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Examining a congruency-typology model of leadership for learning using two-level latent class analysis with TALIS 2018

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EXAMINING A CONGRUENCY-TYPOLOGY MODEL OF LEADERSHIP FOR LEARNING USING TWO-LEVEL LATENT CLASS ANALYSIS WITH TALIS 2018

OECD Education Working Paper No. 219

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This working paper has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

This cancel and replace has been issued to replace the term "instructional learning" with the correct term "instructional leadership".

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Abstract

Are teachers and principals aligned in their perceptions of the core components of the theory of Leadership for learning across countries, or are there subgroups of schools in which there is misalignment? The purpose of this study is to examine the extent to which a congruency-typology model of leadership for learning is distributed across countries/economies using the TALIS 2018 dataset through examining the interaction of significantly different subgroups of teacher and principal responders through using multilevel latent class analysis (LCA) with a cross-level interaction. I analyse data from lower secondary schools of n=152 635 teachers in 9 079 schools and their principals across 47 countries/economies. Currently in the research literature on school leadership, leadership for learning has emerged as a framework to bring together managerial, transformational, distributed, and instructional leadership. Yet little is known about leadership for learning across national contexts. This study 1) maps the TALIS 2018 survey items to the current literature and surveys for leadership for learning, 2) then details the methods and analysis framework to examine if there are multiple significantly different types of teachers, principals, and schools from a leadership for learning theory framework. The final model 3) identifies a three-group teacher typology and a three-group principal typology, linking these types to school context, covariates, as well as teacher and principal training and experience. Results relate directly to the intersection of research, policy, and practice for training and capacity of school leaders across 47 countries/economies globally.

Résumé

Les enseignants et les directeurs sont-ils alignés dans leurs perceptions des éléments fondamentaux de la théorie du Leadership pour l'Apprentissage d'un pays à l'autre, ou y a-t-il des sous-groupes d'établissements dans lesquels il y a un décalage? Le but de cette étude est d'examiner dans quelle mesure un modèle de congruence de typologie du leadership pour l'apprentissage est réparti entre les pays/économies en utilisant l'ensemble de données TALIS 2018 et en examinant l'interaction de sous-groupes d'enseignants et des directeurs d'établissement interrogés significativement différents à travers une analyse de classes latentes (LCA) avec une interaction entre les niveaux. J'analyse les données du premier cycle des établissements secondaires de n = 152 635 enseignants dans 9 079 établissements et leurs directeurs dans 47 pays/économies. Actuellement, dans la littérature de recherche sur le leadership scolaire, le leadership pour l'apprentissage a émergé comme le cadre de référence pour regrouper le leadership managérial, transformationnel, distribué et pédagogique. Pourtant, on sait peu de choses sur le leadership pour l'apprentissage dans des contextes nationaux. Cette étude 1) met en correspondance les éléments de l'enquête TALIS 2018 avec la littérature actuelle et les enquêtes sur le leadership pour l'apprentissage, 2) détaille ensuite les méthodes et le cadre d'analyse pour examiner s'il existe plusieurs types d'enseignants, de directeurs et d'établissements significativement différents dans le cadre théorique du leadership pour l'apprentissage. Le modèle final 3) identifie une typologie des enseignants à trois groupes et une typologie des directeurs à trois groupes, reliant ces types au contexte scolaire, aux covariables, ainsi qu'à la formation et à l'expérience des enseignants et des directeurs. Les résultats se situent directement à l'intersection de la recherche, des politiques et des pratiques de formation et de développement des chefs d'établissement dans 47 pays/économies du monde.

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Executive summary

School leadership is an important area of focus for researchers, policymakers, and educators globally, as schools and schooling systems search for ways to help inform instructional improvement and student achievement, improve teacher working conditions, and help develop the teachers and leaders who can serve their local communities through providing a strong educational context through their schools. Yet much remains to be learned about how principals lead schools across different national contexts, how teachers and principals agree or not on the central components of school leadership practice, and to what extent educators perceive leadership in their schools as a single monolithic dimension, or if there are significantly different types of school leadership, especially when considering the extent to which teachers and principals are aligned (or not) in their perceptions of leadership behaviours and frequency of activities. The purpose of this study is to leverage the large Teaching and Learning International Survey (TALIS) 2018, which includes responses of teachers and school leaders from across 47 countries/economies, to examine the extent to which there are significantly different types of schools based on the alignment or misalignment of teacher and principal perceptions around practices linked to instructional leadership and leadership for learning theories: a congruency-typology model of leadership for learning.

While multiple theories of school leadership and leadership styles abound (Hallinger, 2018[1]; Krüger and Scheerens, 2012[2]; Muijs et al., 2004[3]), instructional leadership has become a central focus for school improvement across a wide variety of national contexts in which school leadership is focused on 1) communicating goals, vision, and expectations; 2) coordinating and supervising curriculum and instruction; 3) overseeing, planning, and participating in teacher professional development; 4) aligning resources to priorities, and 5) ensuring a supportive and orderly environment (Hallinger, 2011[4]; Robinson, Lloyd and Rowe, 2008[5]). However, instructional leadership research has been critiqued as being overly vague and lacking strong linkages to how to shift teacher and school leader practice in ways known to improve instruction (Bush and Glover, 2014[6]; Neumerski, 2013[7]; Rigby, 2014[8]), as well as how to include teachers in the management and leadership of the school, at times termed integrated leadership (Marks and Printy, 2003[9]; Printy, Marks and Bowers, 2009[10]; Urick and Bowers, 2014[11]).

More recently, the concept of instructional leadership has been expanded to the theory of leadership for learning to include human resource management and further adult development and professional development components, as well as student and teacher assessment and feedback (Boyce and Bowers, 2018[12]; Hallinger, 2011[4]; Hallinger and Heck, 2010[13]; Murphy et al., 2007[14]; OECD, 2016[15]), resulting in a five domain model of 1) 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 environment (Halverson and Kelley, 2017[16]; Halverson, Kelley and Shaw, 2014[17]).

Recently, the OECD surveyed *n*=152 635 teachers in 9 079 lower secondary schools and their principals across 47 countries/economies around these issues of school teacher and leadership practice as part of the Teaching and Learning International Survey, TALIS 2018 (Ainley and Carstens, 2018[18]; OECD, 2019[19]). The goal of the present study is to leverage this large global survey of teaching and leader practices to describe the extent to which there are significantly different types of teacher and principal responders across the survey in their perceptions of the practices around the five domains of leadership for learning in their schools. Importantly, this study draws on a congruency-typology framework for

school leadership for learning (Bowers et al., 2017[20]) to investigate the extent that significantly different types of teacher responders across the survey are congruent or incongruent with the perceptions of leadership for learning in their school. Schools in which teachers and principals are aligned in their perceptions (either high or low) of leadership for learning are postulated to be very different contexts for teacher and principal professional development and instructional improvement in comparison to schools in which teachers and principals are not aligned and disagree in their perceptions of leadership for learning.

This study uses multilevel modelling to appropriately nest teacher responses within schools and compare those responses to their principals, acknowledging the dependent nature of the data, and uses recent innovations in mixture modelling to estimate a two-level latent class analysis (LCA), estimating the extent to which there are multiple significantly different types of teacher responders across the survey items (a typology) as well as different types of principal responders. Importantly, the model includes a cross-level interaction, such that I examine the extent to which the different types of schools are identified through the proportions of the identified typology of teacher responders as well as the typology of principal responders to items on TALIS 2018 that relate to leadership for learning, providing an opportunity to examine the extent that teachers and principals agree or disagree in their perceptions: a congruency-typology model of leadership for learning. Using a reduced sample model of n=93,494 teachers across 5,831 schools (due to missing data across eleven countries/economies), I also examine the relationship of a host of teacher, principal, and school covariates in relation to the probability of a teacher or principal being in one of the identified typologies.

In this study, I report three different types of findings: 1) a conceptual mapping of leadership for learning to TALIS 2018 items; 2) the results of the two-level latent class analysis congruency-typology model of leadership for learning, and 3) differences in the model results across country/economy contexts. First, this study provides the first evidence of a conceptual mapping of the components of the leadership for learning framework to the TALIS 2018 items. Conducted by the Organisation for Economic Co-operation and Development (OECD) since 2008, for issues concerning school leadership, TALIS has historically been focused on theories of transformational and instructional leadership (Ainley and Carstens, 2018[18]; OECD, 2009[21]; OECD, 2014[22]; OECD, 2016[15]). However, recent school leadership surveys, especially in the US context, have begun to examine principal and teacher practices through the lens of leadership for learning, especially the recent survey the Comprehensive Assessment of Leadership for learning (CALL) (Halverson and Kelley, 2017[16]; Halverson, Kelley and Shaw, 2014[17]) using the five domain model noted above. However, to date, no schools have reported results in which teachers and principals provide data for both CALL and TALIS 2018. Thus, the first outcome of the present study then is that I provide a detailed conceptual mapping of the five CALL domains and all subdomains to specific TALIS 2018 survey items, to provide a means to examine leadership for learning using TALIS 2018 items for teachers and principals. This conceptual mapping resulted in 30 variables at the teacher level and 41 variables at the principal level. In this study I provide specifics on each of these items and the evidence for the conceptual mapping to TALIS 2018 across the five domains of leadership for learning from CALL.

Second, the results of the two-level latent class analysis congruency-typology model of leadership for learning identified that there are at least three different types of teacher responders at Level 1 (CW within), and three different types of principals/schools at Level 2 (CB between). At the teacher level, the majority CW1 (52.4%) teachers were high leadership for learning teachers, who reported high responses across the leadership for learning domains. These teachers were more often female, held a Master's degree, had the

highest job satisfaction, chose teaching as a first career choice, were more experienced, and more often were full time employees. CW2, 19.9% of the teachers, as the smallest group in the typology, reported a high focus on learning, a high climate of trust and community engagement, and a high agreement on shared discipline expectations and climate in the school, but reported low feedback on their teaching, low amounts of effective professional development, and low collaboration on lessons. CW2 teachers had the lowest workload stress, high job satisfaction, were the least experienced, and were the most likely to not be full time employees. CW3 (27.7%) teachers reported moderate levels of feedback on their teaching, with low climate of trust and community engagement, and the lowest stakeholder engagement and shared discipline climate. CW3 teachers more often held Master's degrees, had higher workload stress, and lower job satisfaction.

At the principal/school level the three CB types included CB1 (37.8%) the high leadership for learning schools. CB1 schools had a majority of CW1 high leadership for learning teachers, with principals who generally had high perceptions of leadership for learning across the domains, providing strong evidence for a level of congruency between the teachers and principals in the CB1 school type. CB1 principals reported having some teaching duties, were trained in instructional leadership, and reported higher levels on the diversity beliefs and organisational innovativeness scales. CB1 leadership for learning schools were less often private schools, had higher enrolments and lower migrant student populations. CB2 (35.4%) schools had more even proportions of the three-teacher group typology, and were typified with principals who reported more moderate perceptions across the leadership for learning domains, with the lowest levels of teacher assessment and feedback. CB2 principals held a PhD less often, had some teaching duties, were trained more often in instructional leadership, and reported less training in school administration and less autonomy in educational policies. CB2 schools had higher enrolment and higher levels of students whose primary language differed from the instructional language. CB3 (27.0%) schools, as the smallest group in the typology, were typified as being the most misaligned between teacher and principal responses, as 46.2% of the teachers in CB3 schools were the CW1 high leadership for learning teachers, yet principal responses were low across multiple domains, and specifically around mentoring and induction with CB3 principals reporting that teacher mentoring and induction was low or not part of their responsibilities in their school. Interestingly, CB3 principals provide a moderate level of feedback to teachers, higher than CB2. CB3 principals had the least amount of teaching duties, were less often trained in teacher education or instructional leadership, and reported less autonomy in staffing, budgeting and instructional policy, as well as that a lack of resources were more often a problem in their schools. CB3 principals are typified by noting multiple challenges and issues in their schools and disagreeing that mentorship is a primary responsibility of the principal.

Relying on these findings across the response patterns of the three-teacher typology and the three principal/school typology, I provide evidence from the TALIS 2018 responses that suggests expanding the number of leadership for learning domains from the five domain model to an eight-domain model of 1) student assessment and feedback, 2) teacher feedback, 3) teacher self-efficacy and a common set of beliefs about teaching and learning, 4) professional development and trust, 5) professional collaboration on lessons, 6) mentoring and induction, 7) stakeholder engagement, and 8) shared discipline climate. I provide the individual TALIS 2018 items that correspond to each of these proposed eight domains of leadership for learning.

And finally, the third main finding from this study are the proportions of the typology across the 47 included countries/economies. Interestingly, a main finding of this study is that while a large percentage of the research literature on instructional leadership and leadership for learning comes from the US context, the results of this study indicate that

the United States has only two of the three types of schools identified here through the congruency-typology model of leadership for learning. Replicating previous research (Soncin, Bowers and Agasisti, 2018[23]; Urick and Bowers, 2014[11]), the majority of schools in the United States TALIS 2018 sample are the high leadership for learning schools, CB1, followed by CB2. Yet, the United States has virtually no CB3 schools. Thus, a central finding of this study is that while such a large percentage of the school leadership research is used globally as the foundation for instructional leadership and leadership for learning theory, policy, principal training, and practice, and indeed for TALIS 2018, the US context does not include one of the three types of schools identified here, CB3, which is 27% of schools identified across 47 countries/economies. This finding replicates previous research which has shown that there is disagreement across principals in some countries on the extent that they agree with instructional leadership practices (Aas and Brandmo, 2016[24]). Indeed, some of the central components of instructional leadership and leadership for learning theories that concern mentoring do not acknowledge the contested nature of the role of principal mentorship across different nations (Kemmis et al., 2014[25]), as in countries such as Finland, mentorship is conceived more as teacher collaborative self-development than a role of school leadership. The findings of the present study mirror this past research and provide a means through the congruency-typology model of leadership for learning to identify these differences across the 47 countries/economies using TALIS 2018.

Purpose and literature review

Description of research objectives

Are teachers and principals aligned in their perceptions of the core components of the theory of leadership for learning across countries, or are there subgroups of schools in which there is misalignment? The purpose of this research project is to examine the extent to which a congruency-typology model of leadership for learning is distributed across countries using the TALIS 2018 dataset through examining the interaction of significantly different subgroups of teacher and principal responders through using multilevel latent class analysis (LCA). Currently in the research literature on school leadership, leadership for learning has emerged as a framework to bring together managerial, transformational, and instructional leadership. Yet, little is known about leadership for learning across national contexts. This study aims to 1) map the TALIS 2018 survey items to the current literature and surveys for leadership for learning, 2) examine if there are multiple different types of teachers, principals, and schools from a leadership for learning theory framework, 3) link these types to school context, equity, and teacher and principal training and experience. Results relate directly to the intersection of research, policy, and practice for training and capacity of school leaders in multiple contexts.

Introduction

Across the education research and practice literature, school leadership is continually noted as one of the most influential school factors on student success, second only to quality teachers and instruction (Hallinger, 2018[26]; Leithwood, Harris and Hopkins, 2008[27]; Waters, Robert Marzano and McNulty, 2003[28]). Yet, the question of how effective school leadership operates in practice, its components and contexts, and how to train aspiring and current school leaders in best practices, remains a highly active area of research and development globally (Kovačević and Hallinger, 2019[29]; Muijs et al., 2004[3]; OECD, 2019[19]; Scheerens, 2012[30]; Wang, Bowers and Fikis, 2017[31]). Indeed, multiple theories of school leadership action have been examined throughout the research, with some of the most popular focusing on principals leading the core practices of instruction and developing teacher instructional improvement practices in their schools (i.e. transformational and instructional leadership theories), with many countries promoting leadership training and professional development in these areas. However, there is not consensus on this issue.

As noted in a recent OECD (2019[19]) report on the TALIS 2018 dataset across 48 countries/economies, at the country level there are "different roles principals have in different countries, whether they are pedagogical and administrative leaders or administrative leaders only" (p.136). This question of the instructional leadership role versus a strictly management role for effective school leader practice is also a recurring question within the school leadership research literature (Grissom and Loeb, 2011[32]; Sebastian et al., 2019[33]) in which an ongoing debate continues as to the role in school leadership practice of organisational management versus instructional-focused leadership across specific contexts. In short, should a school leader focus on instruction, or focus on the management of the organisation, or a combination of both?

In addition to these questions about the leader's role, the teacher's role in school leadership and the overall instructional and professional development climate of a school is an active area of research and development. Because schooling organisations are seen as fairly flat hierarchically, leadership can be thought of as being stretched thinly across a school, and

thus including the formal leader as well as the teachers (Diamond and Spillane, 2016[34]; Muijs and Harris, 2007[35]; Spillane, 2006[36]; Spillane, Halverson and Diamond, 2004[37]). Thus, there are perennial questions from a policy perspective of how best to train school leaders, which roles and actions are the most effective in which contexts, and how the work of the school leader interacts with the teachers' perceptions of leadership across a school. Describing and understanding the different ways in which principals and teachers perceive these practices across schools and global contexts as informed by current school leadership theory can help to pinpoint areas of potential research, development, and practice.

Leadership for learning

Across the research and practice literature on school leadership, multiple theories have emerged over the past 50 years to help describe and understand the multiple and often conflicting demands on the work of school leaders, with four of the most popular being transformational leadership, instructional leadership, integrated leadership, and leadership for learning. Leadership for learning is a recently emerging domain of school leadership theory that bridges between these other theories of transformational, instructional, and integrated instructional theories of leadership (Boyce and Bowers, 2018[12]; Hallinger, 2011[4]; Halverson and Kelley, 2017[16]; Murphy et al., 2007[14]). Transformational leadership (Rost, 1993[38]) is a theory of a style of leadership applied to schools in which school leaders focus the structures and mission of the organisation to encourage teachers to build a community of practitioners in the school committed to engaging teachers in the work of instructional improvement (Berkovich, 2016[39]; Leithwood and Jantzi, 1990[40]; Leithwood and Jantzi, 2006[41]; Printy, Marks and Bowers, 2009[10]; Thoonen et al., 2011[42]). This in turn creates a culture and climate in the school of teacher collaboration, dialogue, and improvement (Thoonen et al., 2011[42]). In contrast, instructional leadership focuses on three aspects of the principalship of leading the vision and mission of the school, managing curriculum and instruction, and creating a culture of instructional improvement through providing resources and structuring the professional development of the school (Hallinger, 2003[43]; Hallinger, 2005[44]; Hallinger and Murphy, 1985[45]; Neumerski, 2013[7]; Rigby, 2014[8]). As noted by Urick and Bowers (2014[11]) in reviewing the literature on the differences between transformational and instructional leadership:

> *Transformational principals do not practice the guidance of curriculum and instruction or the monitoring of student learning… transformational leaders spend more time directly building community through support of the needs of teachers and the community and through transfer of school goals to personal goals. Instructional leaders build a positive climate through professional development and coordination and attainment of instructional goals. However, unlike transformational leaders, instructional leaders do not work to build a climate. Instead, in instructional leadership, a positive climate is an indirect result of a common and successful focus on instruction* (p.101).

In a meta-analytic review of the effects of transformational versus instructional leadership in schools across 27 studies, Robinson et al. (2008[5]) found that instructional leadership practices significantly outperformed transformational leadership practices when examining student and school test score outcomes (Robinson, Lloyd and Rowe, 2008[5]), with all but two studies in the analysis focusing on the US context. Recent, as well as past instructional leadership research has shown this mediating effect of the principal's focus on instruction on the academic and professional climate of the school through providing a strong set of professional learning opportunities for teachers along with a clear vision and mission (Bellibas and Liu, 2017[46]; Bellibas and Liu, 2018[47]; Boyce and Bowers, 2018[48]; Heck and Hallinger, 2009[49]; Heck and Hallinger, 2014[50]; Heck, Larsen and Marcoulides,

1990[51]; Pietsch and Tulowitzki, 2017[52]; Price, 2012[53]; Sebastian and Allensworth, 2012[54]; Sebastian, Huang and Allensworth, 2017[55]) (Urick et al., 2018[56]; Urick and Bowers, 2019[57]).

In contrast to the research comparing transformational and instructional leadership, the theory of integrated instructional leadership postulates that leadership is multi-dimensional rather than dichotomous, and so effective school leadership practice is a consideration of the extent to which transformational and instructional leadership is practiced simultaneously (Marks and Printy, 2003[9]; Printy, 2014[58]; Printy, Marks and Bowers, 2009[10]; Urick and Bowers, 2014[11]). Indeed, in their study of 24 restructured schools, Marks and Printy (2003[9]) found that schools in their study with high instructional leadership also had high transformational leadership, and that while they found schools with high transformational leadership and low instructional leadership, they found no schools with high instructional leadership and low transformational leadership. Thus, as a core component of the integrated instructional leadership framework, Marks and Printy (2003[9]) concluded that transformational leadership was necessary but insufficient for instructional leadership (Printy, Marks and Bowers, 2009[10]). Accordingly, for the integrated leadership framework, successful schools simultaneously practice transformational leadership and instructional leadership. This finding was then more recently replicated with the large nationally generalizable US Schools and Staffing Survey (SASS) (Urick and Bowers, 2014[11]).

However, despite these positive findings across the literature in general, there is not universal agreement around the concepts and practices of transformational, instructional, or integrated leadership theories. For example, in surveying 149 Norwegian school leaders across 24 items related to transformational and instructional leadership, Aas and Brandmo (2016[24]) were unable to replicate the transformational, instructional, and integrated leadership factor structure from US-focused studies, arguing that school leadership may differ in Nordic countries in comparison to the United States. In a second example, in referring to a specific issue within these school leadership theories, namely mentorship and induction, Kemmis et al. (2014[25]) demonstrate how the concept of mentorship from the school leaders' perspective is a contested domain across national contexts. The authors demonstrate how in three different national contexts, New South Wales in Australia, Sweden, and Finland, the concept of the role of the leader in teacher mentorship is fundamentally different, with mentorship in Australia as helping teachers move through early teaching probation, traditional mentorship as support in Sweden, and mentorship that is exclusively the domain of teachers across different schools in Finland as collaborative peer-group development (Kemmis et al., 2014[25]).

At a conceptual level, both transformational leadership (Berkovich, 2016[39]) and instructional leadership (Neumerski, 2013[7]; Rigby, 2014[8]) have been critiqued as rather than being theories, that they are vague lists of behaviours that proponents encourage schools to practice, with little evidence that specific components of the lists are related to instructional improvement. Indeed, in one of the few randomised controlled experiments in education leadership, Jacob et al. (2015[59]) tested the causal effect of providing the Balanced Leadership professional development intervention in the United States , which is based on the Waters, Marzano, and McNulty (2003[28]) framework. This framework of over 20 factors closely mirrors the lists of effective practices education leaders are encouraged to engage in throughout their practice (Waters, Robert Marzano and McNulty, 2003[28]). In the randomised controlled experiment of over 100 schools in the mid-west of the United States, the authors found that principal perception of the efficacy of their leadership increased due to the intervention, but that there was no effect on teacher perceptions or student achievement, although they did find that principal and teacher turnover was lower in the treatment schools (Jacob et al., 2015[59]).

A recent body of evidence has begun to suggest the important role of organisational management in the principal's work, in comparison to transformational and instructional leadership. In an exploratory factor analysis study of principal surveys of leadership practices, Grissom and Loeb (2011[32]) surveyed about 250 US school principals from the state of Florida on 42 different items that included items related to instructional leadership, organisational management, internal and external relations, and general school administration (Grissom and Loeb, 2011[32]), finding that only organisational management was connected to student achievement. When looking at principal time use in the same United States Florida context, time spent on organisational management was related to student achievement in comparison to instructional leadership activities (Horng, Klasik and Loeb, 2010[60]). In discussing these findings, Grissom and Loeb (2011[32]) argue for a model of school leadership more akin to Marks and Printy (2003[9]) in which they note that "we suggest that a more holistic view of school leadership as necessitating skills across multiple dimensions, in instruction but also in management of the school as an organization" (p.1119), arguing that organisational management works in concert with instructional leadership. Indeed, a recent study of about 260 principals from the city of Chicago in the United States examined the extent to which principals practiced organisational management practices versus instructional leadership, using a similar survey to Grissom and Loeb (2011[32]) and latent class analysis (Sebastian et al., 2019[33]). The authors' results indicated evidence for a strong link between these two constructs, as while they found a type of principal leadership with high perception of both organisational management and instructional leadership, as well as a type with low in both, they did not identify principals who were high in one and low in the other (Sebastian et al., 2019[33]). As stated by the authors:

> *From the perspective of a practicing principal, the results of this study suggest that if improvements in principal practice can be made to influence student achievement, they need to be devoted to both instructional leadership and organisational management.* (p.15) *(Sebastian et al., 2019[33])*

Consequently, authors across the education administration research literature also point to the managerial and human relations management domains as important for effective school leadership practice, in addition to the work of transformational and instructional leadership (Boyce and Bowers, 2018[12]; Grissom and Loeb, 2011[32]; Sebastian et al., 2019[33]). Recent findings from a meta-narrative analytic review of 109 quantitative studies that used US nationally generalizable SASS data provides evidence for the continued evolution of integrated instructional leadership towards the concept of leadership for learning (Boyce and Bowers, 2018[12]). In their study, Boyce and Bowers (2018[12]) found that effective school leadership included the influence of the principal on individual teacher classroom, school, and social motivations, but also included influence on leading teacher adult development, shaping the school climate through professional development, as well as leading the mission and vision of the school. The authors also note the equally important influence of strong principal human resource management including maintaining high teacher job satisfaction, teacher commitment, and teacher retention and hiring practices (Boyce and Bowers, 2018[12]). In addition to these findings, a recurrent theme across the instructional leadership literature is the influence of principals addressing the context of the school (Edmonds, 1979[61]; Hallinger, 2011[4]; Hallinger, 2018[26]; Hallinger and Murphy, 1985[45]; Hallinger and Murphy, 1986[62]). For example, schools may "layer" their leadership practice by focusing on different aspects of these leadership areas across transformational and instructional leadership depending on the school context (Day, Gu and Sammons, 2016[63]; Urick and Bowers, 2014[11]) or by focusing on resource allocation to address specific needs (Urick, 2016[64]). Indeed, recent empirical analyses of large numbers of articles and journals across the education leadership research literature have

shown not only the strong rise in these leadership topics over the past 30 years, but also the connected aspects of the multiple dimensions of school leadership, as multiple authors attempt to integrate and connect across each of these theoretical domains (Hallinger & Kovačević, 2019 in press; Kovačević & Hallinger, 2019 in press; Oplatka, 2009; Wang, 2018; Wang & Bowers, 2016; Wang et al., 2017).

Thus, as noted by Boyce and Bowers (2018[12]), the literature on instructional leadership continues to highlight these additional aspects of school leadership as it evolves towards what has been termed "leadership for learning" (Hallinger, 2011[4]; Hallinger and Heck, 2010[13]; Halverson and Kelley, 2017[16]; Murphy et al., 2007[14]). As noted by Hallinger (Hallinger, 2011[4]): "While the term 'instructional leadership' originally focused on the role of the principal, 'leadership for learning' suggests a broader conceptualization that incorporates both a wider range of leadership sources as well as additional foci for action" (p.126). In these additional areas, the principal works collaboratively across the school to include teachers, parents, and the community. In the leadership for learning research domain Hallinger (2011[4]) nominated five leadership areas based on Robinson et al.'s (2008[5]) findings of establishing goals and expectations, strategic resourcing, planning coordinating and evaluating teaching and the curriculum, promoting and taking part in teacher learning, and ensuring an orderly and supportive environment. Murphy et al. (2007[14]) proposed eight areas of leadership focus in leadership for learning, including vision for learning, instructional programme, curricular programme, assessment programme, communities of learning, resource acquisitions and use, organisational culture, and social advocacy. Taking an empirical perspective, Boyce and Bowers (2018[48]) used multilevel factor analysis and the 2011-2012 US nationally generalizable Schools and Staffing Survey (including 34 850 teachers across 7 070 schools) to investigate the extent that teacher factors relate to leadership for learning, and identified nine domains including six domains at the individual level including classroom control, teacher commitment, school influence, collegial climate, student attendance, neighbourhood context, and three domains at the group or organisational level of instructional leadership, management, and social environment (Boyce and Bowers, 2018[48]). Interestingly, recent work examining principal perceptions of their work from *n*=260 principals in Chicago public schools in the United States found that instructional leadership and school organisational management were important and highly related aspects of effective leadership, including school discipline and safety, budgeting, hiring, and managing staff (Sebastian et al., 2019[33]). This finding provides additional empirical evidence for the above inclusion of human resources, school resource allocation, and school safety and discipline domains within broader conceptions of leadership, such as leadership for learning.

Recently, in working to measure leadership for learning directly, a team at the University of Wisconsin-Madison in the United States has developed, tested and validated the Comprehensive Assessment of Leadership for learning (CALL) survey (Blitz, Salisbury and Kelley, 2014[65]; Halverson and Kelley, 2017[16]; Halverson, Kelley and Shaw, 2014[17]; Kelley et al., 2012[66]). Synthesising the research across these previous studies, CALL includes over 200 questions clustered into five main domains of leadership for learning each with three to four subdomains including: 1) 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 (Halverson and Kelley, 2017[16]). Thus, in the current literature, leadership for learning includes such areas as promoting the vision and academic climate of the school, motivating and engaging teachers in collaborative practice, and managing the curriculum. However, leadership for learning also includes intentional focus on communities, resources, and safety and discipline. As leadership in schools is an interaction between teachers and principals (Bellibas and Liu, 2017[46]; Boyce and Bowers, 2018[48]; Hallinger and Heck, 2011[67];

Leithwood and Jantzi, 2008[68]; Urick and Bowers, 2014[69]; Urick and Bowers, 2019[57]), CALL importantly surveys teachers and school leaders across each of these domains (Blitz and Modeste, 2015[70]; Halverson and Kelley, 2017[16]). Additionally, while past surveys of school personnel rely on perceptions of school leadership, CALL is focused on the evidence of practices that happen daily in schools (Halverson and Kelley, 2017[16]).

As is evident from the above literature on leadership for learning, to date there have been multiple proposed domains of leadership for learning across this literature (Boyce and Bowers, 2018[48]; Hallinger, 2011[4]; Halverson and Kelley, 2017[16]; Murphy et al., 2007[14]). Table 1 provides a comparison across these studies, with the Murphy et al. (2007[14]) and Hallinger (2011[4]) studies as reviews and summaries of the research literature, while Boyce and Bowers (2018[48]) used factor analysis to empirically identify the domains, and Halverson and Kelley (2017[16]) used the CALL survey as an intentional validation each of the domains. Here in Table 1, I use the order of the columns from left to right to imply increasing levels of evidence across this literature for the specific domains and subdomains of leadership for learning. As Table 1 demonstrates, the central tenets of leadership for learning align well across the studies, with the addition of items measuring a safe and effective learning environment being added after the Murphy et al. (2007[14]) study. As noted across the validation literature on the development of the CALL survey (Blitz, Salisbury and Kelley, 2014[65]; Halverson and Kelley, 2017[16]; Halverson, Kelley and Shaw, 2014[17]; Kelley and Halverson, 2012[71]; Kelley et al., 2012[66]), the domains and subdomains across CALL are purposefully constructed to measure the central concepts from this literature as detailed in Table 1.

Table 1. Proposed domains of leadership for learning

Murphy et al (2007)	Hallinger (2011)	Boyce & Bowers (2018b)	CALL
Vision for learning	Establishing goals and expectations	Instructional leadership	Focus on learning
- Instructional program - Curricular program - Assessment program	Planning coordinating and evaluating teaching and the curriculum	- Instructional leadership - School influence - Management	Monitoring teaching and learning
- Communities of learning - Organisational culture	Promoting and taking part in teacher learning	-Teacher commitment - Collegial climate - Management	Building nested learning communities
- Resource acquisitions and use - Social advocacy	Strategic resourcing	- School influence -Neighbourhood context - Social environment	Acquiring and allocating resources
	Ensuring an orderly and supportive environment	- Classroom control - Student attendance - Social environment	Maintaining a safe and effective learning environment

Currently across the school leadership research, there are a limited number of surveys that measure the central components of school leadership theory, be they transformational, instructional, integrated leadership, or leadership for learning. Two recent surveys are CALL, focused on leadership for learning as discussed above (Halverson and Kelley, 2017[16]), and VAL-ED which focuses on instructional leadership practices (Goldring et al., 2015[72]). However, neither survey has been validated at a nationally generalizable level. Two important surveys in this regard are the Schools and Staffing Survey (SASS) from the United States as noted above (Boyce and Bowers, 2018[12]), and the Teaching and Learning International Survey (TALIS) administered by the OECD. TALIS, first administered in

24 countries in 2008, then 34 countries in 2013, and most recently 2018 with almost 50 countries/economies participating, is focused on capturing the perceptions of teachers and school leaders on the contexts and working conditions in schools, including aspects of school leadership, be it managerial, transformational, or instructional leadership (Ainley and Carstens, 2018[18]; OECD, 2009[21]; OECD, 2014[22]; OECD, 2019[19]). While multiple levels of schooling are included in TALIS, the central focus is on lower secondary schools (ISCED 2) and measuring and comparing teacher and leader perceptions across multiple education policy and national contexts (Ainley and Carstens, 2018[18]). Using the previous 2008 and 2013 TALIS administrations, there has been a strong set of literature on teacher perceptions of instruction and working conditions (Chudgar and Luschei, 2016[73]), yet there has been much less attention in the research literature on examining school leadership and the interaction between leaders and teachers using TALIS data (Urick, 2018[74]; Urick and Bowers, 2019[57]).

The TALIS survey, especially TALIS 2018 has eight main components (Ainley and Carstens, 2018[18]) that link conceptually with the above research on leadership components across transformational, instructional, integrated instructional leadership, and leadership for learning. These include 1) teachers' instructional practices, 2) school leadership, 3) teachers' professional practices, 4) teacher education and initial preparation, 5) teacher feedback and development, 6) school climate, 7) teacher self-efficacy, and 8) human resources. TALIS 2018 also includes two new additional domains of innovation and diversity/equity, as well as multiple personal and school background, context, and job satisfaction items (Ainley and Carstens, 2018[18]).

While the aim and scope of TALIS 2018 is multifaceted, with multiple aims that include teacher and principal working conditions, job satisfaction, job commitment, training and development, as well as instructional approaches, in addition to leadership (Ainley and Carstens, 2018[18]), there are multiple areas across TALIS 2018 that overlap conceptually with the core domains of leadership for learning. Table 2 provides a conceptual mapping in which I have mapped teacher (T) and principal (P) items on the TALIS domains (columns) to the twenty subdomains of CALL (rows). As CALL is the most recent validated and comprehensive measurement of leadership for learning to date (Halverson and Kelley, 2017[16]), the CALL subdomains provide an excellent scaffold for mapping TALIS 2018 items to the leadership for learning conceptual domains. Individual items for each cell at the teacher and principal levels are provided in Annex A. However, I note that this mapping is only at a conceptual level, and is not intended to infer that the two surveys can be equated as not only is CALL much more extensive and specifically focused on leadership for learning, but CALL items are focused on the frequency of specific practices as a form of formative assessment (Camburn and Salisbury, 2012[75]; Halverson and Kelley, 2017[16]; Kelley and Halverson, 2012[71]; Kelley et al., 2012[66]). TALIS 2018 conversely has a much broader aim and scope and mostly includes questions about teacher and principal perceptions, with some items referring to frequency of practice, and is focused on summative assessments and comparisons across OECD national and policy contexts (Ainley and Carstens, 2018[18]). To date, there has been no research published in which survey participants took both CALL and TALIS. Without such empirical comparisons, this mapping of one survey to the other can only be at a conceptual level.

Table 2. TALIS 2018 and CALL subdomains

	Teachers' instructional practices	School leadership	Teachers' professional practices	Teacher education and initial preparation	Teacher feedback and development	School climate	Teacher self-efficacy	Human resources
Focus on learning								
1.1 Maintaining a school-wide focus on learning		P			T	T P	T	
1.2 Formal leaders are recognised as instructional leaders		P	T			T		
1.3 Collaborative design of integrated learning plan		P	T			T P		
1.4 Providing appropriate services for students who struggle						T		
Monitoring teaching and learning								
2.1 Formative evaluation of student learning	T	P			P			
2.2 Summative evaluation of student learning		P			T P			
2.3 Formative evaluation of teaching		P	T	P	T			
2.4 Summative evaluation of teaching					T P			
Building nested learning communities								
3.1 Collaborative school-wide focus on problems of teaching and learning		P	T			T P		
3.2 Professional learning		P			T			
3.3 Socially distributed leadership		T P				T P		
3.4 Coaching and mentoring					T P			
Acquiring and allocating resources								
4.1 Personnel practices					T P			
4.2 Structuring and maintaining time		P						T
4.3 School resources are focused on student learning						T		
4.4 Integrating external expertise into school instruction program					T			
4.5 Coordinating and supervising relations with families and the external communities		T P						

	Teachers' instructional practices	School leadership	Teachers' professional practices	Teacher education and initial preparation	Teacher feedback and development	School climate	Teacher self-efficacy	Human resources
Maintaining a safe and effective learning environment								
5.1 Clear, consistent and enforced expectations for student behaviour						T P		
5.2 Safe learning environment		P				T P		
5.3 Student support services provide safe haven for students who traditionally struggle		T						

As shown in Table 2, TALIS 2018 includes items that correspond to each subdomain of CALL. Annex A provides the specific TALIS 2018 item conceptual mappings for each CALL subdomain. In this mapping I have worked to conceptually align each TALIS item to the most relevant and corresponding subdomain of CALL. In each position in the cells in Table 2, the T or P may indicate multiple different TALIS 2018 items. As demonstrated in Table 2, overall the three TALIS 2018 domains with the most overlap with CALL leadership for learning subdomains are school leadership, teacher feedback and development, and school climate. Teacher professional practices are also well represented. Conversely, the four TALIS 2018 domains of teachers' instructional practices, teacher education and initial preparation, teacher self-efficacy, and human resources are represented at a much smaller extent across the CALL subdomains. Additionally, the teacher (T) or principal (P) designations in Table 2 are important considerations, as for CALL the survey asks similar questions about practices across leadership for learning to both teachers and principals, and thus can be considered a multisource feedback instrument (Bowers et al., 2017[20]). In comparison, TALIS 2018 contains only specific items that are the same or similar at the teacher and principal levels. In instances where there is conceptual alignment between the teacher and principal levels, Annex A denotes this domain with the "alignment" designation in the far left column.

The issue of alignment of questions between teachers and principals on TALIS was recently examined using TALIS 2008 and multilevel factor analysis (Urick and Bowers, 2019[57]). Urick and Bowers (2019[57]) analysed data from *n*=59 152 teachers across *n*=3 788 schools in 24 countries. They examined items related to instructional leadership, with a focus on the extent to which teachers and principals across national contexts perceive of instructional leadership in their schools. At the principal level the authors replicated the OECD factor structure in which principals saw instructional leadership as three factors of communicating school goals, promoting professional development, and supervision of instruction. However, at the teacher level, teachers perceived of school leadership as a single dimension. In summarising their study, Urick and Bowers (2019[57]) noted that:

> *First, teachers view instructional leadership as one main task. There is little variation in how teachers respond across these items... Teachers perceive all of these items as one main principal behaviour, whereas principals saw instructional leadership as three main tasks: goals, professional development, and supervision of instruction. Second, because of this difference in perceptions, when both principals and teachers are included in a multilevel model of instructional leadership, there are two main factors at the school level, principal perception versus teacher perception. Even though teachers were asked some of the exact same*

> *survey questions about instructional leadership as the principals, these items did not load together at the school level, which suggests that principals and teachers view them differently*. (pp. 18-19)

This finding that teacher perception is isomorphic from the individual level to the organisational level was a novel finding in this study (Urick and Bowers, 2019[57]). Previous research had questioned the almost exclusive use of teacher perceptions of leadership across the literature and had urged for research designs to take into account not only the multilevel structure of the data, but also the perceptions of both teachers and principals (Leithwood and Jantzi, 2008[68]; Urick, 2016[64]; Urick, 2016[76]; Urick and Bowers, 2011[77]; Urick and Bowers, 2014[69]). Thus, both teacher and principal perceptions of school leadership are important to consider when examining school leadership domains.

A congruency-typology framework model of school leadership

Thus, over the last 30 years, education administration and leadership research has progressively built a research literature base across these multiple different styles of school leadership, leading from transactional and transformational leadership, to instructional leadership, and most recently leadership for learning (Boyce and Bowers, 2018[12]; Printy, Marks and Bowers, 2009[10]; Urick and Bowers, 2014[11]). However, recent research has begun to question the prevalence of these leadership styles as separate constructs, and instead has postulated a typology theory of school leadership, in which there are significantly different types of school leaders who practice different levels of interdependent leadership styles (Urick and Bowers, 2014[11]). For instance, as noted above, Marks and Printy (2003[9]) first provided evidence for the integrated leadership model, in which transformational leadership may be necessary but insufficient for shared instructional leadership (Marks and Printy, 2003[9]; Printy, Marks and Bowers, 2009[10]). This finding was then replicated by Urick and Bowers (2014[11]) using the large nationally generalizable US SASS sample (n=7,650 schools). In their study, Urick and Bowers (2014[11]) postulated a typology theory of school leadership, in which they used latent class analysis to identify the extent to which there were statistically significantly different types of school leaders across the SASS data, finding evidence of a three-group typology, Balkanising (22%), Controlling (24%), and integrated (54%) each of which included some level of transformational and shared instructional leadership. Importantly, these types were distributed first along transformational leadership and then shared instructional leadership, replicating Marks and Printy (2003[9]), with the majority integrated leadership type having the highest perceptions of both transformational and shared instructional leadership. Additionally, as covariates can be modelled in LCA on the probability of a principal being classified into one of the three groups, the authors showed that in comparison to the Integrating leadership type, rural and small enrolment schools were more likely to have a Balkanising principal, while both Balkanising and Controlling types were less likely to be female principals, and have the school meet state or district accountability performance goals. Urick (2016[64]) then followed up this work with a two-level latent class analysis of the SASS data (n=35,560 teachers across 7,310 schools) finding that teacher turnover was lowest for the integrated leadership type in comparison to the rest of the typology.

Thus, this literature provides a strong initial evidence base for a typology theory of school leadership. Indeed, over the past decade there have been multiple school leadership typology studies. One of these studies used cluster analysis to cluster principals based on their time use (Goldring et al., 2008[78]) finding Eclectic leaders who spent time across many activities in the school fairly evenly, instructional leaders who spent a large amount of time in classrooms, and student-focused leaders who focused on student affairs. Also using cluster analysis, with a focus on Nordic countries, Ólafsson (2016[79]) examined the

principal leadership questions from TALIS 2013 (questions 21a-i, 22 a-e, 26h,i, 29a-h, and 38a-f) focusing on "leadership practices, attitudes to power sharing, views on certain potentially limiting factors to the principal's effectiveness, actions following teacher appraisal and attitudes to mentoring" (p 69) (Ólafsson, 2016[79]). Ólafsson found four principal clusters of 1) high instructional and collaborative focus, 2) low instructional focus with a high discipline and reporting focus, 3) moderate instructional and collaborative focus, and 4) focus on teachers' responsibility and consequences for student outcomes. However, as it is a descriptive technique, a central critique of cluster analysis is that there is no agreed upon means to estimate statistically significantly different clusters (Bowers, 2010[80]; Romesburg, 1984[81]; Vermunt and Magidson, 2002[82]). To address this issue, recent research using inferential statistics has begun to use the emerging domain of mixture models in leadership typology studies.

In research that has thus focused on what has been termed "person-centred analysis" (Collins and Lanza, 2010[83]), research has demonstrated that mixture models, and specifically latent class analysis (LCA) models provide a strong means to estimate the extent that there may be one or more than one significantly different subgroup of responders across a survey dataset (Jung and Wickrama, 2008[84]; Masyn, 2013[85]; Muthén, 2004[86]; Samuelsen and Raczynski, 2013[87]). In education leadership research, the Urick and Bowers (2014[11]) study noted above used LCA with nationally generalizable US data to identify three significantly different types of principals. Using LCA and survey responses of principals across Italy (n=1073), recent research (Agasisti, Bowers and Soncin, 2019[88]) identified three different types of principal responders, 1) educative leaders (49%) who focus on developing teachers' instructional skills, 2) leaders who teach (35%) who report leading their schools but also serve in instructional roles in classrooms with students, and 3) transactional leaders (16%) who focus on the management of the school. The authors go on to show that leaders who teach serve in lower performing Italian schools in the southern region of Italy, which is correlated with higher levels of poverty.

Focusing on TALIS 2013 data, in a report titled "School Leadership for learning" (OECD, 2016[15]), the authors used LCA with data from principals of lower secondary schools across 36 countries/economies. The authors analysed TALIS 2013 principal survey responses in four domains 1) the amount of decision making distributed to teachers, parents and students (distributed leadership PDISLEADS scale), 2) facilitating co-operation among teachers, ensuring teachers take responsibility for improving their teaching skills, and ensuring teachers take responsibility for student learning outcomes (instructional leadership PINSLEADS scale), 3) time spent on curriculum and teaching-related tasks and meetings (TC2G19B), and 4) engagement with developing educational goals, programs and a professional plan for the school (TC2G20A, TC2G20B). The authors identified a four-group typology across instructional and distributed leadership with a general pattern of high-high (50%), high-low (17%), low-high (23%), and low-low (10%). The four-group typology included integrated leadership (50%) with a strong focus on instructional and distributed leadership, inclusive leadership (17%) with a strong focus on distributed leadership but a weak focus on instructional leadership, educational leadership (23%) with a strong focus on instructional leadership but a weak focus on distributed leadership, and administrative leadership (10%) with a low focus on both instructional and distributed leadership (OECD, 2016[15]). Additionally, at the national/country level, the authors of the report found three groups of countries, the largest group were countries with mainly integrated leaders, next were countries with mainly inclusive leaders, and the smallest group included countries with mainly educational leaders. Interestingly, the smallest country group of educational leaders includes Italy, which corresponds with the recent Italian leadership LCA noted above which also found a high level of principals who either teach directly or do not focus on instructional or distributed leadership to a high degree

(Agasisti, Bowers and Soncin, 2019[88]). Additionally, in replication of the studies that demonstrate the multi-dimensional aspect of instructional and distributed leadership (Day, Gu and Sammons, 2016[63]; Marks and Printy, 2003[9]; Printy, Marks and Bowers, 2009[10]; Urick and Bowers, 2014[11]) the authors of the OECD TALIS 2013 LCA (OECD, 2016[15]) demonstrate similar findings when they graph countries in the two dimensions of distributed and instructional leadership, showing strong evidence that distributed leadership may be necessary but insufficient for instructional leadership. Indeed, a recent study of TALIS 2013 principal-level only survey data using LCA replicated and extended much of this work, demonstrating these differences across countries in transformational, distributed, and instructional leadership (Soncin, Bowers and Agasisti, 2018[23]). However, across the majority of this work, the focus has been on principal perception of their own leadership. To address this issue, recent research has called on researchers to model the complexity of leadership in schools through using nested complex datasets in which teacher perceptions of leadership are combined and modelled with the principal perceptions using hierarchical modelling, nesting teachers within schools, along with including school covariates and outcomes (Bowers and White, 2014[89]; Hallinger and Heck, 1996[90]; Hallinger and Heck, 2011[67]).

Thus, a core issue within the leadership typology research concerns the interaction of teacher perceptions of school leadership with principal perceptions of leadership. As much of the past research has either focused exclusively on teachers or principals (Leithwood and Jantzi, 2008[68]; Urick, 2016[76]; Urick and Bowers, 2011[77]; Urick and Bowers, 2014[69]; Urick and Bowers, 2019[57]), there is a need to examine how teacher and principal perceptions agree or disagree. Using the CALL survey validation dataset, researchers set out to address these issues of the above school leadership typology research through using a multilevel latent class analysis (LCA) framework (Bowers et al., 2017[20]). As noted above, the CALL survey focuses on the core concepts of leadership for learning across five main domains. The CALL validation dataset included *n*=3 367 teachers and 117 schools and their principals in the United States. In their study, Bowers et al. (2017[20]) proposed a "congruency-typology" model of school leadership, in which they proposed that there may be a multiple group typology of teachers as well as school leaders (typology theory), and that these two groups may agree or disagree in how they are aligned or misaligned across the core aspects of leadership for learning (congruency theory). Thus, Bowers et al. (2017[20]) postulated that there may be four types of leadership for learning schools as measured through CALL, a low-low type in which teachers and principals agree that leadership for learning practices do not occur often (congruency), a high-low type in which teachers have high perceptions of leadership for learning but principals have low perceptions (misalignment), a low-high type in which teachers are low but principals high in their perceptions (misalignment), and a high-high type in which teachers and principal agree that the practices happen often (congruency). Interestingly, (Bowers et al., 2017[20]) found a three-group typology of teachers, and a three-group typology of principals and their schools, with evidence for the overall congruency-typology of only low-low, low-high, and high-high. Missing was evidence of a school type in which teachers perceived high levels of leadership for learning while principals perceived low levels. Additionally, while the low-low schools employed more experienced teachers, they also had the least experienced principals on average. Conversely, the high-high leadership for learning schools had the least experienced teachers and most experienced leaders (Bowers et al., 2017[20]).

Framework and research questions

Thus, a congruency-typology model of leadership for learning using multilevel LCA appears to be a productive means to address many of the critiques of the previous school

leadership research noted above. However, the only congruency-typology model of leadership for learning to date used the validation sample of CALL (Bowers et al., 2017[20]). While the validation sample for CALL provides a strong validity framework for the leadership for learning constructs (Blitz, Salisbury and Kelley, 2014[65]; Halverson and Kelley, 2017[16]; Kelley and Halverson, 2012[71]) it is not generalizable beyond the CALL sample. Given the strong conceptual alignment between TALIS 2018 and CALL discussed above in Tables 1 and 2 and Annex A, the TALIS 2018 dataset provides a unique opportunity to test the congruency-typology model of leadership across a large trans-nationally generalizable sample of schools. Additionally, TALIS includes a range of relevant covariates to include at the teacher and leader levels. Thus, using the leadership for learning CALL conceptual mapping to TALIS 2018, the research questions for this study include:

1. To what extent are there significantly different subgroups of teacher and leader responses to TALIS 2018 (a typology of teachers and a typology of leaders)?
2. To what extent is the teacher typology and leader typology distributed across schools and countries/economies?
3. To what extent is there alignment or misalignment between the teacher typology and the leader typology when nesting teachers within schools?

Methods

Sample, data, and variables

This study is a secondary analysis of the TALIS 2018 dataset. As noted above, TALIS 2018 is a globally generalizable survey of the perceptions of teacher and school leader working conditions, instructional and management priorities, and leadership across the participating countries/economies. Building on the progress from TALIS 2008, and TALIS 2013, TALIS 2018 includes a range of survey items for teachers and school leaders, with a focus on lower secondary schools (ISCED 2) (Ainley and Carstens, 2018[18]; OECD, 2009[21]; OECD, 2014[22]; OECD, 2019[19]). The TALIS 2018 sampling framework surveyed about 20 teachers and the school leader in about 200 schools in each of the participating countries/economies (Ainley and Carstens, 2018[18]). Focusing on the lower secondary school sample (ISCED 2) for the present study, this equates to a teacher sample size of about *n*= 152 635 teachers across 9 079 schools in 47 countries/economies (a slightly reduced sample as the full TALIS 2018 dataset includes data from 48 countries/economies). This sample size represents the sample used for the majority of the analyses in this study. However, due to missing data for the covariates in the covariate analysis portion of the study, the final sample size for the covariate model described below is *n*=93 494 teachers with *n*=5 931 Principals/Schools in 36 countries/economies. Covariates are mainly missing across the eleven specific countries Argentina (Ciudad Autónoma de Buenos Aires), Austria, Bulgaria, Spain, France, Israel, Italy, Netherlands, Portugal, Sweden, and the United States, which are removed from the covariate analysis using list-wise deletion. All remaining variables had low to no missing data (less than 5%), and so following the recommendations from the analysis literature, I used FIML (Full Information Maximum Likelihood) for data imputation in both the full model and the covariate model. As TALIS 2018 is not a simple random sample, the below analysis includes the teacher-level statistical weight TCHWGT and the school-level statistical weight SCHWGT.

Drawing on the literature and the conceptual mapping of TALIS 2018 to the CALL survey discussed above in Table 2 and Annex A, this study includes survey items that conceptually align with the leadership for learning framework presented throughout this report. As noted in Table 2, these items come from eight domains of TALIS, including teachers' instructional practices, school leadership, teachers' professional practices, teacher education and initial preparation, teacher feedback and development, school climate, teacher self-efficacy, and human resources. Importantly, as the model includes teachers and principals, as noted in Table 2 from the conceptual mapping, teacher specific TALIS domains include teachers' instructional practices, teacher self-efficacy, and human resources, while the principal specific domains include teacher education and initial preparation. The remaining domains have at the minimum a partial conceptual alignment with leadership for learning and similar survey questions at the teacher and principal levels, as noted in Annex A.

Table 3 and Table 4 list TALIS 2018 variable descriptives for variables included in the indicator part of the analysis, with 30 variables at the teacher level (Table 3) and 41 variables as the principal/school level (Table 4). Variables are organised according to Annex A based on the five main CALL domains of focus on learning, monitoring teaching and learning, building nested learning communities, acquiring and allocating resources, and safe and effective environment. Tables 3 and 4 list the variable name, weighted mean, standard deviation, minimum, maximum, and TALIS 2018 variable label and recoding. As

discussed below for the analysis, all indicator variables were dichotomised, with higher positive values equal to 1, and lower or negative values equal to 0. For continuous variables, the grand mean for each variable was used for a mean split. Survey items that had a negative response, for example TT3G29D4: Teacher - I never receive feedback on my students external results, were reverse coded (as indicated in Table 3 and 4, right column). Table 5 and Table 6 list the descriptives for the covariates at Level 1 (teacher) (Table 5) and Level 2 (principal/school) (Table 6) including the variable name, weighted mean, standard deviation, minimum, maximum, TALIS 2018 variable label and recoding.

Table 3. Level 1 Teacher indicator variable descriptives (weighted)

Variable	Mean	SD	Min	Max	Variable label
Focus on learning					
Above mean teacher self-efficacy	0.50	0.500	0	1	T3SELF; 1='12.695' to max, else='0' (mean dichotomised)
Above mean team innovativeness	0.64	0.481	0	1	T3TEAM; 1='11.537' to max, else='0' (mean dichotomised)
School staff share a common set of beliefs about teaching and learning	0.79	0.405	0	1	TT3G48F; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
School provides staff w. opp. to actively participate in school decisions	0.78	0.414	0	1	TT3G48A; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
School encourages staff to lead new initiatives	0.83	0.377	0	1	TT3G48H; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Above mean professional collaboration in lessons among teachers	0.45	0.497	0	1	T3COLES; 1='9.101' to max, else='0' (mean dichotomised)
Monitoring teaching and learning					
I administer my own assessment to assess student learning	0.65	0.476	0	1	TT3G43A; 0='Never'/Occasionally, 1='Frequently'/Always
I provide written feedback on student work to assess student learning	0.52	0.500	0	1	TT3G43B; 0='Never'/Occasionally, 1='Frequently'/Always
I let students evaluate their own progress to assess student learning	0.37	0.484	0	1	TT3G43C; 0='Never'/Occasionally, 1='Frequently'/Always
I observe students working on particular tasks to assess student learning	0.69	0.461	0	1	TT3G43D; 0='Never'/Occasionally, 1='Frequently'/Always
I receive feedback on my students external results	0.68	0.468	0	1	TT3G29D4; 0='Not' checked, 1= Checked (reverse coded)
I receive feedback on school-based and classroom-based results	0.76	0.427	0	1	TT3G29E4; 0='Not' checked, 1= Checked (reverse coded)
I receive feedback on my observation of classroom teaching	0.84	0.367	0	1	TT3G29A4; 0='Not' checked, 1= Checked (reverse coded)
I receive feedback on assessment of my content knowledge	0.61	0.487	0	1	TT3G29C4; 0='Not' checked, 1= Checked (reverse coded)
I receive feedback on self-assessment of my work	0.54	0.498	0	1	TT3G29F4; 0='Not' checked, 1= Checked (reverse coded)

Variable	Mean	SD	Min	Max	Variable label
Building nested learning communities					
Above mean exchange and co-operation among teachers	0.53	0.499	0	1	T3EXCH; 1='10.962' to max, else='0' (mean dichotomised)
Above mean number of different prof dev activities (NUMPDACT)	0.43	0.495	0	1	Sum TT3G22A-22F. 1= 2.347 to max, else='0' (mean dichotomised)
Above mean effective professional development	0.55	0.497	0	1	T3EFFPD; 1='12.330' to max, else='0' (mean dichotomised)
School has a culture of shared responsibility for school issues	0.78	0.414	0	1	TT3G48D; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly Agree
Agree Teachers can rely on each other	0.89	0.317	0	1	TT3G49E; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Teacher is an assigned mentor or has been assigned a mentor (MENTORIN)	0.23	0.420	0	1	TT3G21A or TT3G21B; 0='If' both No, 1='either' or both Yes
Have taken part in formal induction activities	0.55	0.498	0	1	TT3G19A3; 0='Not' checked, 1='Checked' (reverse coded)
Have taken part in informal induction activities	0.49	0.500	0	1	TT3G19B3; 0='Not' checked, 1='Checked' (reverse coded)
Acquire and allocate resources					
Above average hours spent on team work and dialogue with colleagues	0.38	0.486	0	1	TT3G18B; 1='2.840' to max, else='0' (mean dichotomised)
Most teachers believe that student well-being is important	0.96	0.201	0	1	TT3G49B; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Most teachers are interested in what students have to say	0.92	0.264	0	1	TT3G49C; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Above average participation among community stakeholders in school	0.55	0.497	0	1	T3STAKE; 1='11.226' to max, else='0' (mean dichotomised)
School provides parents/ guardians with opportunities for active participation in school decisions	0.79	0.409	0	1	TT3G48B; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Safe and effective environment					
School staff enforce rules for student behaviour consistently	0.75	0.430	0	1	TT3G48G; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Teachers and students usually get on well with each other	0.96	0.191	0	1	TT3G49A; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
N	152,635				

Table 4. Level 2 Principal/School indicator variable descriptives (weighted)

Variable	Mean	SD	Min	Max	Variable label
Focus on learning					
Teachers understand school curricular goals	0.93	0.262	0	1	TC3G27A; 0='Not' at all/To some extent, 1='Quite' a bit, A lot
Teachers succeed in implementing the school's curriculum	0.87	0.336	0	1	TC3G27B; 0='Not' at all/To some extent, 1='Quite' a bit, A lot
Teachers hold high expectations for student achievement	0.79	0.410	0	1	TC3G27C; 0='Not' at all/To some extent, 1='Quite' a bit, A lot
Students have a desire to do well in school	0.76	0.430	0	1	TC3G27F; 0='Not' at all/To some extent, 1='Quite' a bit, A lot
School staff share common set of beliefs about teaching and learning	0.90	0.306	0	1	TC3G26G; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Ensuring teachers feel responsible for their students learning outcomes	0.79	0.407	0	1	TC3G22F; 0='Never'/Rarely, 1='Often'/Very Often
Teachers represented on school management team	0.67	0.471	0	1	TC3G19E; 0='No'/Not applicable; 1=Yes
Providing staff with opportunities to participate in school decisions	0.97	0.159	0	1	TC3G26A; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree

Variable	Mean	SD	Min	Max	Variable label
This school encourages staff to lead new initiatives	0.97	0.165	0	1	TC3G26I; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly Agree
Supporting co-operation among teachers to develop new teaching practices	0.64	0.479	0	1	TC3G22D; 0='Never'/Rarely, 1='Often'/Very Often
Collaborative school culture which is characterised by mutual support	0.94	0.243	0	1	TC3G26F; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly agree
Monitoring teaching and learning					
Student survey responses related to teaching used in this school	0.85	0.355	0	1	TC3G24B6; 0='Not' checked, 1= Checked Reverse coded
Students external results used in this school	0.91	0.284	0	1	TC3G24D6; 0='Not' checked, 1= Checked Reverse coded
School-based and classroom-based results used in this school	0.97	0.163	0	1	TC3G24E6; 0='Not' checked, 1= Checked Reverse coded
I provided feedback to teachers based on my observations	0.64	0.481	0	1	TC3G22C; 0='Never'/Rarely, 1='Often'/Very Often
Mentoring important to improve teachers pedagogical competence	0.70	0.459	0	1	TC3G36A; 0='Not'/Low importance or No mentoring, 1='Moderate'/High importance
Mentoring important to improve teachers collaboration with colleagues	0.70	0.458	0	1	TC3G36C; 0='Not'/Low importance or No mentoring, 1='Moderate'/High importance
Mentoring important to support less experienced teachers in their teaching	0.71	0.454	0	1	TC3G36D; 0='Not'/Low importance or No mentoring, 1='Moderate'/High importance
Mentoring important to expand teachers main subject(s) knowledge	0.63	0.482	0	1	TC3G36E; 0='Not'/Low importance or No mentoring, 1='Moderate'/High importance
Mentoring important to improve students general performance	0.66	0.462	0	1	TC3G36F; 0='Not'/Low importance or No mentoring, 1='Moderate'/High importance
Principal uses observations of classroom teaching as formal appraisal of teachers' work	0.77	0.424	0	1	TC3G24A2; 0='Not' checked, 1= Checked
Principal uses student survey responses related to teaching as formal appraisal of teachers' work	0.48	0.500	0	1	TC3G24B2; 0='Not' checked, 1= Checked
Principal uses assessments of teachers content knowledge as formal appraisal of teachers' work	0.50	0.500	0	1	TC3G24C2; 0='Not' checked, 1= Checked
Principal uses students external results as formal appraisal of teachers' work	0.60	0.490	0	1	TC3G24D2; 0='Not' checked, 1= Checked
Principal uses school-based and classroom-based results as appraisal of teachers' work	0.70	0.460	0	1	TC3G24E2; 0='Not' checked, 1= Checked
Principal uses self-assessments of teachers work as appraisal of teachers' work	0.55	0.497	0	1	TC3G24F2; 0='Not' checked, 1= Checked
Building nested learning communities					
This school has a culture of shared responsibility for school issues	0.92	0.278	0	1	TC3G26D; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly Agree
Ensuring teachers take responsibility for improving their teaching skills	0.73	0.447	0	1	TC3G22E; 0='Never'/Rarely, 1='Often'/Very Often
Agree Teachers can rely on each other	0.96	0.207	0	1	TC3G26K; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly Agree
A mentor is appointed to help the teacher improve his/her teaching	0.30	0.457	0	1	TC3G25D; 0='Never'/Sometimes, 1='Most' of the time/Always
Teacher access to mentoring programme	0.72	0.451	0	1	TC3G34; 0='No,' 1='Yes' new to teaching/new teachers here/all teachers
Mentors main subject field(s) same as that of teacher being mentored	0.66	0.476	0	1	TC3G35; 0='No' rarely or never or No mentoring, 1='Yes' sometimes/most of the time
Acquiring and allocating resources					
Above mean % of time spent on prof. tasks curric. and teach related tasks and meetings	0.45	0.498	0	1	TC3G21C; 1='17.356' to max, else='0' (mean dichotomised)
Formal induction programme for new teachers	0.54	0.499	0	1	TC3G31A; 0='No,' 1=Yes
Informal induction activities for new teachers	0.68	0.467	0	1	TC3G31B; 0='No,' 1=Yes

Variable	Mean	SD	Min	Max	Variable label
Above mean stakeholder involvement	0.49	0.500	0	1	T3PCOM; 1='10.733' to max, else='0' (mean dichotomised)
I provided parents/guardians with info on school and student performance	0.70	0.485	0	1	TC3G22G; 0='Never'/Sometimes, 1='Often'/Very Often
The school co-operates with the local community	0.80	0.400	0	1	TC3G27G; 0='Not' at all/To some extent, 1='Quite' a bit, A lot
Safe and effective environment					
School staff enforce rules for student behaviour consistently	0.89	0.311	0	1	TC3G26H; 0='Strongly' disagree/Disagree, 1='Agree'/Strongly Agree
Above mean school delinquency and violence	0.40	0.490	0	1	T3PDELI; 1='7.032' to max, else='0' (mean dichotomised)
I collaborated with teachers to solve classroom discipline problems	0.65	0.478	0	1	TC3G22A; 0='Never'/Sometimes, 1='Often'/Very Often
Mean number of teacher responders per school	16.81	5.961	1	89	
N	9,079				

Table 5. Level 1 Teacher covariate descriptives (weighted)

Variable	Mean	SD	Min	Max	Variable label
Female	0.70	0.460	0	1	TT3G01; 1='Female,' 0=Male
Master degree	0.34	0.475	0	1	TT3G03; 1='Master,' else=0
Doctoral degree	0.01	0.095	0	1	TT3G03; 1='PhD,' else=0
Teacher workload stress scale	9.20	2.054	3.89	16.38	T3WLOAD
Teacher job satisfaction scale	12.08	1.989	3.27	16.48	T3JOBSA
Teaching offered a steady career path	0.70	0.457	0	1	TT3G07A; 0='Not'/Low importance, 1='Moderate'/High importance
Teaching allowed me to influence the development of children and young people was important for me becoming a teacher	0.94	0.239	0	1	TT3G07E;0='Not'/Low importance, 1='Moderate'/High importance
Teaching was first career choice	0.72	0.451	0	1	TT3G08; 0='No,' 1=Yes
Years experience as a teacher	16.43	10.880	0	58	TT3G11B
Not full time employed	0.21	0.409	0	1	TT3G10A; 0='Full' time, 1='Part-time' (71-90% of hrs)/Part-time(50-70% of hrs)/Part-time (less than 50% of hrs)
High special needs classroom	0.04	0.204	0	1	TT3G14; 0='None'/Some, 1='Most'/All
N	93,494				

Table 6. Level 2 Principal covariate descriptives (weighted)

Variable	Mean	SD	Min	Max	Variable label
Female	0.51	0.500	0	1	TC3G01; 1='Female,' 0=Male
Masters degree	0.37	0.484	0	1	TC3G03; 1='Master,' else=0
Doctoral degree	0.02	0.153	0	1	TC3G03; 1='Doctoral,' else=0
FTE without teaching	0.54	0.499	0	1	TC3G05; 1='Full-time' (more than 90% of hrs) without teaching obligation, else=0
No training school admin	0.12	0.321	0	1	TC3G06A; 1='Never' completed programme or course school admin or principal training, else=0
No training teacher ed	0.08	0.274	0	1	TC3G06B; 1='Never' completed programme or course teacher training/education, else=0
No training instructional leadership	0.13	0.340	0	1	TC3G06C; 1='Never' completed training or course instructional leadership, else=0
Years experience as principal	8.51	8.024	0	50	TC3G04B
Student teacher ratio	16.87	31.787	0.05	549	STRATIO

Variable	Mean	SD	Min	Max	Variable label
Rural	0.31	0.463	0	1	SCHLOC; 1='Rural,' else=0
City	0.32	0.468	0	1	SCHLOC; 1='City,' else=0
No autonomy for school staffing	0.43	0.495	0	1	T3PAUTS; 1='No' school autonomy for staffing, else=0
No autonomy for school budgeting	0.72	0.448	0	1	T3PAUTB; 1='No' school autonomy for budgeting, else=0
No autonomy for educational policies	0.26	0.437	0	1	T3PAUTP; 1='No' school autonomy for educational policies, else=0
No autonomy for instructional policies	0.30	0.458	0	1	T3PAUTI; 1='No' school autonomy for instructional policies, else=0
Lack of resources a problem	0.10	0.306	0	1	T3PLACRE; 1='Lack' of resources a problem, else=0
Diversity beliefs	13.37	1.888	3.64	14.83	T3PDIVB; TALIS scale
Organisational innovativeness	12.35	2.004	2.33	17.66	T3PORGIN; TALIS scale
Job satisfaction with work environment	13.49	1.996	1.13	18.46	T3PJSENV; TALIS scale
Workload stress	9.98	2.218	2.89	16.11	T3PWLOAD; TALIS scale
Private school	0.15	0.355	0	1	TC3G12; 1='Private,' else=0
High teacher turnover	0.13	0.334	0	1	TC3G14B; 1='Number' of teachers who permanently left this school in the last 12 months 6-10/11-15/16 or more, else=0
Enrolment in thousands	0.49	0.452	0.01	5.76	TC3G16/1000
High percent of students with 1st language different from instructional language	0.11	0.318	0	1	TC3G17A; 1='Percent' of students 1st language different from instructional language 11%-30%/31%-60%/More than 60%, else=0
High percent of students with special needs	0.10	0.302	0	1	TC3G17B; 1='Percent' of students with special needs 11%-30%/31%-60%/More than 60%, else=0
High percent of students from socio-economically disadvantaged homes	0.47	0.499	0	1	TC3G17C; 1='Percent' of students from socio-economically disadvantaged homes 11%-30%/31%-60%/More than 60%, else=0
High percent of students who are immigrants or with migrant background	0.05	0.219	0	1	TC3G17D; 1='Percent' of students who are immigrants or with migrant background 11%-30%/31%-60%/More than 60%, else=0
High percent of students who are refugees	0.01	0.098	0	1	TC3G17E; 1='Percent' of students who are refugees 11%-30%/31%-60%/More than 60%, else=0

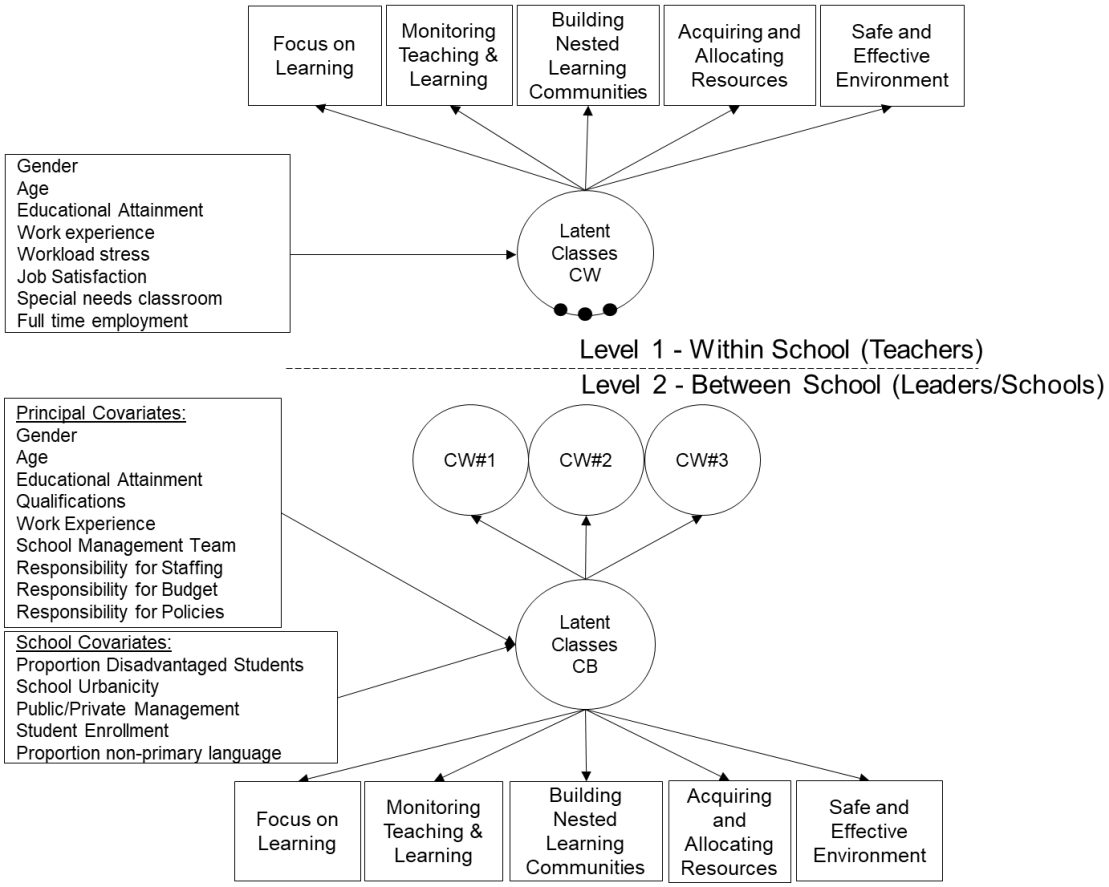
Analysis

The purpose of this research study is to examine the extent to which a congruency-typology model of leadership for learning is distributed across countries/economies using the TALIS 2018 dataset through examining the interaction of significantly different subgroups of teacher and principal responders using multilevel latent class analysis (LCA). Multilevel LCA is an emerging analysis technique to examine not only the extent to which there is a typology of responders across a survey, but also to appropriately nest the data within a hierarchical model (Finch and French, 2014[91]; Henry and Muthén, 2010[92]; Park and Yu, 2018[93]; Vermunt, 2003[94]; Yu and Park, 2014[95]). A well-known issue in education leadership research, given that teachers are nested within schools, this creates a dependency structure in the data that can then be taken advantage of to examine the within-school variance at the teacher level, between-school variance at the school level, and potential cross-level interactions (Boyce and Bowers, 2018[12]; Hallinger and Heck, 1996[90]; Hallinger and Heck, 2011[67]; Hox, 2010[96]; Raudenbush and Bryk, 2001[97]). Multilevel LCA extends the hierarchical framework to latent class analysis and mixture models, through estimating a typology at Level 1 as well as a typology at Level 2, and allowing for a cross-level interaction term that informs the Level 2 typology with the Level 1 types (Henry and Muthén, 2010[92]). The analysis here is a non-parametric two-level random effects latent class analysis. Multilevel LCA model estimation is a three-phase process (Henry and Muthén, 2010[92]), and here I follow the recommendations from the previous multilevel leadership for learning LCA from Bowers et al. (2017[20]) which also nested

teachers within schools. In phase 1, a Level 1 only teacher within-school LCA model is estimated.

In phase 1, only the top panel of Figure 1 (within school, teachers) model is estimated, without considering the Level 2 structure. The enumeration model includes items from each of the TALIS domains noted above. Following the recommendations of the LCA literature (Masyn, 2013[85]; Nylund-Gibson and Masyn, 2016[98]; Nylund, Asparouhov and Muthén, 2007[99]), modelling follows a single-level LCA process, of first fitting the enumeration model by iteratively testing for the number of latent classes k, assessing model fit, and interpreting the k-1 latent class model when the data no longer fits the model. Model fit is assessed through the use of multiple fit statistics including the Lo-Mendel-Rubin (LMR) test (Lo, Mendell and Rubin, 2001[100]), as well selecting the model with the lowest Bayesian Information Criterion (BIC) (Nylund-Gibson and Masyn, 2016[98]; Nylund, Asparouhov and Muthén, 2007[99]; Park and Yu, 2018[93]; Vermunt, 2010[101]). The identified Level 1 typology is used to inform the next phases of the analysis. Additionally, the Level 1 LCA model may be of substantive interest on its own, and further modelling using the three-step LCA could be of interest with possible distal outcomes (Bakk and Vermunt, 2016[102]; Nylund-Gibson, Grimm and Masyn, 2019[103]). This process is then repeated for the Level 2 data (Henry and Muthén, 2010[92]), here for principals/schools (Figure 1, bottom half). The number of latent classes at Level 1 and Level 2 are then used in the full multilevel model in phase 3. Covariates are included at this final step at phase 3. Figure 1 provides a structural model for the two-level LCA with a cross-level interaction.

Figure 1. Two-level latent class analysis model with a cross-level interaction, covariates at Level 1 and Level 2



Phase 3 of the multilevel LCA model is to estimate the full model shown in Figure 1. Here, I have depicted the model with a three-group typology at Level 1 from phase 1, noted as CW for latent classes C within. Note that the number of Level 1 latent classes is determined as noted above from phase 1, and I use three here only as an example. Following the recommendations from recent multilevel LCA research (Bowers et al., 2017[20]; Graves, 2019[104]), as show in Figure 1, the multilevel model includes three latent classes at Level 1 with a cross-level interaction in which teachers are nested within schools. The Level 2 between-school typology (CB) tests the extent that the Level 1 types are distributed evenly across schools, or to what extent there are subgroups of schools (CB) at the Level 2 between-level as defined by different proportions of the Level 1 subgroups (Figure 1, filled circles at Level 1 and CW#1 – CW#3 at Level 2) .

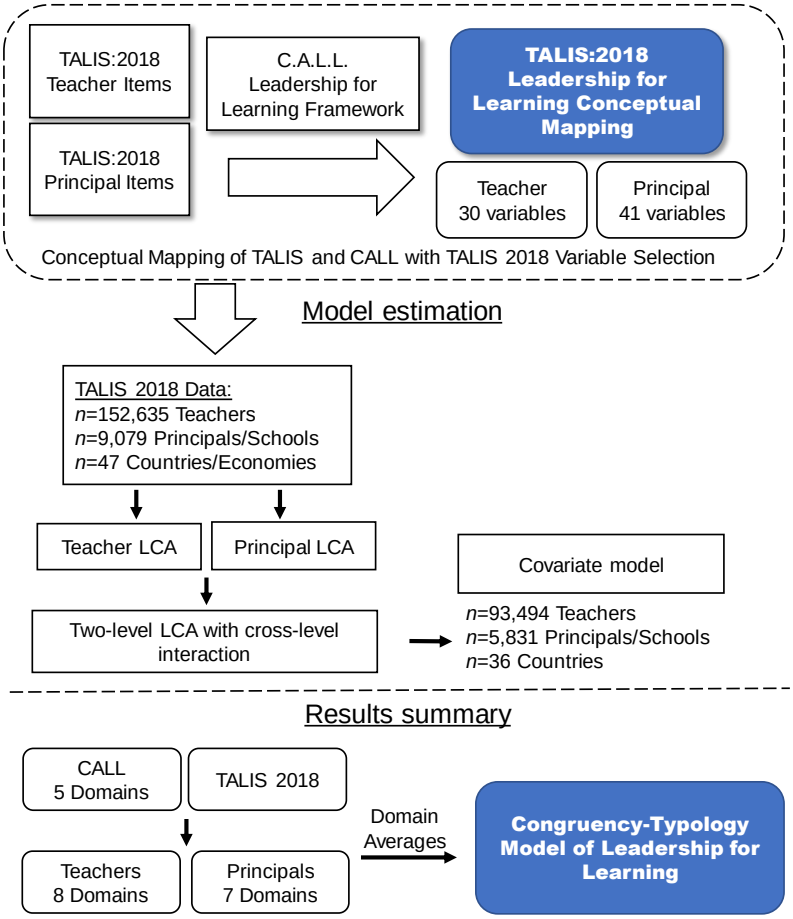
The full final multilevel LCA model (Figure 1) for phase 3 of the analysis nests teachers within (CW) in schools (between or CB). Here, in the fully specified model, the TALIS 2018 indicators noted above for teachers are specified as the indicators in the Level 1 within enumeration, along with teacher demographic, experience, motivation, and training covariates on the probability of being included into any one of the Level 1 latent classes, here for example assumed to be three latent classes (CW). A cross-level interaction is included in which the proportions of the Level 1 latent classes are indicators at Level 2 for the between part of the model (CB), in addition to principal Level 2 variables noted in the conceptual framework for leadership for learning. Additionally, principal and school covariates are included at Level 2 on the probability of a school being classified into one of the three example between-level latent classes (CB). Thus, the estimation strategy is to first estimate the teacher (Level 1 CW) only LCA model, then the principal/school (Level 2 CB) only LCA model. Once the number of latent classes at Level 1 and Level 2 are identified, then I estimate the full two-level latent class analysis with the cross-level interaction without covariates and report the results using the full TALIS 2018 sample. Then, I estimate the full model with covariates using the reduced sample noted above given missing covariate data across eleven countries/economies, and report the results.

Overview and summary of study framework and structure for methods and results

Figure 2 provides an overview and summary of the framework and structure, the sample, the estimation strategy, and the structure of the results. Specific details on each section are provided throughout the study. The structure of the study is in three parts. First, in the top of Figure 2, to provide a linkage between the instructional leadership framework of the TALIS survey and the CALL survey, the TALIS 2018 items are mapped to the CALL five domains, identifying 30 variables at the teacher level and 41 variables at the principal level (see Annex A). In the centre of Figure 2, as detailed in the methods above and in the results below, the full TALIS 2018 dataset is used to estimate first a teacher Level 1 (CW within) latent class analysis model, and then a principal/school Level 2 (CB between) latent class analysis model, estimating the extent to which there is a typology of teacher and principal responders to TALIS 2018 through a leadership for learning framework. Then I estimate the full two-level latent class analysis model with a cross-level interaction using the full TALIS 2018 dataset. Then, given the issues noted above with missing data across 11 countries/economies, I use a reduced sample size to estimate the covariates on the two-level LCA with a cross-level interaction. In the bottom of Figure 2, as will be noted below, the results of the model suggest a three latent class solution at the teacher level, and a three latent class solution at the principal/school level in which the responses across the typologies suggest that rather than the five domains of leadership for learning theorized through the CALL framework, the results of the present study suggest that there may be eight leadership for learning domains at the teacher level, and seven domains at the

principal level. As will be detailed below in the results, I then use these domain averages to summarise these results, compare across the typology of teachers and schools, and examine the differences across countries/economies represented in TALIS 2018 to summarise the results of the congruency-typology model of leadership for learning.

Figure 2. Framework of the study, sample and model estimation strategy for latent class analysis (LCA), and results structure



Results

In this results section I will first present the fit of the single-level models for Level 1 teachers, then Level 2, principals/schools in which, following the recommendations of the literature, I fit iterative models with increasing latent classes to assess model fit. Once the appropriate number of latent classes is determined at each level individually, I then present the fit of the full two-level model without covariates, describe the teacher and principal latent classes at levels 1 and 2, as well as the proportions of teacher latent classes across Level 2 as the cross-level interaction. With the description of the latent classes at each level, I will also present the findings on the covariates at each level. With the full model described, I will then proceed to summarise the model indicators at Level 1 and 2, and present the findings on the congruency-typology findings. Finally, I will then present the findings on the cross-nation/economy analysis, describing the differences in the congruency-typology model across the national contexts.

A three latent class model fit both the Level 1 teacher and Level 2 principal/school individual level models well. As noted above, to determine the number of latent classes at each level, following the recommendations of the literature (Collins and Lanza, 2010[83]; Nylund-Gibson, Grimm and Masyn, 2019[103]; Nylund-Gibson and Masyn, 2016[98]; Nylund, Asparouhov and Muthén, 2007[99]), I ran iterative sets of models of increasing numbers of latent classes at each level, and once the model no longer fit the data, interpreting the model with the best fit. TALIF or the single-level Level 1 teacher model, Table 7 provides the fit statistics for the two class through nine class models. Up to nine classes the lowest BIC was not determined. However, the three-class model had a significant LMR p-value, while the four-class model did not. Thus, I decided to use the more parsimonious three-class model. The model fit the data well with a -2 Log Likelihood of -2220150.116, AIC 4440484.232, BIC 4441398.326, $p<0.001$, and an entropy of 0.831.

Table 8 provides the model fit statistics for the two class through seven class Level 2 principal/school level model. For the Level 2 model, the lowest BIC was not determined from two classes to eight latent classes, nor were any of the models significant by the LMR criterion. However, entropy was high for all Level 2 models tested. While at three latent classes the proportion of the classes was all over 10%, at four latent classes, a small proportion class was identified at less than 3% of the sample. Additionally, model identification for the four-class model was problematic as the indictor plots showed that for this small fourth class the indicators were fixed to the threshold ceiling and floor values (data not shown). As noted in the LCA literature, additional latent class proportions below 5% of the sample are an indication of a poor model fit. Thus, for model parsimony, I decided on the three-class solution for Level 2. The three-class Level 2 principal/school level model fit the data well with -2 log likelihood of -154029, AIC 308307.85, BIC 309194.41, and entropy of 0.901.

Table 7. Level 1: Teacher latent class analysis model results and fit statistics

Classes	-2LL	AIC	BIC	p-value	Entropy
2	-2277579.731	4555281.461	4555887.545	<0.001	0.836
3	**-2220150.116**	**4440484.232**	**4441398.326**	**<0.001**	**0.831**
4	-2182855.185	4365956.370	4367178.474	0.235	0.828
5	-2163478.923	4327265.846	4328795.960	0.458	0.813
6	-2150277.368	4300924.737	4302762.860	0.501	0.82
7	-2140882.366	4282196.732	4284342.865	0.714	0.822
8	-2132387.133	4265268.266	4267722.410	0.529	0.815
9	-2124304.234	4249164.469	4251926.622	0.474	0.795

Table 8. Level 2: Principal latent class analysis model results and fit statistics

Class	-2LL	AIC	BIC	p-value	Entropy
2	-158702	317570.41	318159.08	0.453	0.994
3	**-154029**	**308307.85**	**309194.41**	**0.747**	**0.901**
4	-150891	302115.95	303300.39	0.263	0.925
5	-148032	296482.63	297964.96	0.693	0.919
6	-145623	291747.44	293527.65	0.615	0.908
7	-143690	287965.71	290043.80	0.431	0.914

Level 1: Teacher-level typology (CW)

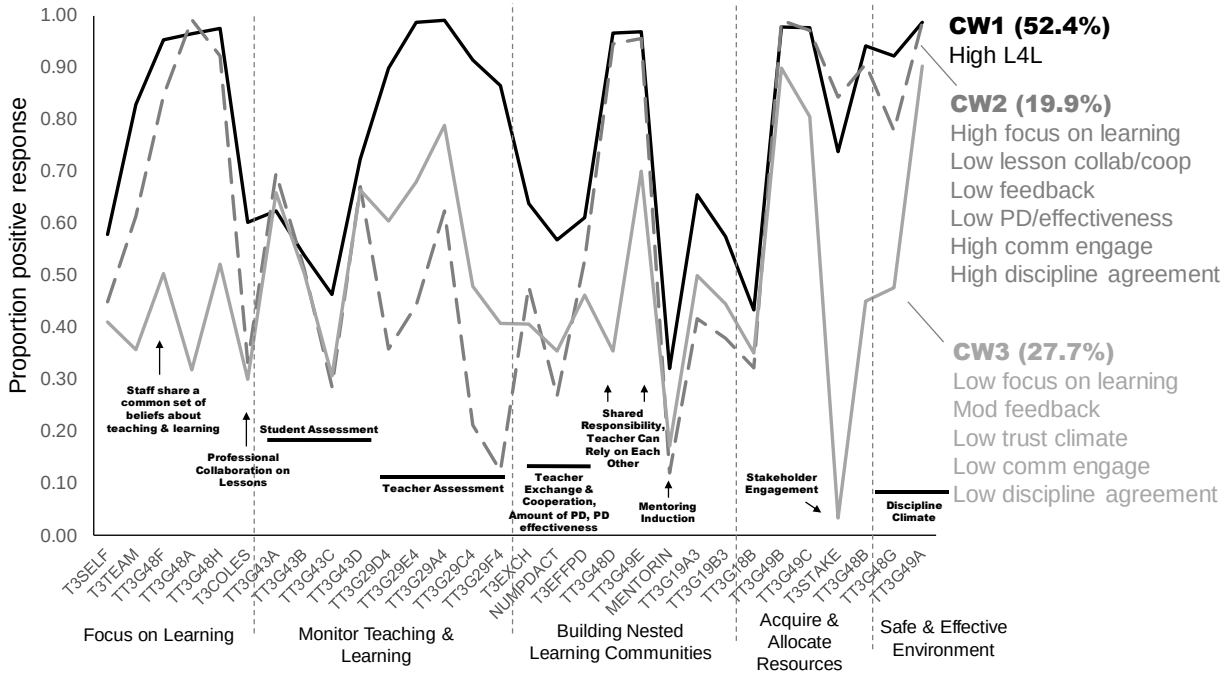
With the three latent class model identified at Level 1 (CW), and the three latent class analysis model identified at Level 2 (CB), following the recommendations of the methods literature as noted above (Bowers et al., 2017[20]; Henry and Muthén, 2010[92]; Park and Yu, 2018[93]), the final phase of the analysis was to run the full two-level LCA model as described in Figure 1 using the code in Annex B, with teachers at Level 1 (CW), nested within Level 2 (CB) principals/schools. I first will describe the full model without covariates, and then provide the covariate model findings for the teacher Level 1 part of the model, and then the principal/school Level 2 part of the model. The final two-level model without covariates fit the data well, with an entropy of 0.894, and a strong model classification fit as shown in Table 9, with the fit of the joint probabilities across CW x CB (3 by 3, or 9 total groups) on the diagonal mostly above 0.9, with the lowest 0.878, with low probabilities for misclassification on the off-diagonals. The order of the numbers of the groups are not in numerical order for Table 9 as I reorder the group number to simplify the presentation of the results below. Thus, I interpret the final model with a three-group typology at Level 1, teachers, and a three-group typology at Level 2, principals/schools.

Table 9. Average latent class probabilities for most likely class membership (row) by latent class (column) for the joint probabilities of CW by CB.

			1	2	3	4	5	6	7	8	9
			CB2	CB2	CB2	CB1	CB1	CB1	CB3	CB3	CB3
			CW2	CW3	CW1	CW2	CW3	CW1	CW2	CW3	CW1
1	CB2	CW2	**0.878**	0.038	0.054	0.015	0.001	0.002	0.011	0.001	0.001
2	CB2	CW3	0.027	**0.903**	0.025	0.000	0.023	0.001	0.001	0.020	0.000
3	CB2	CW1	0.043	0.025	**0.898**	0.001	0.001	0.023	0.001	0.000	0.008
4	CB1	CW2	0.028	0.001	0.001	**0.853**	0.038	0.076	0.003	0.000	0.000
5	CB1	CW3	0.001	0.026	0.001	0.021	**0.913**	0.036	0.000	0.003	0.000
6	CB1	CW1	0.001	0.001	0.024	0.034	0.031	**0.904**	0.000	0.000	0.004
7	CB3	CW2	0.010	0.000	0.001	0.001	0.000	0.000	**0.893**	0.034	0.061
8	CB3	CW3	0.000	0.005	0.000	0.000	0.001	0.000	0.029	**0.939**	0.025
9	CB3	CW1	0.000	0.000	0.003	0.000	0.000	0.002	0.052	0.025	**0.919**

Figure 3 plots the indicators for the three latent class typology subgroups of the teacher-level (CW) part of the model, in which I identified three subgroups, CW1 (52.4%), CW2 (19.9%), and CW3 (27.7%). Indicators on the x-axis in Figure 3 are grouped by the leadership for learning framework in the order provided above in Table 3 of a focus on learning, monitoring teaching and learning, building nested learning communities, acquiring and allocating resources, and safe and effective learning environment. Individual indicator variables as well as groups of variables of interest are denoted in bold text with arrows or horizontal bars in the bottom portion of the plot. Figure 3 shows that for the majority teacher group, CW1, these teachers reported high levels of responses across the leadership for learning indicators. There was only one indicator variable in which CW1 was below the other two groups, TT3G43A: I administer my own assessments to assess student learning. Thus, I termed CW1 the high leadership for learning teacher group.

Figure 3. Level 1: Teacher indicator plot by LCA Group

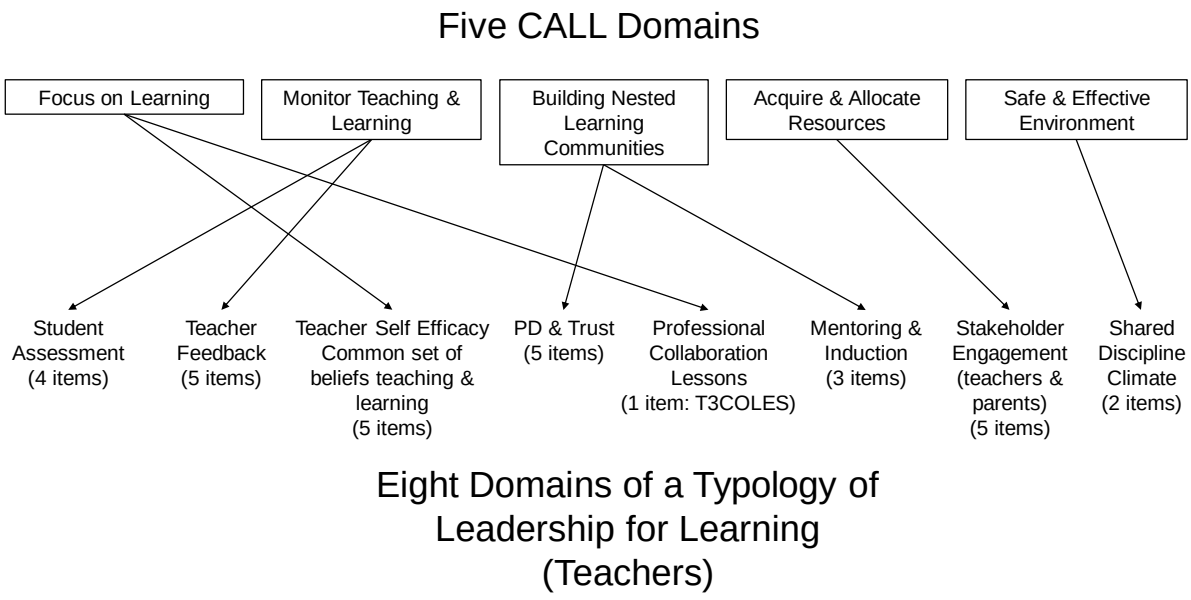


CW2 consisted of 19.9% of the sample of teachers, and these respondents had generally high responses in focus on learning, building nested learning communities, and safe and effective environment, for many indicators matching CW1. These include items such as "Staff share a common set of beliefs about teaching & learning" as well as the two indicators "Shared responsibility, Teachers can rely on each other". However, for specific items and sets of items in monitoring teaching and learning and building nested learning communities, CW2 had low or the lowest responses across the TALIS teacher responders. For instance, while CW2 matched CW1 on TT3G48F "School staff share common set of beliefs about teaching & learning", interestingly CW2 matched CW3 on their responses to T3COLES "Professional collaboration in lessons among teachers", and CW2 had similar responses to CW3 for the indicators on student assessment, "Teacher exchange and co-operation", "Amount of professional development", "Professional development effectiveness", and mentoring and induction. Importantly, while CW2 had high responses overall for a focus on learning, trust in the teaching staff, community engagement, and shared discipline and behaviour expectations, they had the lowest responses on all types of feedback to teachers, as well as amount and effectiveness of professional development.

CW3 (27.7% of the sample) was typified by the lowest levels of a focus on learning, including teacher self-efficacy, shared beliefs about learning, opportunities to make decisions, and professional collaboration on lessons. CW3 was the lowest on teacher culture of shared responsibility and trust in building nested learning communities, and had the lowest responses for community and stakeholder engagement and discipline environment. However, CW3 teachers had moderate responses to receiving feedback on their work.

Across the teacher-level part of the model, while the five domains of the leadership for learning model provide a useful framework to group the indicator variables, Figure 3 demonstrates that there are some discrepancies, as within the five domain item clusters, the lines for the three groups cross. In the previous research using this leadership for learning framework with the five domains and a two-level LCA (Bowers et al., 2017[20]), the teacher Level 1 types had an ordinal set of responses, with high, medium, and low groups. Thus, each group in the LCA with the five domain leadership for learning framework behaved similarly within the five clusters of items. In the present study, I find that the five leadership for learning domains fit the data well, but with some differences, suggesting an eight-domain framework. First, in focus on teaching and learning, as noted in Figure 3, CW2 diverges from CW1 and joins CW3 when it comes to teacher perceptions of professional collaboration on lessons. These differences continue across the five domains as presented above. Thus, here in Figure 4 I use the Level 1 typology results in Figure 3 as evidence for eight groups of leadership for learning items as measured using TALIS 2018 and latent class analysis, using the similarities across the three teacher groups noted above, to conceptually group items for 1) student assessment, 2) teacher feedback, 3) teacher self-efficacy and common set of beliefs about teaching and learning, 4) professional development (PD) and trust, 5) professional collaboration, 6) mentoring and induction, 7) stakeholder engagement, and 8) shared discipline climate. I use this order of domains to simplify the below presentation of results. I detail the specific items in Annex C from the LCA by the variable name, variable label in TALIS 2018, the CALL leadership for learning domain, and the eight-domain framework for leadership for learning.

Figure 4. Mapping the five CALL domains to eight domains of leadership for learning at the teacher level using TALIS 2018 items



To simplify the interpretation of the three teacher typology groups, I plot the eight domain averages for CW1, CW2, and CW3 in Figure 5 to help typify the response patterns of the three-group teacher typology. As shown in Figure 5, while all three typology groups have high alignment on average on student assessment, CW1, as the majority of teacher responders (52.4%), have the highest responses across the eight domains of leadership for learning. CW1 are typified as reporting receiving the most feedback, have high perceptions of self-efficacy and shared beliefs about teaching and learning in their schools, with high amounts of professional development and trust, stakeholder engagement, and a shared discipline climate. While the highest responders across the typology, within CW1 the lowest perception is around professional collaboration on lessons and mentoring and induction activities. CW2, as the smallest group of teachers in the leadership for learning typology (19.9%), are typified by reporting the lowest levels of feedback on their teaching with low levels of professional collaboration on lessons and low levels of mentoring and induction. However, CW2 teachers report high levels of teacher self-efficacy and a common set of beliefs about teaching and learning, high amounts of professional development and trust, high stakeholder engagement and a shared climate on discipline. CW3 teachers (27.7%) are typified by the lowest levels of teacher self-efficacy and a common set of beliefs about teaching and learning, low levels of professional development and trust, as well as stakeholder engagement and shared discipline climate. However, CW3 teachers have the second highest perceptions of receiving feedback on teaching, and share similar perceptions with CW2 teachers on professional collaboration on lessons and mentoring and induction.

Figure 5. Domain averages for Teacher Level 1 (CW) typology using the eight domains of leadership for learning

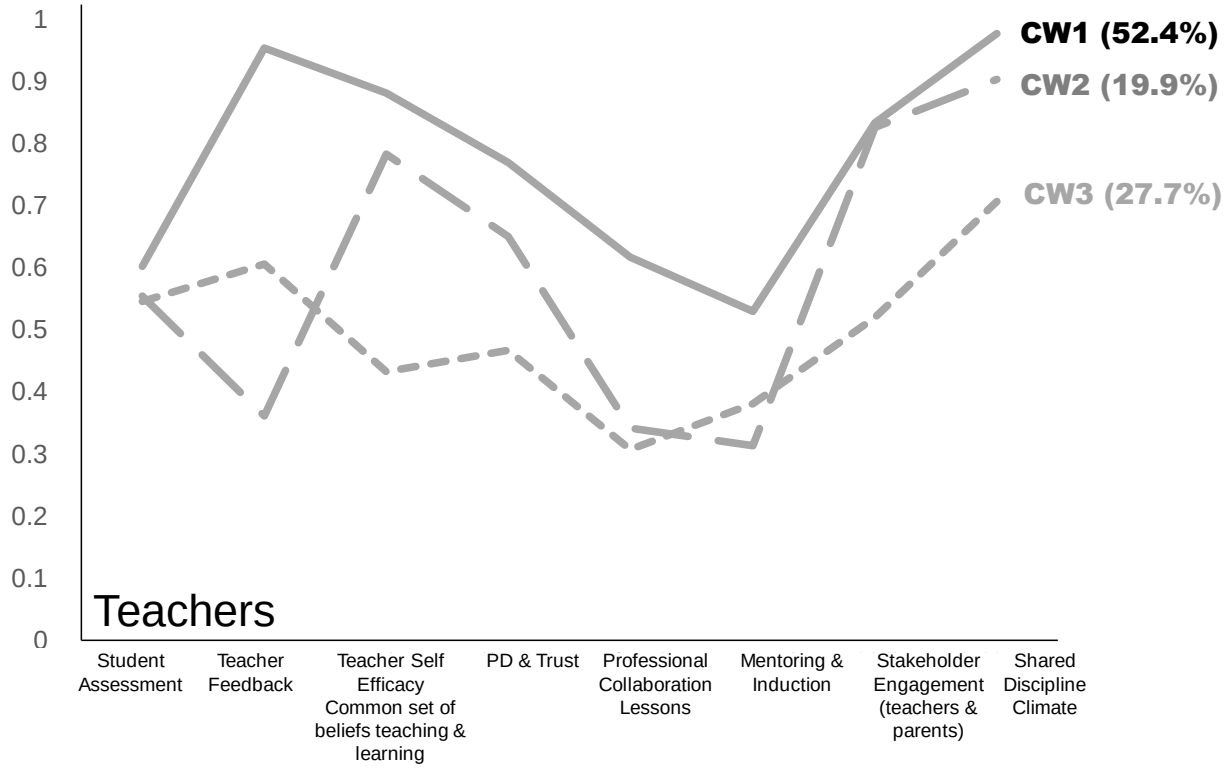


Table 10 provides the covariates for the Level 1 part of the model. As noted in the methods, the covariate model is a reduced sample model due to missing covariates across specific countries/economies. In Table 10, CW2 is used as the reference group, and weighted means are provided for each variable, with odds ratios for each significant covariate on the probability of a teacher being in CW1 or CW3 versus CW2. Next, I present each significant covariate in turn. As odds ratios below 1.0 are difficult to interpret, I invert these odds ratios. Female teachers were 1.334 times more likely to be CW1 versus CW2. For teacher education, teachers with a Master's degree were 1.512 more likely to be CW1 and 1.307 times more likely to be CW3 than CW2. For workload stress and job satisfaction teachers in CW3 had significantly higher workload stress (1.066 times) than CW2 teachers, while CW1 teachers had higher job satisfaction while CW3 teachers had lower job satisfaction than CW2 teachers. Teachers who reported that teaching offered a steady career path were 1.817 times more likely to be CW1 versus CW2 and teachers who reported that teaching was their first career choice were 1.374 times more likely to be CW1 than CW2. CW1 teachers were more experienced teachers in comparison to CW2. CW1 teachers were 1.163 times less likely (1/0.860) to be part-time employed, and 2.114 times (1/0.473) less likely to serve in a high special needs classroom. Thus, overall from the covariate model, CW1 teachers are more likely to be female with a Master's degree and a teacher who purposefully chose teaching as a career who has higher job satisfaction, is a more experienced teacher and teaching more often full time but less often in high special needs classrooms. CW3 teachers more often hold Masters degrees and have higher workload stress and lower job satisfaction than CW2 teachers.

Table 10. Level 1: Teacher covariate model estimates

	CW1 (52.4%)				CW3 (27.7%)				CW2 (19.9%)	
Variable	Mean	OR	p-value		Mean	OR	p-value		Mean	OR
Female	0.72	1.334**	<0.001		0.69	1.107~	0.094		0.68	--
Master's degree	0.33	1.512**	<0.001		0.36	1.307***	<0.001		0.37	--
Doctoral degree	0.01		0.527		0.01		0.645		0.01	--
Teacher workload stress scale	9.07		0.596		9.64	1.066***	<0.001		8.92	--
Teacher job satisfaction scale	12.57	1.066***	<0.001		10.96	0.700***	<0.001		12.43	--
Teaching offered a steady career path important for me becoming a teacher	0.77	1.817***	<0.001		0.64		0.144		0.62	--
Teaching allowed me to influence the development of children and young people was important for me becoming a teacher	0.96		0.136		0.91		0.265		0.93	--
Teaching was first career choice	0.78	1.374***	<0.001		0.64	1.133~	0.052		0.67	--
Years experience as a teacher	17.68	1.021***	<0.001		15.13		0.719		15.05	--
Not full time employed	0.20	0.860*	0.039		0.21		0.804		0.26	--
High special needs classroom	0.03	0.473***	<0.001		0.06		0.316		0.06	--

Note: Teacher weights are applied to the means

Level 2: Principals/Schools (CB)

I now turn to the Level 2 principal/schools part of the model (CB). As noted above, the model identified a three-group principal/school typology of CB1 (37.6%), CB2 (35.4%) and CB3 (27.0%). First, the cross-level interaction included in the analysis allows the proportion of the three teacher groups to vary within each of the Level 2 groups. Figure 6 provides the proportions of the three teacher CW groups within each of the three school CB groups. Overall, for all three CB groups, CW1 is the majority teacher group, followed by CW3, and then CW2. Moving from CB1 to CB2 to CB3 in Figure 6, the proportion of CW1 declines somewhat, increasing both CW2 and CW3 with each step to the right. However, as opposed to the previous Bowers et al. (2017) two-level LCA using a leadership for learning framework, here the proportions of the teacher level groups do not appear to vary substantially between the school-level CB groups, but rather there are more subtle differences in the proportions. Overall, CB1 is typified by a majority of CW1 teachers, while CB2 and CB3 have similar proportions of the three-teacher typology groups.

Figure 6. Proportions of Level 1 Teacher Within (CW) latent classes by Level 2 Principal/School between (CB) latent classes

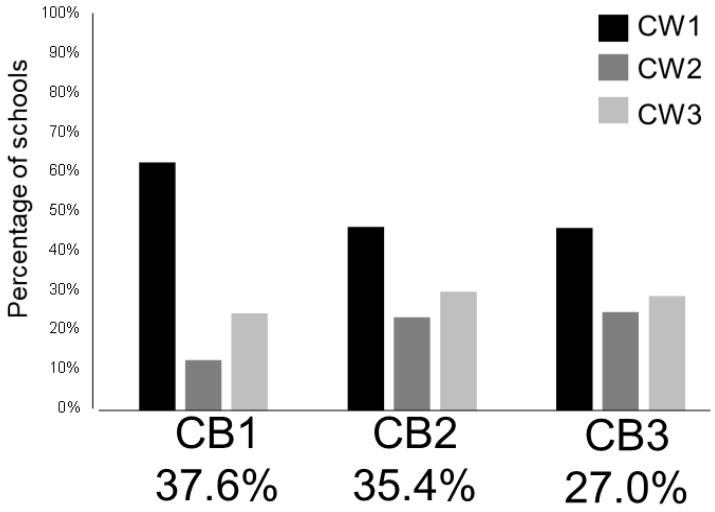
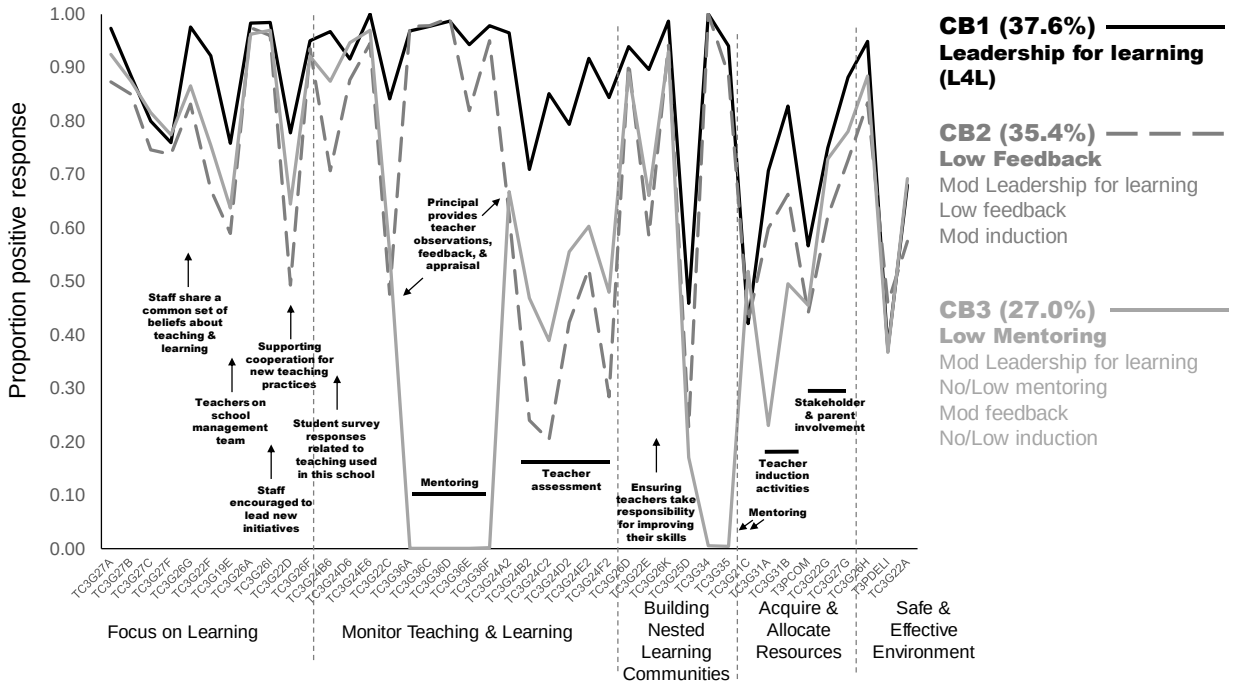


Figure 7 provides the indicator plot for the proportion of positive responses to each item for the three principal/school group typology of CB1 (37.8%) leadership for learning, CB2 (35.4%) low feedback, and CB3 (27.0%) low mentoring. As with Figure 3 for the teacher Level 1 part of the model, here in Figure 7, variables included as indicators on the x-axis are grouped according to the five leadership for learning domains with specific indicators or groups of indicators noted in bold with arrows or horizontal bars near the bottom of the plot. For the principal/school CB part of the model, the largest group is the high responder group of CB1 (37.6%), responding high for all indicators, which I term the "leadership for learning" principal group. CB2 (36.4%) principals mirror many of the responses of CB1, but differ in that they have low responses to item TC3G24B6 "student survey responses related to teaching used at this school", item TC3G22C "I provide feedback to teachers based on my observations", and low responses throughout the feedback and assessment of teachers section of monitoring teaching and learning. Interestingly, CB2 principals have high responses to mentoring and teacher induction.

Figure 7. Level 2 Principal/School indicator plot by LCA Group



CB3 (27.0%) low mentorship principals have responses across many indicator variables that match or are above CB2, however CB3 principals are typified by having the lowest responses to mentoring and induction. As the indicator line is at zero for many of these items, this indicates that the principal noted that either they have a low perception of mentoring, or that mentoring is not something that they oversee in the school as measured through these specific TALIS 2018 survey items. CB3 principals report providing moderate levels of feedback to teachers. In teacher feedback and assessment however, CB3 principal responses sit between CB2 and CB1 principal responses.

As with the Level 1 teacher (CW) part of the model, given the teacher level evidence as well as the Level 2 principal/school (CB) evidence on grouping the indicator variables, Figure 8 plots the item averages across the expanded number of domains from the five domain conceptual grouping of indicator variables from leadership for learning as diagrammed in Figure 4. In contrast to the teacher-level eight domains, for principals there are seven domains, as in TALIS 2018 there are no questions about teacher classroom assessment practices for the principal. Annex D provides these seven leadership for learning conceptual domains, the variable names, TALIS 2018 label, and original CALL leadership for learning domain. Survey items are grouped to the seven conceptual domains based on 1) similar response patterns across the indicator plot and 2) the original conceptual mapping of TALIS 2018 to CALL in Annex A. For example, while TC3G34 and TC3G35 are survey items about mentoring, these items are included in the original CALL mapping of Building Nested Learning Communities (renamed PD and trust here) rather than in Mentoring and Induction, as rather than focusing on the principal's specific mentoring of teachers, these two items deal with access to and training of mentors within the school (compare Annex A to Annex C), which from the perspective of CALL is part of providing an active professional development culture. However, as noted above, as to date there has been no research surveying the same educators with both CALL and TALIS, these item mappings to domains (both Annex A and Annex C) are conceptual only and provided to

help understand TALIS responses within the leadership for learning literature, and organise and simplify the results presented here.

In Figure 8, averages are calculated within each of the seven domains and plotted for the three principal (CB) typology groups to help simplify interpretation of the three-group principal typology across these proposed seven domains of leadership for learning. CB1 leadership for learning principals (Figure 8 solid line) have on average high responses across all seven domains. CB2 low feedback principals (Figure 8 dashed line) are on average typified by low teacher feedback, high professional development and trust, lower professional collaboration on lessons, and high mentoring and induction. In contrast, CB3 low mentoring principals (Figure 8 dotted line), have on average moderate teacher feedback, low professional development and trust, low professional collaboration on lessons, and the lowest mentoring and induction response from principals. There appears to be little difference on average overall in the three principal groups' perceptions of teacher self-efficacy and a common set of beliefs about teaching and learning in the school, perceptions of stakeholder engagement and perceptions of a shared discipline climate.

Figure 8. Domain averages for Principal/School (CB) typology using the seven domains of leadership for learning

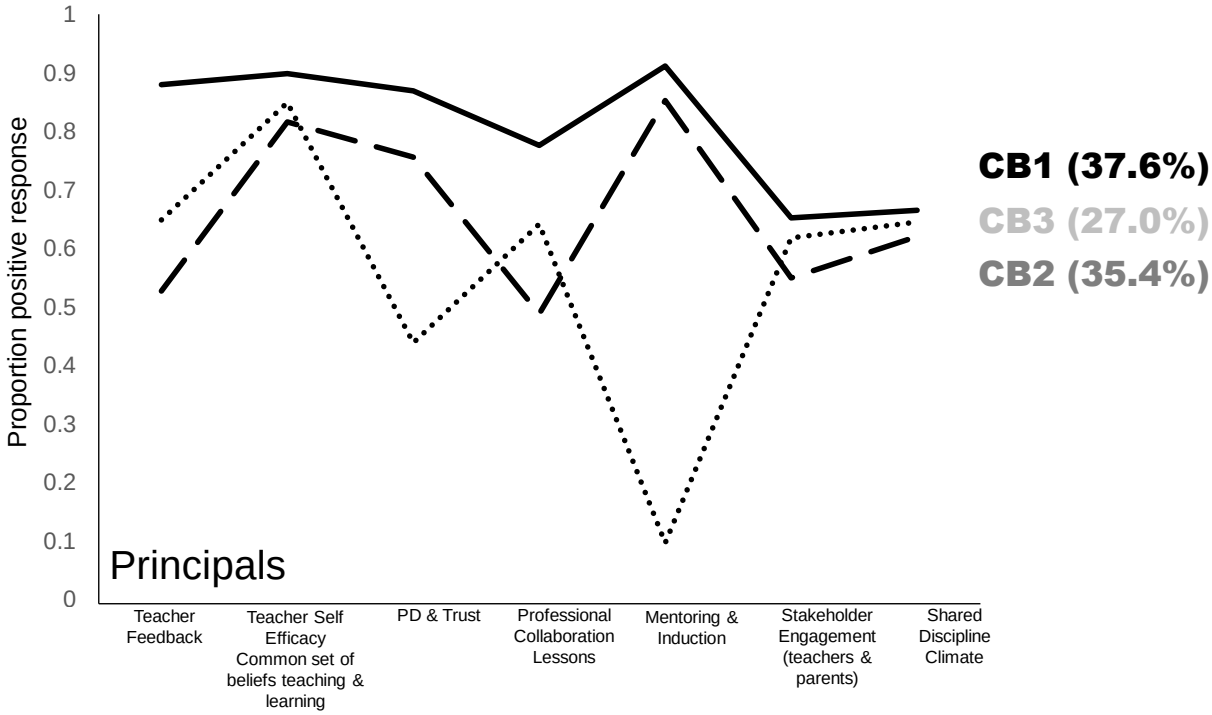


Table 11 provides the covariate estimates for the Level 2 between principal/school (CB) part of the reduced sample covariate model. CB3, the low mentoring principal type, is used as the reference group. CB1 leadership for learning principals are 1.405 times less likely (1/0.712) to be female than male in comparison to CB3 principals. However, in examining the means, 51% of CB1 principals are female while 52% of CB3 principals are female, so while the difference is significant, the interpretation of the odds ratio is that CB1 principals are somewhat less likely to be female but that the majority of principals in the group are female. For principal training, while there was no statistical difference between the principal types in having obtained a Masters degree, CB2 low feedback principals are 2.740 times (1/0.365) less likely to hold a PhD than CB3 principals. Principals who report

that they are a full time employees without teaching duties are 1.724 times (1/0.580) less likely to be CB1 and 1.923 times less likely (1/0.520) to be CB2 than CB3. CB2 principals are 1.865 times more likely to have not received training to be a school administrator than CB3 principals. In contrast, CB2 principals were 1.821 times less likely to have received no training in teacher education versus CB3. Importantly for the present study with the focus on instructional leadership and leadership for learning frameworks, I found interesting differences between the three principal group typology in their training on instructional leadership. Principals who had no training in instructional leadership were 1.825 times less likely (1/0.548) to be CB1 and 2.070 times less likely (1/0.483) to be CB2 than CB3. Interestingly there were no detectable differences in the means between the three principal groups in years experience, student teacher ratio, or school community urbanicity when controlling for the other variables in the model. Principals that report that they have no autonomy for school staffing were 2.183 times less likely (1/0.458) to be CB1 versus CB3 principals, and for principals who report no autonomy for school budgeting were 1.541 times less likely (1/0.649) to be CB1 versus CB3 principals. Principals who reported no autonomy for educational policies were 1.659 times more likely to be CB2 than CB3 and principals who reported no autonomy for instructional policies were 1.969 times less likely (1/0.508) to be CB1 than CB3. For principals who report that lack of resources is a problem for their school they were 1.808 times less likely (1/0.553) to be CB1 and 2.364 times less likely (1/0.423) to be CB2 than CB3. CB1 principals had significantly higher responses on the diversity beliefs scale ($p<0.05$) and organisational innovativeness ($p<0.01$). Principals who reported working in private schools were 1.942 times less likely to be CB1 principals. Principals who served in larger enrolment schools were more likely to be CB1 ($p<0.05$) and CB2 ($p<0.01$) than CB3 principals. Principals who served in schools with a high percentage of students with their first language different from the instructional language were 1.758 times more likely to be CB2 than CB3, and principals who reported that their school served a high percentage of students who are refugees were 3.521 times less likely (1/0.284) to be CB1 than CB3.

Table 11. Level 2: Principal covariate model estimates

	CB1 (37.6%)			CB2 (35.4%)			CB3 (27.0%)	
Variable	**Mean**	**OR**	**p-value**	**Mean**	**OR**	**p-value**	**Mean**	**OR**
Female	0.51	0.712*	0.038	0.49		0.247	0.52	--
Master's degree	0.44		0.236	0.37		0.580	0.31	--
PhD	0.03		0.956	0.01	0.365**	0.006	0.03	--
FTE without teaching	0.50	0.580**	0.002	0.47	0.520***	<0.001	0.63	--
No training school admin	0.07		0.281	0.16	1.865*	0.019	0.13	--
No training teacher ed	0.07		0.303	0.06	0.549*	0.038	0.11	--
No training instructional leadership	0.10	0.548*	0.015	0.12	0.483**	0.003	0.18	--
Years experience as principal	9.10		0.624	7.89		0.148	8.44	--
Student teacher ratio	18.25		0.212	16.01		0.585	16.19	--
Rural	0.31		0.871	0.29		0.214	0.33	--
City	0.34		0.397	0.32		0.531	0.32	--
No autonomy for school staffing	0.29	0.458**	0.001	0.44	0.674~	0.072	0.56	--
No autonomy for school budgeting	0.63	0.649*	0.034	0.74		0.313	0.80	--
No autonomy for educational policies	0.15		0.982	0.33	1.659*	0.039	0.30	--
No autonomy for instructional policies	0.18	0.508*	0.011	0.36		0.300	0.38	--
Lack of resources a problem	0.08	0.553*	0.030	0.07	0.423**	0.002	0.16	--
Diversity beliefs	13.49	1.093*	0.022	13.20		0.590	13.11	--

	CB1 (37.6%)				CB2 (35.4%)				CB3 (27.0%)	
Organisational innovativeness	12.65	1.155**	0.001		12.30		0.196		12.09	--
Job satisfaction with work environment	13.58		0.928		13.53		0.841		13.36	--
Workload stress	9.99		0.407		9.86		0.594		10.08	--
Private school	0.15	0.515**	0.002		0.15		0.250		0.14	--
High teacher turnover	0.15		0.158		0.12		0.927		0.12	--
Enrolment in thousands	0.52	1.419*	0.042		0.51	1.565**	0.004		0.45	--
High percent of students with 1st language different from instructional language	0.12	1.659~	0.086		0.14	1.758*	0.042		0.08	--
High percent of students with special needs	0.11		0.780		0.09		0.583		0.10	--
High percent of students from socio-economically disadvantaged homes	0.42		0.193		0.45	0.720~	0.062		0.54	--
High percent of students who are immigrants or with migrant background	0.04		0.157		0.08		0.235		0.05	--
High percent of students who are refugees	0.01	0.284*	0.011		0.01	0.397~	0.091		0.01	--

Note: Level 2 school weights are applied to the means

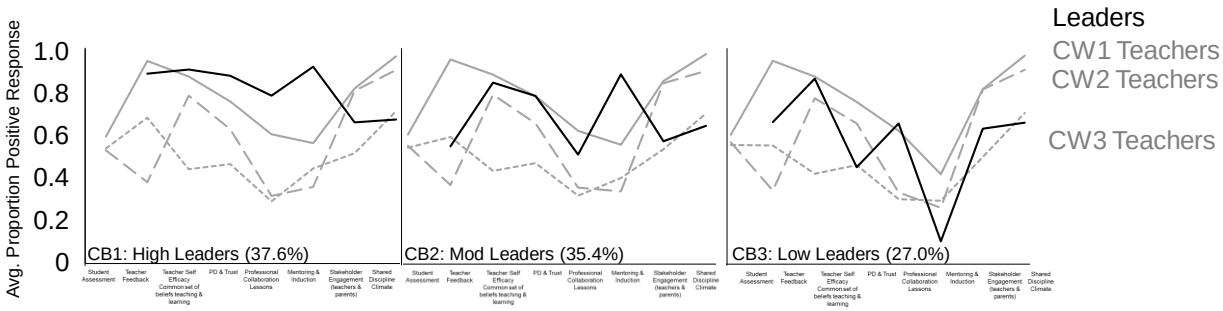
In sum for the principal covariates, in comparison to the CB3 low mentoring principal type, CB1 high leadership for learning principals have some teaching responsibilities, have training in instructional leadership, report some autonomy for school staffing, budgeting, and instructional policies, and do not perceive a lack of resources to be a significant problem. CB1 principals on average have higher diversity beliefs and organisational innovativeness perceptions. For school context, CB1 principals serve more often in public schools, and higher enrolment schools that serve students who are not as often refugee students. In comparison, CB2 low feedback principals more often do not hold a PhD, have some teaching responsibilities, and report more often having received no training in school administration, yet do report some training in teacher education and instructional leadership. CB2 principals report more often having no autonomy over educational policies, but are less likely to report that lack of resources are a problem. CB2 principals serve more often in larger enrolment schools serving schools with higher percentages of students whose first language is different from the instructional language in comparison to CB3 principals. Thus, a central finding of the study, is that through the application of the leadership for learning framework to the TALIS 2018 survey responses using multilevel latent class analysis, the three CB principal groups report substantively different responses across the survey (Figures 7 and 8) , and these differences are reflected in the covariates, especially the covariate "no training instructional leadership" as CB3 principals report much more often that they received no training in instructional leadership, followed by CB2 principals and then CB1 (see Table 11 means).

Interpreting the Full 2-Level congruency-typology model of leadership for learning

As the results of each of the levels in the model presented above are part of the same two-level LCA model, to provide a summary of the results from the three teacher (CW within) groups and the three principal/school (CB between) groups, in Figure 9 I use the eight-domain leadership for learning averages to plot the response patterns for each of the three types of teacher responders (grey lines: CW1 solid, CW2 dashed, CW3 dotted), within each of the three school types including the principal's responses for each CB type (black lines) using the full no covariates two-level model results as outlined above in Figure 2. Here, Figure 9 for the first time provides a means to examine the results within a congruency-typology model framework of leadership for learning across all 152,635 teachers in 9,079 schools with their principals across 47 countries/economies who

answered questions on TALIS 2018, as the congruency or alignment between principals on average in each of the three types of schools can be compared to the three-teacher typology of responses and alignment or misalignment can be noted for each school type. The table in the lower half of Figure 9 provides a summary of the CW teacher percentages within each CB school type, the covariates for the CW teacher types, and a summary of the covariate findings for three principal CB typology and the school covariates.

Figure 9. Comparison of response patterns of leaders and teachers across the three school subgroups and three teacher subgroups



Typology and school covariate summary:

CB1 (37.6%)	CB2 (35.4%)	CB3 (27.0%)
Teachers		
CW1 62.6%	CW1 46.4%	CW1 46.2%
CW1 covariates: More often female, Masters, highest satisfaction, chose teaching, more experienced, FTE		
CW2 12.8%	CW2 23.6%	CW2 24.9%
CW2 covariates: Lowest stress, high satisfaction, least experienced, highest not FTE		
CW3 24.5%	CW3 30.1%	CW3 28.9%
CW3 covariates: More often Masters, higher workload stress, lower satisfaction		
Principal		
Some teaching	Less often PhD	Less often teaching
Trained inst. leadership	Trained inst. leadership	Less training teacher ed
Higher diversity beliefs	Some teaching	Less training inst. leadership
Higher org. innovativeness	Less training school admin	Less autonomy staffing
	Less autonomy ed policy	Less autonomy budgeting
		Less autonomy inst. Policy
		Lack of resources a problem
School		
Less often private	Higher enrolment	
Higher enrolment	Higher language learner	
Less migrant population		

For CB1 (Figure 9, left panel) the principal average responses are generally high across the domains, either matching or are somewhat above CW1 responses. The exception is for the two domains of stakeholder engagement and shared discipline climate. As noted in the lower panel table in Figure 9, as well as Figure 6, in CB1 the majority of teachers are CW1 responder type teachers (62.6%). CW1 teachers are more often female, have a Master's degree, have higher work satisfaction, intentionally selected teaching as their career, and are more often more experienced and full time employees (FTE). In CB1 schools, the principals and teachers are generally aligned on average across the majority of the eight domains proposed in the present study for leadership for learning. It is interesting however that the principals and teachers on average are not aligned on stakeholder engagement and

shared discipline climate, as the majority of teachers in the CB1 schools report a higher perception on addressing these domains than the principal. At the covariate level CB1 schools are more often led by principals who have some teaching responsibility, have been trained in instructional leadership and have higher diversity beliefs and organisational innovativeness in schools that are less often private, more often high enrolment, and less often serving significant migrant student populations.

CB2 schools are much more evenly split in the ratios of CW teachers. As demonstrated in Figure 9 (middle panel), on average the principal perceptions of leadership for learning across the eight-domain model lie between CW1 and CW2 teacher perceptions, with the exception of mentoring and induction (principal perception far exceeds teachers), and are aligned with CW3 teacher averages in stakeholder engagement and shared discipline climate. Nevertheless, in CB2, 46.4% of the teachers are CW1 responders who report high levels of teacher feedback, yet principal perception of teacher feedback in CB2 is more closely aligned with CW3 teachers. Given that there is no majority CW teacher type in CB2 it is difficult to argue for alignment between principals and teachers in their perceptions of leadership for learning in CB2 schools across the majority of domains. However, as the leaders in CB2 lie between CW1 (46.4%) and CW2 (23.6%) teachers on the domains teacher self-efficacy and a common set of beliefs about teaching and learning as well as professional development and trust, and professional collaboration, this evidence suggests alignment for these three domains in the congruency-typology of leadership for learning framework for CB2 schools. Leaders in CB2 schools hold a PhD less often, have been trained in instructional leadership, and report doing some teaching. However, these principals report having been trained less often in school administration and having less autonomy over educational policy. CB2 schools are more often higher enrolment and serve learners whose first language is different from the instructional language.

In comparison to CB1 and CB2 schools, CB3 schools are the smallest percentage of schools (27.0%). As with CB2 schools, CW1 teacher types are somewhat more evenly split than in CB1 schools, as none are over 50% of teachers. However, CW1 teachers are 46.2% of teachers in the CB3 schools, yet the principal responses across almost all of the leadership for learning domains are lower than the CW1 teachers. CB3 schools are typified by having principals who report either low levels of mentoring and induction or that these are not the responsibilities of the principal. Interestingly principals in CB3 appear to align in their perceptions with CW1 teachers on teacher self-efficacy and a common set of beliefs about teaching and learning in the school, as well as professional collaboration on lessons. However, principals are aligned with CW3 teachers on professional development and trust, stakeholder engagement, and a shared discipline climate. CB3 schools have principals who teach less often, and have less often been trained in teacher education and instructional leadership. Principals report having less autonomy over staffing, budgeting, and instructional policy, and they report that lack of resources is a problem. Overall, the CB3 school type is an intriguing result when considering the leadership for learning congruency-typology framework. The principals on average do not align with a specific teacher type, and appear to perceive that the school may have many issues and challenges.

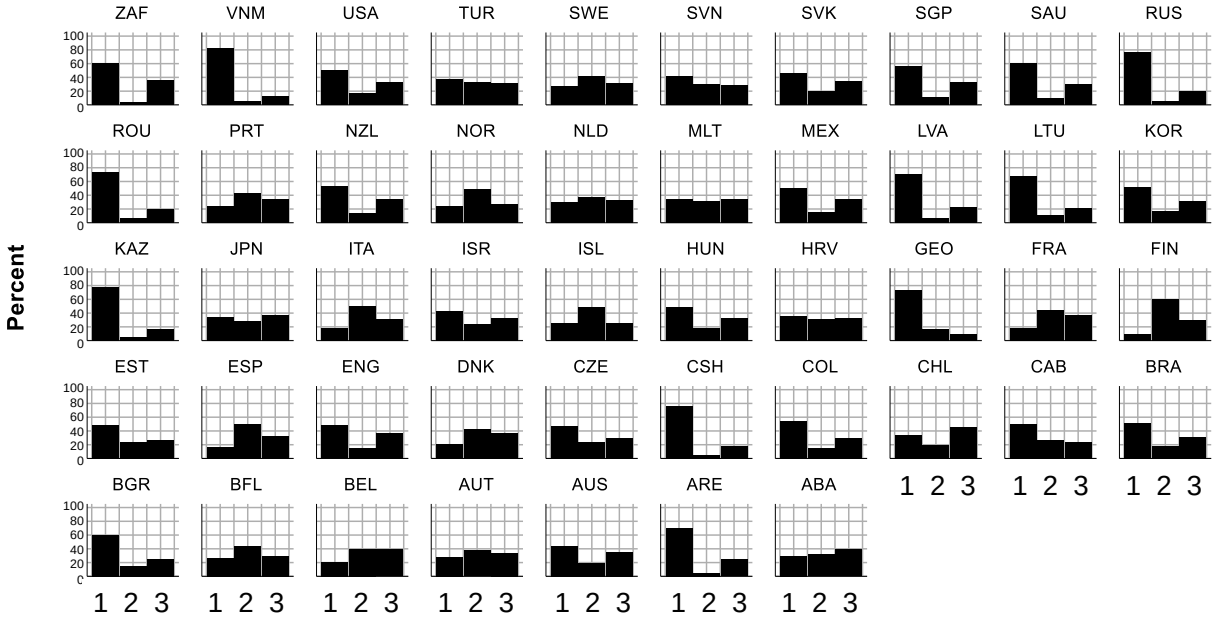
Thus, these findings lend supporting evidence for a congruency-typology model as originally proposed by Bowers et al. (2017[20]), and here extended to the TALIS 2018 data. The previous study found a congruency-typology of high agreement, low agreement, and misalignment where principals had high perceptions of leadership for learning yet teachers were moderate to low (Bowers et al., 2017[20]) using the validation sample for the CALL survey in the United States. Here I find using the TALIS 2018 dataset that across countries/economies a high alignment congruency type with principals agreeing with high responder teachers (CB1), and two misalignment non-congruent school types, one with principals perceiving moderate levels of leadership for learning (CB2), and the other (CB3)

with principals identifying challenges and needs that are quite different from the other two school types. I will return to these results below in the discussion.

Examining a leadership for learning congruency-typology framework across countries

I next turn to examining the two-level LCA typology across countries/economies. Figure 10 plots the proportions of the three teacher (CW) within groups across 47 countries/economies in reverse alphabetical order. Examining the proportions of the teacher typology responders within each country provides an opportunity to examine the prevalence of each of the teacher types at the national level and examine to what extent countries are related in the proportions. Figure 10 demonstrates that there is a variety of proportions across national contexts, with many countries having a large percentage of CW1 and CW3 teachers, while other countries have a more even set of proportions. Overall, it appears that the proportions of the teacher subgroups mostly cluster by region. For example, the proportion of the types with a high percent of CW1 very low CW2 and a low proportion of CW3 are Kazakhstan, Lithuania, Latvia, Romania and Russia, among others. Majority English-speaking countries appear to have more even levels of CW1 and CW3 teachers, with lower levels of CW2 such as Australia, England, New Zealand, and United States, while Nordic countries have some of the highest proportions of CW2 teachers including Denmark, Finland, Iceland, Norway, and Sweden.

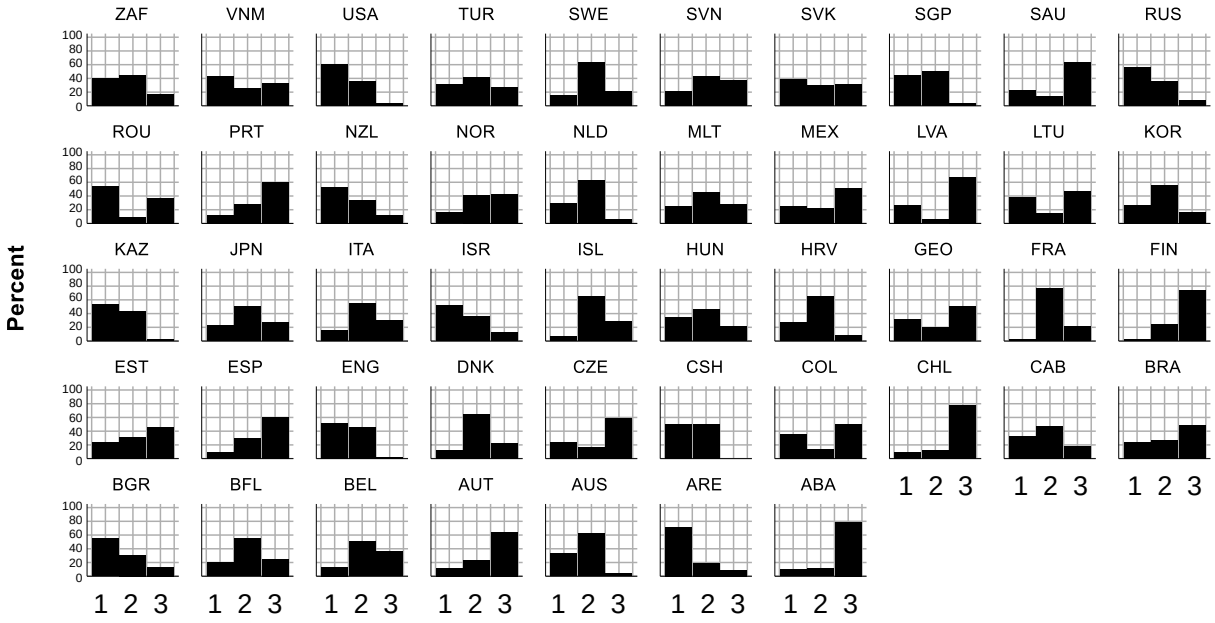
Figure 10. Level 1: Teacher (CW) subgroup proportions across country/economy contexts



Note: Country/economy abbreviations: ABA Argentina; ARE United Arab Emirates; AUS Australia; AUT Austria; BEL Belgium; BFL Flemish Belgium; BGR Bulgaria; BRA Brazil; CAB Alberta Canada; CHL Chile; COL Colombia; CSH Shanghai China; CZE Czech Republic; DNK Denmark; ENG England (United Kingdom); ESP Spain; EST Estonia; FIN Finland; FRA France; GEO Georgia; HRV Croatia; HUN Hungary; ISL Iceland; ISR Israel; ITA Italy; JPN Japan; KAZ Kazakhstan; KOR Korea; LTU Lithuania; LVA Latvia; MEX Mexico; MLT Malta; NLD Netherlands; NOR Norway; NZL New Zealand; PRT Portugal; ROU Romania; RUS Russia; SAU Saudi Arabia; SGP Singapore; SVK Slovak Republic; SVN Slovenia; SWE Sweden; TUR Turkey; USA United States; VNM Viet Nam; ZAF South Africa

Turning to the Level 2 between-level principal/school CB typology across countries/economies, the distribution appears much less associated with global region. Importantly, the Level 2 proportions of the three CB subgroups capture aspects of the entire multilevel LCA congruency-typology model for leadership for learning. These CB proportions represent not only the principal perceptions of leadership for learning, but also the cross-level interaction with the three teacher CW subgroups, and thus, as noted above in the literature review and methods, captures the central aspects of the congruency-typology model of leadership for learning across the 47 country/economy contexts represented through TALIS 2018. Additionally, as the statistical weights are applied, these results are generalizable to the populations of teachers and principals in schools across the 47 countries/economies.

Figure 11. Level 2: Principal/School (CB) subgroup proportions across country/economy contexts



Note: Country/economy abbreviations: ABA Argentina; ARE United Arab Emirates; AUS Australia; AUT Austria; BEL Belgium; BFL Flemish Belgium; BGR Bulgaria; BRA Brazil; CAB Alberta Canada; CHL Chile; COL Colombia; CSH Shanghai China; CZE Czech Republic; DNK Denmark; ENG England (United Kingdom); ESP Spain; EST Estonia; FIN Finland; FRA France; GEO Georgia; HRV Croatia; HUN Hungary; ISL Iceland; ISR Israel; ITA Italy; JPN Japan; KAZ Kazakhstan; KOR Korea; LTU Lithuania; LVA Latvia; MEX Mexico; MLT Malta; NLD Netherlands; NOR Norway; NZL New Zealand; PRT Portugal; ROU Romania; RUS Russia; SAU Saudi Arabia; SGP Singapore; SVK Slovak Republic; SVN Slovenia; SWE Sweden; TUR Turkey; USA United States; VNM Viet Nam; ZAF South Africa

Figure 11 plots the Level 2 CB proportions for each of the three CB subgroups for the 47 countries/economies. I start with the US context. For the United States, the largest principal/school between (CB) type is CB1, over 50% of the schools are the "leadership for learning" type with high responses for leadership for learning for both principals and teachers across the TALIS 2018 indicators. This replicates the previous research using the nationally generalizable US Schools and Staffing Survey (Boyce and Bowers, 2018[12]; Urick and Bowers, 2014[11]) as well as TALIS 2013 (Soncin, Bowers and Agasisti, 2018[23]) which showed that the majority of principal responders to items related to instructional and transformational leadership were in the highest response type, integrated leadership. The

US context is important to consider for not only a leadership for learning framework, but also in examining the results from TALIS 2018. A large percentage of the research on instructional leadership, transformational leadership in schools, and leadership for learning as evidence for these theories as well as motivation for the items in TALIS 2018 is drawn from the US context and education leadership research literature, followed by the UK, Canadian, Australian, and New Zealand contexts. Nevertheless, the congruency-typology model of leadership for learning in the present study allows for the first time to examine these concepts across multiple different country/economy contexts.

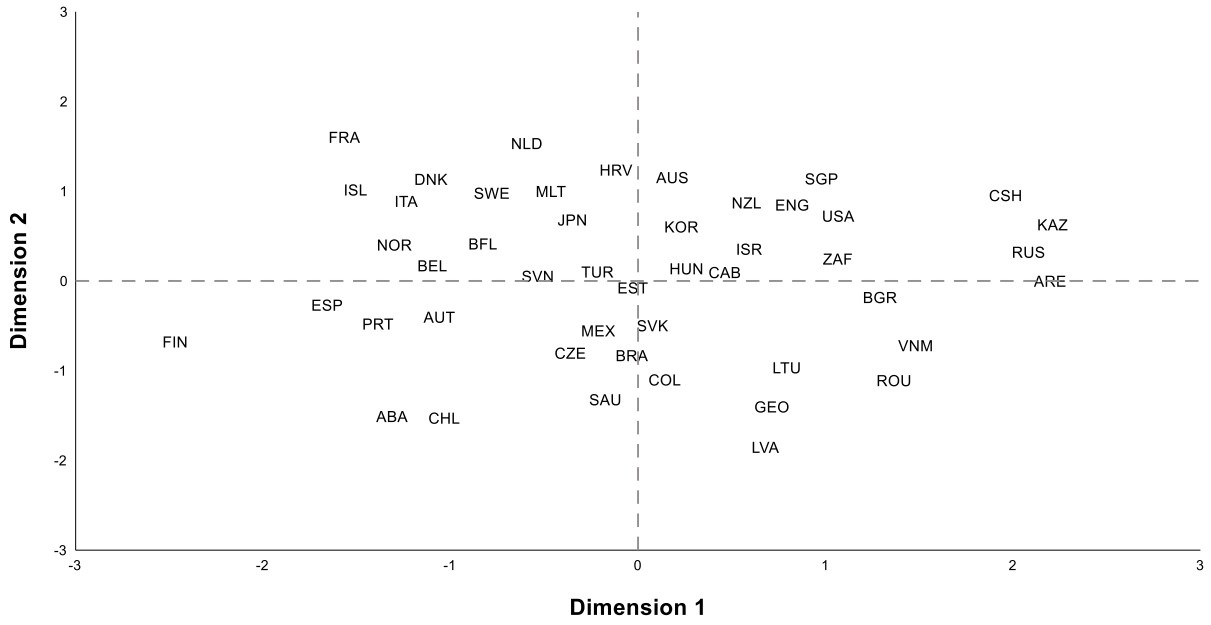
As a central finding of the present study, I argue here that while such a large amount of the research that informs instructional leadership, leadership for learning, and the TALIS 2018 survey itself is from the US context, the results of this study suggest that the United States has only two of the three types of school leadership contexts globally as measured through the two-level latent class analysis congruency-typology leadership for learning model. I acknowledge that this model is a very specific analysis framework. Nevertheless, the US results are striking, and suggest that the context from which such a large percentage of the current theories in education leadership is based is missing one of the three types of school leadership contexts. This leadership context that is missing, CB3, is typified by principals who note the challenges and issues with their school, have generally lower perceptions of leadership for learning, and see little role of the leader for mentoring and induction in schools. The point that the US school leadership research is missing this important school leadership context, which represents over a quarter of all schools globally (27.0%) who participated in TALIS 2018, is a core finding of the present study, which I will return to below. Interestingly, other countries/economies with this issue include Australia and England, and to a lesser extent New Zealand for the majority English speaking countries, but also Kazakhstan, Russia, Shanghai China, Singapore, and United Arab Emirates.

Returning to the research that examines the cross-national context in education leadership noted above in the literature review, in Figure 11, the difference in the CB proportions between United States and Norway are striking. While the United States has a majority of schools in CB1 leadership for learning, Norway is almost evenly split between CB2 (low feedback) and CB3 (low mentoring). As noted in the previous literature (Aas and Brandmo, 2016[24]), when attempting to fit an instructional leadership factor model to Norwegian principal perceptions of leaders, Aas and Brandmo (2016[24]) were unable to fit such a model. One interpretation of the Aas and Brandmo (2016[24]) results is that Norwegian principals did not agree with the instructional leadership model from the US context. These stark differences in CB proportions in Figure 11 lend further evidence to this finding. For a second example, the difference between Australia, Sweden, and Finland is similarly striking, as Australia has a majority of CB2 schools with a large percentage of CB1 schools, while Sweden mostly has CB2 schools, while Finland has a majority of CB3 schools, the low mentoring type. However, this is not unexpected given the results from Kemmis et al. (2014[25]). In their study of the contested conceptions of mentoring across national contexts, Kemmis et al. (2014[25]) demonstrated that Australian teacher mentoring has a strong role for the principal and is focused on both support and evaluation, in Sweden mentoring has a mix of support, evaluation, and collaborative self-development, while in Finland there is little role for the principal as mentoring is the domain of a network of teachers as professionals across the country as collaborative self-development. Here, Figure 11 provides evidence in support of these findings and importantly demonstrates that the multilevel LCA congruency-typology model of leadership for learning using TALIS 2018 data can capture these differences across country/economy contexts. Importantly, as Kemmis et al. (2014[25]) note that mentoring across global contexts in teaching is considered a "contested" domain, Figure 11, as well as the CB figures (Figures 7 and 8) reflect this

contested notion, as mentoring and induction across the three-group typology has the largest differences in responses across the indicators.

To provide a summary of the outcomes from the multilevel LCA congruency-typology model of leadership for learning across country/economy contexts, Figure 12 plots a multi-dimensional (MDS) scaling of the average probabilities across the CW by CB groups for each of the 47 countries/economies. For the MDS, I have used the posterior probabilities across the nine subgroup typology (three CW by three CB) and aggregated the average probabilities to the country/economy level. I then plot the two-dimensional solution using ALSCAL MDS, which represents 98.7% of the variance across the data and plots the orthogonal solution in two latent dimensions using Euclidian distance. Thus, Figure 12 plots the latent differences across the national contexts by the differences captured by the two-level LCA congruency-typology model of leadership for learning.

Figure 12. Multi-Dimensional Scaling (MDS) of Level 2 (CB) by Level 1 (CW) LCA posterior joint probabilities by country/economy



Note: Country/economy abbreviations: ABA Argentina; ARE United Arab Emirates; AUS Australia; AUT Austria; BEL Belgium; BFL Flemish Belgium; BGR Bulgaria; BRA Brazil; CAB Alberta Canada; CHL Chile; COL Colombia; CSH Shanghai China; CZE Czech Republic; DNK Denmark; ENG England (United Kingdom); ESP Spain; EST Estonia; FIN Finland; FRA France; GEO Georgia; HRV Croatia; HUN Hungary; ISL Iceland; ISR Israel; ITA Italy; JPN Japan; KAZ Kazakhstan; KOR Korea; LTU Lithuania; LVA Latvia; MEX Mexico; MLT Malta; NLD Netherlands; NOR Norway; NZL New Zealand; PRT Portugal; ROU Romania; RUS Russia; SAU Saudi Arabia; SGP Singapore; SVK Slovak Republic; SVN Slovenia; SWE Sweden; TUR Turkey; USA United States; VNM Viet Nam; ZAF South Africa

I highlight six main interpretations of the results plotted in Figure 12. First, this type of MDS plot captures the findings noted above, of the distance in the systems between the United States and Norway (horizontally separated from each other), as well as Australia, Sweden, and Finland (diagonally separated), displaying the differences across these national contexts in the components of leadership for learning of instructional leadership (Aas and Brandmo, 2016[24]; 2019[105]) as well as mentoring and induction (Kemmis et al., 2014[25]). Second, given that much of the education leadership research drawn on for TALIS 2018 is from the US context, Figure 12 provides evidence that the US context is

very different from the majority of the countries participating in TALIS 2018. Third, much has been written about the Finnish education system, given their high performance on international tests (Sahlberg, 2007[106]; 2011[107]). Here, Figure 12 shows that Finland and the United States are diametrically dissimilar to each other in the two-level congruency-typology model of leadership for learning. A central finding of this study is that not only does this technique capture this difference, but that these differences are at the intersection of leadership and teaching connected to the concepts of leadership for learning. There is much to learn from these differences across the national contexts, especially in relation to areas in the current leadership theories that are "contested", such as with mentoring noted above. Fourth, the other countries/economies in the lower left quadrant including Argentina, Austria, Chile, Portugal, and Spain appear quite different given their location on the plot in Figure 12 in the congruency-typology model of leadership for learning from the other countries/economies represented. To date in the education leadership literature these national contexts have been understudied and this finding points to the need for further attention to understanding the differences in the leadership and teaching in these contexts. Fifth, countries/economies in the lower right quadrant appear to mostly be regionally related, as this quadrant includes the Baltic states, as well as Bulgaria, Georgia, and Romania. Finally, sixth, the upper left quadrant is quite interesting including France as well as many of the Nordic countries, Italy, and Japan among others.

Discussion

This report provides the results from a two-level latent class analysis model that tests a congruency-typology model of leadership for learning with the TALIS 2018 dataset of *n*=152 635 teachers, 9 079 principals/schools, and 47 countries/economies. Building on the past research reviewed in the literature review above that maps instructional leadership and leadership for learning frameworks to the TALIS 2018 items, with a focus on the five CALL survey domains, I find evidence for a three-group typology of teachers (CW1 52.4%, CW2 19.9%, CW3 27.7%), and a three-group typology of principals/schools, including a cross-level interaction between the teacher and principal/school levels (CB1 37.6% leadership for learning, CB2 35.4% low feedback, CB3 27.0% low mentoring). The evidence in this report is correlational only, as is the vast majority of research in education leadership and instructional leadership and leadership for learning specifically. Throughout this study and this discussion below, I make no causal claims as each of the relationships highlighted could be due to a variety of factors. The goal of this study is to surface and highlight the relationships across the variables (both measured and latent in the model) as they relate to the leadership for learning framework in an effort to understand and describe the work globally around instructional leadership and leadership for learning as measured through TALIS 2018 in participating countries/economies. As the model is fairly complex, I encourage future research to first replicate the findings reported here, and then extend them to further detail the framework and perceptions of leadership for learning globally.

The evidence from the indicator plots across these typologies at the teacher and leader levels suggests moving from a five domain leadership for learning framework (Bowers et al., 2017[20]; Halverson and Kelley, 2017[16]; Halverson, Kelley and Shaw, 2014[17]) to eight domains of 1) student assessment and feedback, 2) teacher assessment and feedback, 3) teacher self-efficacy and a common set of beliefs about learning, 4) professional development and trust, 5) professional collaboration on lessons, 6) mentoring and induction, 7) stakeholder engagement, and 8) a shared discipline climate. A reduced sample covariate model suggests that CW1 (52.4%) teachers who respond with high perceptions of leadership for learning are more often female, have Master's degrees, higher job satisfaction, are more experienced, and chose teaching as a career. CW2 (19.9%) teachers who have high self-efficacy, shared beliefs about learning, professional development, trust, engagement of stakeholders, and a shared discipline climate have the lowest stress as well as high job satisfaction and are least experienced. CW3 (27.7%) who receive moderate levels of feedback but have some of the lowest responses to leadership for learning have Masters degrees more often than CW2 teachers, but higher workload stress, and lower job satisfaction. At the principal/school level CB1 (37.8%) principals have the highest perceptions of leadership for learning and the highest congruency with their teachers, as CB1 schools have a majority of CW1 teachers. Principals in the CB1 leadership for learning schools have some teaching responsibilities, are trained in instructional leadership, and have high diversity beliefs and organisational innovativeness, with the schools being less often private schools with higher enrolment and lower migrant populations. CB2 (35.4%) principals have more moderate perceptions of leadership for learning with less congruency with their teachers. CB2 principals less often have a PhD degree, and have less training in school administration than CB3 principals. CB2 principals have received training in instructional leadership and have some teaching responsibilities. CB2 principals report more often having less autonomy over educational policies than CB3 principals. CB2 schools are somewhat higher enrolment and have higher levels of language learners that differ from the instructional language. CB3 (27.0%) principals have the low perceptions of

leadership for learning and are also less congruent with their teachers in comparison to CB1 schools. CB3 principals have the least teaching responsibilities, and are less often trained in teacher education and instructional leadership, and report lower levels of autonomy in staffing, budgeting, and instructional policy. CB3 principals also report more often that lack of resources are a problem in their school.

A central finding of this study is that across the TALIS 2018 data, not only are the majority of the teachers the CW1 type (52.4%) but that these teachers are more often in the CB1 schools, which are the highest proportion of schools (37.6%). The CB1 schools thus have the highest alignment in leadership for learning given the high prevalence of CW1 teachers. Combined with the covariate findings, this alignment, or "high-high" leadership for learning school type, suggests that these schools have highly trained, autonomous, experienced, and satisfied educational professionals that converge in similar notions of school leadership. An intriguing finding is that the principals of these schools report having been trained in instructional leadership more often, and have the highest diversity and organisational innovativeness beliefs. As the analysis here is correlational only, one interpretation may be that schools that have a high proportion of high leadership for learning CW1 teachers are able to recruit or promote high leadership for learning principals. On the other hand, it may be that high leadership for learning CB1 principals create a schooling environment, which promotes and sustains the development of high CW1 leadership for learning teachers. Or perhaps across schools and countries/economies it is a mix of these. However, it is striking that in examining the covariate results, as principals and teachers report lower levels of education, lower autonomy, and less interaction in the classroom there is an increase in CW2 (least experienced) and CW3 (least satisfied) teachers, and the alignment between leaders and teacher perceptions of leadership for learning decreases. Perhaps more experienced, satisfied, and well-trained professionals seek each other out across schools. However, at the policy level, this finding is intriguing as a means of examining possible directions for school improvement. These results suggest that perhaps the CW1/CB1 high leadership for learning alignment school may provide an interesting case of principal and teacher collaborative work, and so further study within each national context of these schools could provide useful directions for school improvement policy. Additionally, methods similar to the one used here could be used with TALIS 2018 survey items to identify these different school leadership for learning contexts within a nation or policy region. As noted in the previous research on using such methods to informatively cluster schools for cross-school professional development (Bowers, 2015[108]; Bowers, Ni and Esswein, 2018[109]), school personnel may benefit from structured professional development in which they are matched across schools either with similar schools identified through these methods, or perhaps pairing strongly aligned schools with those that wish to align more in leadership for learning.

While past research on transformational and instructional leadership has demonstrated a strong three factor model to support instructional leadership theory (Hallinger, 2011[4]; Robinson, Lloyd and Rowe, 2008[5]; Urick and Bowers, 2019[57]), past research on the five domains of leadership for learning has to date mostly been conceptual and theory focused (Boyce and Bowers, 2018[12]; Halverson and Kelley, 2017[16]; Halverson, Kelley and Shaw, 2014[17]). In this study I first worked to conceptually map the TALIS 2018 survey to the five CALL survey domains to provide a means to begin to understand leadership for learning globally through TALIS 2018. Nevertheless, this mapping is conceptual only. Additionally, as CALL survey items are focused on actions in schools, TALIS 2018 items have a mix of questions that ask how frequently a task occurs along with perception and dispositional items. As there are currently no datasets in which teachers and leaders responded to both CALL and TALIS 2018, it is not possible to statistically estimate the alignment of TALIS 2018 items to the five domains of leadership for learning. However, I

argue here that this conceptual alignment provided in this study provides a unique opportunity to leverage the large global sample of TALIS 2018 to begin to describe and understand how teachers and school leaders perceive their schools through a leadership for learning lens. As TALIS 2018 includes many questions beyond instructional leadership that align with leadership for learning, including human resource questions, adult development, and mentoring and induction, the present study is meant to be a first step in working to understand how the different aspects of leadership for learning may be enacted globally. Here, the results of the two-level LCA model suggest shifting from a five domain model of leadership for learning, to an eight-domain model, as the three-group typologies at the teacher and principal levels suggest that respondents may see three of the five original domains as each being two separate domains. These include separating a) monitoring teaching and learning to student assessment and feedback and teacher assessment and feedback, b) focus on learning to teacher self-efficacy and a common set of beliefs about teaching and learning as well as professional collaboration on lessons, and c) building nested learning communities to professional development and trust as well as mentoring and induction. Stakeholder engagement and a shared discipline climate for safe and effective schools remain from the original five-domain model. Thus, this expanded eight-domain model provides a means to identify the average differences across a complex survey such as TALIS 2018. I encourage future research to investigate further to what extent these proposed eight domains of leadership for learning are helpful in understanding TALIS 2018 response patterns.

A central finding of this study is that the congruency-typology framework is a useful means to capture the leadership climate across schools. This study builds upon the previous congruency-typology model examining leadership for learning with the CALL data in the United States (Bowers et al., 2017[20]), and demonstrates that the congruency-typology framework is able to capture not only interesting differences within and between schools, but also across countries/economies globally. Previous leadership typology research that has used latent class analysis with US samples and TALIS 2013 has shown that the most prevalent type of principal responder for instructional leadership is the responder type that responds highly across both transformational and instructional leadership survey items (Soncin, Bowers and Agasisti, 2018[23]; Urick and Bowers, 2014[11]). This result was replicated here and extended to the leadership for learning framework as the results showed that for the US context, the most prevalent responder is the high perception responder type, CB1, here extending to the congruency-typology framework with the majority of the teachers agreeing with the principal as CW1 teachers with high leadership for learning perceptions.

Continuing with a focus on the US results, it is intriguing that although the research that supports both theories of instructional leadership and leadership for learning, and the TALIS 2018 items, depends to a large extent on research from the US context, the results of this study suggest that the United States has only two of the three types globally of leadership for learning schools. A caveat is of course that these three types of leadership for learning schools are empirically defined through a very specific selection of variables from TALIS 2018 and the two-level latent class analysis congruency-typology model. Nevertheless, given the global conversation on both leadership for learning as well as policy in many nations attempting to implement instructional leadership theories and ideas (Aas and Paulsen, 2019[105]), this finding that the United States is missing one of the three types of schools is intriguing. I will note, that I am not arguing here that the US research is wrong, but rather that it may be incomplete, as US researchers have not had access in their context to this third school type in the typology. Indeed, in the original study using the CALL validation sample to survey leadership for learning in the United States and using a two-level latent class analysis congruency-typology model (Bowers et al., 2017[20]), while

a type of school in which the principal disagreed with teachers and had overall lower perceptions of leadership for learning than teachers on average was hypothesised, the study found no evidence for this congruency-typology type of school that would be similar to the CB3 type here. Thus, we must assume that the US research and theories do not include this possible third dimension of school leadership, as until the present more global OECD datasets have become available, it has not been possible to identify this issue. The third CB3 type here is a school in which principals and teachers do not agree on leadership for learning, and one in which the school leader identifies many different issues across leadership for learning as well as the covariates as challenges and issues for the school. The point that this model with the TALIS 2018 data captures the current global research issue that indicates that at the education policy level, mentorship by principals is "contested practice" across multiple national contexts (Kemmis et al., 2014[25]) provides a means to extend leadership for learning frameworks to include a wider global lens of schooling practice that includes these types of differences across national contexts, as mentorship is a key variable in CB3, and indeed throughout the leadership for learning framework.

A natural critique of course of these conclusions is that if the US school leadership research, context, and theories have been used to such an extent to lay the foundation of the items in TALIS 2018, and these theories were unaware of this third type of school leadership context, then how could this third type of leadership context be detected using these survey items and the leadership for learning framework? I argue that as the CB3 school type is in many ways a type of responder in which the TALIS 2018 items may not be able to capture their experiences, such as around mentoring, that the CB3 type perhaps is identifying disagreement globally with instructional leadership and leadership for learning, and that it is this disagreement that the model captures. Rather than indicating much about leadership for learning practice in CB3 schools, an alternative interpretation of the results is that these schools have a different set of theories of action from leadership for learning, and are merely disagreeing that the issues that are surveyed in the TALIS 2018 items are appropriate items for measuring what they do. This interpretation is supported by the strong disagreement that CB3 principals have around the mentorship and induction items on TALIS 2018. Thus, the CB3 type is capturing a type of leadership, but perhaps that type of leadership is neither instructional leadership nor leadership for learning. It is unclear from the results presented here to what extent any of the CB school-level types are related to more or less successful schools, as a link to student achievement outcomes was not available at the time of the analysis for this study. It may be that the CB3 school leadership type is unrelated to student achievement, or is focused on management over instruction. I encourage future research in this area.

Recent research using TALIS 2013 data and a single principal-level latent class analysis (Soncin, Bowers and Agasisti, 2018[23]) supports the findings of the present study. In Soncin et al. (2018[23]), the authors drew on the research on the integrated instructional leadership literature discussed above in the literature review (Marks and Printy, 2003[9]; Printy, Marks and Bowers, 2009[10]; Urick and Bowers, 2014[11]) comparing the responses of n=9,384 principals on TALIS 2013 for 32 countries/economies across items related to instructional leadership versus transformational and distributed leadership (Soncin, Bowers and Agasisti, 2018[23]). Relying on only the principal-level data, they find evidence with this framework for a four-group typology of integrating leaders (64.9%), supportive leaders (8.5%), participative leaders (22.2%), and contingent leaders (4.4%). These findings relate to the findings of the present study in three main ways. First, the finding that a high responder type is the majority corresponds to the previous research noted above in the instructional leadership literature as well as in the present study. Second, the majority integrating leader type, in which principal answers are near the top of the survey scales, was the most prevalent leader type in the United States. And third, the participative leader

type was the largest proportion of responders in Finland, Norway, and Japan, in which leaders generally did not agree with items relating to supporting new teacher practices, increasing responsibility towards teaching effectiveness, and increasing responsibility towards student outcomes but had high perceptions of participation in the schooling organisation by staff, parents, and students. Thus, similar to the results of the present study, the TALIS 2013 principal LCA study (Soncin, Bowers and Agasisti, 2018[23]) also identifies a large proportion of principals that disagree with the survey items around mentorship and instructional leadership, and these principals are more often in countries that for the present analysis are generally on the left side of the Figure 12 multi-dimensional scaling plot of country/economy differences across the model.

Thus, together, this past research along with the present study suggests that there are multiple countries/economies that disagree with a selection of items in TALIS, especially as they relate to instructional leadership and leadership for learning. For countries that are on the left side of Figure 12 here, and especially Finland, these findings suggest that these countries provide a unique opportunity to understand different dimensions of school leadership. Countries/economies with higher proportions of CB3 schools appear to have school leadership climates in which the principal identifies a lack of practices around instructional leadership and leadership for learning, as well as lack of autonomy around school processes and a lack of resources. Combining this issue with the dearth of instructional leadership and leadership for learning research from outside the United States, England (United Kingdom) and other proximal countries to this cluster in Figure 12, a central recommendation of the present study is to encourage researchers who are constructing these survey items to work much more closely with countries which have a high proportion of CB3 schools, as well as the countries in the other three quadrants of Figure 12. The perspectives of the principals and teachers in these schools are a vital set of information for how school leadership research, policy, and practice can understand the many and varied ways that school leadership may or may not influence instructional improvement that has historically been under-researched. Additionally, in constructing items for these surveys, and future iterations of TALIS, the results of this study suggest that researchers conduct cognitive interviews across national contexts, perhaps selecting a sample of countries from each of the four quadrants in Figure 12, to ensure that the items selected for global school leadership surveys capture these many and varied multiple perspectives. These results also point to the need for much more in-depth qualitative research that examines deeply the lived experiences and practices of school leaders and teachers across the countries/economies in the different quadrants. In-depth comparison case studies could radically improve and inform the research on the differences across leadership contexts as suggested through the results presented here.

Moreover, Figure 12 provides an interesting opportunity for school leadership and policy development for countries/economies within each quadrant. These countries share some component of agreement from their teachers and principals across TALIS 2018 in the congruency-typology model of leadership for learning. In the search for collaboration in school improvement across national contexts, countries/economies near each other in Figure 12 may find unexpected similarities across their contexts in the perceptions of their teachers and leaders, and thus could create conversations that could surface important issues that separate what is idiosyncratic across the contexts versus what could be generalizable. This type of clustering school contexts for professional development and dialogue through using these types of pattern analytic methods, such as typology analysis of survey items or achievement trajectories, is an emerging area of research and professional development practice (Bowers, 2015[108]; Bowers, Ni and Esswein, 2018[109]), and I encourage future research in this area.

And finally, as with many of the global studies of education systems cited above, the present study also identifies Finland as a unique context. This is especially striking given the differences from the United States findings. Yet, while Finland has received considerable attention in the media and research, much of that research has been focused at the classroom level (Sahlberg, 2007[106]; 2011[107]). The results of the present study suggest that the school leadership context and the congruency with teacher perceptions of that context may be just as important, if not more so. Given these findings, I encourage future research to include not only a focus on Finnish teachers and classrooms, but to also deeply investigate Finnish school leadership and the interplay between teachers and leaders, and how this differs across national contexts. The mentorship research that involves researchers from Australia, Finland, and Sweden (Kemmis et al., 2014[25]) is an excellent example of the types of collaborative research that can help to highlight these differences and similarities with important implications for research, policy, and practice.

Limitations

While I argue here that the results of this study are robust, this study is limited in multiple ways. First, there may be additional typology groups at both the Level 1 teacher level and the Level 2 principal/school level. The research methods in mixture modelling and latent class analysis is a rapidly evolving field (Nylund-Gibson, Grimm and Masyn, 2019[103]), and the multilevel extension of these models has received much less attention than the single-level model research methods to date (Park and Yu, 2018[93]). As the research continues to advance in the multilevel LCA domain, I encourage future research to build on the findings here, as there are most likely additional subgroups of both teachers and principals/schools. Here the interpretation of the LCA results should be interpreted as that there are at least three groups at Level 1 and at least three groups at Level 2. Second, measurement invariance (Kim et al., 2016[110]; Kim and Wang, 2019[111]; Masyn, 2017[112]; Vandenberg and Lance, 2000[113]) is an issue widely acknowledged to impact any study with OECD data that includes cross-country comparisons, especially as the issue of measurement invariance applies not just to the individual items, but here also to the latent typology variables. This issue arises when there is a cultural difference in how participants respond, such as for students reporting mathematics confidence, where in the US they would provide high confidence on average, in many Asian countries few students will select the highest response on these types of survey questions (Kim and Wang, 2019[111]). Thus, average differences across national contexts would be cultural and difficult to compare. I acknowledge that the measurement invariance issue may be an issue in the results of the present study. However, given how little is known across national contexts about instructional leadership and leadership for learning, as discussed throughout this study, I argue that even if measurement invariance is an issue, the differences across country/economy contexts are still important to consider for theory, policy, and practice. Currently the estimation of the level of measurement invariance across a two-level latent class analysis with three groups at Level 1 across 30 variables, three groups at Level 2 across 41 variables, and across 47 countries is beyond the scope of the present study. The research literature in this domain however is continuing to advance, and so I encourage future research to investigate this issue.

Third, the model included neither a country/economy "third level" nor country fixed effects in the covariate regressions as a well-known issue in multilevel models is that statistical power is dominated by the size of the sample in the highest level, and so 47 is quite low. This is compounded in mixture models as the number of parameters expands rapidly with each class, and statistical power, even with large samples, is limited, and thus researchers are urged to specify only the minimum most parsimonious model needed (Collins and

Lanza, 2010[83]; Dziak, Lanza and Tan, 2014[114]). Additionally, model convergence of the model specified here with over 150 000 teachers was computationally intensive given current computer hardware limitations. Here, as one of the first studies to do so, the focus of the present study was to examine the congruency-typology leadership for learning framework across the entire TALIS 2018 dataset. I encourage future researchers to explore the extent to which either a third level or an additional set of covariates, such as country/economy fixed effects, could be included in the model, especially as model estimation software and computer hardware continues to advance.

Fourth, one threat to the internal validity of the present study is the mixture of TALIS 2018 items and scales in the enumeration of the latent classes, as a small number of scales were included to identify the latent classes. A well-known issue with scaled items that are factors of combined individual items in OECD surveys is the issue of measurement invariance of individual scales (Ainley and Carstens, 2018[18]; Van De Vijver et al., 2019[115]). As some of these scales did not reach scalar invariance, one critique of the present study is that this makes cross-country comparisons problematic. However, as country/economy was not included in the model, this issue may be attenuated somewhat. Fifth, at the covariate level, specific countries across the TALIS survey may have within-country system mandates that require a specific response, such as mandating Masters degrees for principals. This could create an additional threat to the internal validity of the study as this type of issue could induce a system or country fixed effect into the covariate component of the model. However, as the full specification of the model did not include covariates, as the covariate model used the smaller sample (see methods), this issue is not applicable to the main findings beyond a possible effect on the covariates themselves. I encourage future research to consider this issue.

And finally, the present study does not include student achievement outcomes. It is of interest to know which teacher types and which school types are related to higher student achievement, such as on the PISA tests. At the time of this writing, a link between TALIS 2018 and PISA results is not available. However, this type of link between the datasets is planned by the OECD for a subset of countries/economies, and so I encourage future research to investigate this issue.

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Annex A. CALL and TALIS 2018

	CALL Subdomains	TALIS 2018 Teachers	TALIS 2018 Principal
1. Focus on Learning			
Alignment	1.1 Maintaining a school-wide focus on learning	Teacher self-efficacy overall TQ34a-l TQ32a-d TQ48f - school staff share a common set of beliefs about teaching and learning	Academic Press PQ27a,b,c,f PQ26g - school staff share a common set of beliefs about teaching and learning PQ22f - I took actions to ensure that teachers feel responsible for their students' learning outcomes
Alignment	1.2 Formal leaders are recognized as instructional leaders	TQ48a,h -This school provides staff with opportunities to actively participate in school decisions - lead new initiatives	PQ19e – teachers included on management team PQ26a,i - school provides staff with opportunities to actively participate in school decisions -school encourages staff to lead new initiatives
	1.3 Collaborative design of integrated learning plan	TCOLL – professional collaboration TQ33a,b,c,h TQ48h - school encourages staff to lead new initiatives	PQ22d - took actions to support co-operation among teachers to develop new teaching practices PQ26f,i - There is a collaborative school culture which is characterised by mutual support - This school encourages staff to lead new initiatives
	1.4 Providing appropriate services for students who struggle	TQ49d - If a student needs extra assistance, the school provides it	N/A
2. Monitoring Teaching and Learning			
	2.1 Formative evaluation of student learning	Instructional assessment and feedback TQ43a,b,c,d,e	PQ26c - school provides students with opportunities to actively participate in school decisions
Alignment	2.2 Summative evaluation of student learning	TQ29b,d – types of feedback student evals – state tests	PQ24b,d– information used in formal appraisal of teachers student evals – test scores
	2.3 Formative evaluation of teaching	Engagement in collaborative activities TQ33a-h	PQ36a,c,d,e,f – mentoring provided for improving teaching practice PQ22b - I observed instruction in the classroom
	2.4 Summative evaluation of teaching	TQ29a,c,f – teaching observation - assessment of content knowledge - self-assessment portfolio	PQ24a-f – types of information used in teacher work appraisals PQ22c - I provided feedback to teachers based on my observations
3. Building Nested learning Communities			
Alignment	3.1 Collaborative school-wide focus on problems of teaching and learning	TCEXCH – Exchange and coordination for teaching TQ33d,e,f,g TQ48d,f - school has a culture of shared responsibility for school issues -staff share a common set of beliefs about teaching and learning	PQ26d,g -school has a culture of shared responsibility for school issues -staff share a common set of beliefs about teaching and learning PQ22d - I took actions to support co-operation among teachers to develop new teaching practices
	3.2 Professional learning	TQ22a-i PD participation types Effective professional development TQ26a-k	PQ22e - I took actions to ensure that teachers take responsibility for improving their teaching skills

	CALL Subdomains	TALIS 2018 Teachers	TALIS 2018 Principal
Alignment	3.3 Socially distributed leadership	TQ48d - school has a culture of shared responsibility for school issues TQ49e - Teachers can rely on each other	PQ26d- school has a culture of shared responsibility for school issues -Teachers can rely on each other PQ26k - Teachers can rely on each other
	3.4 Coaching and mentoring	TQ22g – PD as peer/self-observation or coaching	PQ34 PQ35 – teacher access to mentors and subject mentors PQ25d - A mentor is appointed to help the teacher improve his/her teaching
4. Acquiring and Allocating Resources			
Alignment	4.1 Personnel practices	TQ19a,b TQ21a,b – induction - mentoring	PQ31a,b PQ32, PQ34 – induction - mentoring
	4.2 Structuring and maintaining time	TQ18b – Time on team work and dialogue with colleagues within this school	PQ21c – time on developing curriculum, teaching, classroom observations, student evaluation, mentoring teachers, teacher professional development PQ22d - I took actions to support co-operation among teachers to develop new teaching practices
	4.3 School resources are focused on student learning	TQ49b,c,d – teachers interested in student well-being – what students have to say – provide extra assistance	N/A
	4.4 Integrating external expertise into school instruction program	TQ22a,b,c,d,e,f,h,i - PD outside of school org	N/A – questions focused on principal PD, not how they direct teacher PD
Alignment	4.5 Coordinating and supervising relations with families and the external communities	TSCSTAKE TQ48b - This school provides parents or guardians with opportunities to actively participate in school decisions	PSCSTAKE Parent-community involvement PQ27d,e,g PQ26b - school provides parents or guardians with opportunities to actively participate in school decisions PQ22g - I provided parents or guardians with information on the school and student performance
5. Maintaining a Safe and Effective Learning Environment			
Alignment	5.1 Clear, consistent and enforced expectations for student behaviour	TQ48g - school staff enforces rules for student behaviour consistently throughout the school	PQ26h - school staff enforces rules for student behaviour consistently throughout the school
	5.2 Safe learning environment	TQ49a - Teachers and students usually get on well with each other TQ49b - Most teachers believe that the students' well-being is important.	Student delinquency scale PQ30a,b,c,d PQ22a - I collaborated with teachers to solve classroom discipline problems
	5.3 Student support services provide safe haven for students who traditionally struggle	TQ49d – if a student needs extra assistance they get it	N/A
	5.4 Buffering the teaching environment	N/A	N/A
TALIS Specific			
	Innovation	Team innovativeness TQ32a,b,c,d	Organisational innovativeness PQ28a,b,c,d
	Equity and diversity	Diversity practices TQ47a,b,c,d	Diversity practices PQ38a,b,c,d

Note: *The "Alignment" designation in the left-most column denotes instances where there is conceptual alignment between the teacher and principal levels between CALL and TALIS 2018.

Annex B. Mplus code for the 2-level Latent Class Analysis Model

```
TITLE:      TALIS 2-Level CB3 CW2 full level 2 with covariates;
DATA:       FILE = C:\Bowers\20190503\20190503 Full data both levels 01.dat;
VARIABLE:   NAMES = CTYSCHID CTEACHID IDTEACH IDSCHOOL SCHWGT TCHWGT IDCNTRY
                    T3SELF T3TEAM TT3G48F TT3G48A TT3G48H
                    T3COLES TT3G43A TT3G43B TT3G43C TT3G43D
                    TT3G29D4 TT3G29E4 TT3G29A4 TT3G29C4 TT3G29F4
                    T3EXCH NumPDAct T3EFFPD TT3G48D TT3G49E
                    MENTORIN TT3G19A3 TT3G19B3 TT3G18B TT3G49B
                    TT3G49C T3STAKE TT3G48B TT3G48G TT3G49A
                    TFEMALE THS_PLUS TASSOC TBACH TMS_PH
                    T3JSENV T3JSPRO T3WELS T3WLOAD T3JOBSA
                    T3DIVP NOREGQUAL ELCONSUB ELPEDSUB ELGENPED
                    ELCLASPRA ELMIX ELMULTI ELCROSSCUR ELICT
                    ELBEHAV ELMONDEV CARPATH INFCHILDRN TEACH1CAR
                    TT3G11B TYRSCERT TNOTPERM TNOTFTE HISPED
                    TREADING TMATH TSCIENCE TSOCSTUD TLANGS
                    TANCIENT TTECH TART TPHSYED TRELIGON
                    TVOCED TOTHER
                    TT3G16
                    TC3G27A_01 TC3G27B_01 TC3G27C_01 TC3G27F_01 TC3G26G_01
                    TC3G22F_01 TC3G19E_01 TC3G26A_01 TC3G26I_01 TC3G22D_01
                    TC3G26F_01 TC3G24B6_01 TC3G24D6_01 TC3G24E6_01 TC3G22C_01
                    TC3G36A_01 TC3G36C_01 TC3G36D_01 TC3G36E_01 TC3G36F_01
                    TC3G24A2_01 TC3G24B2_01 TC3G24C2_01 TC3G24D2_01 TC3G24E2_01
                    TC3G24F2_01 TC3G26D_01 TC3G22E_01 TC3G26K_01 TC3G25D_01
                    TC3G34_01 TC3G35_01 TC3G21C_01 TC3G31A_01 TC3G31B_01
                    T3PCOM_01 TC3G22G_01 TC3G27G_01 TC3G26H_01 T3PDELI_01
                    TC3G22A_01
                    L_FEMALE L_HS_PLUS L_ASSOC L_BACH L_MS_PH
                    FTE_NOTEACH FTE_TEACH PTE_NOTEACH PTE_TEACH NO_ADMINTRAIN
                    NO_TEDTRAIN NO_INSTLTRAIN TC3G04A TC3G04B TC3G04C
                    TC3G04D TC3G04E STRATIO TPRATIO TARATIO
                    RURAL CITY NOSTAFF NOBUD NOEDPOL
                    NOINSTPOL LACKRES PRINCAGE T3PDIVB T3PORGIN
                    T3PJSENV T3PWLOAD PRIVATE HITEATURN ENROLLK
                    HILANGDIFF L_HISPED HIECODIS HIMIGRANT HIREFUGE;
            MISSING = ALL(99999);
            IDVARIABLE = CTEACHID;
            WEIGHT = TCHWGT;
            BWEIGHT = SCHWGT;
            !WITH Covariates
            USEVARIABLES = T3SELF T3TEAM TT3G48F TT3G48A TT3G48H
                    T3COLES TT3G43A TT3G43B TT3G43C TT3G43D
                    TT3G29D4 TT3G29E4 TT3G29A4 TT3G29C4 TT3G29F4
                    T3EXCH NumPDAct T3EFFPD TT3G48D TT3G49E
                    MENTORIN TT3G19A3 TT3G19B3 TT3G18B TT3G49B
                    TT3G49C T3STAKE TT3G48B TT3G48G TT3G49A
                    TC3G27A_01 TC3G27B_01 TC3G27C_01 TC3G27F_01 TC3G26G_01
                    TC3G22F_01 TC3G19E_01 TC3G26A_01 TC3G26I_01 TC3G22D_01
                    TC3G26F_01 TC3G24B6_01 TC3G24D6_01 TC3G24E6_01 TC3G22C_01
                    TC3G36A_01 TC3G36C_01 TC3G36D_01 TC3G36E_01 TC3G36F_01
                    TC3G24A2_01 TC3G24B2_01 TC3G24C2_01 TC3G24D2_01 TC3G24E2_01
                    TC3G24F2_01 TC3G26D_01 TC3G22E_01 TC3G26K_01 TC3G25D_01
                    TC3G34_01 TC3G35_01 TC3G21C_01 TC3G31A_01 TC3G31B_01
                    T3PCOM_01 TC3G22G_01 TC3G27G_01 TC3G26H_01 T3PDELI_01
                    TC3G22A_01
                    TFEMALE TBACH TMS_PH
                    T3WLOAD T3JOBSA
                    ELCONSUB ELPEDSUB ELGENPED
```

```
                ELCLASPRA ELMIX ELMULTI ELCROSSCUR ELICT
                ELBEHAV ELMONDEV CARPATH INFCHILDRN TEACH1CAR
                TT3G11B TNOTFTE HISPED
                TREADING TMATH TSCIENCE
                L_FEMALE L_BACH L_MS_PH
                FTE_NOTEACH NO_ADMINTRAIN
                NO_TEDTRAIN NO_INSTLTRAIN TC3G04B STRATIO
                RURAL CITY NOSTAFF NOBUD NOEDPOL NOINSTPOL
                LACKRES T3PDIVB T3PORGIN T3PJSENV
                T3PWLOAD PRIVATE HITEATURN ENROLLK HILANGDIFF
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                TC3G24F2_01 TC3G26D_01 TC3G22E_01 TC3G26K_01 TC3G25D_01
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                NO_TEDTRAIN NO_INSTLTRAIN TC3G04B STRATIO
                RURAL CITY NOSTAFF NOBUD NOEDPOL NOINSTPOL
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                MENTORIN TT3G19A3 TT3G19B3 TT3G18B TT3G49B
                TT3G49C T3STAKE TT3G48B TT3G48G TT3G49A
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                    ELCLASPRA ELMIX ELMULTI ELCROSSCUR ELICT
                    ELBEHAV ELMONDEV CARPATH INFCHILDRN TEACH1CAR
                    TT3G11B TNOTFTE HISPED
                    TREADING TMATH TSCIENCE;


            %BETWEEN%
            %OVERALL%
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                    NO_TEDTRAIN NO_INSTLTRAIN TC3G04B STRATIO
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Annex C. Teacher LCA indicator variables with CALL domain conceptual mapping and new 8 domains mapping

Variable	Variable label	CALL domain	8 Domain
Above mean teacher self-efficacy	T3SELF	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Above mean team innovativeness	T3TEAM	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
School staff share a common set of beliefs about teaching and learning	TT3G48F	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
School provides staff w. opp. to actively participate in school decisions	TT3G48A	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
School encourages staff to lead new initiatives	TT3G48H	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Above mean professional collaboration in lessons among teachers	T3COLES	Focus on learning	Professional Collaboration Lessons
I administer my own assessment to assess student learning	TT3G43A	Monitoring teaching and learning	Student assessment
I provide written feedback on student work to assess student learning	TT3G43B	Monitoring teaching and learning	Student assessment
I let students evaluate their own progress to assess student learning	TT3G43C	Monitoring teaching and learning	Student assessment
I observe students working on particular tasks to assess student learning	TT3G43D	Monitoring teaching and learning	Student assessment
I receive feedback on my students external results	TT3G29D4	Monitoring teaching and learning	Teacher feedback
I receive feedback on school-based and classroom-based results	TT3G29E4	Monitoring teaching and learning	Teacher feedback
I receive feedback on my observation of classroom teaching	TT3G29A4	Monitoring teaching and learning	Teacher feedback
I receive feedback on assessment of my content knowledge	TT3G29C4	Monitoring teaching and learning	Teacher feedback
I receive feedback on self-assessment of my work	TT3G29F4	Monitoring teaching and learning	Teacher feedback
Above mean exchange and co-operation among teachers	T3EXCH	Building nested learning communities	PD & trust
Above mean number of different prof dev activities	NUMPDACT	Building nested learning communities	PD & trust
Above mean effective professional development	T3EFFPD	Building nested learning communities	PD & trust
School has a culture of shared responsibility for school issues	TT3G48D	Building nested learning communities	PD & trust
Agree Teachers can rely on each other	TT3G49E	Building nested learning communities	PD & trust
Teacher is an assigned mentor or has been assigned a mentor	MENTORIN	Building nested learning communities	Mentoring and induction
Have taken part in formal induction activities	TT3G19A3	Building nested learning communities	Mentoring and induction
Have taken part in informal induction activities	TT3G19B3	Building nested learning communities	Mentoring and induction
Above average hours spent on team work and dialogue with colleagues	TT3G18B	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
Most teachers believe that student well-being is important	TT3G49B	Acquire and allocate resources	Stakeholder engagement (teachers & parents)

Variable	Variable label	CALL domain	8 Domain
Most teachers are interested in what students have to say	TT3G49C	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
Above average participation among community stakeholders in school	T3STAKE	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
School provides parents/ guardians with opportunities for active participation in school decisions	TT3G48B	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
School staff enforce rules for student behaviour consistently	TT3G48G	Safe and effective environment	Shared discipline climate
Teachers and students usually get on well with each other	TT3G49A	Safe and effective environment	Shared discipline climate

Annex D. Principal LCA indicator variables with CALL domain conceptual mapping and new 8 domains mapping

Variable	Variable label	CALL domain	8 Domain
Teachers understand school curricular goals	TC3G27A	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Teachers succeed in implementing the schools curriculum	TC3G27B	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Teachers hold high expectations for student achievement	TC3G27C	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Students have a desire to do well in school	TC3G27F	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
School staff share common set of beliefs about teaching and learning	TC3G26G	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Ensuring teachers feel responsible for their students learning outcomes	TC3G22F	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Teachers represented on school management team	TC3G19E	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Providing staff with opportunities to participate in school decisions	TC3G26A	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
This school encourages staff to lead new initiatives	TC3G26I	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Supporting co-operation among teachers to develop new teaching practices	TC3G22D	Focus on learning	Professional Collaboration Lessons
Collaborative school culture which is characterised by mutual support	TC3G26F	Focus on learning	Teacher self-efficacy & common set of beliefs about teaching
Student survey responses related to teaching used in this school	TC3G24B6	Monitoring teaching and learning	Teacher feedback
Students external results used in this school	TC3G24D6	Monitoring teaching and learning	Teacher feedback
School-based and classroom-based results used in this school	TC3G24E6	Monitoring teaching and learning	Teacher feedback
I provided feedback to teachers based on my observations	TC3G22C	Monitoring teaching and learning	Teacher feedback
Mentoring important to improve teachers pedagogical competence	TC3G36A	Monitoring teaching and learning	Mentoring and induction
Mentoring important to improve teachers collaboration with colleagues	TC3G36C	Monitoring teaching and learning	Mentoring and induction
Mentoring important to support less experienced teachers in their teaching	TC3G36D	Monitoring teaching and learning	Mentoring and induction
Mentoring important to expand teachers main subject(s) knowledge	TC3G36E	Monitoring teaching and learning	Mentoring and induction
Mentoring important to improve students general performance	TC3G36F	Monitoring teaching and learning	Mentoring and induction
Principal uses observations of classroom teaching as formal appraisal of teachers' work	TC3G24A2	Monitoring teaching and learning	Teacher feedback
Principal uses student survey responses related to teaching as formal appraisal of teachers' work	TC3G24B2	Monitoring teaching and learning	Teacher feedback
Principal uses assessments of teachers content knowledge as formal appraisal of teachers' work	TC3G24C2	Monitoring teaching and learning	Teacher feedback
Principal uses students external results as formal appraisal of teachers' work	TC3G24D2	Monitoring teaching and learning	Teacher feedback
Principal uses school-based and classroom-based results as appraisal of teachers' work	TC3G24E2	Monitoring teaching and learning	Teacher feedback

Variable	Variable label	CALL domain	8 Domain
Principal uses self-assessments of teachers work as appraisal of teachers' work	TC3G24F2	Monitoring teaching and learning	Teacher feedback
This school has a culture of shared responsibility for school issues	TC3G26D	Building nested learning communities	PD & trust
Ensuring teachers take responsibility for improving their teaching skills	TC3G22E	Building nested learning communities	PD & trust
Agree Teachers can rely on each other	TC3G26K	Building nested learning communities	PD & trust
A mentor is appointed to help the teacher improve his/her teaching	TC3G25D	Building nested learning communities	PD & trust
Teacher access to mentoring programme	TC3G34	Building nested learning communities	PD & trust
Mentors main subject field(s) same as that of teacher being mentored	TC3G35	Building nested learning communities	PD & trust
Above mean % of time spent on prof. tasks curric. and teach related tasks and meetings	TC3G21C	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
Formal induction programme for new teachers	TC3G31A	Acquire and allocate resources	Mentoring and induction
Informal induction activities for new teachers	TC3G31B	Acquire and allocate resources	Mentoring and induction
Above mean stakeholder involvement	T3PCOM	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
I provided parents/guardians with info on school and student performance	TC3G22G	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
The school co-operates with the local community	TC3G27G	Acquire and allocate resources	Stakeholder engagement (teachers & parents)
School staff enforce rules for student behaviour consistently	TC3G26H	Safe and effective environment	Shared discipline climate
Above mean school delinquency and violence	T3PDELI	Safe and effective environment	Shared discipline climate
I collaborated with teachers to solve classroom discipline problems	TC3G22A	Safe and effective environment	Shared discipline climate