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Abstract

The present study addresses the question of whether school leadership matters. It employs second-order meta-analysis to synthesise results from 12 first-order meta-analyses examining school leadership effects published 2003-2019. These meta-analyses collectively examined 512 primary studies published across four decades (1978-2019). Results showed that the overall mean effect size for school leadership was small in magnitude (r = .33). Effect sizes for leadership models were larger than those for leadership practices, thereby indicating the utility of examining models as compared to practices for understanding leadership influence. Relatedly, findings of significant positive effects for eight different school leadership practices underscore the need to examine comprehensively the scope of school leaders' work beyond that related to teaching-and-learning. Additionally, leaders require myriad competencies and skills including how to galvanize, motivate, and equip teachers to achieve school goals. The substantially larger mean effect sizes for organizational and teacher as compared to student outcomes challenge the assertion by some that principals are less consequential than teachers in contributing to school effectiveness. Indeed, the larger effect sizes for principals as compared to other types of leaders reflect the key role they play in leading schools.

Keywords: leadership models, leadership practices, principals, school leadership, second-order meta-analysis

Second-order Meta-analysis Synthesising the Evidence on Associations between School Leadership and Different School Outcomes

School leaders, comprising principals, vice-principals, and teacher leaders, exercise their "influence on organizational members and diverse stakeholders toward the identification and achievement of the organization's vision and goals" (Leithwood, 2012, p. 3). They develop and promote the school vision on student learning, and align the school philosophy, structure, and activities to achieve this shared vision (Bush & Glover, 2003). In the process, they channel school resources, build the capacity of their schools, and engage external stakeholders.

Given their potential impact, many researchers examine how school leaders exercise influence (e.g., leadership models) and what they do (e.g., leadership practices). However, results show that leadership influence on student achievement is even smaller than that of classroom teaching (Leithwood, Day, Sammons, Harris, & Hopkins, 2006), thereby raising the question of whether school leadership matters in the first place. If it does, which leadership models and practices are most important and what do they influence? For example, some researchers advocate that leaders prioritize teaching-and-learning over other areas but does this recommendation understate the complexity of leadership?

A literature review indicates that the aforementioned questions are not adequately addressed because most studies collect limited data that preclude the comparison of the influence of different leadership variables on various outcomes or the investigation of contextual and methodological factors moderating leadership-outcome relationships. Without an informed evidence base, policymakers and leadership developers have little to rely on when deciding what school leaders should prioritize or do. Indeed, school leaders risk being overwhelmed by the " dizzying set of responsibilities" with respect to different stakeholders (Liebowitz & Porter, 2019; p. 786). The knowledge gap also means that school leaders are unable to identify specific areas where their leadership can contribute maximally.

In addressing the knowledge gap, the present study employs second-order meta-analysis to synthesise results from first-order meta-analyses (or "meta-analyses" hereafter) examining the effects of school leadership models and practices. This analytical strategy enables findings from the large number of meta-analyses published (2003-2019) to be summarised and broad insights to be derived. These meta-analyses collectively examine hundreds of primary studies dated 1978-2019. Such data are not easily available for analysis from an individual primary study or even in a first-order meta-analysis.

Leadership Models

School leaders adopt different leadership models, three of which have received more scrutiny than others (Gumus, Bellibas, Esen, & Gumus, 2018). First, instructional leadership, prioritizing the improvement of teaching-and-learning, emerges from the quest to identify effective principals in the 1960s (Gumus et al, 2018). However, it was Hallinger and Murphy (1985) who brought clarity to the field with their three-dimensional model (defining the school mission, managing the instructional program, promoting positive school learning climate). Presently, there is a consensus that school leaders should focus on improving the quality of teaching-and-learning to improve student outcomes (Boyce & Bowers, 2018; Daniëls, Hondeghem, & Dochy, 2019; Dimmock & Tan, 2016; Hallinger & Kovacevic, 2019). Instructional leadership originally emphasizes principals' role (Gumus et al, 2018) but related

conceptions (e.g., learning-centred leadership) adopt a more inclusive definition of leadership sources in the school (Bush, 2003).

Second, transformational leadership contends that hierarchical position (Leithwood & Poplin, 1992) is less important than charisma in motivating teachers and students to achieve school goals (Shamir & Howell, 1999). According to Marks and Printy (2003), "transformational leaders motivate followers by raising their consciousness about the importance of organizational goals and by inspiring them to transcend their own self-interest for the sake of the organization'' (p. 375). For example, Bass (1998) identified four main components of transformational leadership: idealized influence, inspirational motivation, intellectual stimulation, individual consideration.

Third, distributed leadership recognizes that schools operate in complex environments and therefore, all school members must be empowered in decision-making to improve the school (Spillane, 2005). This empowerment leverages members' expert knowledge and mitigates principals' time pressure (Cuban, 1988; Huber, 2004). Indeed, the growing literature on teacher leadership (e.g., participative leadership, leadership as organizational quality, distributed leadership, parallel leadership) characterizes teachers as being involved in coordination and management, curriculum work, professional development of colleagues, school improvement, parental and community involvement, professional contributions, and pre-service teacher education (York-Barr & Duke, 2004).

Given the different emphases, it is important to ascertain the relative effectiveness of different leadership models. However, some meta-analyses focus on only one type of leadership model or practices associated with the model. For example, Sisman (2016) focused on instructional leadership model and practices while Leithwood and Sun (2012) focused on transformational leadership practices. Other meta-analyses compare effects for different leadership models, but they are limited in their coverage of studies. For example, Karadag (2020) compared the effectiveness of instructional, transformational, and distributed leadership models but only using data from studies dated 2008-2018. Therefore, the present study will ascertain associations between the three school leadership models and school outcomes.

Leadership Practices

In contrast to leadership models, some researchers examine what leadership do. It is useful to examine leadership practices because researchers may measure the same model by different practices (compare Leitner (1994) with May & Wagemaker (1993)). Practices associated with the same leadership model may also differ in their association with student learning. For example, Robinson and colleagues (2008) showed that school leaders' promotion of and participation in teacher learning was almost three times as important as their ensuring orderly and supportive environments although both practices are related to instructional leadership. Furthermore, different leadership models may comprise similar or related practices (e.g., communicating school goals in instructional leadership vs building goal consensus in transformational leadership), so it is difficult to compare the contribution of these models meaningfully.

A review of leadership frameworks (Leithwood, 2012; Murphy, Elliot, Goldring, & Porter, 2006; Sebring, Allensworth, Bryk, Easton, & Luppescu, 2006; Swaffield, & MacBeath, 2009), leadership models (Bennett, Wise, Woods, & Harvey, 2003; Hallinger & Murphy, 1985; Sun & Leithwood, 2012), research on different leaders in the school hierarchy (Hallinger & Murphy, 1985; York-Barr & Duke, 2004), cross-cultural leadership research (Gurr, 2015;

Hallinger & Murphy, 1985; Walker & Qian, 2012, 2015; Wang, 2007; Yin, Lee, & Wang, 2014), and reviews of leadership practices (Hitt & Tucker, 2016) reveals nine leadership practices that school leaders are engaged in.

The first two practices, enhancing teaching-and-learning and building a shared vision and values, are directly related to learning-centred leadership. Leaders enhance the quality of teaching-and-learning by ensuring that teaching caters to student needs; developing, monitoring, and improving instructional programs; evaluating instruction; protecting instructional time; providing incentives for learning; helping students to excel academically; monitoring student progress; maintaining a safe and orderly environment; and contributing to district curriculum design (Hallinger & Murphy, 1985; Leithwood, 2012; Murphy et al, 2006; Sebring et al, 2006; Sun & Leithwood, 2012; Walker & Qian, 2015; York-Barr & Duke, 2004). Allied to enhancing teaching and learning is building shared vision and values. This leadership practice includes school leaders building goal consensus; setting performance expectations; communicating the vision and goals; maintaining high performance expectations; strengthening the school culture to facilitate teaching-and-learning; and being visible by modelling aspirational and ethical practices (Gurr, 2015; Hallinger & Murphy, 1985; Leithwood, 2012; Murphy et al, 2006; Sebring et al, 2006; Sun & Leithwood, 2012).

Beyond learning-centred leadership practices, there are seven other leadership practices examined in the literature. Three leadership practices enhance teacher capacity (providing professional development, empowering teachers, motivating teachers), thereby addressing teacher needs for competence, autonomy, and relatedness respectively (Eyal & Roth, 2011; Shepherd-Jones & Salisbury-Glennon, 2018). Teachers are professionally developed when leaders provide opportunities for the entire faculty to learn, provide intellectual stimulation, foster staff responsibility for learning, create communities of practice, and embrace continuous learning (Gurr, 2015; Hallinger & Murphy, 1985; Leithwood, 2012; Murphy et al, 2006; Sebring et al, 2006; Sun & Leithwood, 2012; York-Barr & Duke, 2004). School leaders empower teachers by establishing collaborative decision-making processes, inculcating shared accountability, and sharing and distributing leadership (Bennett et al, 2003; Gurr, 2015; Leithwood, 2012; Sebring et al, 2006; Sun & Leithwood, 2012; Swaffield & MacBeath, 2009). School leaders motivate their colleagues by providing individualized consideration and support; building trusting relationships; supporting, buffering, and recognizing staff; and providing contingent rewards and other incentives (Hallinger & Murphy, 1985; Leithwood, 2012; Murphy et al, 2006; Sebring et al, 2006; Sun & Leithwood, 2012).

The next two leadership practices pertain to organizational responsibilities (managing organizational resources, redesigning the school for improvement). Resource management is exemplified by leaders selecting, acquiring, and allocating resources to realize school goals, promoting data use for continual improvement, and considering school contexts to maximize organizational functioning (Leithwood, 2012; Murphy et al, 2006; Sebring et al, 2006). Leaders adopt a long-term perspective by redesigning the school (Dimmock, 2000). This practice has only recently begun to receive scholarly attention (e.g. Gurr, 2015). It involves leaders questioning existing processes and participating in school improvement.

The last two leadership practices comprise responsibilities beyond the school confines (engaging families and community, managing external accountability pressures and relationships). Engaging families and community to support student learning recognizes that students need continuous positive influence in school and at home (Murphy et al, 2006; Sebring et al, 2006). It comprises school leaders building productive relationships and collaborating with

families and community partners to strengthen student learning, and anchoring the school in the community (Leithwood, 2012; Murphy et al, 2006; Sebring et al, 2006; Sun & Leithwood, 2012; York-Barr & Duke, 2004). In addition to engaging families and the community, school leaders need to manage external accountability pressures and relationships (e.g., cultivating relationships with education officials and influential individuals). This practice is encapsulated in theoretical frameworks such as the Ontario Leadership Framework (Leithwood, 2012) and Learning-Centred Leadership Framework (Murphy et al, 2006) and in some scholarly works in Asia (Walker & Qian, 2012, 2015; Wang, 2007; Yin et al., 2014).

Given the broad range of leadership practices, it is important for school leaders to know what leadership practices are more important than others. However, most meta-analyses do not cover leadership practices comprehensively (Leithwood & Sun, 2012; Liebowitz & Porter, 2019; Robinson et al, 2008; Sun & Leithwood, 2015; Witziers et al, 2003). For example, Sun and Leithwood (2015) focused on direction-setting practices while Liebowitz & Porter (2019) examined practices informed by Grissom and Loeb's (2011) framework. To address this knowledge gap, the present study will ascertain associations between each of the school leadership practices and outcomes. However, only eight of the practices will be examined; there are no effect sizes related to managing external accountability pressures and relationships available for analysis in the present study.

Models versus Practices

An important research question is whether leadership models or practices are better predictors of school outcomes. On the one hand, leadership models may be more predictive because they encapsulate enduring priorities such as teaching-learning, empowerment and collaboration, and staff motivation in instructional, distributed, and transformational leadership respectively (Gumus et al, 2018) that are less affected by changing contexts and stakeholder needs. On the other hand, leadership practices may predict school outcomes better because their specificity enables us to examine each practice separately (Hitt & Tucker, 2016).

Previous meta-analyses report mixed results on whether leadership models or practices predict school outcomes better. For example, Uysal and Sarier (2018) found that instructional and transformational leadership were positively associated with student achievement whereas leadership practices were not. Karadag (2020) reported very similar effect sizes among leadership models and practices.

School Outcomes

School leadership contributes to organizational, teacher, or student outcomes. Organizational outcomes are exemplified by organizational justice, citizenship, commitment, trust, performance, culture, climate, and decision-making strategy (Cogaltay & Karadag, 2016; Sisman, 2016). Teachers' outcomes relate to their job satisfaction, well-being, and teaching practices (Chin, 2007; Leithwood & Sun, 2012; Liebowitz & Porter, 2019). Most meta-analyses measure students' outcomes using the latter's academic achievement (e.g., Karadag, 2020).

School leadership may influence organizational and teacher outcomes more than student outcomes (Hendriks & Scheerens, 2013) for two reasons. First, principals work more closely with teachers than students. Second, teacher leaders influence colleagues more easily than students. Therefore, leaders may shape organizational and teacher processes more proximally than student learning. The indirect effects leadership model argues that these processes then contribute to student learning (Hendriks & Scheerens, 2013).

However, the evidence on relative effect sizes between school leadership and different outcomes is mixed. Some meta-analyses report larger effect sizes for organizational and teacher processes (Chin, 2007; Liebowitz & Porter, 2019). However, others report a different pattern of results. For example, Leithwood and Sun (2012) reported that management by exception, a leadership practice, was weakly (and negatively) associated with school conditions compared to positive leadership effect sizes for student achievement. The present study will ascertain effect sizes pertaining to associations between school leadership and different school outcomes.

Contextual and Methodological Moderators

The present study examines if six contextual and methodological characteristics moderate associations between school leadership and outcomes. First, leaders' hierarchical position may moderate the relationship (Connolly, James, & Fertig, 2019). Effect sizes for principals may be larger than those for teacher leaders because they have greater overall influence on organizational and teacher processes. However, effect sizes for teacher leaders may also be larger than those for higher-level leaders because of their proximity to classroom teaching. Previous meta-analyses have not examined the moderating influence of school leaders' position. The second moderator is school grade level. At lower grade levels, it is easier for school leaders to contribute to instructional and curricular developments. However, secondary/high school teachers may be more qualified and therefore, better able to support leadership initiatives. Meta-analytic results on the moderating influence of school grade levels are mixed (Chin, 2007; Karadag, 2020; Liebowitz & Porter, 2019; Marzano et al, 2005; Sun & Leithwood, 2012; Uysal & Sarier, 2018). The third moderator pertains to the source of leadership data used in primary studies. Teacher-reported data of principal leadership may be more objective than principal-reported data (Bowers, Blitz, Modeste, Salisbury, & Halverson, 2017), thereby yielding smaller effect sizes. There are no meta-analyses comparing effect sizes from primary studies using different sources of data. The fourth moderator is the type of primary studies. Uysal and Sarier (2018) found that effect sizes reported in dissertations were larger than those in articles in Turkey, but the reverse was true in the US. Some meta-analysts argue that dissertations may exhibit a higher level of quality than articles and have even analysed dissertation data exclusively (Sun & Leithwood, 2012). The fifth moderator is the year of primary studies. Recent studies may report larger effect sizes because of advances in leadership and teacher preparation. However, leadership effects measured in recent studies may also be smaller because of homogenization in school processes as countries become more economically developed (Heyneman, 2016). The last moderator is the methodological quality of meta-analyses. We expect meta-analyses with greater methodological rigor to report more accurate estimates of school leadership effects; this may mean larger or smaller effect sizes.

The Present Study

To summarize, the present study addresses the question of whether school leadership matters. The specific objectives are to (a) clarify which leadership models or practices are more influential on outcomes; (b) ascertain leadership influence on different outcomes; and (c) clarify if leadership effect sizes vary with contextual and methodological characteristics of studies.

Method

A first-order meta-analysis is a quantitative review that combines and compares results from primary quantitative empirical studies to obtain an average measure of relationships or

outcomes (Glass, McGaw, & Smith, 1981). A second-order meta-analysis is a meta-analysis of methodologically comparable first-order meta-analyses that investigate similar relationships or outcomes (Schmidt & Oh, 2013). It is similar to a first-order meta-analysis in that it employs the same analytical techniques and converts effect sizes to a common metric for meaningful comparisons. However, it differs in that it analyses computed effect size data from previously conducted meta-analyses instead of effect size data from primary studies, considering the reliability of effect sizes reported in meta-analyses. It can assess variability among results reported in first-order meta-analyses because it analyses a substantially larger database of studies. Therefore, it is also referred to as overview of reviews, systematic review of reviews, umbrella review, meta-meta-analyses, or meta-analysis of meta-analyses (Polanin, Maynard, & Dell, 2016).

Identification of Studies

A search of meta-analyses synthesising results from a range of studies, including doctoral dissertations and journal articles, that examine associations between school leadership (models, practices) and outcomes (organizational, teacher, student) in K-12 schools published up to December 2019 was performed using three computer databases (Academic Search Complete, British Education Index, ERIC). Search terms in abstracts included combinations of relevant keywords, namely ("educational leadership" OR "school leader" OR "principal" OR "vice-principal" OR "department head" OR "teacher leader" OR "collaborative leadership" OR "instructional leadership" OR "distributed leadership" OR "transformational leadership" OR "leadership practice" OR "leadership style") AND ("meta-analysis" OR "review" OR "meta-analytic"). This search returned 14 potential studies.

This search was complemented by manual searches of (a) references to meta-analyses of school leadership effects in review articles; (b) eight key school leadership-related journals (Educational Administration Quarterly, Educational Management Administration and Leadership, International Journal of Educational Management, International Journal of Leadership in Education, Journal of Educational Administration, Leadership and Policy in Schools, School Effectiveness and School Improvement, School Leadership and Management); and (c) six educational review journals (Asia Pacific Education Review, Educational Research Review, Educational Review, Oxford Review of Education, Review of Educational Research, Review of Research in Education). These searches returned another six potential studies.

Selection of Studies

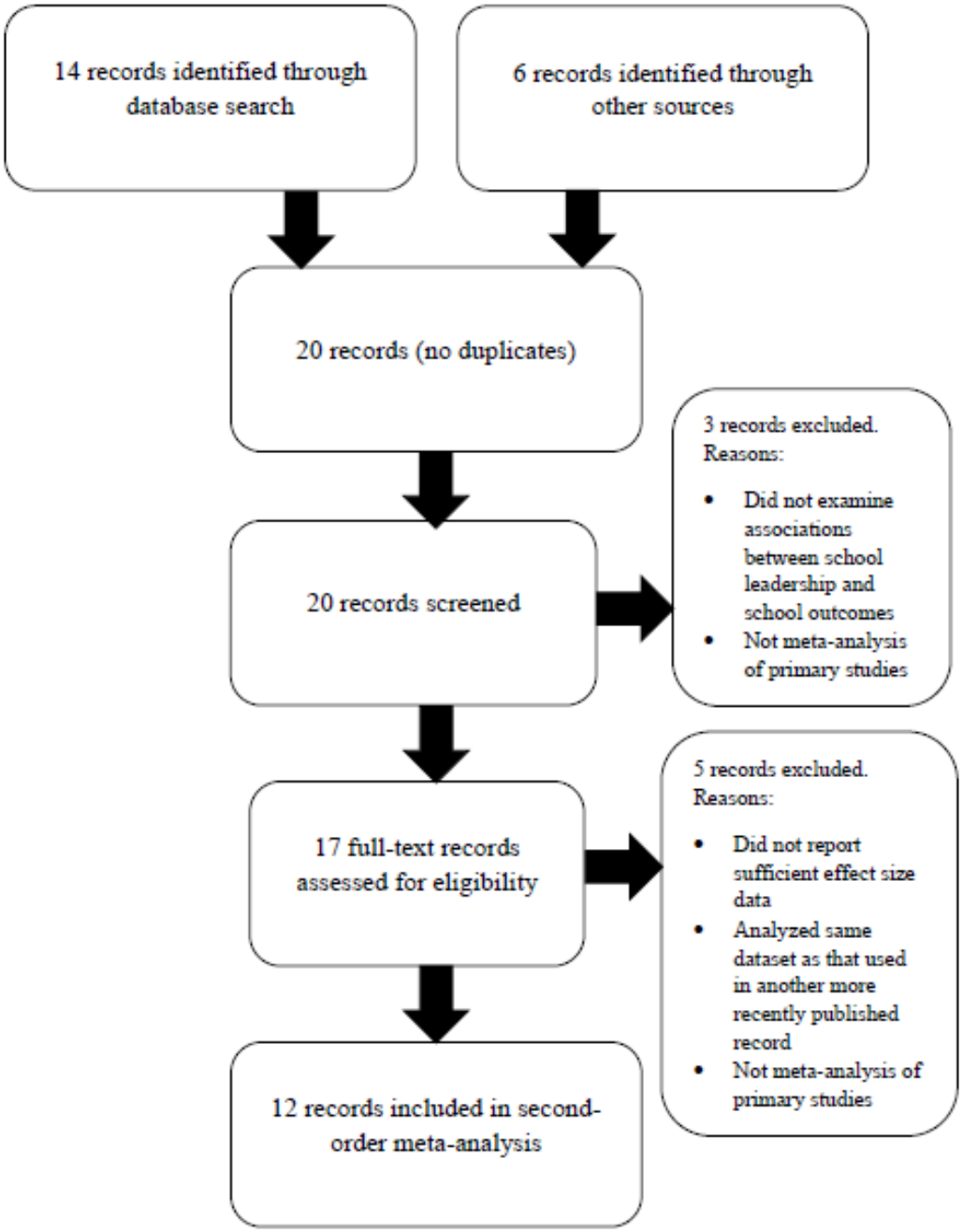
The 20 meta-analyses were next screened to ascertain if they (a) used meta-analysis to examine associations between school leadership (principal, vice-principal, teacher leaders) models/practices and school outcomes (organizational, teacher, student); (b) reported effect size data that can be converted to a common metric (e.g., correlations, Fisher's z, Cohen's d; see Lipsey & Wilson (2001)); (c) sampled K-12 students; and (d) were written in English.

Meta-analyses were excluded if they (a) examined predictors of school leadership; (b) were qualitative reviews; or (c) examined the same set of primary studies as that analysed in another meta-analysis. These exclusion criteria resulted in eight meta-analyses being excluded (Supplementary Material 1 and 2).

Supplementary Material 1 and 2

Therefore, a final pool of 12 meta-analyses were included in the second-order meta-analysis (Figure 1). The 512 primary studies examined in these meta-analyses were individually recorded in a spreadsheet. The degree of overlapping primary studies for each meta-analysis was determined as the percentage of all primary studies examined. Results showed a low level of overlap (3.71-16.41%), below the 25% rule-of-thumb (Cooper & Koenka, 2012), thereby enabling us to treat effects reported as being reasonably independent from each other.

Figure 1
PRISMA Diagram



Coding Procedure

A formal coding scheme was developed to record substantive and methodological details from the meta-analyses (Supplementary Material 3 and 4):

- Study identification details: author(s), publication year, title of meta-analysis
- School leadership variables: (a) whether the meta-analyses focused on leadership models, practices, or a combination of the two (mixed); (b) leadership models (distributed, instructional, transformational, combination of two or more (mixed)); and (c) leadership practices (enhancing teaching-and-learning, building shared vision and values, providing professional development, empowering teachers, motivating teachers, managing resources, redesigning the school, engaging families and community)
- School outcomes: organizational, teacher, student, combination of two or more (mixed)
- Effect size data on school leadership models/practices and outcomes
- School contextual variables: (a) school leadership positions (principals, more than one type of leaders (mixed)); (b) school grade levels (elementary, secondary/high school, comprising elementary and secondary/high school (mixed))
- Methodological variables: (a) sources of leadership data (teacher-reported, teacher- and principal-reported (mixed)); (b) types of primary studies examined (articles, dissertations, articles and dissertations (mixed)); (c) year of primary studies included in meta-analyses (1978-2000, 2001-2019); and (d) methodological quality of meta-analyses as measured by R-AMSTAR (Kung et al, 2010). R-AMSTAR ratings for the meta-analyses ranged from 18 to 36.

Coding of the independent variables (leadership models and practices) merits elaboration. First, meta-analyses included in the present study exhibited conceptual clarity and articulated very clearly whether they were examining instructional, transformational, and/or distributed leadership models. In contrast, leadership practices examined in the meta-analyses exhibited greater diversity. Therefore, coding of these practices was informed by the categorization of eight leadership practices derived from our extensive review of the extant literature comprising leadership frameworks, leadership models, research on different leaders in the school hierarchy, cross-cultural leadership research, and reviews of leadership practices (see literature review earlier). Some of these practices were related to one or more of the three leadership models coded (e.g., enhancing teaching-and-learning with instructional leadership model) whereas the others (e.g., managing resources) were not. Leadership practices were coded as follows:

- "Enhancing teaching-and-learning" comprised leadership practices related to personalizing the environment to reflect students' backgrounds; developing, monitoring, and improving curricular, instructional, and assessment program; monitoring student progress; supervising and evaluating instruction; protecting instructional time; and maintaining safety and orderliness.
- "Building shared vision and values" comprised practices pertaining to setting high academic expectations of teachers and students; strengthening school culture; maintaining high visibility; and modelling aspirational and ethical practices.

- "Providing professional development" was about providing learning opportunities and intellectual stimulation; fostering responsibility for promoting learning; creating communities of practice; and promoting continuous learning.
- "Empowering teachers" comprised practices on establishing collaborative processes for decision-making; and sharing and distributing leadership and accountability.
- "Motivating teachers" was related to encouraging teachers; fostering commitment; providing individualized consideration and support; building trusting relationships; supporting, buffering, and recognizing staff; providing contingent rewards; and managing by exception.
- "Managing resources" was about acquiring and allocating resources strategically to achieve vision and mission; selecting for the right fit; promoting data use for continual improvement; and considering school context to maximize organizational functioning.
- "Redesigning the school" was related to fostering participation in school improvement.
- "Engaging families and community" comprised practices on building productive relationships with families and external community partners; engaging families and community to strengthen student learning; promoting parental and community involvement; and anchoring schools in the community.

Among these variables examined, school leadership and the methodological quality of the meta-analyses were coded by two raters because they were more susceptible to raters' subjectivity than other variables. Specifically, the first author and a Master of Education graduate coded the leadership variables for all meta-analyses independently. Coding differences were discussed, and a consensus was arrived. Results showed very high inter-rater reliabilities for leadership models (k = 1.00 z = 3.89) and practices (k = 0.98, z = 15.20) (Cohen, 1960; McHugh, 2012). As for methodological quality, the first and second authors rated the meta-analyses independently before meeting to clarify their understanding of R-AMSTAR. After this discussion, they revisited their ratings during the second round of independent coding. Results showed a high degree of agreement in the second set of ratings (difference in total score for each meta-analysis rated not exceeding 2 points out of a total possible score of 42)[1]. The final score for each meta-analysis was determined to be either each rater's (in cases of consensus) or the average of the two ratings (in cases of rating differences).

Supplementary Material 3 and 4

Calculating Effect Sizes

A total of 82 effects were analysed using Comprehensive Meta-analysis (V3). The effects comprised Pearson's correlation coefficients (r's, 64 effects), Cohen's d (17 effects) and Fisher's z (1 effect). Pearson's correlations were used as the metric for reporting effect sizes because the aim was to examine associations between school leadership models/practices and outcomes.

[1] Two items in R-AMSTAR, namely '8C. To have conclusions integrated/drives towards a clinical consensus statement' and '8D. This clinical consensus statement drives toward revision or confirmation of clinical practice guidelines' were omitted because they were not relevant for the present (non-clinical) study. This omission reduced the total possible score from 44 to 42.

They were converted to Fisher's z-scores and weighted by the inverse of their variance. The weighting enabled effect sizes from larger-sample studies (higher reliability) to be given more weight than those from smaller-sample studies (Lipsey & Wilson, 2001). Effect sizes were subsequently converted back to Pearson's correlations in the reporting of results.

Five sets of meta-analyses were performed. The first three computed an overall effect size for school leadership, effect sizes for leadership models and practices, and effect sizes corresponding to different school outcomes. The fourth comprised moderator analyses/meta-regression while the last was a meta-regression of leadership variables comparing the effects of models and practices, controlling for significant moderators. The last two sets of analyses were performed to ascertain the sources of variation among the effect sizes reported across the 12 meta-analyses.

Statistical Independence

To ensure statistical independence among the effect sizes analysed (Lipsey & Wilson, 2001), the following protocol was adopted:

- If studies contained data on subsamples and the entire sample, only the former was coded.
- If studies contained data on various aspects of the same school leadership practice, the average of the effect sizes was computed.
- If studies contained data on specific and overall school leadership practices, only the former was coded.
- If studies contained data on different components of the same school outcome, the average effect size was computed.

Random Effects Models

The random effects model was employed because (a) it does not require that effect sizes analysed are from the same underlying population; (b) it enables results generalization beyond the studies included; and (c) results will be identical to those from a fixed effect model even if the observed variance in effect sizes across studies is due to random sampling errors (Cooper & Hedges, 1994; Hedges & Vevea, 1998). The variation among effect sizes was analysed using the Q test of homogeneity (Hedges & Olkin, 1985). A nonsignificant test result means that the observed variation among the effect sizes is attributable to random sampling errors and that effect sizes belong to a common underlying population. However, a significant Q test result means that the observed variation cannot be accounted by sampling errors and that effect sizes belong to different underlying populations (i.e., there may be different effect sizes because the patten of relationships between school leadership and outcomes varies with types of leadership and outcome variables, school contexts, and methodological approaches employed in studies). The analysis showed that the Q value of 2,417.34 was significant at the .01 level, thereby indicating the need for moderator analyses to ascertain the sources of variation in effect sizes.

Publication Bias

A common concern in meta-analyses is the presence of publication bias in studies (Polanin, Tanner-Smith, & Hennessy, 2016). This means that studies with significant effects are more likely to be published than those with nonsignificant effects. The funnel plot of standard errors by effect sizes showed that effect sizes from individual meta-analyses were distributed on both sides of the mean effect size and that there were effect sizes corresponding to meta-analyses

with different standard errors (Figure 2). Duval and Tweedie's (2000) trim-and-fill method indicated that no additional studies needed to be imputed and added to the left of the funnel plot to yield an unbiased estimate of the mean effect size (Figure 3). Additionally, Rosenthal's (1979) fail-safe N indicated that a very large number of hypothetically missing effect sizes (50,892) were needed to render the *p* value nonsignificant (i.e., $p > .05$). These different analyses suggested there was no evidence of publication bias in the data.

Figure 2
Funnel Plot Without Imputation

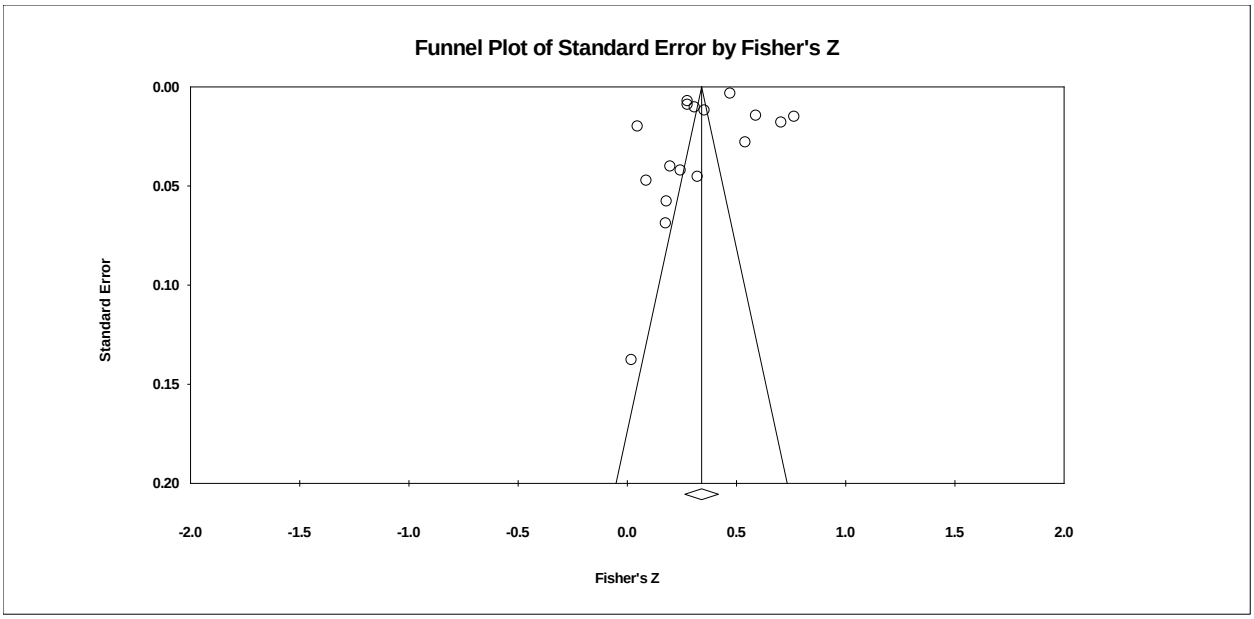
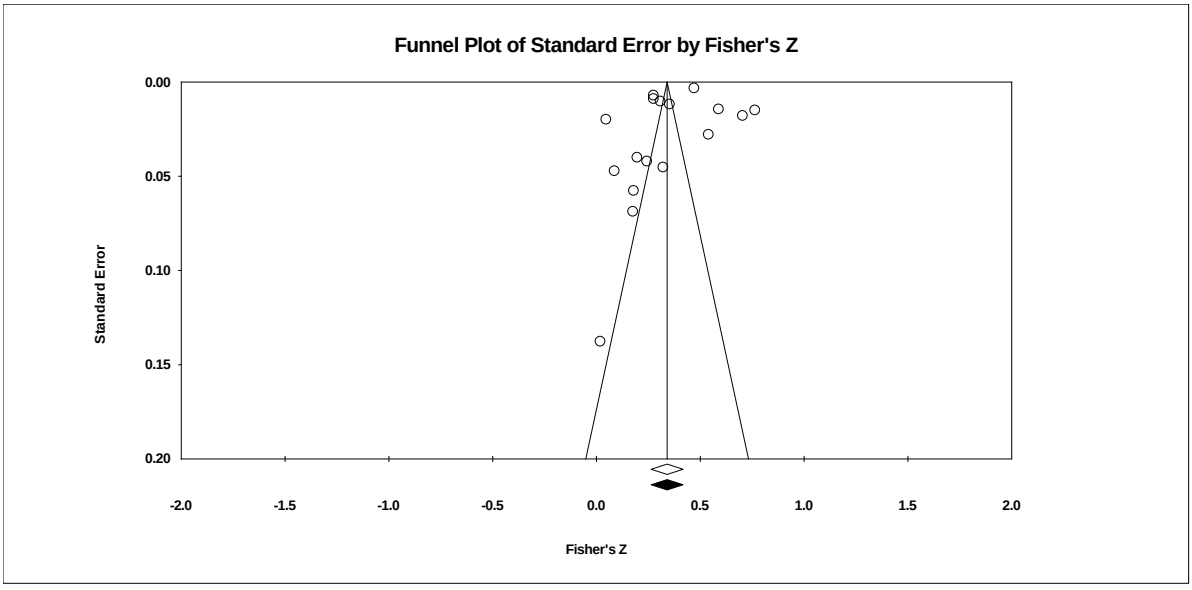


Figure 3
Funnel Plot With Imputation



Results

Effect Sizes

The mean effect size for the random effects model was .33, $p < .01$. This was small in magnitude according to Cohen's (1988) rules of thumb (*r*'s = .20, .50, and .80 for small, medium, large effect sizes respectively). Results showed that mean effects were small but significant for all three school leadership models, $p < .01$: instructional leadership, $r = .27$; distributed leadership, $r = .30$; and transformational leadership, $r = .34$. However, there was only one effect for distributed leadership, so the finding for this variable had to be interpreted with caution. Mean effects were also small but significant for all leadership practice variables: leaders enhancing teaching and learning ($r = .21$), building shared vision and values ($r = .25$), empowering teachers ($r = .26$), motivating teachers ($r = .26$), managing resources ($r = .20$), redesigning the school ($r = .23$), engaging families and community ($r = .17$), leaders providing professional development ($r = .32$). It should be noted that there was only one effect for 'redesigning the school', so the effect size for this variable had to be interpreted with caution. Mean effects were significant for different school outcomes, $p < .01$. Specifically, effect sizes for associations between leadership and teacher ($r = .50$) or organizational ($r = .55$) outcomes were medium in magnitude whereas that for the association between leadership and student outcomes was small in magnitude ($r = .24$).

Table 1
Associations between Different Leadership Models and Outcomes

	No of independent effect sizes	No of meta-analyses included	Effect sizes(*r*)				Heterogeneity	
			Mean	-95%CI	+95%CI	Z	Q(df)	I^2
Leadership models								
Instructional leadership	6	5	.27	.16	.38	4.69**	111.76**(5)	95.53
Distributed leadership	1	1	.30	.28	.32	29.75**	0(0)	0
Transformational leadership	6	5	.34	.11	.54	2.88**	1295.66**(5)	99.61
Leadership practices								
Enhancing teaching and learning	3	3	.21	.16	.25	7.96**	2.33(2)	14.10
Building shared vision and values	3	3	.25	.18	.31	7.57**	4.50(2)	55.54
Providing professional development	3	3	.32	.25	.38	8.31**	3.67(2)	45.43
Empowering teachers	2	2	.26	.20	.32	8.31**	0.31(1)	0
Motivating teachers	3	3	.26	.18	.35	5.86**	3.58(2)	44.15
Managing resources	3	3	.20	.11	.29	4.39**	3.60(2)	44.37
Redesigning the school	1	1	.23	.15	.30	5.57**	0(0)	0
Engaging families and community	3	3	.17	.01	.33	2.04*	30.30**(2)	93.40
School outcomes								
Organizational outcomes	6	5	.55	.44	.65	8.39**	273.14**(5)	98.17
Teacher outcomes	5	4	.50	.30	.66	4.52**	511.99**(4)	99.22
Student outcomes	16	9	.24	.19	.29	8.67**	1313.32**(15)	98.86

Note. * $p < .05$ ** $p < .01$

Moderation Effects

Next, moderator analyses were conducted to examine potential sources of heterogeneity in effect sizes (Table 2). First, results showed that effects were stronger ($Q(2) = 7.23$, $p < .05$) when school leadership was measured using models ($r = .45$) vis-à-vis practices ($r = .22$) or a mixture of the two ($r = .27$). Next, effects were stronger ($Q(1) = 10.07$, $p < .01$) for principal leadership ($r = .44$) vis-à-vis a mixture of different leadership positions ($r = .25$). However, leadership effects did not vary among elementary schools, secondary/high schools, or a mixture of these schools ($Q = 0.04(2)$, $p = .98$).

There were no effect size differences between studies using teacher-reported data and those using data from different sources ($Q(1) = 2.14$, $p = .14$). Results also showed that meta-analyses examining dissertations ($r = .40$, $p < .01$) reported larger effect sizes than those focusing on articles ($r = .10$, $p = .33$) or a mixture of study types including dissertations and articles ($r = .30$, $p < .01$), $Q(2) = 6.95$, $p < .05$. There were no significant differences in effect sizes computed from studies published 1978-2000 vis-à-vis 2001-2019 ($Q = 2.37(1)$, $p = .12$). A meta-regression, instead of moderator analysis, was performed to examine the moderating effect of methodological quality because the moderator was a continuous variable. Results showed that this variable was not a significant predictor of effect sizes ($\beta = 0.01$, $p = .41$).

Table 2
Moderator Analyses

Categories of moderators	No of independent effect sizes	No of meta-analyses included	Effect sizes				ANOVA
			Mean	-95%CI	+95%CI	Z	Q(df)
Leadership models vs practices							
Models	6	2	.45	.33	.55	7.13**	7.23*(2)
Practices	5	5	.22	.07	.36	2.84**	
Mixed	6	5	.27	.14	.39	4.04**	
School leaders' position							
Principals	7	6	.44	.35	.53	8.74**	10.07**(1)
Mixed	10	5	.25	.17	.33	5.83**	
School grade levels							
Elementary	7	6	.28	.14	.41	3.83**	0.04(2)
Secondary/High	8	6	.26	.13	.38	3.78**	
Mixed	7	7	.27	.13	.40	3.64**	
Sources of leadership data							
Teacher-reported	3	3	.43	.27	.57	5.00**	2.14(1)
Mixed	14	8	.30	.22	.38	7.17**	
Types of primary studies							
Journal articles	2	1	.10	-.10	.30	0.98	6.95*(2)
Dissertations	5	3	.40	.29	.51	6.38**	
Mixed	12	8	.30	.22	.37	7.19**	
Year of primary studies analysed							
1978-2000	5	4	.41	.29	.51	6.31**	2.37(1)
2001-2019	12	7	.30	.22	.37	7.31**	

Note. * $p < .05$ ** $p < .01$

Meta-regression Results

Another meta-regression was performed to compare effect sizes between school leadership models and practices, controlling for the two significant moderators. Results (Table 3) showed that the intercept ($\beta = 0.21$, $p < .01$) was significant, and that after controlling for school leaders' position (principals, $\beta = 0.21$, $p < .01$) and types of studies (dissertations, $\beta = 0.20$, $p < .05$), the variable differentiating leadership models and practices was significant ($Q(2) = 11.24$, $p < .01$). Compared to the reference category of effect sizes involving a mixture of leadership models and practices, effect sizes for leadership models were larger ($\beta = 0.14$, $p < .10$); the regression coefficient for leadership practices was not significant ($\beta = -0.13$, $p = .11$). The three variables (leadership models/practices, school leaders' position, and types of studies) explained 42% of the between-study variance in effect sizes.

Table 3
Meta-regression

Variables	β (SE)	Overall Q(df)
Intercept	0.21**(0.06)	
Leadership models vs practices (reference category = mixed)		11.24**(2)
Models	0.14#(0.08)	
Practices	-0.13(0.08)	
School leaders' position (reference category = mixed)		
Principals	0.21**(0.07)	
Types of studies (Reference category = mixed)		
Dissertations	0.20*(0.09)	

Note. # $p < .10$. * $p < .05$. ** $p < .01$

Discussion

Models as Predictors of Leadership Influence

Results showed that school leadership models had larger effect sizes ($r = .45$) than practices ($r = .22$). This translates to models explaining 20.25% of the variance in school outcomes as compared to 4.84% for practices. However, the analysis examined only three common leadership models (instructional, distributed, transformational). In reality, the work of school leaders is more likely to encapsulate different leadership models (Marks & Printy, 2003). The present study is unable to ascertain the effect size of these 'integrated' leadership models because the meta-analyses examined do not report effect sizes of such models.

Scope of School Leaders' Work

Findings of significant effects for leadership practices underscore the scope of school leaders' work beyond that related to teaching-and-learning (Daniëls et al, 2019; Liebowitz & Porter, 2019). Indeed, educational administration scholarship in the last 60 years has been dominated by the so-called "cognitive anchor" of "leadership for student learning and development" (Hallinger & Kovacevic, 2019). However, there is evidence that instructional management does not unequivocally benefit student learning (Grissom, Loeb, & Master, 2013) and that other aspects of school leaders' work may be more important than instructional management (Grissom & Loeb, 2011). The different effect sizes associated with the eight types of leadership practices are indicative of school leaders' myriad responsibilities.

Building Teacher Capacity

Another set of results indicated that leadership practices building teacher capacity (empowering, motivating, providing professional development to teachers) had larger effect sizes than others. These results indicate that school leaders work through and with teachers, so it is important to focus on people (addressing teachers' needs in building up their capacity) rather than tasks (instructional effectiveness via enhancing teaching-learning and building shared vision and values) or resources (managing resources and redesigning the school). They also reflect the challenge that school leaders have involving external stakeholders (families and community) to achieve desired school outcomes. York-Barr and Duke (2004) highlighted that teacher leaders can contribute to school improvement if student learning goals are clearly articulated and different ways in which teacher leaders can achieve these goals are identified (empowering teachers), leadership functions are matched to individual teachers' capacities and leadership expectations are discussed (teachers' professional development), and support and regular

feedback is provided to teacher leaders (motivating teachers). Therefore, results pertaining to associations between leadership practices building teacher capacity and school outcomes extend previous research focusing on relationships between leadership models and teacher motivation (Eyal & Roth, 2011; Shepherd-Jones & Salisbury-Glennon, 2018).

Influence on Organizational Outcomes

Compared to student outcomes, results indicated that school leadership had larger effect sizes for organizational and teacher outcomes. Effects for organizational (r = .55) and teacher (r = .50) outcomes were medium in magnitude, translating to 30.25% and 25% of the variance in school outcomes respectively (vis-à-vis 5.76% for student outcomes). These results are consistent with those reported in some meta-analyses (Chin, 2007; Liebowitz & Porter, 2019). Results from the present study challenge the assertion that the influence of school leadership is weaker relative to teachers. What the present study did not investigate is whether leadership influence on organizational and teacher outcomes in turn contributes to student learning. Future studies can follow up to examine this issue.

Importance of Principal Leadership

Results showed that effect sizes in studies examining principal leadership were larger than those in studies examining more than one type of leaders (which may include principals). These results reflect the strategic role of principals, vis-à-vis other school leaders, in leading the school to identify and realize the shared vision and school goals (Connolly et al, 2019; Gumus et al, 2018; Leithwood, 2012). There may be more distribution of leadership responsibilities in many schools; leadership emanating from the ‘‘interactions of school leaders, followers, and their situation’’ (Spillane, 2005, p. 144) and ‘‘learning together and constructing meaning and knowledge collectively and collaboratively’’ (Lambert, 1998, p. 5). However, the scope of empowerment is determined largely by the principal. Even with distributed leadership, principals are still in the picture – working with other school leaders, giving advice from a whole-school perspective, and supporting other school leaders in the discharge of leadership responsibilities. External stakeholders may also be inclined to work with principals (vis-à-vis other school leaders), given that principals are the ultimate decision-makers on school directions and resource allocation (Bush & Glover, 2003). In sum, policy rhetoric may have attempted to shift the focus from principals to other leaders (e.g., teachers) within schools but results from the present study suggest that we should continue to emphasize the role of principal leadership even as we seek to empower teachers and distribute leadership responsibilities among more individuals in schools.

Including Articles and Dissertations in Meta-analyses

Moderator analysis results showed that the mean effect size for meta-analyses examining only dissertations was larger than those focusing on articles or those which included a mixture of study types (including articles, dissertations). The inclusion of published and unpublished studies mitigates the threat of publication bias (Polanin et al, 2016), thereby allowing researchers to obtain more accurate estimate of effect sizes. Nonetheless, it is disconcerting that some meta-analysts report the difficulty of identifying effect size statistics in articles (Chin, 2007; Marzano et al, 2005; Sun & Leithwood, 2015). Therefore, their sample of primary studies comprises a large proportion of dissertations. Scholars are mixed with regards to the merits of including dissertations in meta-analyses. Some researchers have reservations about the quality of dissertations given that they are not peer-reviewed anonymously (Robinson et al, 2008).

However, others argue that including dissertations mitigates against publication bias (Rosenthal, 1979). On balance, authors of journal articles should include sufficient effect size statistics so that meta-analysts will have access to a range of primary studies to compute effect sizes.

Conclusion

Results from the second-order meta-analysis of 82 effects from 12 meta-analyses examining associations between school leadership and outcomes provided evidence that school leadership matters. First, there was a range of effect sizes for different leadership models and practices. Next, effect sizes for associations between school leadership and organizational or teacher outcomes were substantially larger than that for student outcomes. Importantly, leadership models had larger effect sizes than practices, controlling for leaders' hierarchical position (principals had larger effect sizes than other leaders) and the inclusion of different types of primary studies (meta-analyses examining a variety of primary studies, including articles and dissertations, had larger effect sizes than those focusing on articles or dissertations only).

The study contributes to scholarship and practice in two ways. First, results indicating that transformational leadership (vis-à-vis other leadership models) and specific leadership practices building up teacher capacity (providing professional development, empowering teachers, and motivating teachers vis-à-vis other practices) add to a growing body of evidence that effective school leaders need to have an integrated repertoire of leadership skills. For example, Day, Gu, and Sammons' (2016) longitudinal national study of primary and secondary schools in England showed that successful principals combined transformational and instructional leadership in different ways ("shaping" and "layering") to address evolving needs of schools in different phases of their school improvement journey. Therefore, leadership development should equip school leaders not just with competencies and skills on improving teaching-and-learning but also on how to galvanize, motivate, and equip teachers to achieve shared goals. Second, the present study ascertains the contribution of principal leadership to school effectiveness measured comprehensively using organizational and teacher, in addition to student, outcomes. This challenges the assertion by some that principals are less consequential than teachers in contributing to school effectiveness measured in terms of student outcomes only (see claim by Leithwood et al (2006) that principals are only ranked second, below teachers, in their importance for student learning within schools). School effectiveness here relates to factors operating at different levels within the school, as contrasted with those emanating from sources outside the school (e.g., familial or broader educational influences such as education policy), that contribute to student learning (Reynolds et al, 2014). School effectiveness factors are exemplified by school leadership and organization and classroom teaching processes. School effectiveness is a subset of educational effectiveness which is concerned with the broader educational context in addition to student-, classroom-, and school-level factors impacting student learning (Creemers & Kyriakides, 2008).

As with all studies, results from the present study need to be read with some limitations in mind. First, the study only examined three common school leadership models, so related findings should not be extrapolated to other models. Future studies can compare systematically associations between other models and school outcomes. Second, leadership effects may vary with sociocultural factors associated with different geographical regions but there is insufficient information on geographical distinctions in the data to test if leadership effects are moderated by geography. Indeed, only four of the meta-analyses analysed focused on specific countries or territories (Turkey in Cogaltay and Karadag (2016) and Sisman (2016); Turkey and US in Uysal

and Sarier (2018); US and Taiwan in Chin (2007)). Future studies can examine the moderating influence of sociocultural contexts on school leadership effects. The third limitation is that the present study was not able to clarify processes underpinning associations between school leadership and outcomes. Future research can employ a meta-ethnographic approach to unravel the complexity of school leaders' work and ascertain specific processes by which school leaders influence school outcomes.

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Supplementary Material 1
Exclusion of Meta-analyses

Meta-analyses	Reason for exclusion
Antoniou (2013)	This is a review of Scheerens' (2012) "School leadership effects revisited: Review and meta-analysis of empirical studies". The book discusses results from previous meta-analyses and includes a new meta-analysis of 25 studies carried out from 2005 to 2010. The latter meta-analysis overlaps with another published meta-analysis by Hendriks and Scheerens (2013) in the primary studies examined. Therefore, this book was excluded from the present second-order meta-analysis.
Boyce & Bowers (2018)	This is a meta-narrative review of studies.
Hallinger, Li, & Wang (2016)	This meta-analysis examined gender differences in instructional leadership.
Karadag, Bektas, Cogaltay, & Yalcin (2015)	The primary studies examined in this meta-analysis overlapped substantially with those reported in a more recently published meta-analysis by Karadag (2019).
Kis & Konan (2014)	This meta-analysis examined gender differences in instructional leadership.
Liu & Werblow (2019)	This meta-analysis used meta-analytic approaches to examine TALIS 2013 data instead of primary studies.
Sun & Leithwood (2015)	This meta-analysis did not report sufficient effect size data for the present second-order meta-analysis.
Tian, Risku, & Collin (2016)	This is a narrative review of studies

Note: Scheerens, J. (2012). *School leadership effects revisited: Review and meta-analysis of empirical studies*. Dordrecht: Springer.

Supplementary Material 2
References for Meta-analyses Excluded from the Second-order Meta-analysis

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Supplementary Material 3
Summary of Meta-analyses

Authors (year)	No of primary studies analysed	School contextual and methodological variables					
		Leaders' position	Grade levels	Sources of leadership data	Methodological quality of meta-analyses (/42)	Types of primary studies analysed	Year of primary studies analysed
Chin (2007)	28	Principals	Elementary, secondary	Mixed	26	Dissertations	1993-2003
Cogaltay & Karadag (2016)	69	Principals	Mixed	Teachers	30	Articles, dissertations	2000-2013
Hendriks & Scheerens (2013)	15	Mixed	Primary, secondary	Mixed	23	articles, books, book chapters, reports	2005-2010
Karadag (2019)	151	Mixed	Elementary, middle, high	Mixed	32	Articles, dissertations	2008-2018
Leithwood & Sun (2012)	79	Mixed	Mixed	Mixed	29	Dissertations	1996-2009
Liebowitz & Porter (2019)	51	Principals	elementary, secondary	Mixed	36	Articles, dissertations, reports, working papers	2000-2019
Marzano, Waters, & McNulty (2005)	69	Principals	K-12	Teacher	19	Mixed	1978-2001
Robinson, Lloyd, & Rowe (2008)	27	Mixed	Mixed	Mixed	22	Articles, book chapters, reports	1978-2005
Sisman (2016)	67	Principals	Primary, high schools, mixed	Teacher	31	Articles, dissertations	2000-2016
Sun & Leithwood (2012)	79	Mixed	Elementary, secondary	Mixed	28	Dissertations	1996-2008
Uysal & Sarier (2018)	39	Mixed	Primary, secondary, mixed	Mixed	30	Articles, dissertations	2000-2017
Witziers, Bosker, & Kruger (2003)	42	Principals	Mixed	Mixed	18	Articles, books, book chapters, conference papers, dissertations, reports	1986-1996

Supplementary Material 4

Summary of Meta-analyses

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
Chin (2007)	Transformational leadership on student achievement (elementary, r = .46; secondary, r = .53); teachers' job satisfaction (elementary, r = .76; secondary, r = .64); school effectiveness (elementary, r = .71; secondary (r = .66)										
Cogaltay & Karadag (2016)										School leadership on job satisfaction (r = .56); organizational justice (r = .75); organizational citizenship (r = .35); organizational commitment (r = .43); organizational trust (r = .73); performance (r = .36); organizational culture (r = .56); organizational	

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
										climate (r = .50)	
Hendriks & Scheerens (2013)										School leadership (indirect effects model) on student achievement (*r* = .05)	
Karadag (2019)	Instructional leadership on student achievement (*r* = .34) Transformational leadership on student achievement (*r* = .27) Distributed leadership on student achievement (*r* = .30)									Mixed leadership practices on student achievement (*r* = .27) School leadership on math achievement (r = .25); reading achievement (r = .38); social science achievement (r = .24); science achievement (r = .26); language achievement (r = .13) School leadership on student achievement: elementary (*r* = .30); middle (*r* = .36); high (*r* = .35); mixed levels (*r* = .28)	

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
Leithwood & Sun (2012)			Holding high performance expectations on school conditions (r = .45); teacher internal states and behaviours (r = .25); student achievement (r = .08) Developed shared vision/goals on school conditions (r = .43); teacher internal states and behaviours (r = .50); student achievement (r = .03) Modelling behaviour on school conditions (r = .40); teacher internal states and behaviours (r = .54); student	Providing intellectual stimulation on school conditions (r = .42); teacher internal states and behaviours (r = .50); student achievement (r = .05)	Building collaborative structures on school conditions (r = .47); teacher internal states and behaviours (r = .22); student achievement (r = .17)	Providing individualized support on school conditions (r = .43); teacher internal states and behaviours (r = .52); student achievement (r = .15) Contingent rewards on school conditions (r = .34); teacher internal states and behaviours (r = .51); student achievement (r = .01) Management by exception on school conditions (r = -.11); teacher internal states and behaviours (r = -.31); student achievement (r = -.0.09)			Providing community focus on teacher internal states and behaviours: (r = .21)		Leithwood & Sun (2012) conceptualized these leadership practices from transformational leadership perspective

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
			achievement (r = .08) Strengthening school culture on school conditions (r = .42); teacher internal states and behaviours (r = .22); student achievement (r = .03)								
Liebowitz & Porter (2019)		Instructional management on student achievement (d = 0.11); teacher well-being (d = 0.34); teaching practices (d = 0.35); school organizational health (d = 0.81); elementary student achievement (d = 0.07); secondary student achievement (d = 0.09); elementary teacher well-being (d = 0.25); secondary teacher well-being (d = 0.31); elementary teaching practices (d = 0.28); secondary tteaching practices (d = 0.33); elementary				Internal relations on student achievement (d = 0.16); teacher well-being (d = 0.38); school organizational health (d = 0.73); elementary student achievement (d = 0.07); secondary student achievement (d = 0.17); elementary teacher well-being (d = 0.31); secondary teacher well-being (d =	Organizational management on student achievement (d = 0.08); school organizational health (d = 0.78); elementary student achievement (d = 0.03); secondary student achievement (d = 0.08) Administration on secondary student achievement (d = 0.09)		External relations on elementary student achievement (d = 0.08); secondary student achievement (d = 0.08)		

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
		organizational health (d = 1.01); secondary organizational health (d = 0.44)				0.28); elementary organizational health (d = 1.14); secondary organizational health (d = 0.28)					
Marzano, Waters, & McNulty (2005)		Discipline on student achievement (r = .27) Involvement in curriculum, instruction, & assessment on student achievement (r = .20) Knowledge of curriculum, instruction, & assessment on student achievement (r = .25) Monitoring/Evaluation on student achievement (r = .27)	Affirmation on student achievement (r = .19) Culture on student achievement (r = .25) Focus on student achievement (r = .24) Ideals/Beliefs on student achievement (r = .22) Visibility on student achievement (r = .20)	Intellectual stimulation on student achievement (r = .24)	Input on student achievement (r = .25)	Contingent rewards on student achievement (r = .24) Communication on student achievement (r = .23) Optimizer on student achievement (r = .20) Relationshjps on student achievement (r = .18)	Order on student achievement (r = .25) Resources on student achievement (r = .25)	Change agent on student achievement (r = .25)	Outreach on student achievement (r = .27)	School leadership practices on student achievement: elementary (r = .29); middle school/junior high (r = .24); high school (r = .26); K-8 (r = .15); K-12 (r = .16)	"Flexibility" and "situational awareness" were excluded from the present study because they were dispositional variables and therefore could not be classified as belonging to any of the 8 leadership practices
Robinson, Lloyd, & Rowe (2008)	Instructional leadership on student outcomes (d = 0.42)	Planning, coordinating, & evaluating teaching & curriculum on student outcomes (d = 0.42)	Establishing goals & expectations on student outcomes (d = 0.42)	Promoting & participating in teacher learning &			Strategic resourcing on student outcomes (d = 0.31)				

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
	Transformational leadership on student outcomes (d = 0.11)	Ensuring an orderly and supportive environment on student outcomes (d = 0.27)		development on student outcomes (d = 0.84)							
Sisman (2016)										Leadership practices on organizational variables: Transformational leadership (*r* = .52); emotional intelligence (*r* = .72); job satisfaction (*r* = .37); decision-making strategy (*r* = .44); organizational climate: (*r* = .58); organizational commitment (*r* = .44); organizational citizenship (*r* = .56)	Sisman (2016) conceptualised leadership practices from instructional leadership perspective
Sun & Leithwood (2012)			Holding high performance expectations on student achievement (*r* = .08) Modelling behaviour on student	Providing intellectual stimulation on student achievement (*r* = .05)	Building collaborative structures on student achievement (*r* = .17)	Providing individualized support on student achievement (*r* = .15) Providing contingent rewards on student				Transformational Leadership practices on student achievement: elementary (*r* = .17); secondary (*r* = .07)	Leithwood & Sun (2012) conceptualised leadership practices from transformational leadership perspective

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
			achievement (r = .08) Developing shared vision and building goal consensus on student achievement (r = .03) Strengthening school culture on student achievement (r = .03)			achievement (r = .01) Management by exception on student achievement (r = -.05)					
Uysal & Sarier (2018)	Instructional leadership on student achievement: Turkey (r = .25); US (r = .16) Transformational leadership on student achievement: US (r = .01)									US School leadership practices on student achievement: primary (r = .03); secondary (r = -.07) Turkey School leadership on student achievement: primary (r = .21); secondary (r = .12)	Uysal & Sarier (2018) also examined "collaborative leadership". However, this variable was excluded from the present study as its conceptual meaning was unclear.
Witziers, Bosker, & Kruger (2003)										Leadership practices on student	Witziers, Bosker, & Kruger (2003) conceptualise

	School leadership effect sizes										Remarks
	Leadership models	Leadership practices								Mixture of leadership models and/or practices	
	Instructional, transformational, distributed leadership	TL	Vision	PD	Empower	Motivate	Resources	Redesign	Community		
										achievement (Z_r = .02)	d leadership practices from instructional leadership perspective

Note. TL = Enhancing teaching and learning; Vision = Building shared vision and values; PD = Providing professional development; Empower = Empowering teachers; Motivate = Motivating teachers; Resources = Managing resources; Resign = Redesigning the school; Community = Engaging families and community.