primary units of analysis for this study to examine the extent to which principals and teachers have congruent and aligned perceptions of leadership for learning in their school, as evidenced by their responses to the CALL survey. Additionally, the development, validation, and theoretical underpinnings of CALL Domains and Subdomains have been reported previously (Blitz, Milanowski, & Clifford, 2011; Blitz, et al., 2014; CALL, n.d.; Camburn & Salisbury, 2012; Halverson & Dikkers, 2010; Kelley & Halverson, 2012; Kelley, Halverson, & Camburn, 2012). The data resulting from the CALL validation sample provides insight into how schools can be categorized according to actual leadership practices and effectiveness. The rationale for examining this alignment is discussed in the next subsection.

Framework of the present study
The purpose of the present study is to examine the extent to which principals and teachers have congruent and aligned or misaligned perceptions of the leadership for learning in the school, as evidenced by their responses to the CALL survey. Through drawing on the congruency-typology model noted above, we use the validation sample of the CALL survey to 1) examine the extent to which teachers and principals significantly differ in their responses to the 21 subdomains of CALL and form significantly different subgroups of teacher and principal responders, 2) then examine the extent to which these different groups of responders are congruent with each other or not, and 3) how these different groups of responders are distributed across the sampled schools. Through examining the contextual relationships of the congruency-typology model through the leadership for learning and task-oriented focus of CALL our goal is to provide a window into the rich contextualized complex leadership climates within these schools as a means to capture and describe these interrelationships for the first time.

An emerging statistical technique that is increasingly used to examine the statistically significant differences of a typology of responders across a survey instrument is known as Latent Class Analysis (LCA) (Collins & Lanza, 2010; Geiser, 2012; Goodman, 2002; Jung & Wickrama, 2008; B. O. Muthén, 2004; Samuelsen & Raczynski, 2013; Vermunt & Magidson, 2002). As an application of mixture modeling (B. O. Muthén, 2004; B. O. Muthén & Muthén, 2000), LCA takes as an assumption that there may be more than one type of responder. This is in comparison to more traditional modeling procedures that attempt to fit all responders to a single best fit regression line or response parameter, which may be a misspecification since important information about

significantly different types of responders and contexts is important information to include (Bowers & White, 2014; Hallinger & Heck, 2011b). As opposed to such methods as cluster analysis techniques in education leadership research (Bowers, 2010a; Goldring, Huff, May, & Camburn, 2008), LCA provides a hypothesis test on the extent that statistically significantly different modes of responders exist across the survey responses (Bowers & Sprott, 2012a, 2012b; Boyce & Bowers, in press). Consequently, for the present study, we wished to capture the complex interactions between different types of principal and teacher responders to CALL, testing the congruency-typology model proposed above, rather than fit all responders to a single type.

Likewise, the multilevel nested context of leadership in schools is important to consider when examining school organizational processes (Bowers, 2010b, 2015; Hallinger & Heck, 2011a). Only through appropriately modeling the multilevel nature of teachers nested within schools (Raudenbush & Bryk, 2002) can statistical models begin to examine the alignment between principal and teacher perceptions of the academic climate and leadership for learning. Given the issue noted above that we wished to capture not only the individual principal perceptions of leadership for learning, but examine the alignment and congruency between principals and teachers on CALL, while also acknowledging that there may be different statistically significant types of principal and teacher responders, the present study builds upon recent work in multilevel latent class analysis (Henry & Muthén, 2010; Urick, 2012; Vermunt, 2003). Multilevel LCA extends the LCA framework noted above into a multilevel model in which statistically different types of teachers interact with different types of principals and school contexts. As shown by Urick (2012), these types of models provide a rich set of evidence about the interplay between teacher perceptions and principal perceptions of the leadership and instructional focus in schools. As just one example, Urick (2012) demonstrated that there may be significant effects of a match or mismatch between teacher perceptions and principal perceptions of instructional leadership in schools, in which when a strong match exists, such as when teachers and the principal agree across multiple aspects of instructional leadership survey items, teacher retention and persistence in the job increases while a mismatch is associated with higher teacher turnover.

Thus, as one of the first means to test the congruency-typology model using a task-oriented leadership for learning survey, the research questions for this study were:

1) To what extent are there significantly different subgroups of teacher and leader responses to the CALL leadership for learning survey (a typology of teacher responses and a typology of leader responses)?

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2) To what extent are the different subgroups distributed across schools?
3) To what extent does the alignment between different types of principals and teachers in the responses to CALL characterize the instructional and leadership climates of the schools?

METHOD

Sample:
As noted in previous studies detailing the specifics of the CALL survey (Kelley & Halverson, 2012; Kelley, et al., 2012), CALL is administered online to participating schools (CALL, n.d.) in which CALL researchers recruited elementary, middle, and high schools across the country. The researchers sought to recruit a representative sample of urban, suburban, and rural schools from several states. For the validation sample, 120 schools were recruited from across the country with most of the schools located in Wisconsin, Mississippi, and California. Most of the participating 120 schools yielded a response rate over 50%.

For the present study, we analyzed the CALL validation sample, which included the responses to the CALL survey from $n=3,367$ teachers nested at level 1 within n=117 schools and school leaders at level 2. Data from 3 of the 120 validation sample schools (2.5% of the sample) were excluded from the subsequent analysis due to missing data at either the school or teacher levels. Of note, the CALL survey provides a unique opportunity to examine both the leader and teacher responses to the same or similar questions across the multiple domains of leadership for learning (see Table 1). At the school level, many schools had multiple responders who indicated that they were in a formal leadership position in the school. Due to the requirements of the LCA discussed below, there can be only one response per variable at level 2 (school level), thus for schools with multiple leader responders, responses were averaged.

Variables
The CALL survey is extensive, with 200 questions across the full survey. Specific items are aligned to each of the five domains (each with four to five subdomains) noted above in Table 1 of D1: Focus on Learning, D2: Monitoring Teaching and Learning, D3: Building Nested Learning Communities, D4: Acquiring and Allocating Resources, D5: Maintaining Safe and Effective Learning Environments. For an in-depth discussion of item construction, validity, and reliability, please see (Blitz & Modeste, 2013; Kelley & Halverson, 2012). To reduce the complexity and number of parameters to be estimated in the final models, factors were generated for each of the subdomains by averaging all of the items within a subdomain. This was done separately for the teachers at level 1 and the leaders at level 2. Additional variables included in the model included teacher total years

Table 2: Descriptive statistics for level 1 (teacher) variables included in the model

Variables	Mean	(SD)	Min	Max	Description
Domain 1.1	2.50	(0.79)	0	4	Maintaining a school-wide focus on learning
Domain 1.2	2.52	(0.79)	0	4	Formal leaders are recognized as instructional leaders
Domain 1.3	2.45	(0.93)	0	4	Collaborative design of integrated learning plan
Domain 1.4	2.72	(0.71)	0	4	Providing appropriate services for students who traditionally struggle
Domain 2.1	2.55	(0.84)	0	4	Formative evaluation of student learning
Domain 2.2	2.69	(0.79)	0	4	Summative evaluation of student learning
Domain 2.3	1.78	(1.07)	0	4	Formative evaluation of teaching
Domain 2.4	1.96	(0.99)	0	4	Summative evaluation of teaching
Domain 3.1	2.46	(0.69)	0	4	Collaborative school-wide focus on problems of teaching and learning
Domain 3.2	2.55	(0.92)	0	4	Professional learning
Domain 3.3	2.02	(0.79)	0	4	Socially distributed leadership
Domain 3.4	1.98	(0.91)	0	4	Coaching and mentoring
Domain 4.1	1.68	(0.63)	0	4	Personnel practices
Domain 4.2	2.33	(0.64)	0	4	Structuring and maintaining time
Domain 4.3	2.11	(0.85)	0	4	School resources are focused on student learning
Domain 4.4	2.08	(0.92)	0	4	Integrating external expertise into school instructional program
Domain 4.5	2.06	(0.60)	0	4	Coordinating relations with families and community
Domain 5.1	2.70	(0.65)	0	4	Clear, consistent and enforced expectations for student behavior
Domain 5.2	2.52	(0.61)	0	4	Safe learning environment
Domain 5.3	2.49	(0.65)	0	4	Support services provide safe haven for students who traditionally struggle
Domain 5.4	2.68	(0.99)	0	4	Buffering the teaching environment
Years teaching experience	13.61	(9.09)	0	47	Total years of teaching experience
Special education teacher	0.15	(0.36)	0	1	1=Special education teacher
Teacher leader	0.28	(0.45)	0	1	1=Teacher leader
Data team member	0.29	(0.46)	0	1	1=Teacher is a member of the data team
Core subject teacher	0.42	(0.49)	0	1	1=Teacher teaches core subject
High school teacher	0.87	(0.34)	0	1	1=Teacher teaches at high school level
n	3,367				

of experience, if they were a special education teacher, a teacher leader (*Q: Are you currently in a leadership role, such as a coach, master teacher, school coordinator, dean, department chair or guidance counselor?*), were on a data/inquiry team (*Q: Are you a member of a special team such as a data analysis, inquiry, or leadership team?*), taught a subject in the academic core curriculum (*language arts, mathematics or science*) or if the school was a high school or not, and at level two the number of years that the principal had been a principal of 0-2, 3-5, or 6+. Table 2 and Table 3 provide the means, standard deviations, minimum, maximum, and variable labels for all variables included in the model at both the teacher (Table 2) and leader levels (Table 3).

Analysis
We conducted a non-parametric two-level random effects latent class analysis (LCA) using MPlus 6.1 (Henry & Muthén, 2010; L. K. Muthén & Muthén, 2010). LCA provides a means to examine if there are statistically significant different modes (latent classes) across the survey responses (Bowers & Sprott, 2012a, 2012b; Collins & Lanza, 2010; Goodman, 2002; Jung & Wickrama, 2008; McCutcheon, 2002; B. O. Muthén, 2004; Samuelsen & Raczynski, 2013), grouping teachers and leaders by similar response profiles (Barnes, Camburn, Sanders, & Sebastian, 2010; Urick, 2012; Urick & Bowers, 2014c). These different subgroups of responses may represent a typology of teachers and a typology of leaders, as defined by their

Table 3: Descriptive statistics for level 2 (leader) variables included in the model

Variables	Mean	(SD)	Min	Max	Description
Domain 1.1	2.81	(0.61)	1.43	3.86	Maintaining a school-wide focus on learning
Domain 1.2	3.01	(0.53)	1.00	4.00	Formal leaders are recognized as instructional leaders
Domain 1.3	2.89	(0.70)	0.50	4.00	Collaborative design of integrated learning plan
Domain 1.4	2.64	(0.61)	0.91	3.89	Providing appropriate services for students who traditionally struggle
Domain 2.1	2.58	(0.71)	1.11	4.00	Formative evaluation of student learning
Domain 2.2	2.84	(0.69)	1.20	4.00	Summative evaluation of student learning
Domain 2.3	2.34	(0.77)	0.64	4.00	Formative evaluation of teaching
Domain 2.4	2.44	(0.65)	1.22	4.00	Summative evaluation of teaching
Domain 3.1	2.83	(0.50)	1.67	4.00	Collaborative school-wide focus on problems of teaching and learning
Domain 3.2	2.71	(0.77)	0.38	4.00	Professional learning
Domain 3.3	2.60	(0.51)	1.25	3.83	Socially distributed leadership
Domain 3.4	2.41	(0.75)	0.14	3.83	Coaching and mentoring
Domain 4.1	1.96	(0.52)	0.31	3.13	Personnel practices
Domain 4.2	2.61	(0.63)	0.00	4.00	Structuring and maintaining time
Domain 4.3	2.62	(0.70)	1.00	4.00	School resources are focused on student learning
Domain 4.4	2.56	(0.80)	0.38	4.00	Integrating external expertise into school instructional program
Domain 4.5	2.29	(0.59)	0.71	4.00	Coordinating relations with families and community
Domain 5.1	3.05	(0.46)	2.00	4.00	Clear, consistent and enforced expectations for student behavior
Domain 5.2	2.77	(0.58)	0.00	4.00	Safe learning environment
Domain 5.3	2.67	(0.61)	0.50	3.73	Support services provide safe haven for students who traditionally struggle
Domain 5.4	3.22	(0.42)	2.33	3.83	Buffering the teaching environment
Years school leader	1.93	(0.67)	1.00	3.00	1 = 0-2 yrs; 2 = 3-5yrs, 3 = 6 or more yrs
n	117				

different sets of responses across the survey. Latent class analysis addresses the question of if a distribution across a set of survey responses is heterogeneous or homogeneous, or in other words, are there unidentified subgroups within the survey responses that relate to substantively different patterns of responses, as defined by significant differences in specific sets of responses from participant subgroups. As detailed in Figure 2, the two level latent class analysis model includes a level 2 component, nesting teachers in schools and testing the extent to which the different subgroups identified at level 1 distribute across different types of schools, as defined by the different proportions of the level 1 teacher types. The LCA model also included an additional embedded LCA at level 2 on the leaders, modeling the extent that there are different subgroups of leaders across similar survey items to the teachers. And finally, the model allowed a simultaneous cross-level interaction, such that the level 2 leaders subgroups were free to interact on the teacher subgroups, or in other words, the probability of being placed into any one of the three latent leader subgroups was conditional on what kind of teachers

the school had as defined by the level 1 teachers LCA (see Figure 1). Appendix B provides the Mplus code used for the model.

We analyzed a model that contained three teacher subgroups and three leader subgroups. Of note, the Level 2 portion of the model can be interpreted as the different subgroups between schools, which captures both the variance in leader responses to CALL as well as school-level variables. The model here includes variables in addition to the 21 subdomain CALL item averages, including teacher level variables (years experience as a teacher, Special Education Teacher, Teacher Leader, Data Team member, Core Curriculum teacher, High school or not) and one additional leader variable, years as a school leader. In this way, all responders were modeled.

A current issue in the mixture modeling literature regarding multilevel latent class analysis is that there is currently no agreed upon method to determine the correct number of latent classes at both levels (Henry & Muthén, 2010). When
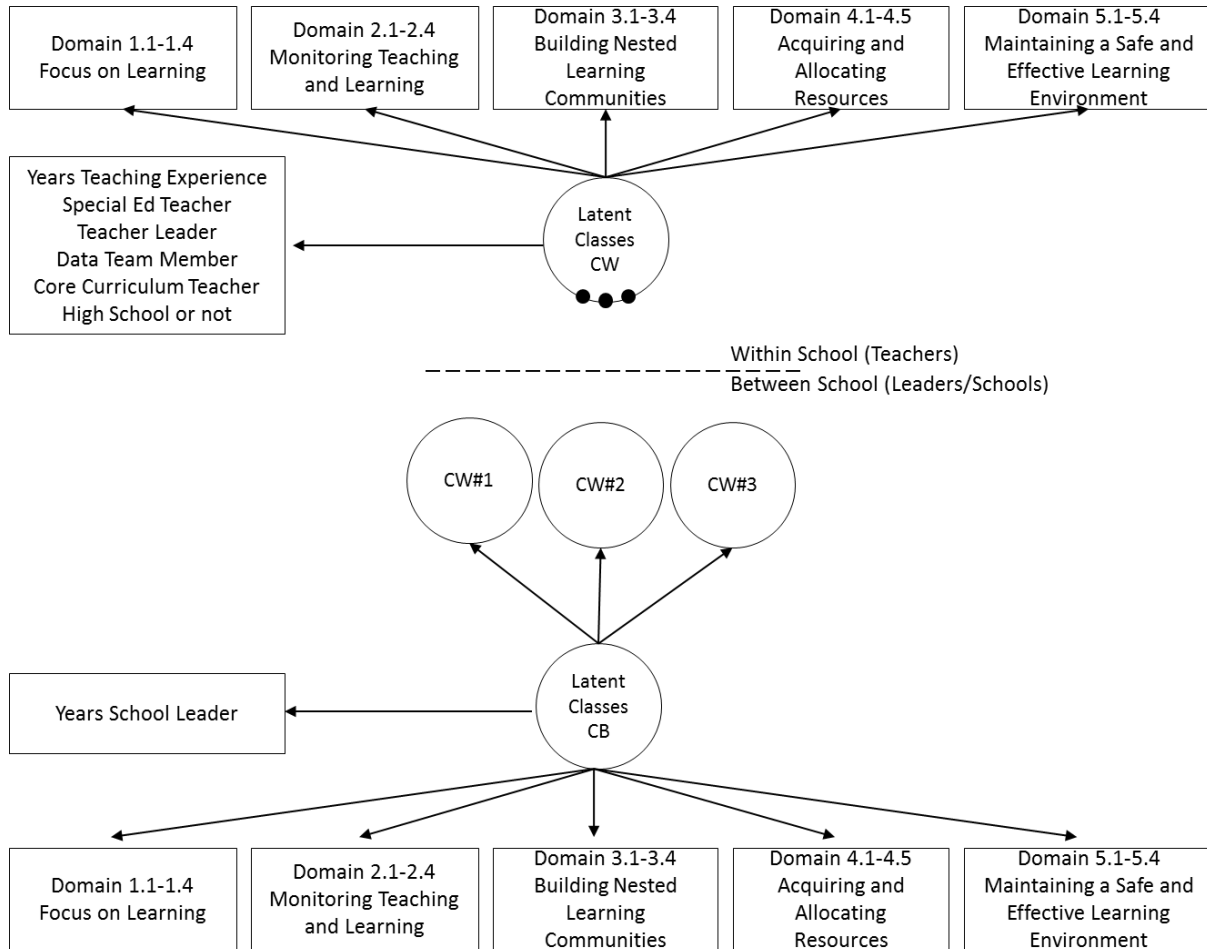
Figure 2: Two level latent class analysis (LCA), with three classes at level 1 teacher level (CW) and three classes at level 2 school level (CB). Three teacher-level within (CW) latent classes are modeled on the 21 item means subdomain factors across the survey as well as multiple teacher variables, such as years as a teacher, if they were a Special Ed teacher, etc. The three between level (CB) latent classes are modeled using the 21 mean item subdomain factors across the survey for leaders for each school as well as years as a leader in the school. The means from the three within level latent classes are allowed to vary across level 2.

analyzing single level models, multiple fit statistics exist to assess the statistically significant number of latent classes (Lo, 2005; Lo, Mendell, & Rubin, 2001; Nylund, Asparouhov, & Muthén, 2007). However, fit statistics for the correct number of classes when interacting a within and between level latent class analysis is currently an active area of research. Thus, following current recommendations (Henry & Muthén, 2010; Urick, 2012), we chose three teacher (within level) and three leader (between) groups based on single level models analyzed at both the teacher (level 1) and leader (level 2) levels (see Results). Additionally, there was some partial missingness across the

teacher and school responses. As is recommended for this type of missing data issue (Graham, Cumsille, & Elvira, 2003) we used Full Information Maximum Likelihood (FIML) imputation in the final model and report the survey response patterns for non-imputed data.

RESULTS

The purpose of this study is to examine the extent to which teacher and principal response patterns to the Comprehensive Assessment of Leadership for Learning (CALL) survey align across different types of schools and responders. This analysis helps to inform current theory and

practice around the central factors within the construct of instructional leadership and leadership for learning. This analysis details the congruency of responses between teachers and leaders to better understand the different types of agreement and disagreement across the domains of the theory and types of schools as the leaders and teachers work to align (or not) their practices, skills and development. In this way, we aim to help delineate the most significant areas of interest across the extensive CALL survey subdomain areas, while providing a rich description of how teachers and leaders in the sample schools perceive the academic, learning and leadership climate of the school. We start this results section by describing the fit of the model. Second, we move to a description of the typology of three different types of leaders and three different types of teachers, as defined by their different response patterns to the CALL survey. Third, we present the results of how the different response patterns are distributed across the different school types. We then conclude by presenting a discussion of how the results of the analysis help to inform research, policy and practice.

A Two-Level Latent Class Analysis of Teachers and Principals

Following the recommendations from the LCA and mixture modeling literature (Henry & Muthén, 2010; B. O. Muthén, 2004; Nylund, et al., 2007) we began by first fitting level 1 only (teachers) LCA models to the data. Level 1 only and Level 2 only models must be fit first before the full two-level model, since final fit statistics are not available in the modeling software because two-level LCA model fitting statistics have not yet been identified in the literature (Henry & Muthén, 2010; Samuelsen & Raczynski, 2013). Following the recommendations from the literature, this process starts by fitting a model with only one group at level 1, examining fit, then proceeding to two groups, three and so on. When the model no longer fits, then the k-1 model is selected as the best fit model (Nylund, et al., 2007). For the teacher data, 3, 4 and 5 latent class level 1 models fit the data well, each with LMR and BLRT p-values less than 0.001. However, in examining the survey responses in the 4 and 5 class level 1 models, the additional latent classes appeared to be subgroups of the three class model, and resulted in small proportions of the sample fit to the additional latent classes (data not shown). Thus, following previous recommendations from the mixture modeling literature, we selected the 3 class model as the best fit with the most substantive groups. For level 2, the leader level, we repeated the process from level 1, as a stand-alone model, in which the leader data were modeled as a single level model to assess the appropriate number of classes, as is recommended (Urick & Bowers, 2014c). As with level 1, a three latent class model also fit the level 2 data well, with LMR and BLRT p-values less than 0.001. Having identified that a three group latent class model was appropriate for both the teacher and leader levels, we then fit the full two-

level latent class analysis model with a cross-level interaction as detailed in the methods (see Figure 1).

The final two-level LCA model included three within-level teacher latent classes and three between-level leader latent classes. The overall model fit the data well with a loglikelihood value of -86499.076, AIC of 173396.153, BIC of 174614.387 and an entropy of 0.922 (entropy ranges from 0 to 1, with models over 0.6 and approaching 1 fitting the data better). Additionally, as is recommended for two-level LCA models (Urick, 2012), we provide the fit matrix of most likely class probabilities as an indication of good model fit in Appendix A, with probabilities greater than 0.9 along the diagonal for all but one subgroup, CB3/CW3 which also had a high probability at 0.887.

At level 1, the model identified three different groups of *teacher* responses: a High "Leadership for Learning" (LL) group (25.4% of the sample), a Moderate LL group (43.3%), and a Low LL group (31.4%). At level 2, the model identified three different groups of *leader* responses: a High "Leadership for Learning" (LL) group (12.8%), a Moderate LL group of (47.0%) and a Low LL group of schools (40.2%).

Figure 3 provides the response patterns for the three different groups of leaders (*Figure 3 top panel*) and teachers (*Figure 3 bottom panel*) by their mean responses to the 21 subdomain averages across the five domains of CALL. Subdomains are referred to in the figures as D1_1, Domain 1, subdomain 1.1, etc. (refer to Table 1 for the primary and subdomain of CALL). The y-axis in both panels represents the mean survey responses for each of the 21 subdomains, with an increasing response indicating that the practice is performed more often in the school, from the practice never occurring (low), to rarely, somewhat, quite a bit, to a great deal (high).

The High responder group was the smallest group for both leaders (12.8%) and teachers (25.4%) with the highest mean responses across the subdomains. Leaders then split fairly evenly between the moderate (47.0%) and low groups (40.2%) while the modal teacher subgroup is the Moderate LL teachers (43.3%), with Low LL teachers accounting for only about one third of the sample (31.4%). In comparing the top and bottom panels of Figure 2, note the different levels of distance between the high and low leader groups in their mean survey responses (*Figure 3 top pan*el) versus the teachers (*Figure 3 bottom panel*), with teachers having a larger amount of variance across the groups (a broader spread vertically across the three groups). This finding replicates and expands upon the recent findings noted above from the multisource feedback studies which found that principal responses to leadership survey items are on average higher than teacher responses to the same items,
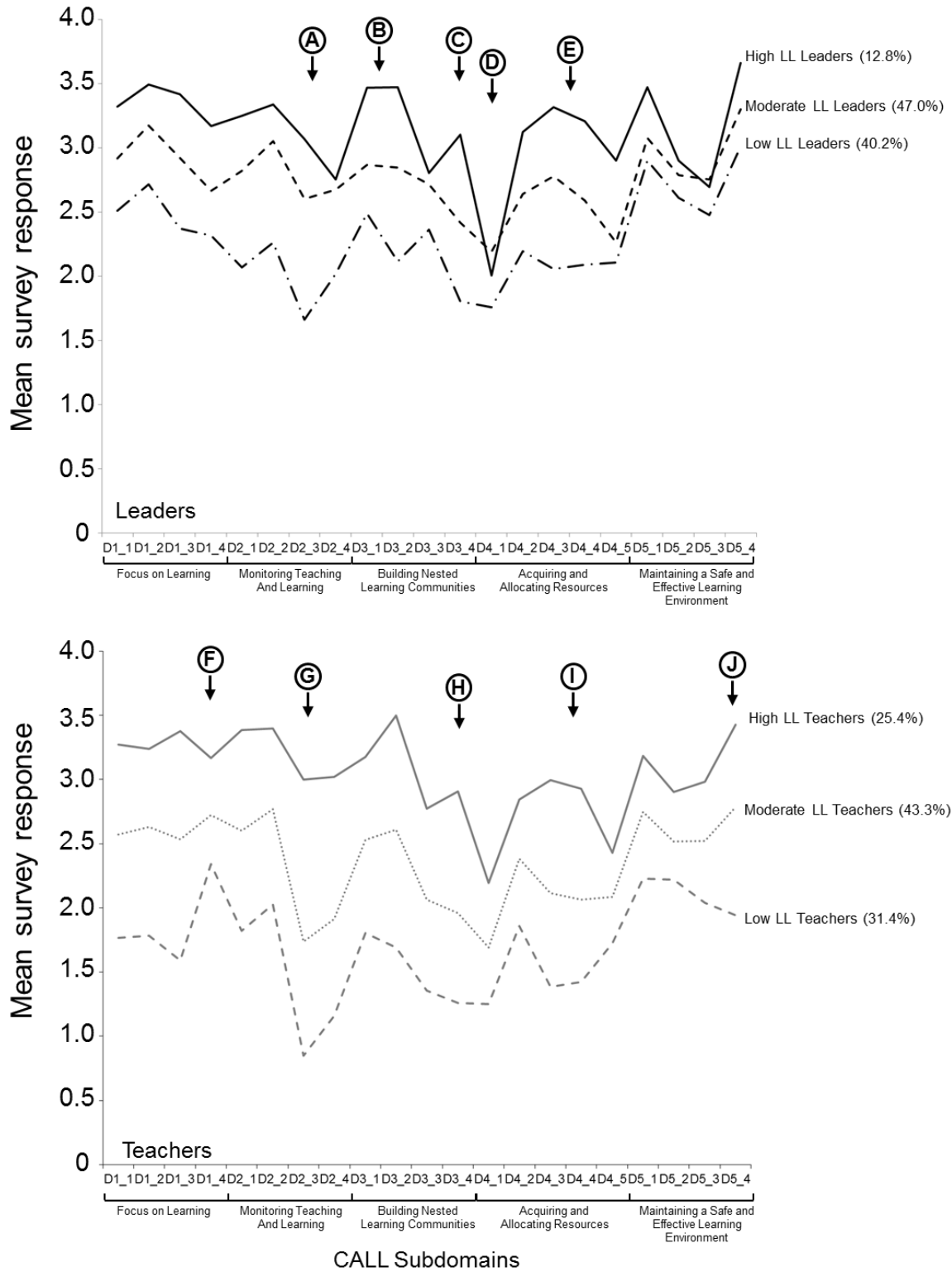
Figure 3: Response profiles of three leader/school level subgroups (level 2) and three teacher subgroups (level 1) across the 21 CALL subdomain item means, with areas of interest noted. Letters denote regions of interest in the response patterns and are further detailed in Table 4.

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Table 4: Leader and Teacher response patterns of interest based on Figure 3/Figure 4.

Label	Sub-domain	CALL Wording	Change
Leaders			
A	2.3	Formative evaluation of teaching	Lowest response for Low LL leaders
B	3.1-3.2	Collaborative school-wide focus on problems of teaching and learning & Professional learning	Highest responses for High LL Leaders
C	3.4	Coaching and mentoring	Increase for High LL Leaders
D	4.1	Personnel practices	Lowest response for High and Moderate LL leaders
E	4.2-4.5	Structuring time, resources, expertise, and family relations	Large differential between High LL leaders and Moderate
Teachers			
F	1.4	Providing appropriate services for students who traditionally struggle	Low LL teachers focus on this (highest point of profile) while High LL teachers decrease
G	2.3	Formative evaluation of teaching	Lowest point in profile for Low LL teachers and low for Moderate Teachers
H	3.4	Coaching and mentoring	Only High LL teachers increase
I	4.2-4.5	Structuring time, resources, expertise, and family relations	Generally higher responses for High LL teachers across these items
J	5.4	Buffering the teaching environment	High and Moderate LL teachers rise while Low LL teachers fall

and differ in substantive ways (Goff, et al., 2014; Goldring, Cravens, et al., 2015; Goldring, Mavrogordato, et al., 2015; Urick & Bowers, 2014b). Building on this work, Figure 3 and Table 4 provide the response patterns across the 21 subdomains of CALL broken out by the three significantly different types of leader and teacher responders.

Comparing Response Pattern Differences of Leader and Teacher Typologies to CALL
We now turn to describing the differences within the leader and teacher subgroups, and then present the findings across the schools. While there are multiple differences across the

subgroup response patterns, the letters in Figure 3 and Table 4 highlight the major regions of interest in which the response patterns (high, moderate and low) differ across the CALL survey. The CALL survey represents an effort to assess leadership for learning through focusing on the skills and practices used in the school (Halverson, et al., 2014; Kelley & Halverson, 2012). In an effort to determine which sections across the extensive domains of CALL differ within both the typology of leaders and the typology of teachers, we aim to understand which domains of CALL are of significant interest in typifying specific types of schools. This will help us understand the professional context of the

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school and potentially help work to craft targeted professional development in future survey administrations that responds to the unique contexts of the schools. As noted above in the literature review and methods, because we drew on a congruency-typology model to inform our analysis of the data, rather than depend on fitting all responders to a single "best fit" regression line, the three significantly different response patterns of teachers and principals provided through these LCA results across CALL provide a unique opportunity to examine and describe the rich contextual differences between significantly different types of responders across different types of schools on the same leadership for learning survey items.

One of the larger differences within both typologies is that for both the Low response leaders and teachers (Figure 3, bottom line in both panels), formative evaluation of teaching, as measured in subdomain 2.3 of CALL, is seen as relatively an area less frequently implemented as other areas, since both sets of patterns show a sharp decline as denoted by letters "A" and "G" in Figure 3 (see Figure 3 and Table 4). This is in comparison to a focus on traditionally struggling students (subdomain 1.4) by the Low LL teachers (note the steep rise in Figure 3 bottom panel bottom dashed line denoted in region "F"). For the other two types of teachers, their response patterns for subdomain 1.4 do not rise in this manner, to the point that the High teacher subgroup actually decreases slightly for subdomain 1.4, indicating that for the Low LL teachers, focusing on traditionally struggling students is a high priority, while the region marked "G" for the Moderate and Low LL teachers has the lowest responses, indicating that these two subgroups of teachers are rarely formatively evaluated. Conversely, the High subgroup leaders and teachers focus comparatively more on formative evaluation of teachers (subdomain 2.3, region "A" and "G") and resource allocation (subdomains 4.2-4.5, regions "E" and "I") than the other two subgroups in the typologies.

For both leaders and teachers in the high and moderate groups, personnel practices (subdomain 4.1, region "D") are relatively less important in comparison with the full response patterns, since Figure 3 shows a steep decline for subdomain 4.1 in both leaders and teachers, with close agreement between high and moderate leaders. In other words, the three leader types agree the most on subdomain 4.1, personnel practices, with the lowest responses. There are also additional differences in the response patterns of the three different types of teachers and leaders in that the High LL responders for both teachers and leaders reported more often in comparison to the other two patterns in that they focus on coaching and mentoring (subdomain 3.4, region "C" and "H", note the rise only for the high pattern, an up-facing "elbow" in the response pattern). The teacher response patterns also differed substantially in how often the three different types saw their schools buffering the teaching

environment (subdomain 5.4, region "I"), in which the high and moderate teacher response patterns increased while the low pattern decreased in comparison. Note that in region "J" for the leaders this difference in pattern is not evident, indicating that while the Low LL teachers felt that the leaders did not buffer them as often, this perception was not congruent with the leader perception.

To summarize the differences in the CALL responses between the three subgroups across the two typologies, High LL teachers and leaders reported focusing more on formative evaluation and resource and time allocation than the moderate and low responders, and less on struggling students, whereas the low responders report that addressing the needs of struggling students is of relatively high importance. Leaders agree the most across the typology on a lack of attention to personnel practices, while the low teacher type reports that buffering of their practice from the environment is not taking place as often, but the low leader type disagrees. Both the high leader and teacher subgroups report that coaching and mentoring happens more often in comparison to the other two subgroup response patterns. We discuss these differences in more detail in the discussion. We turn next to examining how these leader and teacher subgroup response patterns vary across schools and in comparison to each other, examining the level of alignment and congruency within the different school contexts as reported through the different response patterns to CALL.

A Congruency-Typology Model of Leader and Teacher Responses to CALL
As noted in the methods, the two level latent class analysis included a cross-level interaction term in which the level 1 teacher subgroups are free to vary within the level 2 school subgroups, informing the level 2 typology with the proportions and response patterns of the typology of the three different types of teacher respondents. In Figure 4 each of the three leader response patterns are plotted separately across the three columns, by Low LL (Leadership for Learning), Moderate LL and High LL schools. The x-axis remains the same in Figure 4 as it is in Figure 3. The top panel displays the difference in mean response patterns between leaders (solid line) and mean teacher responses (dotted line), averaged across all subgroups in that type of school. Thus, Figure 4 provides a means to examine the level and alignment between the typology of leader responses and the total average response within that school type. Response patterns vary substantially from Low to High (Figure 4, top panel, left to right). Note the relative distance between the solid and dotted lines in Figure 4 (top panel) and the general rise in response patterns to CALL moving from left to right, indicating that the teachers and leaders in the High LL schools report performing the skills and practices assessed by CALL more often.
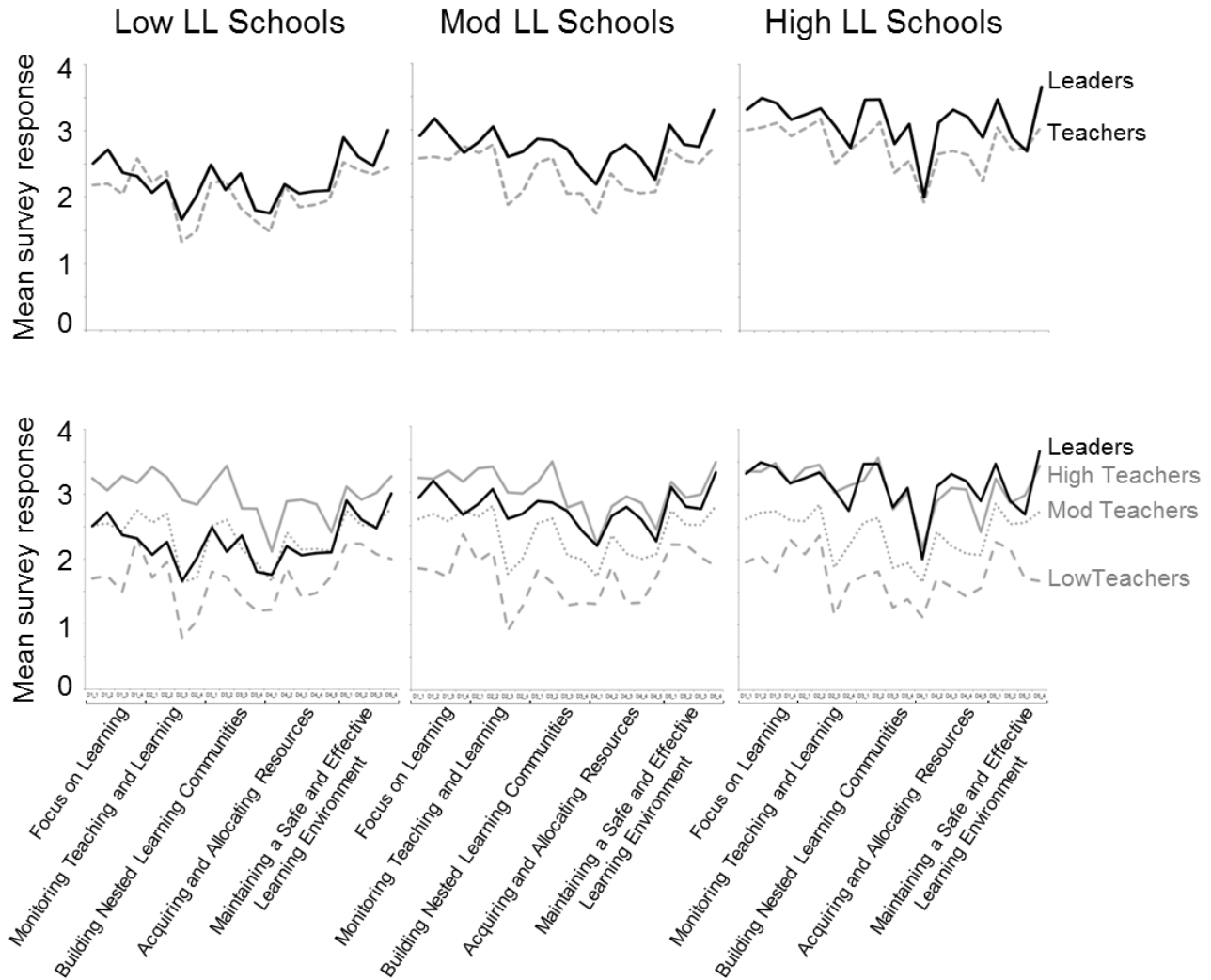
Figure 4: Comparison of response patterns of leaders and teachers across the three school subgroups and three teacher subgroups.

Only in the Low LL schools do the average teacher responses exceed the leaders (Figure 4, top left panel, dotted line higher than solid) for subdomains 1.4 "providing appropriate services for students who traditionally struggle", 2.1 – "formative evaluation of student learning", and 2.2 – "summative evaluation of student learning". Because these four subdomains are the only subdomains in which teachers respond on average higher than the leaders, this may suggest an important distinction for the Low LL schools in that there may be a misalignment between the perceptions of the teachers and leaders in these schools on these issues. The Low LL schools also agree on average on subdomain 4.2, "structuring and maintaining time", with the response patterns converging only on this issue (Figure 4, top left panel). For both the Moderate LL schools, the leaders and teachers on average agree in their responses to domain 1.4,

"providing appropriate services for students who traditionally struggle", but that in only the High LL schools do the leaders and teachers agree on average that the school provides "student support services as a safe haven for students who traditionally struggle", domain 5.4 (Figure 4, top panel). In contrast to the multisource feedback literature noted above which indicated that on average leader responses on these types of surveys are higher than teachers (Goldring, Cravens, et al., 2015), given that we applied the congruency-typology model to the data and are thus able to separate the school response patterns by the leader typology, for the first time we show that for the Low LL schools, there are specific domains of CALL that teachers on average perceive as being enacted more often than the leaders. Additionally, even for the moderate and high response patterns, there is congruency between teachers and leaders

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on average across specific domains. This is an intriguing finding that we return to below in the discussion.

In continuing to examine the alignment and congruency between the leaders and teacher perceptions, the Low LL leaders pattern diverges from the average teacher pattern in two ways where the leaders are responding much higher than the teachers. First, as shown in Figure 4 (top panel, left), the leader pattern rises for domain 1.2 "formal leaders are recognized as instructional leaders" while the teacher pattern remains flat. Second, the leader pattern also rises for subdomain 3.3, "socially distributed leadership" while the teacher pattern declines, indicating that the teachers do not agree on average with the leader perceptions of the extent of socially distributed leadership in the school. Of note, is that as opposed to these areas of differences in the Low LL school response patterns, the leaders and teachers in the Low LL schools align fairly closely on subdomains 4.2 "structuring and maintaining time", 4.3 "school resources are focused on student learning", and 4.4 "integrating external expertise into school instructional programs". This is in comparison to these same subdomains for the Moderate and High LL Schools in which the leader patterns rise above the average teacher patterns, and mirror the High LL teacher patterns closely (Figure 4, domain 4, all plots). We posit that these differences and similarities across the CALL response patterns paint an interesting picture of the congruency, alignment and misalignment of perceptions between teachers and leaders in the work of these schools around leadership for learning. We will return to these important distinctions in the discussion.

In the lower panel of Figure 4, we plot the same leader response patterns from the upper panel (solid lines), and then disaggregate each of the three teacher subgroups across each of the three school subgroups, such that the teacher response patterns show the differences across the columns (grey lines). For the bottom panel of Figure 4, note the relationship of the leader patterns versus the teacher patterns. The bottom panel of Figure 4 demonstrates the differences in the alignment and congruence of the three different types of teachers versus leaders based on their responses to the CALL survey. For the Low LL schools (Figure 4, bottom left) the leader patterns sit between the low and moderate teachers, indicating some agreement (alignment) that the behaviors assessed by CALL are not implemented often in these schools.

For the Moderate LL schools (Figure 4, bottom center), the leader response patterns appear to be fairly high in comparison to the moderate and low teachers. This may indicate incongruence between the leaders and teachers, as the leaders appear to respond that they perceive on average that the types of behaviors assessed by CALL are occurring more often than the moderate and low teachers are reporting (as the majority of the teachers in the school), suggesting a

misalignment in perception of leadership for learning in the schools.

For the High LL schools (Figure 4, bottom right), the leaders have the closest match to the High LL teachers, compared to the other response patterns. This suggests a possible strong alignment between the leaders and the teachers on the CALL survey in these schools. As will be shown below, the majority of the teachers in the High LL schools are the High LL teacher subgroup. And finally for Figure 4, note that while in the High LL schools the leader pattern overlaps substantively with the High LL teachers (Figure 4, bottom right), that in the Moderate and Low LL schools the leader patterns sit between the teacher patterns, between the High and Moderate teachers for the Moderate LL leaders, and for the Low LL schools, mostly aligned with the Moderate LL teachers, rather than close alignment with the Low LL teachers, who are the majority of the teachers in the low LL schools.

In sum, our findings show that in applying the congruency-typology model through a multilevel LCA to the CALL validation sample, we identified three major types of schools. However, in relation to the four-quadrant congruency-typology model described in Figure 1 from the synthesis of the literature, we had originally expected to find four different school types described through the congruency or misalignment between the different subgroup response patterns of teachers and leaders of low/low, low/high, high/low and high/high. As will be addressed in the discussion below, while this finding may be a result of using the validation sample of CALL, we find it interesting that we did not find a subgroup of schools in which the teachers consistently respond higher on average to the survey than the leaders - the "low/high" quadrant from Figure 1. As with the past literature that has noted that strong transformational leadership is necessary but insufficient for schools to enact shared instructional leadership (Marks & Printy, 2003; Printy, et al., 2009; Urick, 2012; Urick & Bowers, 2014c), this finding in the present study suggests that the professional development of teachers in relation to higher responses as to the tasks and behaviors measured by CALL for leadership for learning may require development of the leaders first. We return to this important distinction below.

A Three Subgroup Typology of School Responders to CALL
To aid in examining the differences across the response patterns in Figure 4, the top panel of Figure 5 displays the differences in proportions of the three teacher subgroups across the three school subgroups along with the response patterns copied from Figure 4 to help in examining the response context within each school type (Figure 5, top two panels). The Low LL schools have the highest proportion of Low LL teachers (Figure 5, top panel, light grey bar), while the High LL schools have the highest proportion of High LL

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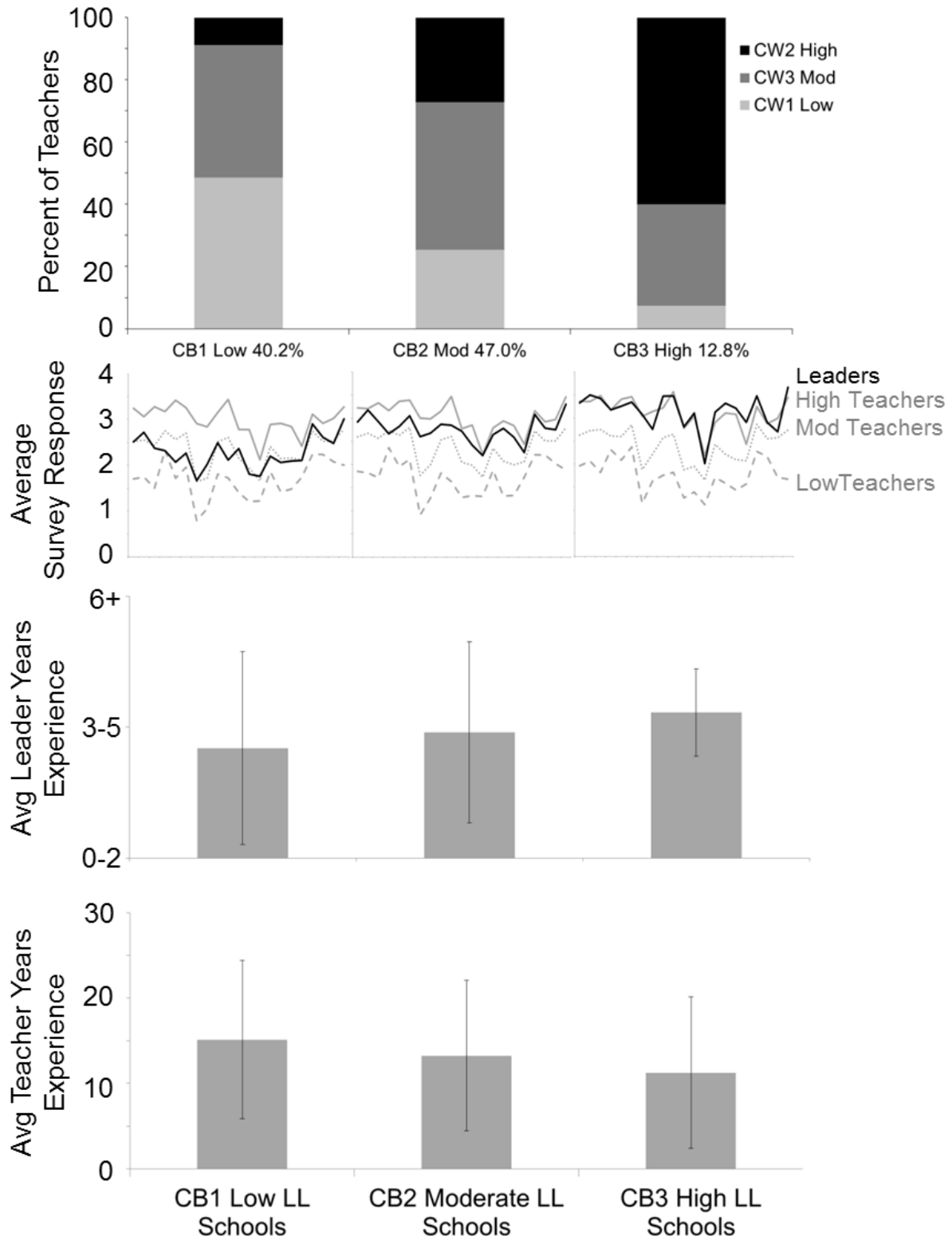
Figure 5: Proportions of teacher subgroups across the school subgroups and differences in non-CALL survey additional variables. Response pattern plots are copied from Figure 3 to provide the response context for each school type. For the bottom two panels, error bars denote +/- 1 standard deviation.

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teachers (Figure 5, top panel, black bar). Note, that similar to the previous study using a two-level LCA and the nationally generalizable Schools and Staffing Survey (Urick, 2012), each subgroup of schools includes each of the three subgroups of teachers, such that even in the Low LL schools, there are High LL teachers, and the reverse is true for the High LL Schools (Figure 5, top panel), although in small proportions.

The second panel of Figure 5 contains a copy of the same plots from Figure 4 to provide the context of the response patterns when viewing the differences in proportions across the school subgroups. In addressing the question of the alignment and congruency between teachers and leaders in the responses to the CALL survey, note that in the Low LL schools, which have about even proportions of moderate and low teachers, the leaders on average agree with the majority teacher perceptions of leadership for learning in the school who indicate that the school has a problematic academic and professional development climate, as evidenced by the leader pattern overlapping and lying somewhat between the moderate and low teacher response patterns. For the Moderate LL schools, while the majority of the teachers are Moderate or Low LL teachers, the leader response pattern is much higher in comparison (Figure 5, compare panels in center column). Note that for the Moderate LL schools, the leader responses are much higher than the Moderate and Low LL teachers, the leaders agree on average with the responses of the High LL teachers in their schools on two subdomains (Figure 5, second panel, center, bold solid line touches sold grey line in two locations), subdomain 4.1 "personnel practices", and subdomain 5.1 "clear, consistent and enforced expectations for student behavior". This is in comparison to the far right column of Figure 5, in which the High LL schools, as the smallest proportion of the sampled schools (12.8%), have the highest proportion of High LL teachers, and the leaders appear to substantively agree with the High LL teacher responses (patterns substantively overlap), indicating strong congruence in the school's perceptions of leadership for learning (Figure 5, right column).

Additionally, for the High LL schools, the top panel of Figure 4 shows a gap between the leaders and teachers, namely around domain 4 "acquiring and allocating resources", but when disaggregated by the teacher typology (Figure 4, bottom right, and Figure 5 right column) this difference disappears as the High LL leaders and teachers overlap. This shows the positive influence of the High LL teachers in the High LL schools in relation to the 40% of the teachers who are not High LL teachers in the High LL schools (Figure 5, right column, top two panels).

The bottom two panels of Figure 5 display the differences across the school subgroups in average leader years of experience and average teacher years experience overall.

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Note that as leader experience goes up left to right from Low LL schools to High LL schools, teacher total years of experience decreases (Figure 5, compare third row of panels to bottom panels). Error bars represent +/- 1 standard deviation. Leader experience was measured in the CALL validation survey as 0-2 years as a school leader, 3-5 years, or 6 plus years. This finding replicates and extends recent multisource feedback research in schools (Goff, et al., 2014) to our congruency-typology model, confirming that in schools with high congruent responses, leaders on average are more experienced and lead less experienced teacher faculty.

Multiple other items asking about the job responsibilities of the teachers were included in the final LCA model (see Figure 2), such as if the teacher teaches special education, is a teacher leader, is a data team member, teaches in a core subject such as English, mathematics or science, or teaches at the high school level. As with the CALL subdomain averages, these variables differed across the three different teacher subgroups and school subgroups. These differences are presented in Table 5, with differences between the teacher subgroups in Table 5A, and differences between the school subgroups in Table 5B. Significant differences were calculated using Pearson chi-square or a one-way ANOVA. The three teacher subgroups had significant differences across these items, with special education and less experienced teachers who were less often teaching in a high school in the High LL teacher subgroup, while teachers who identified as a teacher leader were more often in the Moderate LL teacher subgroup. Low LL teachers were more often core subject teachers and taught at the high school level. Examining the teacher distributions across the school subgroups, High LL schools had the lowest proportion of data team members, and the highest core subject teachers. Moderate LL schools had the lowest proportion of high school teachers. We turn next to a discussion of these findings.

DISCUSSION
The purpose of this study was to examine the different types of responses of teachers and leaders to the Comprehensive Assessment of Leadership for Learning (CALL) in an effort to understand how different schools, principals and teachers respond to survey items focused on skills and practices around leadership for learning to help provide actionable information to inform theory and practice. A central aim of the study was to describe the extent to which teachers' and leaders' perceptions of the level and frequency of the tasks assessed by CALL in the validation sample align or not, given our congruency-typology model of leader and teacher perceptions of leadership for learning. Our goal was to highlight how alignment and congruency of perceptions may speak to issues of detailing and unpacking theories of instructional leadership, distributed leadership, and leadership for learning in an effort to help translate theory

Table 5: Pearson chi-square comparisons of dichotomous teacher variables across school subgroups and ANOVA comparison of avg years teacher experience

Table 5A

Variable	Teachers			p-Value
	CW1 Low	CW3 Moderate	CW2 High	
Special education teacher	12.08%	15.00%	20.08%	<0.001
Teacher leader	23.53%	30.83%	26.80%	<0.001
Data team member	27.80%	32.01%	26.58%	0.013
Core subject teacher	47.74%	37.77%	40.97%	<0.001
High school teacher	92.52%	85.11%	82.20%	<0.001
Avg Years experience[a]	13.75	14.10	12.63	0.001

[a]: One way ANOVA comparison of mean years teacher experience. All other comparisons are Pearson chi-square

Table 5B

Variable	Schools			p-Value
	CB1 Low	CB2 Moderate	CB3 High	
Special education teacher	15.71%	15.13%	15.23%	0.915
Teacher leader	27.92%	27.79%	25.75%	0.629
Data team member	29.81%	30.84%	23.64%	0.009
Core subject teacher	41.61%	39.88%	47.27%	0.016
High school teacher	93.19%	78.72%	94.67%	<0.001

into action for principals and teachers looking to improve their schools across multiple contexts. This study is novel and significant as it is one of the first to examine a simultaneous model of both different types of leaders and teachers, and how they are apportioned in the sampled schools, using a survey focused on skills and practices, such as CALL. Additionally, it also is significant because it offers a practice-based – as opposed to a leadership style-based or a principal-evaluation based – approach to developing a model to guide school improvement practices. Grounding a typology in leadership practices will help leaders understand the steps that need to be taken to improve the conditions of teaching and learning. Identifying practice-based types of schools is an important first step in providing the kinds of formative feedback necessary to guide the work of school improvement. This discussion is organized first to discuss the findings about the three different types of teachers, followed by a discussion of the leaders and interpretations of the interaction of the teachers and leaders in the different types of schools. We then move to discussing the findings as they apply to the current research in the field. Finally, we discuss issues about the modeling procedure and limits of the study, and end with concluding comments and implications.

Summary of the Congruency-Typology CALL Findings Across Schools, Leaders and Teachers
Research Question #3 asked to what extent does the alignment between different types of principals and teachers

in the responses to CALL characterize the instructional and leadership climates of the schools. To address this question, Figure 6 provides a three-part summary of our findings from the analysis across the three different school subgroups. To provide a visual means to examine the total proportions of teachers across the schools and within the subgroups, the bar graph in Figure 6 plots the proportions of the different subgroups of teachers across the different schools by the total number of teachers in the CALL validation sample. A summary of the differences across the school and teacher subgroups is provided in the lower panels. Arrows represent hypothesized transitions between subgroups that are discussed below.

Three different types of teachers
In their responses to the CALL survey, three different patterns of teacher responses emerged, and these teacher subgroups distributed non-randomly across the three different types of schools. For the *Low Leadership for Learning* (LL) teachers, who accounted for about one third of the sample (31.4%), these teachers reported that their school had a relative strength in their work with struggling students and formative and summative assessments of students. We argue this demonstrates a high level of focus on these areas of practice. Additionally, the teachers did not perceive formative evaluation of teaching as something practiced often or that greatly impacted their professional practice in their schools, that they were not provided external expertise to help them in their practice, and they
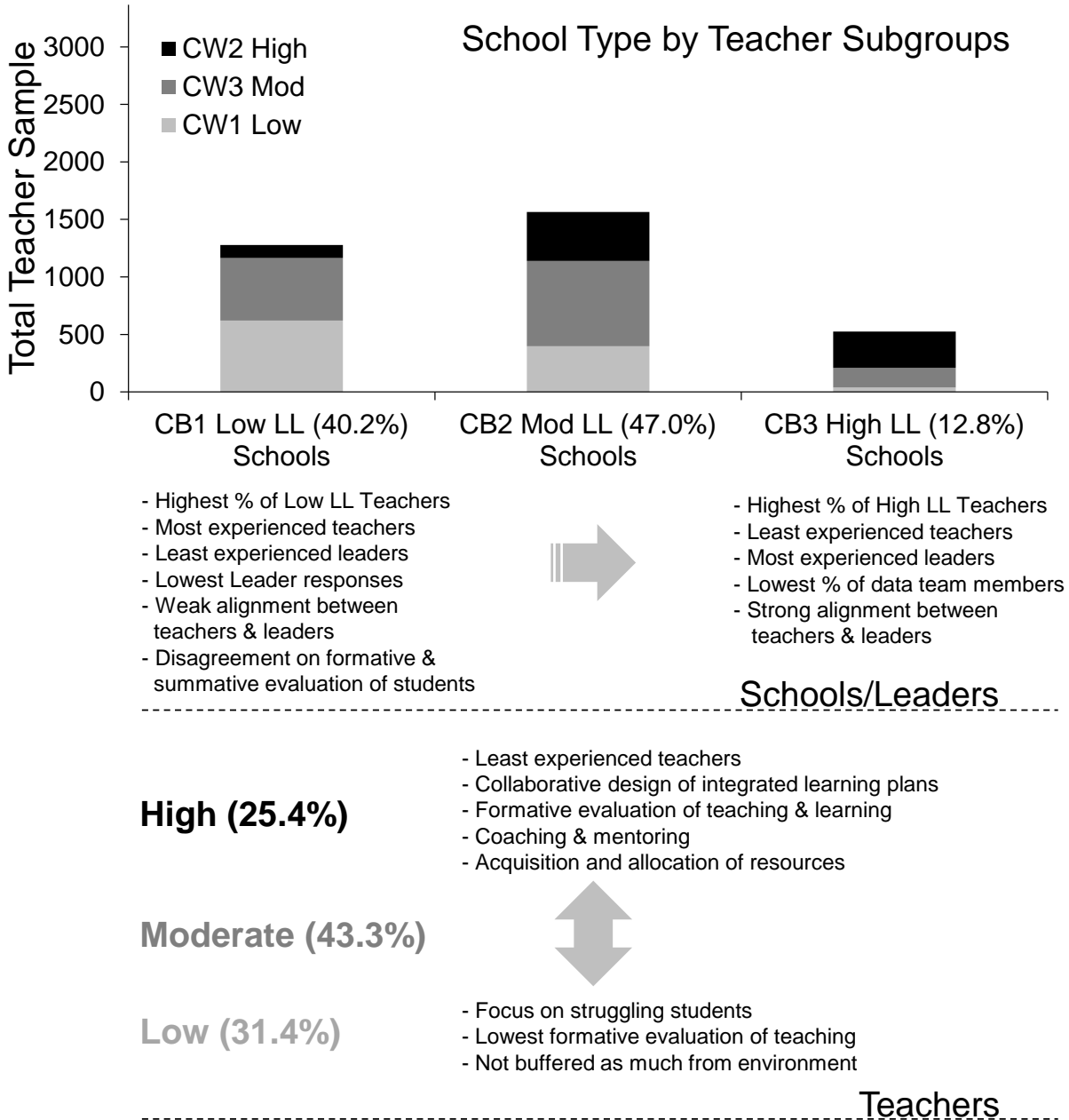
Figure 6: Summary of findings of the two-level latent class analysis of CALL: Three different subgroups of teachers were identified across three different subgroups of leaders/schools, with varying proportions of teacher subgroups within the school subgroups. Substantive differences between the school and teacher response types are noted. Arrows indicate theorized transitions.

reported that their teaching practices were not buffered from the environment as often or as effectively as the other types of teachers. These teachers worked more often in schools in which they made up almost 50% of the teacher responders on average and the schools had the highest average teacher experience, with the least experienced leaders. We hypothesize that for this group of Low LL teachers, there is an absence of effective formative evaluations of their

instruction and what appears to be professional isolation that may mirror past conceptions of individualized teacher practice (Lortie, 1975), and that this does not provide the kinds of social capital resources, in the form of professional community, important to improving teaching and learning across the school (Bryk & Schneider, 2002). These teachers appear to focus on issues that may be mostly under their control and areas where they can receive feedback and see

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development, namely working with traditionally struggling students, and focusing on their own student evaluations. The point that these teachers are working in schools with the most experienced teachers with the least experienced leaders may suggest a "hands off" approach by the leaders (Urick & Bowers, 2014c), as the less experienced leaders leave the difficult work of instruction and pedagogy to the experienced teacher as the experts in their schools. Without a strong professional community focused on formative and summative feedback systems to help improve practice, these experienced teachers report fewer practices that indicate strong professional communities (Halverson, 2010; Louis, Marks, & Kruse, 1996).

In contrast, the *High Leadership for Learning* (LL) teachers accounted for only a quarter of the sample (25.4%), provided the highest responses overall, and, as evidenced by increases in their patterns in comparison to the other two subgroups, reported more often of effectively focusing on collaborative design of integrated learning plans, formative evaluation of teaching and learning, coaching and mentoring, and issues of acquiring and allocating resources. High LL teachers reported working in schools with a majority of other High LL teachers, agreeing with their leaders on average across the majority of the CALL survey, and working in schools that had on average the lowest levels of teacher experience yet the highest levels of leader experience. In short, our argument in this study is that these differences are important indicators of areas of interest in the CALL responses, identifying exactly which practices and skills were operationalized differently in the different contexts.

The *Moderate Leadership for Learning* (LL) teachers, as the majority of the teachers in the sample, sit between the two extremes, exemplifying aspects of both of the other types. For the Moderate LL teachers as the modal group of teachers in the sample, as denoted in Figure 6 with the two headed vertical arrow, based on the data available we are unable to posit the extent that teachers may move between groups. The point that the High LL teachers have higher responses across the CALL survey does not necessarily lead to the conclusion that teachers may move from low, to moderate to high. In fact, given a problematic leader and school environment, a teacher could move from the Moderate LL subgroup to the Low LL subgroup as they move to focus on what they can control in what could be a chaotic professional environment. Thus, at the teacher level, we represent this uncertainty in Figure 6 with a two headed arrow.

Three different types of leaders

As with the teachers, we also identified three significantly different patterns of leaders in their responses to the CALL survey. The *Low Leadership for Learning* (LL) leaders work in what we term a "problematic context" for leadership for learning. The majority of their teachers in the sampled schools were from the Low LL teacher subgroup, and while the Low LL leader response pattern overlapped substantially with the Moderate LL teachers, the leaders' responses were still the lowest leader responses across the CALL survey. This is doubly problematic in that the Low LL leaders had the least amount of experience on average as school leaders, but served schools with the highest average teacher experience. We consider this a type of mismatch at the experience level, reflecting the conclusions of the past congruency research noted above which also found that the high positive congruency schools had on average the most experienced leaders and the least experienced teachers (Goff, et al., 2014). However, the Low LL leaders response patterns were similar to the responses of the teachers in their schools, in that both the leaders and the teachers on average reported the lowest responses to the CALL survey, indicating that when considering leadership for learning, distributed leadership, and instructional leadership from a practices and skills perspective, the leaders and majority of the teachers in the Low LL schools agreed in many ways that these aspects of what CALL assesses were only somewhat or ineffectively attended to in their schools.

This is in contrast to the *High Leadership for Learning* (LL) leaders who, as the smallest subgroup of leaders (12.8%), reported working in schools with a majority of the High LL teachers, had the highest average leadership experience and schools with the lowest average teacher experience. These leaders had a strong alignment with the High LL teachers, agreeing in most respects across the CALL survey that the skills and practices were often a focus of their practice.

The *Moderate Leadership for Learning* (LL) teachers and leaders sit between the Low LL and High LL subgroups, with the Moderate LL leaders providing response patterns that were on average higher across the CALL survey domains than the Moderate and Low LL teachers, and in some areas approaching and agreeing/matching the average High LL teacher responses. We interpret this result with two competing hypotheses. First, the point that the Moderate LL leaders are responding higher than their teachers to CALL, who are mostly Moderate LL teachers, can be interpreted as leaders who may be aspirational but somewhat disconnected from the reality of the day-to-day practice of the school, demonstrating a misalignment between the teachers and leaders. This could be evidence of schools in which leaders set a vision and mission but find it problematic to implement, struggling to bring their teachers along on their plan, and/or face resistance (Corcoran, et al., 2013). However, second, we posit an alternative explanation, in that the Moderate LL schools may lie along a continuum of improvement in the practices and skills assessed by CALL from the Low LL to High LL schools, and thus the Moderate LL schools are interesting examples of change in instructional and distributed leadership and learning. We

represent this hypothesis in Figure 6 with a single headed arrow.

A Congruency-Typology Model of Leadership for Learning
As noted in the results, in relation to the four-quadrant congruency-typology model articulated in the literature review and described in Figure 1, we found evidence in this validation sample for three of the four proposed types of schools, including the low/low, high/low and high/high leader-teacher congruency and alignment or misalignment schools. Using the multilevel LCA technique and the task-based focus of CALL on issues of leadership for learning, we found little evidence from this CALL validation sample to suggest a subgroup of schools in which teachers' perception of leadership for learning tasks and behaviors are significantly higher than leaders' perceptions. Conversely, this study provides a rich set of information around the domains of the CALL survey for the three subgroups of schools identified.

For the congruent schools – the High LL and Low LL schools, we found that the teacher and leader average perceptions overlapped in multiple ways, indicating strong alignment of the teaching faculty and the leaders on the perception of either positive or problematic enacted school leadership environments. Given the historical focus of leadership research on "effective" schools with positive environments (Bowers, 2010b, 2015; Scheerens, 2012; Trujillo, 2013) versus a traditionally sparse literature on challenging school leadership environments (Murphy, 2008), the congruency-typology model provides a means to disaggregate the different subgroups of teachers, leaders and schools and compare congruent schools. Additionally, the finding that 40.2% of the schools were identified as Low LL schools versus only 12.8% of the High LL schools suggests that CALL is a strong assessment of leadership for learning that can help pinpoint the issues in a school that may be leading to a challenging environment. That the leaders and teachers in the Low LL schools on average agree that the leadership for learning tasks are not happening as often in comparison to the High LL schools is again a strong sign of the utility of not only CALL as a useful assessment of leadership in schools, but also the congruency-typology model as a means to examine the extent to which distributed and instructional leadership behaviors are enacted.

For non-congruent, or misaligned schools, our results suggest that, as the high/low congruency-typology subgroup, in the Moderate LL schools, the Moderate LL leader responses align fairly closely with the High LL teachers, who make up a little over 20% of the teachers in the schools. However, the majority of the teachers are the Moderate and Low LL teacher subgroups. Thus, as the Moderate LL leader has a higher overall perception of their school's leadership for learning in comparison with the majority of the teachers, these schools fit into the lower

right quadrant of the congruency-typology model of a "high/low" misaligned school. Our finding that this subgroup of schools is the largest of schools identified from the sample (47%) helps to inform the recent research on multisource data in schools which has shown that on average principals rate themselves higher on leadership constructs than their teachers (Goldring, Cravens, et al., 2015; Goldring, Mavrogordato, et al., 2015). We hypothesize that without the typology perspective of the congruency-typology model, these recent studies may be overly focusing on fitting all participants to a single group when in fact there may be evidence for significantly different subgroups across congruency types. We encourage more research in this area.

For the Moderate LL school subgroup, it is interesting to note that the Moderate LL leaders agreed with their small proportion of High LL teachers on average on issues around domain 4 of CALL of acquiring and allocating resources, especially personnel practices, as well as subdomain 5.1, clear consistent and enforced expectations for student behavior. As we suggest in Figure 6, the Moderate LL subgroup may be a type of school that is transitioning from low to high. This type of interpretation falls within the domain of much of the leadership research over the last forty years that has described that changes in organizational practices must start with and include a focus on hiring and human resource practices (Bowers, 2008; Urick, in press) as well as addressing issues of student behavior and conduct throughout the school day (Cusick, 1983; Edmonds, 1979; Robinson, et al., 2008; Urick, in press; Urick & Bowers, 2014a), both of which align well with current conceptions of school improvement through leadership for learning (Murphy, et al., 2007; Robinson, 2011). Indeed, the Moderate LL school response pattern suggests that the leaders may be engaging in what Marks & Printy (2003) might term the "necessary but insufficient" first steps of encouraging transformational leadership, through engaging the staff in collaboration and professional development, while working towards a potential future shared instructional leadership environment (Boyce & Bowers, 2013; Marks & Printy, 2003; Printy, et al., 2009; Urick & Bowers, 2014c). This is evidenced by the Moderate LL leaders and teachers both noting that the CALL subdomains of 2.3 "formative evaluation of teaching" 3.1 "collaborative school-wide focus on problems of teaching and learning" and 3.2 "professional learning" were relatively higher than the Low LL response patterns (the patterns rise rather than fall). As CALL is designed to provide feedback to the school and to help foster professional development around issues of leadership for learning, we encourage future work in this area to examine transition models as schools take CALL multiple times over subsequent years.

This framework is in comparison to a contingency theory model (Fiedler, 1978) of school leadership, in which the

leader assesses the capacity of the school staff in relation to the context and organizational structure of the school, and then selects the form of leadership appropriate to that context, such as managerial under strict external curricular or whole school improvement directives or an organizational commitment and distributed leadership strategy under more loose constraints (Rowan, 1990; Spillane, 2006; Urick, in press). In considering the distributed leadership framework noted above in the literature review (Spillane, et al., 2004), which served to help guide the construction of CALL (Kelley & Halverson, 2012), the congruency-typology model views the capacity of the teachers and leaders in a school around the five domains of leadership for learning as a developmental continuum within the organizational commitment frame, in which the knowledge, skills and practices around leadership for learning are improved through taking CALL, and perhaps repeatedly taking CALL, and then as a school focusing on areas of improvement. The intent is that the leaders and the teachers learn together and improve the instructional practice in the school through the distributed leadership framework represented in the survey. In focusing on the current skills and practices enacted by the faculty of a school, CALL allows schools to focus on the knowledge and skills needed to improve given the school's current strengths and challenges, rather than on determining the leadership and practice orientation of the school based on its current context. As future administrations of CALL will survey the same schools and staff multiple times, future research should focus attention on teachers and schools that transition from one subgroup to another to test the continuum aspect of the congruency-typology model and examine the variables that predict transition or stability in the longitudinal data patterns. We look forward to this type of work in this area.

Application of a Congruency-Typology Model of Leadership for Learning to Research and Practice
As one of the first studies in educational leadership to examine a multilevel latent class analysis with a cross-level interaction using an assessment of leadership for learning, drawing on the congruency-typology model of school leadership climates, we demonstrate here that important differences in the response patterns of teachers and leaders across schools can be identified, even in a validation sample of this type. We argue that this is important for future research, policy and practice. Not only is this method able to identify that there are substantively different subgroups within and between levels, but the response patterns across a survey such as CALL provides a unique opportunity to examine the differences in context of the academic, collaborative and professional community climates within the schools. Our argument here in support of previous research that helped frame the present study (Bowers & White, 2014; Boyce & Bowers, 2013; Goldring, et al., 2008; Hallinger & Heck, 2011b; Marks & Printy, 2003; Printy, et

al., 2009; Urick & Bowers, 2014c) is that rather than fit all actors to a single regression line or structural model, there is more than one type of teacher, type of leader, and type of school, and these types can be empirically defined by their responses to surveys such as CALL. Recommendations for professional development, teacher and leader training, best practices, instructional improvement, and evaluation must take this into account as teacher, school and leader are not monolithic concepts. Our argument here is that research, policy and practice must begin to stop treating these as such.

Surveys such as CALL combined with a congruency-typology model allow us to peer inside these multifaceted and multilayered organizations on a larger scale to begin to understand how to provide specific resources and training dependent upon the demonstrated needs of the organization through their differential responses to the survey. While the in depth qualitative school leadership research has made this argument for quite some time (Murphy, et al., 2007), it is only recently that surveys and statistical models have become available to confirm and extend these findings and then provide formative professional development feedback systems (Halverson, 2010) that could help to provide data to explain differences in perceptions between teachers and leaders (Covay Minor et al., 2014; Goff, et al., 2014; Goldring, Cravens, et al., 2015; Goldring, Mavrogordato, et al., 2015; Urick & Bowers, 2014b) and inform context specific professional development and capacity building efforts.

One example of the implications of this study for practice in schools are the findings around the major differences and similarities in response patterns between the teachers and the leaders within each of the three school subgroups. As noted above, the teachers and leaders are not merely high or low across the subdomains of CALL, but their response patterns instead paint an interesting picture of agreement and disagreement – the Congruency-Typology model. While the CALL survey includes 200 items, there appear to be regions of responses within specific subdomains of questions that help typify the three different school subgroups (see Figure 6 and Table 4). For these schools, in responding to the CALL survey results, these differences and similarities can point to specific strengths to build upon as well as improvement areas to focus capacity building. First, as we found only three of the four types of schools in the proposed Congruency-Typology model, one implication for practice may be that, as with the previous school leadership typology research (Marks & Printy, 2003; Printy, et al., 2009; Urick & Bowers, 2014c), school leadership development across the core domains of leadership for learning may be a necessary first step in school instructional improvement, as we found little evidence for teacher perception exceeding the leader perception of leadership for learning. While cross-sectional, our findings suggest that schools may move from the low teacher – low leader

quadrant, to the low teacher – high leader, to the high-high quadrant. This finding suggests that for practice, developing school leaders first is an important acknowledgement. Only recently has the domain of principal professional development and support become a focus of research, especially for school districts (Darling-Hammond, LaPointe, Meyerson, & Orr, 2007; Goldring, Grissom, Neumerski, Murphy, & Blissett, 2015; Mitgang, 2013; Riehl, 2015). This study provides an additional means to help focus these types of development practices, as the differences across the domains of CALL in practice point to specific needs for each school. Second, the different types of leaders in this study did not differ to a large amount in domain five, maintaining a safe and effective learning environment, aligning with other recent research that has shown that good leadership must start with managing the order and safety of the school (Urick, in press). Thus, for practical application of the findings here to principal professional development, our findings suggest that development should focus in other domains that may have higher leverage, domains where there are larger differences for leaders. As an example, the largest differences between the low and moderate leaders and the high leadership for learning leaders were in CALL Domain 3, building nested learning communities, and Domain 4, acquiring and allocating resources (see Figure 3 & Table 4). The teachers also report large differences between the high subgroup and the moderate and low teacher subgroups for these domains. For moving from the Moderate LL school to the High LL school type, our findings suggest that these two areas from CALL may help serve to focus a school on the areas in need of development for the staff, both teachers and leaders.

As a final example of the possible practical uses of this type of congruency-typology model as applied to the professional development of principals, recently, researchers used a large-scale randomized controlled experimental design to test the efficacy of the impact of the McREL Balanced Leadership principal professional development program (Jacob, Goddard, Kim, Miller, & Goddard, 2015), one of the first large-scale randomized controlled experiments in education leadership to date. The McREL Balanced Leadership program is one of the most heavily used principal professional development programs in the US and is designed around the Marzano leadership framework (Marzano, et al., 2005) which frames the work of the principal around many of the core tasks and responsibilities that are incorporated into national principal standards, such as ISLLC and ELCC (Jacob, et al., 2015; Young et al., 2013). However, while the authors of the randomized controlled experimental trial showed significant positive effects of the McREL Balanced Leadership program on principal perception of their own leadership in their schools, they found no significant effects on teacher perceptions of leadership or on student achievement over multiple years (Jacob, et al., 2015). As one of the first studies of its kind in

this domain, it remains to be seen if the results can be replicated in other samples. However, in relation to the present study, our findings around a congruency-typology model indicate that there are significantly different types of school leadership and academic climates, such as our finding here of three different subgroups of schools. Studies such as Jacob et al. (2015) view all schools as existing along a single random distribution of leadership and teacher professional development needs, so a classical random assignment of participant schools appears logical. However, in the present study we show strong evidence for the alternative theory of a congruency-typology model in which significantly different subgroups of teachers, leaders and schools exist who may need substantively different forms of professional development given their significantly different response patterns to surveys such as CALL. Thus, we recommend that future research in this area take into account the possibility of the congruency-typology model in which professional development interventions such as the McREL Balanced Leadership may be beneficial to only one specific identified subgroup of schools, perhaps here the Low LL schools, and would have no effect for the other subgroups that make up the majority.

Limitations

This study represents several firsts. This study is one of the first to offer a structure for a leadership practice-based congruency-typology model of schools, designed for the purpose of providing formative feedback for school improvement. The CALL survey represents one of the first widely used tools designed to assess the degree to which leadership practices occur in schools. The data upon which the study draws, however, was initially collected for the purpose of validating the CALL tools. The sample included were only schools that opted into the CALL validation study, which means that the results of the model should be interpreted with some caution since it is a biased intact sample. The dataset is not longitudinal, and we were not able to collect consistent data from across the entire sample to compare the CALL responses with, for example, common measures of student learning outcomes. Although the items in the CALL domains are grounded in the rich literature of leadership effects on learning, we are not in a position to directly conclude that the High LL schools are engaging in practices that improve student learning as a result of our sample. As more and more schools continue to use the CALL survey, and as individual schools use the survey multiple times over the years, we will assemble a dataset that can inform the relations of CALL practices to outcomes, and we will be in a better position to address the relation between the practices of the three types of schools presented here and student learning outcomes.

Second, from a modeling perspective, the initial single level LCA model fitting procedure identified that four and five latent class models may fit the teacher data well. We opted

for a more parsimonious and conservative model here of three latent classes at each level, however this does not rule out that additional substantive latent groups may fit just as well and should be investigated further in future studies. This issue leads to the third major limitation, in that as noted in the methods and results, two-level latent class analysis is an area under active research in the mixture model domain (Henry & Muthén, 2010; Samuelsen & Raczynski, 2013), with final fit statistics for the total number of groups at both levels currently unavailable. We argue that the overall model fit statistics show that the model fits the data well, and that since we opted for a conservative model of only three latent classes at each level, that the final model is robust. However, as research on multilevel mixture modeling progresses, we encourage future work on further identifying the final correct number of latent classes at both levels, using large nationally generalizable samples, which may lead to future researchers identifying schools which fit all four quadrants of the congruency-typology model.

Additionally, while we found an ordinal high, moderate and low response pattern for both teachers and leaders, a critique of the multilevel LCA method could be that the results would be the similar with a much simpler analysis that merely provides median splits of the data or categorization through binning three groups or more, such as creating quartiles, across a leadership scale, rather than test a typology model. However, as noted in the LCA literature (B. O. Muthén, 2004; Samuelsen & Raczynski, 2013), latent class analysis provides a wealth of information beyond arbitrary categorization of median splits or the like. First, the LCA groups are built from varying levels of responses across the full range of variables included, providing a means to examine differential group responses across multiple dimensions of data, as we have shown here with the response pattern plots throughout. Second, LCA provides empirically defined group membership and fit statistics, which is a vast improvement over arbitrary categorization or quartile binning which assumes equal group membership across all bins. A strength of the LCA procedure is the ability to empirically test if there are multiple modes of responders across a dataset, and with the school level included here, to also test if these responder groups are distributed randomly or unevenly across the schools.

Conclusions & Implications
In conclusion, this study presents a rich and thick description of the response patterns of teachers and leaders to the CALL survey, identifying specific areas of improvement and practice for schools with varying contexts and levels of practice across the survey. We offer the term "quantitative phenomenology" (Lawrence, 1987; Mayoh & Onwuegbuzie, 2015) to describe this type of study. The resulting typology of school types provides a glimpse into a future in which schools will be able to draw upon

customized formative feedback to guide improvement practices. As the CALL survey continues to be used beyond the validation sample, we look forward to continued work in this area. As just one example, the theory of action of the CALL is that it is meant in-part to itself be a formative assessment of leadership for learning in the participant schools (Kelley & Halverson, 2012), informing the participants about their actions and serving as a framework to assess and improve practices through feedback loops within the school (Halverson, 2010). With the present study as a base-line, it is of substantive interest to examine how schools may improve across the multiple dimensions assessed by CALL through time, such as if schools that start in the Low LL school type proceed through the Moderate LL type and attain aspects of High LL schools, the demonstrating hypothesis noted above of a continuum of practice around CALL. Leaders are responsible for improving the conditions for teaching and learning in schools. As we continue to develop more sophisticated methods for documenting the outcomes of schools, we hope that this work will advance the study of data-driven tools to inform the everyday work of educators in schools across the world.

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Appendix A: Two-level latent class classification matrix fit probabilities of most likely latent class pattern by between and within categories

CB	CW	CB 1 Low			CB 2 Mod			CB 3 High		
		CW1 Low	CW2 High	CW3 Mod	CW1 Low	CW2 High	CW3 Mod	CW1 Low	CW2 High	CW3 Mod
Low	Low	0.950	0.000	0.026	0.022	0.000	0.002	0.000	0.000	0.000
	High	0.000	0.918	0.057	0.000	0.023	0.001	0.000	0.000	0.000
	Mod	0.035	0.015	0.925	0.000	0.001	0.024	0.000	0.000	0.000
Mod	Low	0.016	0.000	0.000	0.936	0.000	0.037	0.010	0.000	0.001
	High	0.000	0.011	0.001	0.000	0.927	0.035	0.000	0.026	0.000
	Mod	0.001	0.000	0.017	0.020	0.021	0.924	0.000	0.001	0.016
High	Low	0.000	0.000	0.000	0.046	0.000	0.000	0.919	0.000	0.035
	High	0.000	0.000	0.000	0.000	0.040	0.002	0.000	0.938	0.019
	Mod	0.000	0.000	0.000	0.005	0.001	0.054	0.017	0.037	0.887

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Appendix B: Mplus Code

```
TITLE: 2-Level non-parametric LCA Model for CALL Data

DATA: FILE = C:\CALL\Data_01.dat;

VARIABLE:    NAMES = ID SCHOOLID
                D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4
                D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5
                D5_1 D5_2 D5_3 D5_4
                TyrsTot SpecEd TLead TData TCore HS
                LdD1_1 LdD1_2 LdD1_3 LdD1_4
                LdD2_1 LdD2_2 LdD2_3 LdD2_4
                LdD3_1 LdD3_2 LdD3_3 LdD3_4
                LdD4_1 LdD4_2 LdD4_3 LdD4_4 LdD4_5
                LdD5_1 LdD5_2 LdD5_3 LdD5_4
                Ldyrsavg;
          MISSING =  ALL(9999);
          IDVARIABLE  = ID;
          USEVARIABLES =  ID
                D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4
                D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5
                D5_1 D5_2 D5_3 D5_4
                TyrsTot SpecEd TLead TData TCore HS
                LdD1_1 LdD1_2 LdD1_3 LdD1_4
                LdD2_1 LdD2_2 LdD2_3 LdD2_4
                LdD3_1 LdD3_2 LdD3_3 LdD3_4
                LdD4_1 LdD4_2 LdD4_3 LdD4_4 LdD4_5
                LdD5_1 LdD5_2 LdD5_3 LdD5_4
                Ldyrsavg;
          CATEGORICAL = SpecEd TLead TData TCore HS;
          CLASSES = cb(3) cw(3);
          BETWEEN = cb LdD1_1 LdD1_2 LdD1_3 LdD1_4
                LdD2_1 LdD2_2 LdD2_3 LdD2_4
                LdD3_1 LdD3_2 LdD3_3 LdD3_4
                LdD4_1 LdD4_2 LdD4_3 LdD4_4 LdD4_5
                LdD5_1 LdD5_2 LdD5_3 LdD5_4
                Ldyrsavg;
          CLUSTER = SCHOOLID;
          WITHIN  = D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4
                 D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5
                 D5_1 D5_2 D5_3 D5_4
                 TyrsTot SpecEd TLead TData TCore HS;

ANALYSIS:

          TYPE    = mixture twolevel;
          PROCESSORS = 32(STARTS);
          MITERATION = 5000;
          STARTS = 2000 200;
          STITERATIONS = 100;

MODEL:
          %WITHIN%
          %OVERALL%

          %BETWEEN%
```

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```
    %OVERALL%
    cw on cb;

MODEL CW:
    %WITHIN%
    %CW#1%
    [D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4];
    [D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5];
    [D5_1 D5_2 D5_3 D5_4];
    [TyrsTot];
    [SpecEd$1];
    [TLead$1];
    [TData$1];
    [TCore$1];
    [HS$1];

    %CW#2%
    [D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4];
    [D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5];
    [D5_1 D5_2 D5_3 D5_4];
    [TyrsTot];
    [SpecEd$1];
    [TLead$1];
    [TData$1];
    [TCore$1];
    [HS$1];

    %CW#3%
    [D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4];
    [D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5];
    [D5_1 D5_2 D5_3 D5_4];
    [TyrsTot];
    [SpecEd$1];
    [TLead$1];
    [TData$1];
    [TCore$1];
    [HS$1];

MODEL CB:
    %BETWEEN%
    %CB#1%
    [LdD1_1 LdD1_2 LdD1_3 LdD1_4];
    [LdD2_1 LdD2_2 LdD2_3 LdD2_4];
    [LdD3_1 LdD3_2 LdD3_3 LdD3_4];
    [LdD4_1 LdD4_2 LdD4_3 LdD4_4 LdD4_5];
    [LdD5_1 LdD5_2 LdD5_3 LdD5_4];
    [Ldyrsavg];

    %CB#2%
    [LdD1_1 LdD1_2 LdD1_3 LdD1_4];
    [LdD2_1 LdD2_2 LdD2_3 LdD2_4];
    [LdD3_1 LdD3_2 LdD3_3 LdD3_4];
    [LdD4_1 LdD4_2 LdD4_3 LdD4_4 LdD4_5];
    [LdD5_1 LdD5_2 LdD5_3 LdD5_4];
    [Ldyrsavg];
```

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```
            %CB#3%
            [LdD1_1 LdD1_2 LdD1_3 LdD1_4];
            [LdD2_1 LdD2_2 LdD2_3 LdD2_4];
            [LdD3_1 LdD3_2 LdD3_3 LdD3_4];
            [LdD4_1 LdD4_2 LdD4_3 LdD4_4 LdD4_5];
            [LdD5_1 LdD5_2 LdD5_3 LdD5_4];
            [Ldyrsavg];

OUTPUT:
            SAMPSTAT STANDARDIZED TECH1 TECH4 TECH7 TECH11 TECH12 TECH14;

PLOT:
            type = plot3;
            series =
                 D1_1 D1_2 D1_3 D1_4 D2_1 D2_2 D2_3 D2_4
                 D3_1 D3_2 D3_3 D3_4 D4_1 D4_2 D4_3 D4_4 D4_5
                 D5_1 D5_2 D5_3 D5_4(*);

SAVEDATA:   SAVE=CPROBABILITIES;
            FILE IS CPROBSAV01.DAT;
            FORMAT IS FREE;
            ESTIMATES=MIXESTIMATES01.DAT;
```

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