

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

## Educational Research Review

journal homepage: [www.elsevier.com/locate/edurev](http://www.elsevier.com/locate/edurev)

# The association between teacher leadership and student achievement: A meta-analysis<sup>☆</sup>

Jianping Shen, Huang Wu<sup>\*</sup>, Patricia Reeves, Yunzheng Zheng, Lisa Ryan, Dustin Anderson

Department of Educational Leadership, Research and Technology, Western Michigan University, USA

## ARTICLE INFO

## Keywords:

Teacher leadership  
Teacher empowerment  
Distributed leadership  
Student achievement  
Meta-analysis  
Effect size

## ABSTRACT

Teacher leadership is commonly discussed in educational research and practice. Yet, the relationship between teacher leadership and student achievement has not been soundly established by empirical evidence. The purpose of this meta-analysis was to examine the extent to which teacher leadership was related to students' academic achievement. The results revealed that teacher leadership was positively related to student achievement ( $r = .19$ ). Among seven dimensions of teacher leadership which were all positively associated with student achievement, facilitating improvements in curriculum, instruction, and assessment has shown strongest relationship. The results of subgroup analysis indicated the relationships were similar among studies conceptualizing teacher leadership and using outcome measures differently, and for elementary and secondary school students. However, published studies reported larger effect sizes than unpublished studies. The implications and limitations are discussed.

## 1. Introduction

Teacher leadership is “the process by which teachers, individually or collectively, influence their colleagues, principals, and other members of school communities to improve teaching and learning practices with the aim of increased student learning and achievement” (York-Barr & Duke, 2004, p. 288). Teacher leaders are teachers who seek to accomplish the goal of school improvement not only by continuing teaching students, but also through influencing others within their schools and elsewhere (Danielson, 2006; Wenner & Campbell, 2017). Teacher leadership has received increasing attention over the past 40 years from both educational practitioners and researchers (Muijs & Harris, 2007; Wenner & Campbell, 2017; York-Barr & Duke, 2004). Calls for greater focus on teacher leadership are grounded primarily in two reasons. First, the era of school and educator accountability has intensified expectations for improved student achievement and increased the pressure on schools to improve student results. School improvement is complex work, and principals, alone, are not able to achieve and sustain the expected levels of school improvement. Teachers also play a crucial role in bridging school level decisions and classroom level practices (Heck & Hallinger, 2009; York-Barr & Duke, 2004). The increasing pressure on school improvement and the crucial role of teachers create both rooms and needs for teacher leadership. Second, in response to the increased demands for improved school results, teachers are taking more leadership roles as principals discover the benefit of sharing the leadership responsibility. A survey carried out by (MetLife 2013) Inc. showed that, among 1000 U.S. K-12 public school teachers, 51% are playing leadership roles (e.g., department chair, teacher mentor) in schools.

<sup>☆</sup> Jianping Shen and Huang Wu are joint first authors with equal contribution.

<sup>\*</sup> Corresponding author.

E-mail addresses: [jianping.shen@wmich.edu](mailto:jianping.shen@wmich.edu) (J. Shen), [huang.wu@wmich.edu](mailto:huang.wu@wmich.edu) (H. Wu), [patricia.reeves@wmich.edu](mailto:patricia.reeves@wmich.edu) (P. Reeves), [yunzheng.zheng@wmich.edu](mailto:yunzheng.zheng@wmich.edu) (Y. Zheng), [lisa.j.ryan@wmich.edu](mailto:lisa.j.ryan@wmich.edu) (L. Ryan), [dustin.anderson@wmich.edu](mailto:dustin.anderson@wmich.edu) (D. Anderson).

<https://doi.org/10.1016/j.edurev.2020.100357>

Received 26 October 2019; Received in revised form 28 July 2020; Accepted 13 August 2020

Available online 1 September 2020

1747-938X/© 2020 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license

(<http://creativecommons.org/licenses/by/4.0/>).

Teacher leadership is a common term in educational practice. There is also an immense body of literature on teacher leadership. Within that body of literature, teacher leadership is often promoted and discussed as a normative condition; yet there is still much to learn about how teacher leadership and student achievement are related, among other issues. [York-Barr and Duke \(2004\)](#) argued that, although the claims of potential desired effects of teacher leadership are compelling, empirical research about the relationship between teacher leadership and school improvement in general, and student achievement in particular, remains rare. [Wenner and Campbell \(2017\)](#) also highlighted this knowledge gap. They claimed that “teacher leadership can be no more than a passing fad unless empirical research can support the value of teacher leadership in terms of student learning” (p. 164). In this study, we built on the existing literature base and conducted a meta-analysis on the relationship between teacher leadership and student achievement.

## 2. Literature review

### 2.1. The development of the concept and practice of teacher leadership

Teacher leadership has evolved over time. Initially, teacher leadership referred to teachers designated as “manager” in certain formal roles (e.g., department chair, headteacher, member of advisory, and union representative) ([Silva, Gimbert, & Nolan, 2000](#); [Smylie & Denny, 1990](#)). Since the 1980s, however, the educational reform movement opened discussion concerning the value of professionalism and collegiality and brought about new opportunities for the exercise of teacher leadership ([Lovett, 2018](#); [Smylie & Denny, 1990](#)). Both education reform policy and practice began to recognize teachers as central to the process of restructuring schools in numerous ways. Teacher leadership became less about sharing managerial responsibilities and more about sharing responsibility for making change. These opened up opportunities for teachers to “help redesign schools, mentor colleagues, engage in problem solving at the school level, and provide professional growth activities for colleagues.” ([Wasley, 1991](#), p. 5).

The arrival of the era of accountability in the early 2000s has markedly promoted teacher leadership as a lever for improving student outcomes ([Lovett, 2018](#); [Wenner & Campbell, 2017](#)). In the United States, the Every Student Succeeds Act (ESSA) (2015) emphasized the importance of teacher leadership by directly addressing teacher leadership in creating new funding, performance-based compensation systems, and programming opportunities. Many states have also committed to investing in teacher leadership ([New Leaders Inc, 2018](#)). Additionally, a number of associations and organizations have emerged (e.g., Teacher Leadership Institute) and standards (e.g., The Teacher Leader Model Standards) have been developed to support teachers who are seeking opportunities to take on new leadership roles.

The development of teacher leadership in educational practice has led to a proliferation of related research. To date, there are three well-known literature reviews of research on teacher leadership, which track the historical development of the field (i.e., [Muijs & Harris, 2003](#); [York-Barr & Duke, 2004](#); [Wenner & Campbell, 2017](#)). Looking across these reviews, we found that the field has gained in understanding the theoretical questions such as (a) how is teacher leadership defined and related or different from other conceptions of leadership and (b) what are the elements of teacher leadership. However, empirical studies to assess the contribution of teacher leadership are still somewhat limited ([Muijs & Harris, 2003](#); [Wenner & Campbell, 2017](#); [York-Barr & Duke, 2004](#)). [Muijs and Harris \(2003\)](#) claimed that “much more empirical evidence is required if policy-makers, researchers and practitioners are to be convinced of the merits of teacher leadership in principle and practice” (p. 445). [York-Barr and Duke's \(2004\)](#) literature review further confirmed this point. Thirteen years later, [Wenner and Campbell \(2017\)](#) provided an updated review focusing on teacher leadership within the context of accountability based on literature from January 2004 through December 2013. Surprisingly, this review suggested there were still a few empirical studies with robust data collection measures in the field.

### 2.2. The definition of teacher leadership

Even though researchers acknowledged teacher leadership as a unique form of leadership and many efforts have been invested in clarifying the definition of teacher leadership (e.g., [Harris, 2003](#); [Muijs & Harris, 2003](#); [Pounder, 2006](#); [Silva et al., 2000](#)), a generally accepted definition and commonly used term or theory to frame teacher leadership research is still lacking ([Sebastian et al., 2017](#); [Wenner & Campbell, 2017](#); [York-Barr & Duke, 2004](#)). Several theories are used when researchers frame their research surrounding teacher leadership. These theories are generally represented by such terms as, teacher leadership, teacher empowerment, and distributed leadership ([Wenner & Campbell, 2017](#)). Although those three terms conceptualize teacher leadership in slightly unique ways, all of them reflect the notion that leadership encompasses empowerment and collective agency ([Harris, 2003](#)) and teacher leadership involves “teacher influence over key school-wide decision-making process” ([Sebastian et al., 2017](#), p. 465). The following sections briefly reviewed the central idea of each theory that researchers used to frame their study.

#### 2.2.1. Teacher leadership

The concept of teacher leadership is generally understood to mean “teacher agency through establishing relationships, breaking down barriers, and marshalling resources throughout the organization in an effort to improve students’ educational experiences and outcomes” ([York-Barr & Duke, 2004](#), p. 263). In the same vein, [Wenner and Campbell \(2017\)](#) suggested that there are a number of general themes to highlight about teacher leadership in the literature: (a) teacher leadership goes beyond classroom walls, (b) teacher leadership includes promoting professional learning, (c) teacher leadership involves shared policy and decision making, (d) the goal of teacher leadership is improving student learning, and (e) teacher leadership is a process of facilitation of whole school change and improvement.

#### 2.2.2. Teacher empowerment

Most studies conceptualize teacher empowerment from two perspectives: social structural and psychological ([Lee & Nie, 2014](#)).

**Table 1**

A summary of teacher leadership dimensions in the literature.

Author (Year)	Dimension
Gehrke (1991)	A. Continuing to teach and improve one's own teaching B. Organizing and leading peer reviews of school practice C. Providing curriculum development knowledge D. Participating in school-level decision making E. Leading in-service education and assisting other teachers, and F. Participating in the performance evaluation of teachers
York-Barr and Duke (2004)	A. Coordination and management B. School or district curriculum work C. Professional development of colleagues D. Participation in school change/improvement E. Parent and community involvement F. Contributions to the profession G. Preservice teacher education
Harris and Muijs (2004)	A. Brokering role which concerns translating the principles of school improvement into the practices of classroom B. Participative role which emphasizes teachers being part of the school change C. Mediating role which considers teacher as a source of expertise and information, and D. The role of instructional leadership such as forging close relationships
Katzenmeyer and Moller (2009)	A. Developmental focus: teachers are supported in learning new knowledge and skills and are encouraged to help others to learn B. Recognition: teachers are respected and recognized for the professional roles they take and the contributions they make C. Autonomy: teachers are encouraged to take initiative in making improvements and innovations D. Collegiality: teachers collaborate on instruction and student-related matters E. Participation: teachers are actively involved in making decisions and have input on important matters F. Open communication: teachers send and receive communication in open, honest ways in schools G. Positive environment: teachers experience general satisfaction with the work environment
Fairman and Mackenzie (2012)	A. Individual teacher engages in learning about his or her practices B. Individual teacher experiments and reflects C. Teacher shares ideas and learning; mentors, coaches other teachers D. Teachers collaborate and reflect together on collective work E. Teachers interact in groups and through relationships re-culture the school F. Teachers question, advocate, building support and organizational capacity G. Teachers engage in collective school-wide improvement, focus resources, and distributed leadership H. Teachers collaborate with the broader school community, parents I. Teacher (or group) share work outside of school/in professional organizations
Teacher Leadership Exploratory Consortium (2011)	A. Fostering a collaborative culture to support educator development and student learning B. Accessing and using research to improve practice and student learning C. Promoting professional learning for continuous improvement D. Facilitating improvements in instruction and student learning E. Promoting the use of assessments and data for school and district improvement F. Improving outreach and collaboration with families and community G. Advocating for student learning and the profession
Michigan Teacher Leader Preparation Standard (2013)	A. Promoting a Shared School Vision, Mission, and Goals of Learning B. Fostering a Collaborative Culture to Support Educator Development and Student Learning C. Accessing and Using Research to Improve Practice, Student Learning, and Using Authentic Assessments D. Promoting Professional Learning for Continuous Improvement E. Facilitating Improvements in Instruction and Student Learning F. Improving Outreach and Collaboration with Families and Community G. Advocating for Student Learning and the Profession
Ohio Teacher Leadership Framework (2017)	A. Building relationships and partnerships B. Fostering collaborative culture C. Advancing instruction and student learning D. Driving initiatives E. Practicing equity and ethics
Kentucky Teacher Leadership Framework (2015)	A. Leading from the classroom: developing capacities of student and self B. Leading through modeling and coaching: developing capacities of peers C. Leading groups and teams: contributing to positive school change to enhance student learning D. Leading to increase teacher voice and influence: working to enlarge teachers' role in decision-making beyond the

*(continued on next page)*

Table 1 (continued)

Author (Year)	Dimension
Teacher Leadership Institute (2018)	classroom and in concert with other stakeholders
	E. Leading to professionalize teaching: reforming educational systems to create greater opportunities for teachers to learn and lead beyond the local level
	F. Leading to connect to the larger community or world: expanding the world of the classroom beyond the school
	A. Instructional leadership which includes coaching and mentoring, facilitating collaborative relationships, and community awareness, engagement and advocacy, B. Association leadership consisting leading with vision, leading with skill, organizing and advocacy, building capacity of others, and learning community and workplace culture C. Policy leadership including policy implementation, policy making, policy advocacy, and policy engagement

The social structural perspective considers teacher empowerment as teachers' power to influence school decisions (Marks & Louis, 1997; Rice & Schneider, 1994; Sweetland & Hoy, 2000). Marks and Louis (1997) identified four domains of empowerment: (a) school operations and management, (b) students' school experiences, (c) teachers' work life, and (d) control over classroom instruction. The psychological perspective defines teacher empowerment as "an individual's psychological state" (Lee & Nie, 2014, p. 68), which includes self-efficacy, autonomy, and impact, etc. (Lee & Nie, 2014; Short & Rinehart, 1992; Squire-Kelly, 2012).

### 2.2.3. Distributed leadership

Rather than focusing exclusively on either one formal individual leader or certain designated teacher leaders, distributed leadership implies that leadership is a group-level phenomenon (Pearce & Conger, 2003; Spillane, Halverson, & Diamond, 2001), which requires "the conjoint agency of multiple actors" (Tian, Risku, & Collin, 2016). According to Spillane (2005), distributed leadership refers to "a product of the interactions of school leaders, followers, and their situation" (p. 144). Thus, distributed leadership shows a sign of being a broader concept, which includes teacher leadership and teacher empowerment (Harris, 2009, p. 141). Distributed leadership is often used interchangeably with other terms, such as "shared leadership," "collaborative leadership" (Spillane, 2005).

### 2.3. The dimensions of teacher leadership

Over the past decades, there have been considerable efforts aimed at delineating the leadership roles for teachers. For instance, by reviewing 140 studies from 1980 to 2004, York-Barr and Duke (2004) summarized seven dimensions of teacher leadership practices: (a) coordination and management, (b) school or district curriculum work, (c) professional development of colleagues, (d) participation in school change/improvement, (e) parent and community involvement, (f) contributions to the profession, and (g) preservice teacher education. However, these dimensions are somewhat fluid (e.g., dimensions c, f, and g) and do not represent a consensus in the field.

An alternative option for framing teacher leadership is offered by The Teacher Leader Model Standards which were developed by the Teacher Leadership Exploratory Consortium (2011) which is "a broad array of education organizations, state education agencies, teacher leaders, principals, superintendents, and institutions of higher education" (p. 3). The teacher leader standards suggested by this body of work consists of seven domains: (a) fostering a collaborative culture to support educator development and student learning, (b) accessing and using research to improve practice and student achievement, (c) promoting professional learning for continuous improvement, (d) improvements in instruction and student learning, (e) promoting the use of assessments and data for school and district improvement, (f) improving outreach and collaboration with families and community, and (g) advocating for student learning and the profession. These seven dimensions are much more specific and nuanced than those extracted by York-Barr and Duke (2004) from their analysis of studies.

We looked further into existing literature to get to an even finer level of delineation. In Table 1, we summarized a series of teacher leadership dimensions offered by relevant literature and reports examining this construct. Based on the summary, we categorized seven distinct dimensions; then, synthesized and developed our inclusive, yet parsimonious framework of teacher leadership (see Table 2). Our framework consists of seven dimensions: (a) promoting a shared school vision, mission and goals of student learning, (b) coordinating and managing beyond the classroom such as organizing and leading peer reviews of school practice, managing programs, and coordinating the school's daily schedules, (c) facilitating improvements in curriculum, instruction, and assessment such as using authentic assessments, developing district-level curricular programs, and developing curricular/instructional materials, (d) promoting teachers' professional development such as mentoring, facilitating learning communities, promoting pre-service teacher education, and developing capacities of peers, (e) engaging in policy and school decision making which includes policy making, policy engagement, policy implementation, and policy advocacy, (f) improving outreach and collaboration with families and communities such as advocacy for students, schools, and the profession and parent and community engagement, and (g) fostering a collaborative culture in school. These seven dimensions became part of the coding system for this meta-analysis.

### 2.4. Teacher leadership and student outcome

Teacher leadership is essential for school effectiveness and improvement. Regardless of decades of literature on this issue and continuous calls for further examination of teacher leadership as a strategy for improving schools and student learning, until recently, there has been a lack of quantitative empirical studies. As a result, the relationship between teacher leadership and student achievement is far from clear or established (Harris, 2005). Previous literature reviews regarding teacher leadership have all pointed out the urgency for this type of solid

**Table 2**  
The dimension of teacher leadership.

Dimension	Elements and sources
A. Promoting a shared school vision, mission and goals of student learning	<ul style="list-style-type: none"> <li>• Shared vision that brings coherence (Lambert, 2003);</li> <li>• School improvement planning (Ingersoll, Dougherty, &amp; Sirinides, 2017; Smylie &amp; Denny, 1990);</li> <li>• Shared school governance (Heck &amp; Hallinger, 2010a, 2010b);</li> <li>• Leading with vision (Teacher Leadership Institute, 2018)</li> </ul>
B. Coordinating and managing beyond the classroom	<ul style="list-style-type: none"> <li>• Formal roles (Cosenza, 2015);</li> <li>• Leadership of operational tasks (Katzenmeyer &amp; Moller, 2009);</li> <li>• Attend program-related meetings, and promote implementation of programs (Smylie &amp; Denny, 1990);</li> <li>• Coordination and management (Harrison &amp; Birky, 2011; Silva et al., 2000; York-Barr &amp; Duke, 2004);</li> <li>• Organizing and leading peer reviews of school practice (Gehrke, 1991);</li> <li>• Assess progress in making school change (Heck &amp; Hallinger, 2010a, 2010b)</li> </ul>
C. Facilitating improvements in curriculum, instruction, and assessment	<ul style="list-style-type: none"> <li>• Accessing and using research to improve practice and student learning (Teacher Leadership Exploratory Consortium, 2011; Smeets &amp; Ponte, 2009; Teacher Leadership Exploratory; Wolkenhauer, Hill, Dana, &amp; Stukey, 2017)</li> <li>• Sharing best practices (Cosenza, 2015);</li> <li>• Instructional leader (Silva et al., 2000; Smith et al., 2017);</li> <li>• Inquiry based use of information to inform decisions and practice (Lambert, 2003);</li> <li>• Collaborative decisions (Heck &amp; Hallinger, 2010a, 2010b)</li> <li>• School or district curriculum work (Smylie &amp; Denny, 1990; York-Barr &amp; Duke, 2004);</li> <li>• Use assessment results as the basis for the allocation and use of resources (Heck &amp; Hallinger, 2010a, 2010b; Teacher Leadership Exploratory Consortium, 2011);</li> </ul>
D. Promoting teachers' professional development	<ul style="list-style-type: none"> <li>• Mentoring, coaching, and modeling (Cosenza, 2015; York-Barr &amp; Duke, 2004);</li> <li>• Sharing best practices (Cosenza, 2015);</li> <li>• Plan building-level staff development activities (Ingersoll et al., 2017; Smylie &amp; Denny, 1990);</li> <li>• Contribution to the profession, and leading in-service or preservice teacher education (Gehrke, 1991; York-Barr &amp; Duke, 2004);</li> <li>• Professional learning community (Muijs &amp; Harris, 2006);</li> <li>• Instructional teacher leadership (Katzenmeyer &amp; Moller, 2009; Smith et al., 2017);</li> <li>• Collaborative decisions on academic improvement (Heck &amp; Hallinger, 2010a, 2010b);</li> <li>• Developmental focus (Katzenmeyer &amp; Moller, 2009; Nesmith, 2011)</li> <li>• Building capacity of others (Teacher Leadership Institute, 2018)</li> </ul>
E. Engaging in policy and decision making	<ul style="list-style-type: none"> <li>• Leadership in governing (Katzenmeyer &amp; Moller, 2009)</li> <li>• Engage in building level decision making (Smylie &amp; Denny, 1990)</li> <li>• Participation in school change/improvement (York-Barr &amp; Duke, 2004)</li> <li>• Shared decision making and active participation (Emira, 2010; Gehrke, 1991; Hulpia, Devos, Rosseel, &amp; Vlerick, 2012; Katzenmeyer &amp; Moller, 2009; Muijs &amp; Harris, 2006; Nesmith, 2011)</li> <li>• Selecting new teachers for school and providing input on school budget (Ingersoll et al., 2017);</li> <li>• Policy implementation, policy making, policy advocacy, and policy engagement (Teacher Leadership Institute, 2018)</li> </ul>
F. Improving outreach and collaboration with families and communities	<ul style="list-style-type: none"> <li>• Parent and community involvement (York-Barr &amp; Duke, 2004);</li> <li>• Interpersonal relationships (Harrison &amp; Birky, 2011);</li> <li>• Networking (Lambert, 2003)</li> <li>• Share work outside of school/in professional organizations (Fairman &amp; Mackenzie, 2012);</li> <li>• Organizing and advocacy (Teacher Leadership Institute, 2018);</li> <li>• Community awareness, engagement, and advocacy (Teacher Leadership Institute, 2018)</li> </ul>
G. Fostering a collaborative culture in school	<ul style="list-style-type: none"> <li>• Collegiality, open communication and positive environment (Katzenmeyer &amp; Moller, 2009; Nesmith, 2011)</li> <li>• Collaboration and relationships (Cosenza, 2015; Emira, 2010; Harrison &amp; Birky, 2011; Hulpia et al., 2012; Muijs &amp; Harris, 2006; Teacher Leadership Institute, 2018)</li> <li>• Collaborative and lead to collective responsibility (Lambert, 2003);</li> <li>• Situational atmosphere (Chang, 2011)</li> </ul>

empirical research (Wenner & Campbell, 2017; York-Barr & Duke, 2004). Fortunately, in recent years, a growing number of empirical studies have emerged in sufficient quantity to set a stage for this meta-analysis. For example, on the basis of a sample of 24,645 schools from five years of the Teaching, Empowering, Leading and Learning (TELL) survey (from 2011 to 2015), Ingersoll et al. (2017) found that holding constant school background characteristics (poverty level, size, etc.), the higher rank of overall teacher leadership was directly associated with the higher percentile rank of student proficiency in both math and reading.

Teacher leadership may also associate with student learning indirectly through school process variables such as school capacity and

school climate (Heck & Hallinger, 2009, 2010a, 2010b; Hallinger & Heck, 2010a, 2010b; Sebastian et al., 2016; Sebastian et al., 2017). Based on a sample of 198 elementary schools in a western state in the US, Hallinger and Heck examined the direct, mediated, and reciprocal effect that distributed leadership has on student learning growth in math and reading (Hallinger & Heck, 2010a, 2010b; Heck & Hallinger, 2009, 2010a, 2010b). They found that distributed leadership boosts student learning by building the school capacity for academic improvement. Additional studies also showed that there were statistically indirect pathways from principal leadership to teacher leadership, to learning climate and student achievement growth in both primary schools (Sebastian et al., 2016) and high schools (Sebastian et al., 2017). Our search for similar empirical investigations of teacher leadership yielded a sufficient body of empirical studies to support the conduct of our meta-analysis to inquire into the relationship between teacher leadership and student achievement.

### 3. Methods

In this study, we used meta-analysis to synthesize quantitative findings regarding the relationship between teacher leadership and student achievement. To guide the research, we adopted the working definition proposed by Wenner and Campbell (2017) in their meta-analysis, which defined teacher leaders as “the teachers who maintain K-12 classroom-based teaching responsibilities, while also taking on leadership responsibilities outside of the classroom” (Wenner & Campbell, 2017, p. 140). As they suggested, this working definition not only highlights all teachers have the capacity to be school leaders, it also implies teacher leaders somehow go beyond their regular duties (e.g., classroom teaching). In other words, teacher leadership emphasizes teachers’ leadership roles outside of the classroom, such as giving support to colleagues in classrooms and participating in policy or decision making at some level.

#### 3.1. Inclusion and exclusion criteria

We established the following three criteria for inclusion of studies in this meta-analysis.

1. Studies were designed to examine the relationship between teacher leadership and student achievement.
2. Studies were framed from the perspective of or related to teacher leadership. If the studies were related to principal leadership or in a general sense, then they were excluded.
3. Studies were quantitative and had adequate information to calculate effect sizes and the effect sizes are transformable to others.

#### 3.2. Search strategies

In order to identify relevant studies, a rigorous process has been employed, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol (Moher, Liberati, Tetzlaff, & Altman, 2009) (see Fig. 1). We first searched all such articles that met the inclusion criteria and that were published on or before December 31, 2018. The literature was identified via ERIC [ProQuest], PsycINFO, Scopus, Education Abstracts, ProQuest Dissertations & Theses Global, and Google Scholar, applying for the following Boolean search parameters: (“teacher leader\*” OR “distributed leadership” OR “teacher empowerment” OR “collaborative leadership” OR “shared leadership”) AND (“student achievement” OR “student outcome” OR “student learning”). In addition, the reference lists of previous literature reviews concerning teacher leadership were screened and the grey literature (e.g., reports, unpublished research) were carefully searched. Furthermore, reference searches of potential studies identified from the database and grey literature searches were screened for other potential studies.

The initial search yielded 673 studies. After the initial screening of titles and abstracts, two reviewers (trained and calibrated) independently reviewed the identified 106 publications based on the inclusion and exclusion criteria in-depth. With disagreements resolved through a consensus seeking procedure, we finally identified 21 studies (31 effect sizes). The studies were published from 1997 to 2018. For the study selection procedure, the observed (exact) agreement was  $p_o = 0.77$ . The coefficient of agreement accounting for chance was  $\kappa = 0.71$ .

#### 3.3. Analytic strategies

##### 3.3.1. Coding procedure

Once the final set of studies was selected, two study coders engaged in a rigorous coding procedure. A codebook (see Appendix A) was devised, including five sections: (a) study characteristics (i.e., publication type, year, and country), (b) teacher leadership constructs (i.e., leadership theory used to frame research and seven teacher leadership practices), (c) student outcome measures (i.e., outcome measures, and content area), (d) sample (i.e., school level and sample size), and (e) effect size information. The average interrater agreement for coding variables was .82. If there were disagreements, the two coders thoroughly discussed the differences

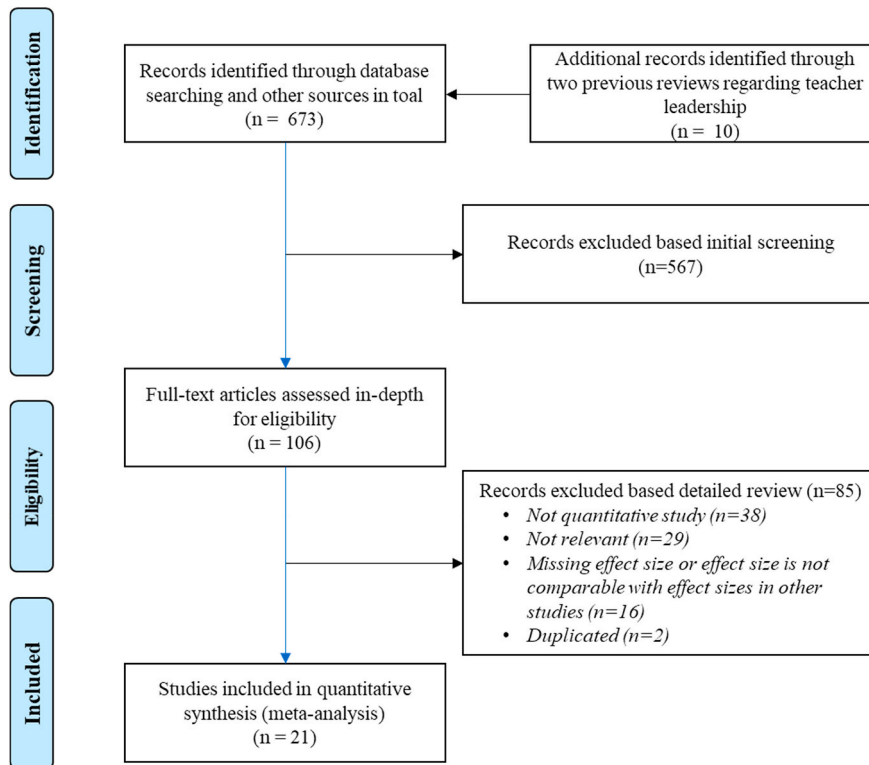


Fig. 1. PRISMA flow diagram.

and came to a census (Pigott & Polanin, 2020).

### 3.3.2. Transforming statistics into a common metric

In this meta-analysis, Pearson correlation ( $r$ ) was selected to represent the relationship between teacher leadership and student achievement. Not all studies presented their results in terms of correlations; therefore, all other effect size measures were transformed into correlations (Pearson's  $r$ ) using formulas specified in the literature<sup>1</sup> (Borenstein, Hedges, Higgins, & Rothstein, 2009). The synthesis of effect was not performed on the correlation coefficient itself. Instead, the Pearson coefficient was transformed to the Fisher's  $z$  scale ( $Z_r = \frac{1}{2} \ln \left( \frac{1+r}{1-r} \right)$ ), and all analyses were performed using the transformed value. There is not much difference between  $Z_r$  and  $r$  for small values of the correlation coefficient (see also Hunter & Schmidt, 2004). Finally, the Fisher's  $z$  transformation of the correlation coefficient was converted back to Pearson correlation coefficient (Borenstein et al., 2009).

### 3.3.3. Combining effect sizes

In some cases, studies report more than one effect size, which Borenstein et al. (2009) called "Complex Data Structures." One example of a complex data structure is that a study reports data on multiple outcomes (e.g., math and reading). Another example is that a study reports multiple effect sizes representing the same construct (e.g., different dimensions of teacher leadership). Rather than treating each outcome as a separate unit in the analysis, researchers recommend using the mean effect size of the outcomes as the unit of analysis (Borenstein et al., 2009; Lipsey & Wilson, 2001; Rosenthal & Rubin, 1986)<sup>2</sup>. When calculating the overall effect size, only one effect size per study was used except the case where studies reported data from two or more independent subgroups (e.g., high

<sup>1</sup> We have found three studies (i.e., Gordon & Louis, 2009; Heck & Hallinger, 2010b; Malloy & Leithwood, 2017) that only reported standardized regression or path coefficient as effect sizes, which is becoming popular in the field of education. Those studies are peer-reviewed studies using advanced analytic methods. However, the effect sizes they reported are not comparable or transformable to correlation. Peterson and Brown (2005) suggested the standardized beta coefficient can be transformed into Pearson correlation by using the formula  $r = \beta + 0.05\lambda$ , where  $\lambda$  is an indicator variable that equals 1 when  $\beta$  is nonnegative and 0 when  $\beta$  is negative. However, most recently, Aloe (2015) and Roth, Le, Oh, Van Iddekinge, and Bobko (2018) argued that Peterson and Brown's (2005) approach is not accurate. Therefore, these three studies are not included.

<sup>2</sup> We understand that recent studies suggested if there are multiple outcomes reported in studies (thus yielding multiple effect sizes), robust variance estimation (RVE) or a three-level meta-analysis model could be used to model the effect sizes (Cheung, 2014; Fisher & Tipton, 2015; Hedges, Tipton, & Johnson, 2010; Tipton, 2015; Tipton & Pustejovsky, 2015; Van den Noortgate, 2013). However, CMA is in the process of incorporating robust variance estimation (RVE) and currently does not have this option.

school and elementary school). Finally, we aggregated all effect sizes into an overall effect size. The analyses were conducted by using Comprehensive Meta-Analysis (Borenstein, Hedges, Higgins, & Rothstein, 2013).

### 3.3.4. Statistical models and testing for heterogeneity

Most meta-analyses are based on one of two statistical models, the fixed-effect model, or the random-effect model. The fixed-effect model assumes that there is a single true effect size which underlies all studies in the analysis. By contrast, the random-effects model allows the true effect size to vary from study to study which follows a population distribution. Accordingly, the results using the random-effect modeling are more generalizable to a range of scenarios than the results using the fixed-effect modeling (Borenstein et al., 2009). In this study, we reported the results under the random-effect model. Since the random-effect model assumes heterogeneity among effect sizes, a statistic ( $Q$ ) that reflects the extent of variation in true effect sizes among all included studies can be estimated using the following formula:

$$Q = \sum_{i=1}^k W_i Y_i^2 - \left( \left( \sum_{i=1}^k W_i Y_i \right)^2 / \sum_{i=1}^k W_i \right),$$

where  $W_i$  is the weight of study  $i$ ,  $Y_i$  is the effect size estimate from study  $i$ , and  $k$  is the number of studies. The  $Q$  statistics can be used to test the assumption of homogeneity in effects. The null hypothesis proposes that all studies share a common effect size. The rejection of null hypothesis suggests that the effect sizes are heterogeneous, and then conducting a subgroup or moderator analysis would be informative to investigate the source of heterogeneity (Card, 2012). Another two measures of heterogeneity are  $T^2$  and  $I^2$ .  $T^2$  describes the variance of the true effect sizes and  $I^2$  tells the proportion of the observed variance would remain if the sampling error is eliminated (Borenstein, 2017).  $T^2$  and  $I^2$  can be computed using following formulas:

$$T^2 = \left( \frac{Q - df}{C} \right) \text{ and } C = \sum W_i - \frac{\sum W_i^2}{\sum W_i},$$

$$I^2 = \left( \frac{Q - df}{Q} \right) \times 100\%,$$

where  $df$  is the degree of freedom, and  $df = k - 1$  (Borenstein et al., 2009; Card, 2012).

In order to address the distribution of true effect sizes, the prediction interval was created using the following formula (Borenstein et al., 2009; Higgins et al., 2009; Riley et al., 2011)

$$\text{Prediction Interval} = M \pm t_{df} \sqrt{T^2 + V_M}$$

where  $M$  is the pooled average effect sizes and  $V_M$  is the variance of  $M$ .

In subgroup analysis, the between-group heterogeneity and within-group heterogeneity can be calculated using

$$Q_{\text{within}} = \sum_{g=1}^G Q_g, \text{ and } Q_{\text{between}} = Q - Q_{\text{within}}$$

$Q_g$  is the heterogeneity within each group  $g$ . If  $Q_{\text{between}}$  is large enough, we accept the alternative hypothesis that groups differ in effect sizes. In addition, to assess the impact of a moderator or covariate, we can compute the proportion of variance explained by that moderator (Borenstein et al., 2009; Card, 2012), which is defined as

$$R^2 = \frac{T^2_{\text{explained}}}{T^2}.$$

### 3.3.5. Interpreting the magnitude of effect sizes

Whether the magnitudes of effects are substantively or practically important is an issue of particular interest to policy makers and program officials. To interpret the practical significance of research results, non-arbitrary benchmark points are indispensable. The best known of these benchmarks are the thresholds proposed by Cohen (1988), where an effect size  $d = 0.2$  or  $r = .10$  is considered small,  $d = 0.5$  or  $r = .30$  is considered medium, and  $d = 0.8$  or  $r = .50$  is considered large. Nevertheless, scholars have cautioned against using Cohen's benchmarks as generic descriptors of the magnitude of effect size because the context also matters. Some settings such as education, are likely to have smaller effect sizes than others; hence, using Cohen's labels may be misleading (Ellis, 2010). Lipsey et al. (2012) investigated a wide range of educational interventions and indicated that the effect sizes these interventions had on standardized reading or math achievement tests were rarely as large as  $d = 0.30$ . Hill, Bloom, Black, and Lipsey (2008) summarized the results of 76 meta-analyses of past studies of educational interventions in K-12 education and also found that the mean effect sizes were in the 0.20 – 0.30 range (Cohen's  $d$ ). On the basis of over 800 meta-analyses which encompassed 52,637 studies, and provided 146,142 effect sizes about influence of various factors (i.e., interventions, policy, or leadership) on student achievement, Hattie (2009) found an average effect size of  $d = 0.40$  and labeled the effect size above  $d = 0.40$  as the "Zone of desired effects." Hattie (2009) also reported effect sizes between  $d = 0.15$  and  $d = 0.40$  as "Teacher effects," representing the typical effects from teachers, and the effect size between  $d = 0.00$  and  $d = 0.15$  as "Developmental effects" representing what students could probably achieve even without schooling.



Based on these findings, in this study we interpret an effect size above  $r = .20$  as the desired teacher effect size, which supports considering a teacher effect size between  $r = .10$  and  $r = .20$  as still meaningful for practice in an educational setting.

### 3.3.6. Publication bias

Several methods were applied to determine if publication bias existed. Fig. 2 depicts the funnel plot, which suggests that the publication bias might not be a big concern in this study. The Begg and Mazumdar rank correlation (Kendall's  $\tau = 0.15, p = .34$ ) and Egger's regression test for intercept (intercept = 0.97, 95% CI [-4.30, 6.25],  $t = 0.38, df = 20, p = .70$ ) also supported that the statistically significant publication bias was not found in this sample (Begg & Mazumdar, 1994; Egger, Smith, Schneider, & Minder, 1997).

## 4. Results

In this section, we presented the results of the analysis. We began with the results of overall association of teacher leadership and student achievement. Second, we focused on the effect sizes for different content areas. Next, we reported the results for each teacher leadership dimensions. Finally, we conducted a series of subgroup analyses to examine if heterogeneity in obtained effect sizes was related to teacher leadership construct, outcome measures, grade level, and study type.

### 4.1. The overall association between teacher leadership and student achievement

This meta-analysis includes 21 studies (22 combined effect sizes and 31 uncombined effect sizes)<sup>3</sup>. Nine studies reported two effect sizes for different content area (e.g., reading, math, and science) and one study reported two effect sizes for elementary and secondary students (see Appendix B for data of each study). The effect sizes for different content area within a study were combined by taking the mean of the effect sizes for those outcomes when synthesizing the overall effect size (Borenstein et al., 2009). As illustrated in the forest plot in Fig. 3 and 20 effect sizes fell in the range of positive impact. In contrast, only two studies by Givens (2013) and Sugg (2013) illustrated a weak negative relationship between teacher leadership and student achievement. Among the 20 positive effect sizes, five and eight effect sizes indicated desired effect ( $r = .20$ ) and meaningful teacher effect ( $r = .10$  and  $r = .20$ ), respectively.

As discussed earlier, there are two statistical models in meta-analysis—the fixed-effect model and random-effect model. The fixed-effect model assumes that one true effect size underlies all the studies, and all differences in the observed effects are due to the sampling error, whereas, the random-effect model assumes different effect sizes underlying different studies which are not functionally identical and allows the true effect to vary from study to study (Borenstein et al., 2009). Under the random-effects model, the summary estimate of the correlation between teacher leadership and student academic achievement was .187 with a 95% confidence interval of .127–.246. Similarly, the Z-value for testing the null hypothesis (that  $r$  is .00) was 5.989, with a corresponding  $p$ -value of  $< .001$ . Consequently, we rejected the null hypothesis and concluded that teacher leadership was positively related to student achievement.

The results of heterogeneity testing of effect sizes indicated that the effect sizes were not explained only by sampling error ( $Q = 1507.26, p < .001$ ). In addition, the  $I^2$  statistic indicated that 98.61% of the observed variance reflects the differences in true effect sizes. The  $T^2$  (the variance of true effect sizes) was 0.018. We also calculated the prediction interval for the effect size of teacher leadership (Borenstein, 2019; Borenstein et al., 2009), which was  $-.098$  to  $.444$ . It is expected that in 95% of all populations, the true effect size would be in this interval.

The statistics suggested that the true effect size of teacher leadership on student achievement varies across studies and the reason for this variability could be twofold: the characteristics of the sample and methodological features of the study. Thus, further moderator analysis or meta-regression was conducted.

### 4.2. Relationships between teacher leadership and student achievement by content areas

Table 3 contains results of the relationship between teacher leadership and student learning in different content areas. There were 11 and 10 available effect sizes reflecting the relationship between teacher leadership and student reading and math achievement, respectively.

The relationships between teacher leadership with student achievement were  $r = .24, p < .001$  for math and  $r = .18, p = .039$  for reading. Eight studies (nine effect sizes) measured the student achievement as a composite in more than one content area, which yielded an average effect size of 0.14. Furthermore, two studies in this meta-analysis (Sebastian et al., 2016; Sebastian et al., 2017) investigated the effect of teacher leadership and student achievement gains or growth<sup>4</sup>, however, due to the small sample, the relationship was not statistically significant with a mean effect size  $r = .20$ .

<sup>3</sup> Cope (2017) reported two effect sizes for different samples. Per Borenstein et al. (2009), we treated each sample as a separate study.

<sup>4</sup> Hallinger and Heck conducted several studies investigating the relationship between distributed leadership and achievement growth (Heck & Hallinger, 2009, 2010a; Hallinger & Heck, 2010a, 2010b). They suggested distributed leadership positively impacts student learning in both reading and math. However, as stated earlier, we were not able to transform the effect sizes they reported to Pearson correlation coefficients. Therefore, those studies were not included in this meta-analysis.

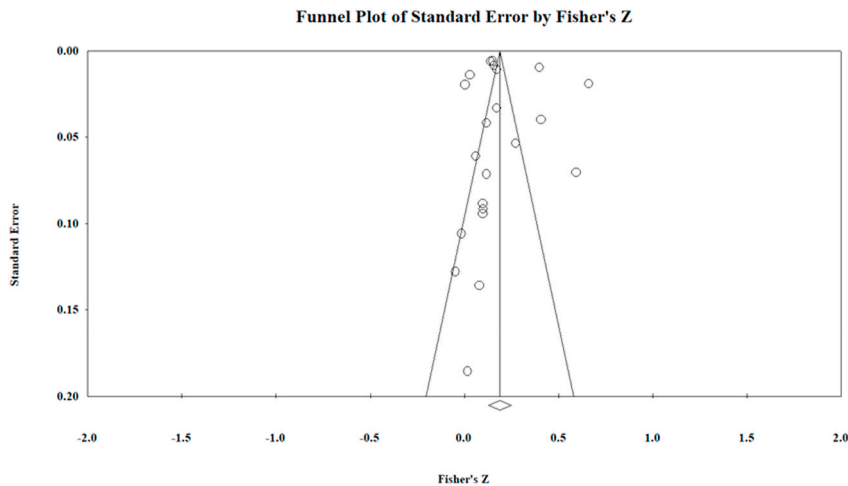


Fig. 2. Funnel plot.

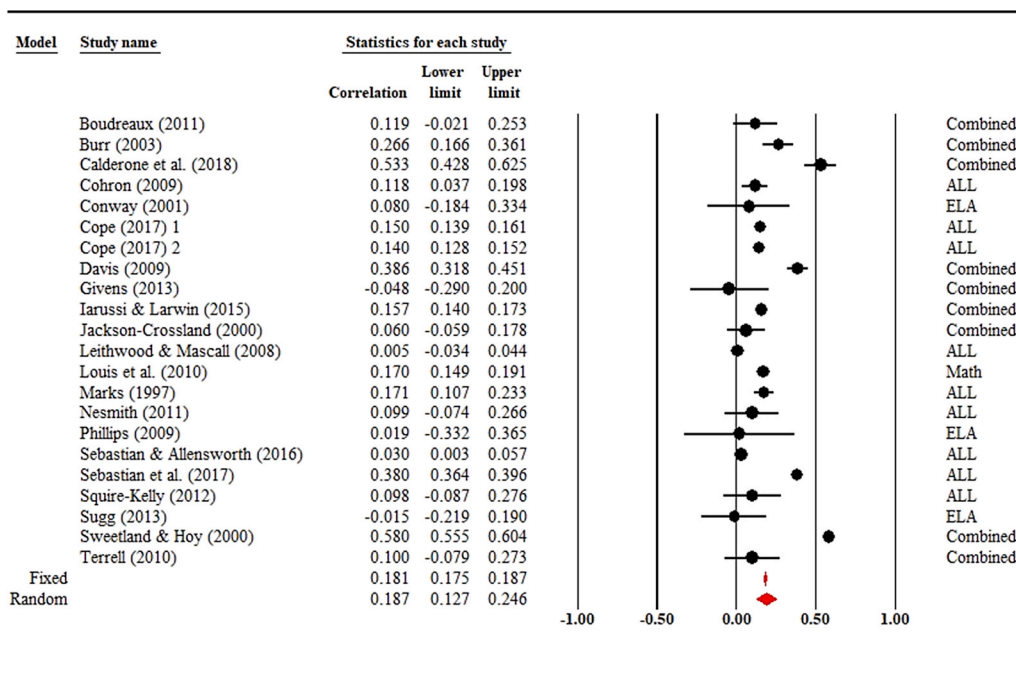


Fig. 3. Forest plot of overall effect meta-analysis.

Note. ELA = English language arts; Math = math achievement; ALL = composite achievement measured on more than one subject within a study; Combined = studies reported separate effect sizes on different subjects which were combined in the analysis.

#### 4.3. Relationships between teacher leadership and student achievement by teacher leadership dimension

The second phase of this meta-analysis was to examine the observed pattern of effect size differences between individual teacher leadership dimensions. By reviewing the literature, we identified seven teacher leadership dimensions on student achievement: (a) promoting a shared school vision, mission and goals of student learning; (b) coordinating and managing beyond the classroom; (c) facilitating improvements in curriculum, instruction, and assessment; (d) promoting teachers' professional development; (e) participating in policy and decision making, (f) fostering a collaborative culture in school, and (g) improving outreach and collaboration with families and community. Using these seven dimensions, we conducted further analyses to isolate effect sizes for each. Fig. 4 displays the results in graphic form with estimated mean effect sizes and 95% confidence intervals for each teacher leadership dimension.

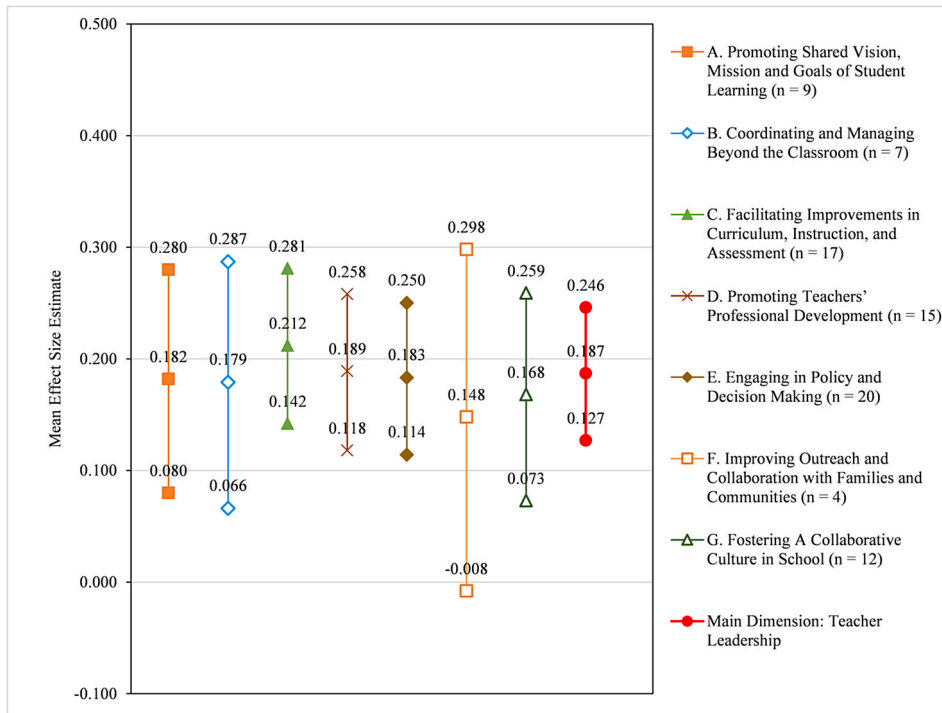
The results manifested that, in general, each of the seven teacher leadership dimensions had a statistically significant and positive relationship with student achievement. The effect sizes range from  $r = .15$  to  $r = .21$ , which fall into the meaningful range we

**Table 3**  
Relationships between teacher leadership and student achievement by content area.

Content Area	k	r	95% CI	z	p	f <sup>2</sup>	T <sup>2</sup>
ELA	11	.18	[.01, .34]	2.06	.039	98.32	0.08
Math	10	.24	[.11, .37]	3.64	<.001	98.75	0.04
All <sup>a</sup>	9	.14	[.06, .22]	3.27	.001	89.96	0.01
Achievement growth	2	.21	[-.15, .52]	1.16	.250	99.79	0.07

Note. All effect sizes were estimated under random-effect model. k = number of combined effect sizes. CI = confidence interval. ELA = English Language Arts.

<sup>a</sup> Student achievement measured on more than one subject within a study.



**Fig. 4.** The effects of teacher leadership dimensions on student achievement.

Note. Bars indicate mean-point estimates (r) bounded by lower and upper limit of 95% confidence interval.

determined for analyzing teacher effects in an educational setting. Among all seven dimensions, the two dimensions of “facilitating

**Table 4**  
Pearson correlations for principal leadership dimensions.

	A	B	C	D	E	F
A. Promoting Shared Vision, Mission and Goals of Student Learning	–					
B. Coordinating and Managing beyond the Classroom	-.14	–				
C. Facilitating Improvements in Curriculum, Instruction, and Assessment	.21	.40	–			
D. Promoting Teachers' Professional Development	-.28	.29	.55	–		
E. Engaging in Policy and Decision Making	-.08	.23	.20	.11	–	
F. Improving Outreach and Collaboration with Families and Communities	.37	.17	-.01	-.43	-.26	–
G. Fostering A Collaborative Culture in School	.28	.41	.42	.20	.05	.18

improvements in curriculum, instruction, and assessment” (r = .21), and “promoting teacher professional development” (r = .19) seem to have the strongest relationships with student achievement. All other dimensions were similar in the magnitude of effect size except “improving outreach and collaboration with families and communities” which seems to have the weakest association with student outcomes (r = .15).

To further assess the relationship between individual teacher leadership dimensions and student achievement, we conducted a multiple meta-regression using all seven sub-dimensions of teacher leadership to predict student achievement. Before that, we

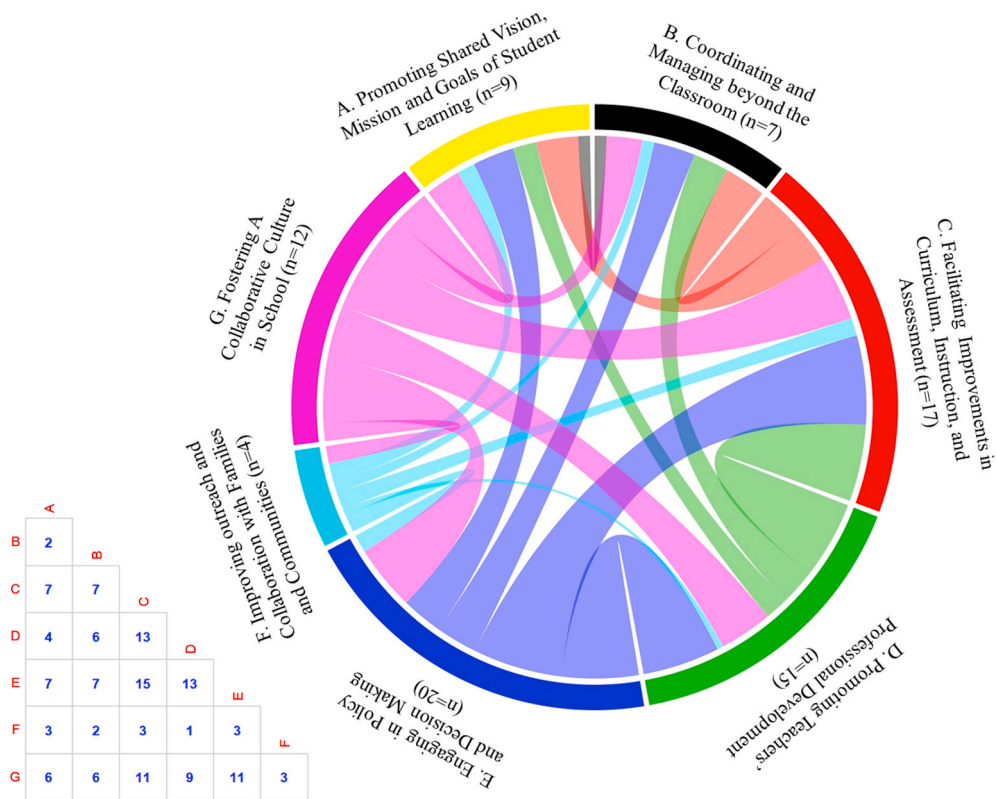


Fig. 5. The relationships among dimensions.

Note. The width of flow represents the strength of intercorrelation, i.e., the shared number of studies. The table at bottom left shows the exact number of shared studies.

examined the intercorrelations among different dimensions of the teacher leadership to detect the degree of multicollinearity. Table 4 shows that there were only some small to moderate intercorrelations among teacher leadership dimensions and the multicollinearity was not likely a problem. We also visualized the relationship among dimensions (see Fig. 5). The width of flow between dimensions represents the number of studies that cover both leadership dimensions. For example, 17 studies mentioned dimension C and 20 studies mentioned dimension E, and 15 studies mentioned both dimension C and E.

Table 5 presents the results of the meta-regression. These estimates were based on the meta-regression with the effect size (correlation) as the outcome measure and all dimensions of teacher leadership (each dummy coded) being entered simultaneously as predictors. Therefore, except for the intercept, all other estimates were coefficients with controls for other teacher leadership dimensions. The estimates were unique effects (correlation between a particular dimension with student achievement) with all other teacher leadership dimensions being controlled. The results indicated that when controlling for other teacher leadership dimensions, “facilitating improvements in curriculum, instruction, and assessment” has a statistically significant relative effect on student achievement. In other words, this analysis pointed out that with control for other six teacher leadership dimensions, teacher leadership in facilitating improvements in curriculum, instruction, and assessment still has a unique relative association with student achievement, a finding that speaks to the importance of this particular dimension of teacher leadership.

Table 5  
Meta-regression of association between teacher leadership dimensions and student achievement.

Dimension	Estimate	SE	z	p	95% CI
Intercept	.25	.15	1.64	.10	[-.04, .56]
A. Promoting Shared Vision, Mission and Goals of Student Learning	-.08	.09	-0.89	.38	[-.27, .10]
B. Coordinating and Managing beyond the Classroom	-.02	.11	-0.18	.86	[-.23, .19]
C. Facilitating Improvements in Curriculum, Instruction, and Assessment	.29	.13	2.19	.03*	[.03, .55]
D. Promoting Teachers' Professional Development	-.15	.12	-1.24	.21	[-.38, .08]
E. Engaging in Policy and Decision Making	-.11	.14	-0.83	.41	[-.39, .16]
F. Improving outreach and Collaboration with Families and Communities	-.07	.09	-0.83	.40	[-.25, .10]
G. Fostering A Collaborative Culture in School	-.07	.13	-0.55	.58	[-.34, .19]

Note. CI = confidence interval. \*p < .05.

**Table 6**  
Relationships between teacher leadership and student achievement by subgroups.

Subgroup	<i>k</i>	<i>r</i>	95% CI		<i>v</i>	<i>z</i>	<i>p</i>	Test of Heterogeneity		
			<i>LL</i>	<i>UL</i>				<i>Q</i>	<i>df</i>	<i>p</i>
<b>Leadership construct</b>								0.98	2	.61
Distributed/shared leadership	3	.09	-.11	.29	0.011	0.89	.37			
Teacher leadership	12	.19	.10	.28	0.004	3.27	<.001			
Teacher empowerment	7	.21	.08	.32	0.002	3.93	.001			
<b>Outcome measure</b>								0.84	2	.66
Standardized test score	12	.21	.13	.30	0.002	4.64	<.001			
Proficiency rate	6	.16	.01	.28	0.004	2.58	.01			
Other	4	.13	-.04	.30	0.006	1.90	.06			
<b>Grade level<sup>a</sup></b>								2.44	1	.12
Elementary school	11	.14	.02	.25	0.004	2.32	.007			
Secondary school <sup>b</sup>	7	.28	.14	.41	0.006	3.87	<.001			
<b>Study type</b>								4.08	1	.04
Dissertation	14	.13	.05	.21	0.002	3.01	.003			
Journal article	8	.26	.17	.35	0.006	5.22	<.001			

Note. All effect sizes and tests were estimated under random-effect model. CI = confidence interval; LL = lower limit; UL = upper limit. *k* is the number of combined effect sizes. *v* is the variance.

\*  $p < .05$ , two-tailed.

<sup>a</sup> Samples in four studies were from schools with all grade configuration.

<sup>b</sup> Middle and high schools.

#### 4.4. Subgroup analysis

In this section, we summarized the results of subgroup analysis (see Table 6). Previous studies have claimed that teacher leadership is closely aligned with many leadership constructs or theories (Wenner & Campbell, 2017; York-Barr & Duke, 2004). In this meta-analysis, we used a combination of key theories of teacher leadership to identify studies, i.e., teacher empowerment, teacher leadership, and distributed/shared leadership. To determine if differences exist in the effect sizes of studies using different terms to frame research, we analyzed the direction and magnitude of effect sizes across the theories. Our results showed a mean correlation of .21 for seven studies using “teacher empowerment” to frame research, .19 for 12 studies using “teacher leadership”, and .09 for three studies using “distributed/shared leadership”. However, the small  $Q_B$  with a value 0.98 suggested that there was no statistically significant difference among the subgroups ( $p = .613$ ). The results can be interpreted as an indicator of construct homogeneity. Despite slight differences among those constructs, given the current empirical evidence, they all capture the central idea of teacher leadership.

The second moderator we focused on was student outcome measures. In this meta-analysis, the outcome measures for 12 studies were standardized test score, six studies were school proficiency rate in state standardized test, and three studies were “other” including informal test score and school achievement rating. Studies that used standardized test score as outcome measure reported a mean correlation of .21 in comparison to .16 for studies using proficiency rate as outcome measure and .13 for other studies. The  $Q$  test for heterogeneity indicated the differences among them were not statistically significant.

We were also interested in whether the association of teacher leadership and student academic outcome was contingent upon grade level. The results showed that in both elementary and secondary (middle and high) schools, teacher leadership had a significant positive relationship with student achievement. The pooled average effects were  $r = .28$  for secondary schools and  $r = .14$  for elementary schools), a nonsignificant difference,  $Q_B = 2.44$ ,  $p = .12$ .

We wish to note that the non-significant results for statistical hypothesis testing must be interpreted with caution. The failure to find a statistical significance difference when comparing subgroups may be either because the effect size difference is truly quite small or due to the insufficient power to reject a false null hypothesis (Borenstein et al., 2009; Hedges & Pigott, 2001; 2004). The small sample sizes must be considered when interpreting the non-significant statistical findings.

The fourth moderator included in our analysis was study type. Many researchers have argued that studies with significant results are more likely to be published and included in a meta-analysis, which results in bias (Borenstein et al., 2009; Littell, 2013). Not surprisingly, our findings suggested that published journal articles produced a larger weighted mean effect size ( $r = .26$ ) than unpublished dissertations ( $r = .13$ ), a difference that was statistically significant ( $Q_B = 4.08$ ,  $p = .044$ ).

## 5. Summary of findings

The purpose of this study was to investigate the relationship between teacher leadership and student achievement. To examine this relationship, we conducted a rigorous statistical meta-analysis of studies that sought evidence of the relationship between teacher leadership and student achievement. The results of our analyses manifested that, in general, there was a small statistically significant positive relationship between teacher leadership and student achievement ( $r = .19$ ), and that our analysis obtained stronger relationship for math achievement than reading achievement ( $r = .24$  for math vs.  $r = .18$  for reading). As far as teacher leadership dimensions are concerned, “facilitating improvements in instruction and curriculum” not only has the largest absolute relationship ( $r = .21$ ), but also has unique relative association with student achievement when controls for all other teacher leadership dimensions.

In addition, the results did not support the assumptions that the relationship between teacher leadership and student achievement

differ between studies which conceptualize teacher leadership in different ways; nor is there evidence that the relationship between teacher leadership and student achievement differ between elementary and secondary schools, or among studies that use three different types of outcomes on student achievement. As mentioned previously, these findings of non-significance must be interpreted with caution because the sample size was small. On the other hand, there was a statistically significant considerable difference between the results of published and unpublished teacher leadership research.

## 6. Discussion

The past few decades have witnessed increasing attention to teacher leadership as an important component of school improvement. Although there were two seminal literature reviews concerning teacher leadership (i.e., [Wenner & Campbell, 2017](#); [York-Barr & Duke, 2004](#)), the relationship between teacher leadership and student academic achievement has not been systematically reviewed. [York-Barr and Duke \(2004\)](#) argued that the empirical evidence about the effect of teacher leadership was relatively limited at the time of their review, especially at the level of student achievement. Wenner and Campbell's review (2017) reaffirmed York and Duke's argument. To fill this knowledge gap, we researched the relevant literature extensively and conducted a meta-analysis based on 21 quantitative studies. Our findings have several implications.

First, [Wenner and Campbell \(2017\)](#) posited that, without empirical evidence linking teacher leadership and student learning, the idea of teacher leadership could be no more than a passing fad. The finding of this meta-analysis - teacher leadership is positively related to student achievement - to some extent, addresses their concerns and shows the vitality of teacher leadership for school improvement and student learning in the age of high accountability ([Muijs & Harris, 2003](#); [York-Barr & Duke, 2004](#)). In addition, in the field of educational leadership, there is much literature on principal leadership by focusing on what principal leadership should be or how principal leadership works. However, as many researchers have argued, principals are not the only source of leadership. Effective school leadership comes from a variety of sources including both principals and teachers. In recent years, scholars such as [Sebastian et al. \(2017\)](#) and [Shen et al. \(2019\)](#) have begun to claim a need to integrate principal and teacher leadership into a new general concept of integrated school leadership. This current meta-analysis also provides initial synthesized evidence for this call.

An examination of several teacher and principal evaluation models suggests that the premise of interdependence between principal and teacher leadership is important. For instance, the [Danielson Framework for Teaching \(2013\)](#) identifies professional responsibilities as one of four dimensions of teacher effectiveness, with four of the six components of this dimension focused on teacher-to-teacher engagement around professional activities that extend beyond the classroom and into dimensions of shared responsibility (i.e. communicating participating in the professional community, growing and developing professionally and showing professionalism). Likewise, one of the four domains in the [Marzano Teacher Evaluation Framework \(2014\)](#) is also professional responsibilities with one of three elements being promoting teacher leadership and collaboration.

In complement of the emphasis on teacher shared leadership and responsibility emphasized by these two highly used teacher evaluation models, the [Reeves and McNeill School ADvance Administrator Evaluation System \(2017\)](#) emphasizes shared leadership and responsibility with teachers to such an extent that the most advanced demonstration of every principal performance characteristic requires evidence of development of teacher leadership, efficacy, and shared responsibility. As all three of the referenced performance frameworks for teachers and principals stress the importance of teacher leadership, we hope that these systems in wide use for educator performance evaluation will generate further empirical studies that explore the interactions between specific manifestations of teacher leadership and student achievement.

Second, this study identified seven key teacher leadership dimensions and found that some dimensions are more associated with student achievement than others. "Facilitating improvements in curriculum, instruction and assessment" is the most strongly associated with positive student outcomes, both individually and in combination with all other dimensions of teacher leadership. These results are consistent with [York-Barr and Duke's \(2004\)](#) finding that, "teacher leadership work that is focused at the classroom level of practice (e.g., implementing instructional strategies) is likely to show student effects more readily than work focused at the organizational level (e.g., participating in site-based decision making)" (p. 288). In that case, school leaders would be wise to make continuous efforts to engage teachers in improving curriculum, instruction, and assessment. For example, principals could encourage teachers to work with their peers to use research and authentic assessment to improve teaching practice, support new instructional ideas and innovations, and allow teachers the authority and autonomy to select and develop curriculum. On a cautionary note, we must point out that despite no sign of multicollinearity, there is some small to moderate correlations among teacher leadership dimensions that may temper our findings.

We also found that some teacher leadership dimensions (e.g., "facilitating improvements in curriculum, instruction, and assessment") have a rather narrow range of effect size, whereas the effect size range of others is wider. One plausible explanation for the wide range is that some dimensions are not investigated as much as others. "Improving outreach and collaboration with families and communities" is an example. Only four studies have included this dimension in their research design, so that the conclusion concerning this dimension is premature. However, it is also possible to argue that the relationship between some teacher leadership dimensions, which yielded a broader range of effect size, and student achievement depends highly upon the school context whereas some others are more universal (such as "facilitating improvements in curriculum, instruction, and assessment").

Third, scholars have argued that, although teacher leadership is a well-known and accepted form of leadership activity, no single term or theory was readily used by all or most researchers ([Harris, 2003](#)). In this study, we compared the effect sizes of studies using different terms and found that there was no statistically significant difference among the studies that used the terms of teacher empowerment, teacher leadership, and distributed leadership. It appears that studies using teacher empowerment tended to underscore teacher participation in school decision making on the technical core of curriculum, instruction, and assessment, as well as professional development. Studies utilizing the construct of teacher leadership not only focus on all three of the above dimensions, but

also show greater concerns about the role of teacher leaders in building a collaborative school culture and stronger relationships with parents and community. Studies using distributed leadership are more likely to conceptualize leadership at the whole school level, which focuses on leaders, followers, and situations. For instance, [Davis \(2009\)](#) distilled seven dimensions of distributed leadership: school organization, vision, culture, instructional program, artifacts, teacher leadership, and principal leadership. Our findings suggest that the effect sizes were not statistically different among those groups of studies using different terms to frame their research. This finding, to some extent, supports that all these terms (teacher leadership, teacher empowerment, and distributed leadership) and related leadership dimensions are efficacious. Therefore, from the practice standpoint, various teacher leadership dimensions are encouraged as illustrated in reference to the Reeves and McNeill School ADvance principal evaluation framework (2017) discussed earlier. From the research standpoint, the research community could, on the one hand, continue to unearth the efficacious dimensions underlying the construct of teacher leadership and, on the other hand, focus on synthesizing those efficacious dimensions to arrive at a common and inclusive conception, in [Wenner and Campbell's \(2017\)](#) words, "building synergistically toward a theory of teacher leadership" (p. 161).

## 7. Limitations and direction for future study

Our study has several limitations which cause us to be conservative in interpretations of the results and point to directions for future efforts. The first limitation derives from the sample of studies, as is the case in all meta-analyses ([Lipsey & Wilson, 2001](#)). A small number of studies were available in several analyses. This is an unignorable issue when calculating average effects for individual teacher leadership dimensions. For example, the estimated effect size for "improving outreach and collaboration with families and community" was based on only four studies as the remaining studies did not focus on this dimension. As a result, the estimates may be less precise due to the small number of studies. Another issue in the sample of studies is the difference between published studies and dissertations. Scholars have observed that studies with significant and positive results are more likely to be published and included in a meta-analysis. If the missing of grey/unpublished literature are systematically different from the published studies, then the sample of studies is biased ([Borenstein et al., 2009](#); [Littell, 2013](#)). Meta-analyses that rely solely or heavily on dissertations come under greater scrutiny with respect to data quality as a result of the lack of the peer-review procedure ([Borenstein et al., 2009](#)). With such concerns in mind, our sample of studies includes both dissertations and journal articles. However, the heterogeneity of the effect sizes between published and unpublished studies indicates another need for further investigations. With the further development of this research area, a more substantial sample will be available to draw a fuller and more nuanced picture of the relationship between teacher leadership and student achievement.

As in the case of principal leadership, teacher leadership is also mediated by school process ([Leithwood & Jantzi, 1999](#)). The second limitation of this meta-analysis is that only a small number of studies rigorously examined the indirect relationships between teacher leadership and student achievement through school capacity (e.g., [Heck & Hallinger, 2010a; 2010b](#)), teacher work setting and motivation (e.g., [Leithwood and Mascal, 2008](#)), and learning climate and classroom instruction (e.g., [Sebastian et al., 2016](#), [Sebastian et al., 2017](#)). As a result, we were unable to conduct a separate analysis to identify key paths from teacher leadership to student achievement. Understanding the indirect paths from teacher leadership to student achievement is critical for the purposes of policy and practice. Thus, we emphasize the need for studies that investigate the indirect correlations between teacher leadership and student learning.

Third, we base this meta-analysis mainly on cross-sectional studies. Therefore, although our meta-analysis supports the positive relationship between teacher leadership and student achievement, the finding does not allow for a causal inference concerning the relationship between teacher leadership and student achievement. It should be acknowledged that our results did not indicate whether one causes the other, and the relationship is possible to be recursive or reciprocal. Higher teacher leadership may result in the improvement of student learning. In turn, in schools with higher student achievement, teachers may be more likely to take leadership responsibilities. Moreover, other confounding variables of school context and process may also be feasible to explain the relationship between teacher leadership and student achievement.

The above limitations do not negate the value and implication of our study. Our meta-analysis offers initial synthesized evidence for the relationship between teacher leadership and student achievement. Teacher leadership is a promising construct for school improvement. During our study, we found that much of the literature on teacher leadership is normative; thus, there is a need for more empirical studies on this topic, particularly those focusing on indirect relationships from teacher leadership to school capacity and to student achievement. Additionally, an intriguing line of inquiry will be to follow the indirect pathways from principal leadership to teacher leadership to student achievement. Much work needs to be done in these promising and crucial areas.

## Funding statement

The research work was supported by a grant titled "High-Impact Leadership for School Renewal" (U423A170077) from the Supporting Effective Educator Development (SEED) Grant Program, US Department of Education. The authors are responsible for the opinions and possible errors in the paper.

## CRedit authorship contribution statement

**Jianping Shen:** Conceptualization, Writing - review & editing, Supervision, Project administration, Funding acquisition. **Huang Wu:** Conceptualization, Investigation, Methodology, Software, Formal analysis, Data curation, Writing - original draft. **Patricia**

**Reeves:** Conceptualization, Writing - review & editing, Supervision, Project administration, Funding acquisition. **Yunzheng Zheng:** Conceptualization, Investigation. **Lisa Ryan:** Conceptualization, Writing - review & editing. **Dustin Anderson:** Conceptualization, Writing - review & editing.

## Appendix A

Variable	Code	Comments
<b>Study Characteristics</b>		
<b>Study Identifier</b>		
1. Study ID		
2. Bibliographic reference		
3. Type of publication	1) Journal 2) book or book chapter 3) Thesis or doctoral dissertation 4) Technical report 5) Conference paper 6) Other (specify)	Cohen's Kappa ( $K$ ) = 0.81
4. Publication year		
5. Country/region		
<b>Independent Variable: Teacher Leadership Constructs</b>		
6. Leadership construct	1) Teacher Leadership 2) Distributed/Shared Leadership 3) Teacher empowerment 4) Other (please specify)	Cohen's Kappa ( $K$ ) = 0.84
7. Leadership dimension	1) Promoting a shared school vision, mission and goals of student learning, 2) Coordinating and managing beyond the classroom 3) Facilitating improvements in curriculum, instruction, and assessment 4) Promoting teachers' professional development 5) Engaging in policy and school decision making 6) Improving outreach and collaboration with families and communities 7) Fostering a collaborative culture in school.	Each choice will be an independent variable (1 is Yes, 0 is No).
<b>Dependent Variable: Student Achievement Constructs</b>		
8. Outcome construct	1) GPA 2) Self-reported achievement 3) Raw Standardized test score 4) Proficient rate 5) Other	
9. Subject	1) Reading 2) Math 3) Composite 4) Other	Cohen's Kappa ( $K$ ) = 0.84
<b>Sample</b>		
10. Grade level	1) Elementary schools (K–5th grade) 2) Secondary schools (6th–12th grades) 3) Both	Cohen's Kappa ( $K$ ) = 0.80
11. Sample size		
11.1. Student sample size		
11.2. Classroom/teacher sample size		
11.3. School/principal sample size		
<b>Effect Size</b>		
12. Effect size ID		Number effect sizes within a study sequentially (e. g., 1, 2, 3, 4).
13. Page number where effect size data was found		
14. Type of data effect size is based on	1) Means and standard deviations 2) Correlation 3) t-value or F-value 4) Chi-square 5) Regression coefficient	
15. Overall effect size		



Appendix B

Author (Year)	Type	Theory	Outcome Measure	Subject	Grade	Sample	Teacher Leadership Dimension						
							A	B	C	D	E	F	G
Boudreaux, 2011	2	TL	Standardized test score	Math & reading	1	United States; 12 sch; 199 tch;	0	0	1	1	1	0	1
Burr, 2003	2	TL	Proficiency rate	Math & reading	1	United States; 3589 stu; 264 sch; 350 tch	0	0	0	0	0	1	0
Calderone et al., 2018	1	TL	Standardized test score	Math & science	2	United States; 173 stu; 8 tch	0	1	1	1	1	0	1
Cohron, 2009	2	TL	Standardized test score	All	1	United States; 573 tch; 70 sch	1	1	1	0	1	1	1
Conway, 2001	2	TE	Standardized test score	Reading	1	United States; 57 tch	0	1	1	1	1	0	1
Cope, 2017 <sup>a</sup>	2	TE	Other	All	1 & 2	United States; 54,436 tch; 1425 sch	1	0	1	1	1	0	0
Davis, 2009	2	TL	Proficiency rate	Math & reading	1	United States; 635 tch; 34 sch	0	0	1	1	1	0	1
Givens, 2013	2	DL/SL	Proficiency rate	Math & reading	2	United States; 64 tch; 35 sch	1	0	0	0	1	0	1
Iarussi and Larwin, 2015	1	TL	Standardized test score	Math & reading	3	United States; 13,391 stu	1	0	1	1	0	0	1
Jackson-Crossland, 2000	2	TE	Standardized test score	Math & reading	1	United States; 271 tch; 15 sch	0	1	1	1	1	0	1
Leithwood and Mascal, 2008	1	TL	Proficiency rate	All	3	United States; 2570 tch; 90 sch	0	0	0	0	1	0	0
Louis et al., 2010	1	DL/SL	Proficiency rate	Math	3	United States; 2005–6: 4491 tch in 157 sch; 2008: 3900 tch in 134 sch	0	0	0	1	1	0	0
Marks & Louis, 1997	1	TE	Other	All	3	United States; 910 tch in 24 sch	0	1	1	1	1	0	0
Nesmith, 2011	2	TL	Other	All	1	United States; 127 tch	1	0	1	1	1	0	1
Phillips, 2009	2	TL	Standardized test score	Reading	1	United States; 40 tch	1	0	1	0	1	1	1
Sebastian et al., 2016	1	TL	Standardized test score	All	1	United States; 534 sch	0	0	1	1	1	0	0
Sebastian et al., 2017	1	TL	Standardized test score	All	2	United States; 121 sch	0	0	1	1	1	0	0
Squire-Kelly, 2012	2	TE	Standardized test score	All	2	United States; 115 tch in 5 sch	0	1	1	1	1	0	1
Sugg, 2013	2	TL	Standardized test score	Reading	2	United States; 2292 stu in 92 tch in 2 sch	0	0	0	0	1	0	0
Sweetland and Hoy, 2000	1	TE	Standardized test score	Math & reading	2	United States; 2741 tch in 86 sch	1	0	1	0	1	0	0
Terrell, 2010	2	DL/SL	Proficiency rate	Math & reading	1	United States; 122 tch in 73 sch	1	1	1	1	1	1	1

Note. Type: 1 = journal article, 2 = dissertation; Theory: TL = teacher leadership, TE = teacher empowerment, DL = distributed leadership, and SL = shared leadership; Subject: All = composite achievement measured on more than one subject within a study; Grade: 1 = elementary schools, 2 = middle and high schools, 3 = other or all types of schools; Sample: stu = students, tch = teachers, and sch = schools; Dimension A-G: 1 = yes, 0 = no. Cope (2017) study includes two independent studies for different sample.

References

References marked with an asterisk indicate studies included in the meta-analysis.

Aloe, A. M. (2015). Inaccuracy of regression results in replacing bivariate correlations. *Research Synthesis Methods*, 6, 21–27. <https://doi.org/10.1002/jrsm.1126>.

Begg, C. B., & Mazumdar, M. (1994). Operating characteristics of a rank correlation test for publication bias. *Biometrics*, 50(4), 1088–1101. <https://doi.org/10.2307/2533446>.

Borenstein, M. (2019). *Training materials title “Meta-analysis: Concepts and applications” and the associated Excel template for calculating prediction interval*. London, UK: Training session offered.

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2009). *Introduction to meta-analysis*. United Kingdom: Wiley.

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2013). Comprehensive meta-analysis (version 3) [Computer software]. Biostat <https://www.meta-analysis.com/>.

Borenstein, M. (2017). Basics of meta-analysis:  $I^2$  is not an absolute measure of heterogeneity. *Research Synthesis Methods*, 8(1), 5–18. <https://doi.org/10.1002/jrsm.1230>.

\* Boudreaux, W. (2011). *Distributed leadership and high-stakes testing: Examining the relationship between distributed leadership and LEAP scores* (Publication No. 3482420) [Doctoral dissertation, Southeastern Louisiana University]. ProQuest Dissertations & Theses Global.

\* Burr, B. J. W. (2003). *Teacher leadership: Is it related to student achievement?* (Publication No. 3095418) [Doctoral dissertation, Texas A&M University]. ProQuest Dissertations & Theses Global.

\* Calderone, S., Kent, A. M., & Green, A. M. (2018). Teacher leaders and student achievement: Can the dots be connected?. *Revista Eletrônica de Educação*, 12(2), 395–407.

- Card, N. A. (2012). *Applied meta-analysis for social science research*. New York, NY: Guilford Publications.
- Chang, I.-H. (2011). A study of the relationships between distributed leadership, teacher academic optimism and student achievement in Taiwanese elementary schools. *School Leadership & Management*, 31(5), 491–515.
- Cheung, M. W.-L. (2014). Modeling dependent effect sizes with three-level meta-analyses: A structural equation modeling approach. *Psychological Methods*, 19, 211–229.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- \* Cohron, W. R. (2009). *The effect of teacher leader interactions with teachers on student achievement: A predictive study*. Publication No. 3370064 [Doctoral dissertation, University of Louisville]. ProQuest Dissertations & Theses Global.
- \* Conway, P. R. (2001). *The relationship among teacher empowerment, teacher beliefs, teacher demographics, and second grade reading achievement* (Publication No. 3012962) [Doctoral dissertation, University of Missouri-Columbia]. ProQuest Dissertations & Theses Global.
- \* Cope, F. F. (2017). *The relationship between teacher empowerment in decision making, and teachers' professional intentions, teacher satisfaction, and student achievement* (Publication No. 10669644) [doctoral dissertation, the university of memphis]. ProQuest Dissertations & Theses Global.
- Cosenza, M. N. (2015). Affirming the teacher leader model standards. *Issues in Teacher Education*, 24(2), 79–99.
- Danielson, C. (2006). *Teacher leadership that strengthens professional practice*. Association for Supervision and Curriculum Development.
- Danielson, C. (2013). *The framework for teaching evaluation instrument*. Retrieved from <http://www.locsd.ca/~div15/wp-content/uploads/2015/09/2013-framework-for-teaching-evaluation-instrument.pdf>.
- \* Davis, M. W. (2009). *Distributed leadership and school performance* (Publication No. 3344534) [Doctoral dissertation, The George Washington University]. ProQuest Dissertations and Theses Global.
- Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal*, 315(7109), 629–634. <https://doi.org/10.1136/bmj.315.7109.629>.
- Ellis, P. D. (2010). *The essential guide to effect sizes: Statistical power, meta-analysis, and the interpretation of research results*. Cambridge University Press.
- Emira, M. (2010). Leading to decide or deciding to lead? Understanding the relationship between teacher leadership and decision making. *Educational Management Administration & Leadership*, 38(5), 591–612.
- Fairman, J. C., & Mackenzie, S. V. (2012). Spheres of teacher leadership action for learning. *Professional Development in Education*, 38(2), 229–246.
- Fisher, Z., & Tipton, E. (2015). Robumeta: An R-package for robust variance estimation in meta-analysis. *arXiv preprint arXiv:1503.02220*.
- Gehrke, N. (1991). *Developing teachers' leadership skills*. ERIC Digest. Retrieved from <https://files.eric.ed.gov/fulltext/ED330691.pdf>.
- \* Givens, K. L. (2013). *A new look at distributive leadership in title I and non-title I schools: Does distributive leadership impact student achievement and school culture?* (Publication No. 3585034) [Doctoral dissertation, Florida Atlantic University]. ProQuest Dissertations & Theses Global.
- Gordon, M. F., & Louis, K. S. (2009). Linking parent and community involvement with student achievement: Comparing principal and teacher perceptions of stakeholder influence. *American Journal of Education*, 116, 1–31.
- Hallinger, P., & Heck, R. H. (2010a). Collaborative leadership and school improvement: Understanding the impact on school capacity and student learning. *School Leadership & Management*, 30(2), 95–110.
- Hallinger, P., & Heck, R. H. (2010b). Leadership for learning: Does collaborative leadership make a difference in school improvement? *Educational Management Administration & Leadership*, 38(6), 654–678.
- Harris, A. (2003). Teacher leadership as distributed leadership: Heresy, fantasy or possibility? *School Leadership & Management*, 23(3), 313–324.
- Harris, A. (2005). Teacher leadership: More than just a feel-good factor? *Leadership and Policy in Schools*, 4(3), 201–219.
- Harris, A. (2009). *Distributed leadership: Different perspectives*. Netherlands: Springer.
- Harris, A., & Muijs, D. (2004). *Improving schools through teacher leadership*. Open University Press.
- Harrison, S., & Birky, G. (2011). Revisiting teacher leadership: Perceptions of teachers and principals. *Northwest Journal of Teacher Education*, 9(2), 35–46.
- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.
- Heck, R. H., & Hallinger, P. (2009). Assessing the contribution of distributed leadership to school improvement and growth in math achievement. *American Educational Research Journal*, 46(3), 659–689.
- Heck, R. H., & Hallinger, P. (2010a). Collaborative leadership effects on school improvement: Integrating unidirectional- and reciprocal- effects models. *The Elementary School Journal*, 111(2), 226–252.
- Heck, R. H., & Hallinger, P. (2010b). Testing a longitudinal model of distributed leadership effects on school improvement. *The Leadership Quarterly*, 21(5), 867–885.
- Hedges, L. V., & Pigott, T. D. (2001). The power of statistical tests in meta-analysis. *Psychological Methods*, 6(3), 203–217. <https://doi.org/10.1037//1082-989X.6.3.203>.
- Hedges, L. V., & Pigott, T. D. (2004). The power of statistical tests for moderators in meta-analysis. *Psychological Methods*, 9(4), 426–445. <https://doi.org/10.1037/1082-989X.9.4.426>.
- Hedges, L. V., Tipton, E., & Johnson, M. C. (2010). Robust variance estimation in meta-regression with dependent effect size estimates. *Research Synthesis Methods*, 1, 39–65.
- Higgins, J. P., Thompson, S. G., & Spiegelhalter, D. J. (2009). A re-evaluation of random-effects meta-analysis. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 172(1), 137–159.
- Hill, C. J., Bloom, H. S., Black, A. R., & Lipsey, M. W. (2008). Empirical benchmarks for interpreting effect sizes in research. *Child Development Perspectives*, 2(3), 172–177.
- Hulpia, H., Devos, G., Rosseel, Y., & Vlerick, P. (2012). Dimensions of distributed leadership and the impact on teachers' organizational commitment: A study in secondary education. *Journal of Applied Social Psychology*, 42(7), 1745–1784.
- Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage.
- \* Iarussi, R., & Larwin, K. H. (2015). The impact of a teacher leader model of professional development for common core state standards implementation on student achievement. *Perspectives: A Journal of Research and Opinion about Educational Service Agencies*, 21(1), 1–30.
- Ingersoll, R. M., Dougherty, P., & Sirinides, P. (2017). School leadership counts. Retrieved from <https://info.newteachercenter.org/1/576393/2018-08-21/34lyxkd>.
- \* Jackson-Crossland, B. (2000). *The relationships between teacher empowerment, teachers' sense of responsibility for student outcomes, and student achievement* (Publication No. 9974618) [Doctoral dissertation, University of Missouri – Columbia]. ProQuest Dissertations & Theses Global.
- Katzenmeyer, M., & Moller, G. (2009). *Awakening the sleeping giant: Helping teachers develop as leaders*. Thousand Oaks, CA: Corwin Press.
- Kentucky Department of Education. (2015). Kentucky teacher leadership framework. Retrieved from <https://education.ky.gov/teachers/Documents/Kentucky%20Teacher%20Leadership%20Framework.pdf>.
- Lambert, L. (2003). Leadership redefined: An evocative context for teacher leadership. *School Leadership & Management*, 23(4), 421–430.
- Lee, A. N., & Nie, Y. (2014). Understanding teacher empowerment: Teachers' perceptions of principal's and immediate supervisor's empowering behaviours, psychological empowerment and work-related outcomes. *Teaching and Teacher Education*, 41, 67–79.
- Leithwood, K., & Jantzi, D. (1999). The relative effects of principal and teacher sources of leadership on student engagement with school. *Educational Administration Quarterly*, 35(5), 679–706.
- \* Leithwood, K., & Mascall, B. (2008). Collective leadership effects on student achievement. *Educational Administration Quarterly*, 44(4), 529–561.
- Lipsey, et al. (2012). *Translating the statistical representation of the effects of education interventions into more readily interpretable forms*. U.S. Department of Education. Retrieved from <https://ies.ed.gov/nctsc/pubs/20133000/pdf/20133000.pdf>.
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage Publications, Inc.
- Littell, J. H. (2013). Guest editor's introduction to special issue: The science and practice of research synthesis. *Journal of the Society for Social Work and Research*, 4(4), 292–299.
- \* Louis, S. K., Dretzke, B., & Wahlstrom, K. (2010). How does leadership affect student achievement? Results from a national US survey. *School Effectiveness and School Improvement*, 21(3), 315–336.
- Lovett. (2018). *Advocacy for teacher leadership: Opportunity, preparation, support, and pathways*. Switzerland: Springer.

- Malloy, J., & Leithwood, K. (2017). Effects of distributed leadership on school academic press and student achievement. In K. Leithwood, et al. (Eds.), *How school leaders contribute to student success* (pp. 69–91). New York, NY: Springer. <https://doi.org/10.1007/978-3-319-50980-8>.
- \* Marks, H. M., & Louis, K. S. (1997). Does teacher empowerment affect the classroom? The implications of teacher empowerment for instructional practice and student academic performance. *Educational Evaluation and Policy Analysis*, 19(3), 245–275.
- Marzano, R. (2014). *Teacher evaluation model*. [https://learn.k20center.ou.edu/api/pds/1c2bb46ffdf0fed14bcbaaf4909b3ea/2014\\_Marzano\\_Learning\\_Map.pdf](https://learn.k20center.ou.edu/api/pds/1c2bb46ffdf0fed14bcbaaf4909b3ea/2014_Marzano_Learning_Map.pdf).
- MetLife, I. (2013). *The MetLife survey of the American teacher: Challenges for school leadership*. <https://www.metlife.com/content/dam/microsites/about/corporate-profile/MetLife-Teacher-Survey-2012.pdf>.
- Michigan Department of Education. (2013). Michigan teacher leader preparation. Retrieved from [https://www.michigan.gov/documents/mde/Teacher\\_Leader\\_Preparation\\_Standards\\_553940\\_7.pdf](https://www.michigan.gov/documents/mde/Teacher_Leader_Preparation_Standards_553940_7.pdf).
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine*, 151(4), 264–269.
- Muijs, D., & Harris, A. (2003). Teacher leadership-improvement through empowerment? An overview of the literature. *Educational Management & Administration*, 31(4), 437–448.
- Muijs, D., & Harris, A. (2006). Teacher led school improvement: Teacher leadership in the UK. *Teaching and Teacher Education*, 22(8), 961–972.
- Muijs, D., & Harris, A. (2007). Teacher leadership in (In) action three case studies of contrasting Schools. *Educational Management Administration & Leadership*, 35(1), 111–134.
- \* Nesmith, B. S. (2011). *An investigation of National Board Certified Teachers' perceptions of teacher leadership dimensions on school support for teacher leadership involvement in high- and low-performing elementary schools in South Carolina* (Publication No. 3489199) [Doctoral dissertation, South Carolina State University]. ProQuest Dissertations & Theses Global.
- New Leaders Inc. (2018). Prioritizing leadership: An analysis of state ESSA plans. Retrieved from <https://newleaders.org/wp-content/uploads/2018/02/2018.NL.ESSA-State-Plan-Policy-Brief-FINAL.pdf>.
- Ohio Department of Education. (2017). Ohio teacher leadership framework. Retrieved from [http://education.ohio.gov/getattachment/Topics/Teaching/Educator-Equity/Educator-Equity-in-Ohio/Local-Equity-Plan-1/Local-Equitable-Access-Strategies/Ohio-Teacher-Leader-Framework\\_508\\_compliant.pdf.aspx?lang=en-US](http://education.ohio.gov/getattachment/Topics/Teaching/Educator-Equity/Educator-Equity-in-Ohio/Local-Equity-Plan-1/Local-Equitable-Access-Strategies/Ohio-Teacher-Leader-Framework_508_compliant.pdf.aspx?lang=en-US).
- Pearce, C. L., & Conger, J. A. (2003). *Shared leadership: Reframing the hows and whys of leadership*. Thousand Oaks, CA: Sage.
- Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology*, 90(1), 175.
- \* Phillips, D. R. (2009). *Quantitative study of the correlation of teacher leadership and teacher self-efficacy on student reading outcomes* (Publication No. 3364170) [doctoral dissertation, university of phoenix]. ProQuest Dissertations & Theses Global.
- Pigott, T. D., & Polanin, J. R. (2020). Methodological guidance paper: High-quality meta-analysis in a systematic review. *Review of Educational Research*, 90(1), 24–46.
- Pounder, J. S. (2006). Transformational classroom leadership: The fourth wave of teacher leadership. *Educational Management Administration & Leadership*, 34(4), 533–545.
- Reeves, P., & McNeill. (2017). School ADvance™ principal and building leader summative rubric 2.0. Retrieved from [http://www.goschooladvance.org/sites/default/files/PrinSumRubExam.SA%20Version%202.0\\_7.30.18.pdf](http://www.goschooladvance.org/sites/default/files/PrinSumRubExam.SA%20Version%202.0_7.30.18.pdf).
- Rice, E. M., & Schneider, G. T. (1994). A decade of teacher empowerment: An empirical analysis of teacher involvement in decision making, 1980–1991. *Journal of Educational Administration*, 43, 1–11.
- Riley, R. D., Higgins, J. P., & Deeks, J. J. (2011). Interpretation of random effects meta-analyses. *Bmj*, 342.
- Rosenthal, R., & Rubin, D. B. (1986). Meta-analytic procedures for combining studies with multiple effect sizes. *Psychological Bulletin*, 99(3), 400–406. <https://doi.org/10.1037/0033-2909.99.3.400>.
- Roth, P. L., Le, H., Oh, I. S., Van Iddekinge, C. H., & Bobko, P. (2018). Using beta coefficients to impute missing correlations in meta-analysis research: Reasons for caution. *Journal of Applied Psychology*, 103(6), 644–658.
- \* Sebastian, J., Allensworth, E., & Huang, H. (2016). The role of teacher leadership in how principals influence classroom instruction and student learning. *American Journal of Education*, 123(1), 69–108.
- \* Sebastian, J., Huang, H., & Allensworth, E. (2017). Examining integrated leadership systems in high schools: Connecting principal and teacher leadership to organizational processes and student outcomes. *School Effectiveness and School Improvement*, 28(3), 463–488.
- Shen, J., Ma, X., Gao, X., Palmer, B., Poppink, S., Burt, W., et al. (2019). Developing and validating an instrument measuring school leadership. *Educational Studies*, 45(4), 402–421.
- Short, P. M., & Rinehart, J. S. (1992). School participant empowerment scale: Assessment of level of empowerment within the school environment. *Educational and Psychological Measurement*, 52, 951–960.
- Silva, D. Y., Gimbirt, B., & Nolan, J. (2000). Sliding the doors: Locking and unlocking possibilities for teacher leadership. *Teachers College Record*, 102(4), 779–804.
- Smeets, K., & Ponte, P. (2009). Action research and teacher leadership. *Professional Development in Education*, 35(2), 175–193.
- Smith, P. S., Hayes, M. L., & Lyons, K. M. (2017). The ecology of instructional teacher leadership. *The Journal of Mathematical Behavior*, 46, 267–288.
- Smylie, M. A., & Denny, J. W. (1990). Teacher leadership: Tensions and ambiguities in organizational perspective. *Educational Administration Quarterly*, 26(3), 235–259.
- Spillane, J. P. (2005). Distributed leadership. *The Educational Forum*, 69(2), 143–150.
- Spillane, J. P., Halverson, R., & Diamond, J. B. (2001). Investigating school leadership practice: A distributed perspective. *Educational Researcher*, 36(1), 3–34.
- \* Squire-Kelly, V. D. (2012). *The Relationship between teacher empowerment and student achievement* [Doctoral dissertation]. Georgia Southern University <https://digitalcommons.georgiasouthern.edu/etd/406>.
- Teacher Leadership Exploratory Consortium. (2011). Teacher leader model standards. Retrieved from <http://www.nea.org/home/43946.htm>.
- Teacher Leadership Institute. (2018). The teacher leadership competencies. Retrieved from <http://www.nea.org/home/61346.htm>.
- \* Sugg, S. A. (2013). *The relationship between teacher leadership and student achievement* (Publication No. 3605485) [Doctoral dissertation, Eastern Kentucky University]. ProQuest Dissertations & Theses Global.
- \* Sweetland, S. R., & Hoy, W. K. (2000). School characteristics and educational outcomes: Toward an organizational model of student achievement in middle schools. *Educational Administration Quarterly*, 36(5), 703–729.
- \* Terrell, H. P. (2010). *The relationship of the dimensions of distributed leadership in elementary schools of urban districts and student achievement* (Publication No. 3397678) [Doctoral dissertation, George Washington University]. ProQuest Dissertations & Theses Global.
- Tian, M., Risku, M., & Collin, K. (2016). A meta-analysis of distributed leadership from 2002 to 2013. *Educational Management Administration & Leadership*, 44(1), 146–164.
- Tipton, E. (2015). Small sample adjustments for robust variance estimation with meta-regression. *Psychological Methods*, 20, 375–393. <https://doi.org/10.1037/met0000011>.
- Tipton, E., & Pustejovsky, J. E. (2015). Small-sample adjustments to multivariate hypothesis tests in robust variance estimation in meta-regression. *Journal of Educational and Behavioral Statistics*, 40, 604–634. <https://doi.org/10.3102/1076998615606099>. doi:10.1002/jrsm.5.
- Van den Noortgate, W., López-López, J. A., Marín-Martínez, F., & Sánchez-Meca, J. (2013). Three-level meta-analysis of dependent effect sizes. *Behavior Research Methods*, 45, 576–594.
- Wasley, P. A. (1991). *Teachers who lead: The rhetoric of reform and the realities of practice*. New York: Teachers College Press.
- Wenner, J. A., & Campbell, T. (2017). The theoretical and empirical basis of teacher leadership: A review of the literature. *Review of Educational Research*, 87(1), 134–171.
- Wolkenhauer, R., Hill, A. P., Dana, N. F., & Stuckey, M. (2017). Exploring the connections between action research and teacher leadership: A reflection on teacher-leader research for confronting new challenges. *The New Educator*, 13(2), 117–136.
- York-Barr, J., & Duke, K. (2004). What do we know about teacher leadership? Findings from two decades of scholarship. *Review of Educational Research*, 74(3), 255–316.