



What's Known

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A systematic review of the relationships between principal characteristics and student achievement

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Highlights

This report reviews studies that have investigated the relationships between principal characteristics (including precursors, behaviors, and leadership styles) and student achievement. Only one experimental study examined a principal intervention designed to improve student achievement. It found that grade 8 students randomly assigned to have one-on-one conversations with the principal scored higher on the state English language arts test. An additional 38 quantitative and 2 mixed method studies provided mixed evidence of the relationships between principal characteristics and student achievement; 11 qualitative studies mirrored the quantitative findings.

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Summary

Researchers have linked positive student outcomes, including student achievement, to high-quality school leadership (Grissom & Loeb, 2011). Ensuring the quality of school leaders is a priority across the Regional Educational Laboratory (REL) Southeast Region. In Florida the Department of Education is revisiting state and district policies regulating how principals are trained, certified, and evaluated.

To support these reform efforts, the Florida Department of Education partnered with REL Southeast to conduct a systematic review of research to illuminate the potential relationships between principal characteristics and student achievement. Each document selected for inclusion was systematically reviewed and the key findings were synthesized to answer the question: What is known about the relationships between principal characteristics and student achievement?

This systematic review examined 52 empirical studies published between 2001 and 2012 on the relationships between principal characteristics and student achievement in the United States.

Key findings include:

- The only randomized controlled trial study that addressed the relationships between principal characteristics and student achievement found that grade 8 students randomly assigned to have one-to-one conversations with the principal scored higher on the state English language arts test than students who did not have such conversations (Silva, White, & Yoshida, 2011).
- All other studies provided correlational or descriptive information about the relationships between principal characteristics (including precursors, behaviors, and leadership styles) and student achievement.

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Why this review?

Due in part to research that has linked the quality of school leadership to improved student outcomes, federal and state educators across the country have expressed increased interest in improving the quality of school leaders as a way to improve student achievement. In Florida the Department of Education is revising and updating its policies related to principal training, certification, and evaluation. To support this effort, the Florida Department of Education partnered with Regional Educational Laboratory (REL) Southeast to conduct a systematic review of research regarding what is known about the relationships between principal characteristics and student achievement to help inform their decisionmaking.

The idea that effective school leadership contributes to student achievement is neither new nor controversial (Murphy, Elliott, Goldring, & Porter, 2006). A growing research base examines principals' influence on student academic achievement. However, much of the earlier research found that the relationships are statistically weak (see box 1 for an explanation of statistical relationships and effect sizes). For example, a meta-analysis of international research conducted from 1986 to 1996 found that the average correlation between educational leadership and student achievement was negligible, less than $r = .10$ (Witziers, Bosker, & Krüger, 2003). A more comprehensive meta-analysis of more than 30 years of research through 2001 found a somewhat stronger correlation of $r = .25$ (Marzano, Waters, & McNulty, 2005¹; Waters, Marzano, & McNulty, 2003). While other researchers found more significant correlations between specific leadership responsibilities (Marzano et al., 2005) or leadership styles (Robinson, Lloyed, & Rowe, 2008²) and student achievement, there has been little empirical research on the relationships between precursors³ (that is, principals' experience, knowledge, personal traits, values, and beliefs) to their leadership behaviors and student achievement (see appendix A for results from previous reviews and meta-analyses and box 2 for definitions of leadership styles).

Historically, the principal's role has been to focus on school organization, performance, and staff morale (Crow & Glascock, 1995; Osterman, Crow, & Rosen, 1997). Thus researchers studied those roles. Moreover, because principals defined themselves in organizational roles, it is possible they did not reach their potential for increasing student achievement.

With the recent focus on student achievement, the principal's role has shifted to instructional leadership (Blase & Blase, 1998; Brookover & Lezotte, 1982). It is possible that principals have stronger impacts on student achievement than previous research suggested, and that those impacts may be increasing as principals adapt to changing expectations. Thus, this review focuses on recent studies with explicit connections between principal characteristics and student outcomes.

Because principals may have stronger impacts on student achievement than previous research suggested and those impacts may be increasing as principals adapt to changing expectations, this review focuses on recent studies with explicit connections between principal characteristics and student outcomes

Box 1. Interpreting effect sizes

Effect sizes are presented throughout the report. An effect size is a number that reflects the strength of a relationship between two variables. In this context, effect sizes express the magnitude of the relationship between a principal's leadership characteristics and student achievement (Cooper, Hedges, & Valentine, 2009). While a variety of effect sizes can be used, for consistency this study reports effect sizes as r (see appendix C for other types of effect sizes). The r effect size ranges from $-.99$ to $+.99$. A positive value means that an increase in the principal behavior is related to an increase in student achievement and that a decrease in the principal behavior is related to a decrease in student achievement. A negative value means that an increase in principal behavior is related to a decrease in student achievement and that a decrease in principal behavior is related to an increase in student achievement. The size of the relationship using r can be interpreted as follows (Cohen, 1988; Rosenthal, 1996):

- $\pm .00-.09$, no or negligible effect.
- $\pm .10-.29$, small effect.
- $\pm .30-.49$, medium effect.
- $\pm .50-.69$, large effect.
- $\pm .70-.99$, very large effect.

If it is not possible to calculate an effect size as r , standardized regression coefficients (β) are reported. Like r , these effect sizes can be positive or negative; a positive β means that an increase in principal behavior is related to an increase in student achievement. Unlike r , β can exceed ± 1 . β is interpreted as the standard deviation change in student achievement associated with a one standard deviation increase in principal behavior. For example, a β of $.85$ means that a one standard deviation increase in principal behavior is associated with a $.85$ standard deviation increase in student achievement.

Box 2. Definitions of key terms

Collegial leadership. Behavior that is supportive of teachers and collegiality between school leaders and teachers.

Distributive leadership. A leadership approach with a collaborative focus where leadership is shared and practiced by all members of the school, not just the principal.

Instructional leader. Traditionally assumed to be the principal or school leader, though more recently the concept has broadened to include other key staff such as lead teachers.

Instructional leadership or pedagogical leadership. Approach whereby the leader helps foster a learning climate free of disruption, a system of clear teaching objectives, and high teacher expectations for students. Elements include principal leadership, clear mission, teaching expectations, and opportunities to learn.

Learning-centered framework. A framework whereby experience, knowledge, personal traits, values, and beliefs are precursors to a principal's leadership behaviors, which in turn influence the overall school experience (for example, standards, curriculum, culture) and specific classroom experiences (for example, teacher practices) of the student, which affect student success (Murphy et al., 2006).

(continued)

Box 2. Definitions of key terms (continued)

Learning-directed leadership. Distributed or collaborative leadership combined with the development of school capacity to support teaching and learning.

Nonacademic outcomes. Student outcomes such as self-concept or participation in school activities.

Organizational leader. The leader of the organization, in this case, the school. The role of the organizational leader has historically focused on overall organization, performance, and staff morale.

Precursors. Principals' experience, knowledge, personal traits, values, and beliefs that influence their leadership behaviors. In this review precursors are defined as conditions that shape principal behavior, as conceptualized by Murphy et al. (2006). However, the precursor categories in this review are not directly aligned with Murphy et al.'s definitions.

Student achievement. Academic achievement, typically measured through assessments of math and English language arts.

Transformational leadership. Approach whereby the leader inspires others with a vision that energizes them and encourages them to work collaboratively toward a common goal. Elements include individualized consideration, intellectual stimulation, inspirational motivation, and idealized influence.

This review included studies conducted in all 50 states, at least 329 school districts, and at least 8,363 schools

How the review was conducted

The first step in this systematic review of the literature was to define a range of potential principal characteristics that might influence student achievement. For this review “principal characteristics” was defined broadly as anything a principal has experienced (for example, training, job experience), does (for example, specific actions such as mentoring students or teachers), or believes (for example, expectations of students and staff). This definition was used to develop the search for research linking principal characteristics to student achievement. The studies were later grouped into three categories of principal characteristics: precursors, behaviors, and leadership styles (see box 3 for the review methodology, appendix B for guiding leadership frameworks, and appendix C for the review protocol).

This review included studies conducted in all 50 states, at least 329 school districts, and at least 8,363 schools. The review team reviewed 803 unique studies that employed a variety of quantitative and qualitative analytic techniques. Of these studies, 52 met the screening criteria: 39 quantitative studies, 11 qualitative studies, and 2 mixed method studies (see figure D1 in appendix D for screening criteria and study characteristics).⁴

What the systematic review found

The only experimental study found that a principal talking one-on-one with students before a test increased their test scores. Of the other 51 studies, 38 quantitative and 2 mixed method studies showed various correlations between principal characteristics and student achievement. However, correlations do not indicate causality.

Box 3. Methodology

One research question guided this systematic review: What is known about the relationships between principal characteristics and student achievement?

To answer the question, the review team conducted a comprehensive search for research on principal characteristics and student achievement using a protocol of standardized procedures (see appendix C). The protocol was intentionally broad to capture a wide range of study types (qualitative case studies and experimentally designed quantitative studies). Review procedures included setting criteria for inclusion and exclusion, using multiple methods to search for potential literature, conducting multiphase screening for inclusion and exclusion by multiple trained reviewers, systematically coding the focus of each included study, and tabulating the results of the included studies.

Both quantitative and qualitative research were included in this systematic review. To be considered for inclusion, studies had to:

- Be an empirical study in a K–12 education setting in the United States.
- Have been peer reviewed (for example, peer-reviewed journal articles, Institute of Education Sciences publications).
- Have been published between 2001 and 2012.
- Include operationally defined, measurable principal characteristics.
- Include at least one measure of student achievement.
- Specifically analyze the relationship between the principal characteristic and student achievement.

This report highlights principal characteristics identified in the quantitative literature and supported by qualitative research that describes the application of the characteristics.

Where applicable, effect sizes were calculated using statistics reported in the studies. Since the relationships between principal characteristics and student achievement are of interest, the effect size is reported as r to estimate the magnitude of the relationship between those two variables (see box 1 and appendix C).

The relationships between principal characteristics and student achievement were more difficult to ascertain in studies using qualitative analysis. Therefore, qualitative studies were included only if an explicit description of student achievement was part of the selection criteria for the study. For example, a qualitative study may have compared various characteristics of the principals from the top- and bottom-performing schools based on statewide student achievement tests to determine whether there was a qualitative difference between the two groups.

This report highlights principal characteristics identified in the quantitative literature and supported by qualitative research that describes the application of the characteristics

One experimental study found that a principal talking with students about their performance prior to a statewide test increased test scores

There was only one experimental study among the quantitative studies (Silva et al., 2011). Experimental studies are the only type of studies that can provide credible evidence on whether an intervention is effective.

Silva et al. (2011) examined the effect of principals having one-on-one conversations with grade 8 students regarding their achievement on an annual state English language arts test. All grade 8 students in the district who were not proficient on the 2008 grade 7 test were randomly assigned one of two interventions.

Experimental group students engaged in individual achievement–based conversations with the principal a month before the 2009 grade 8 test. Each student engaged in two 15-minute conversations during which the principal:

- Discussed the school’s mission.
- Conveyed high expectations for the student’s improvement.
- Reviewed the student’s grade 7 English language arts scores and projected grade 8 scores.
- Set a goal for the student’s grade 8 English language arts assessment.
- Expressed appreciation, support, and encouragement.

Control group students engaged in similar conversations with the principal, but after the 2009 grade 8 test.

Findings suggested that achievement was related to group membership ($r = .33$). On average, students in the experimental group achieved higher scores than their predicted achievement levels compared with control group students and their predicted achievement levels.

Other studies found mixed evidence for the relationships between principal characteristics and student achievement

This review includes 51 other studies that meet all the requirements for inclusion (see appendix D for included studies and study characteristics). Of those 51 studies, 38 quantitative and 2 mixed method studies provided mixed correlations between various principal characteristics and student achievement. However, correlations do not indicate causality. Eleven qualitative studies supported the findings of the other studies.

The study findings are organized into three categories of principal characteristics: precursors, behaviors, and leadership styles (the studies conducted in each category are shown in appendix E). The results for each category are summarized here with detailed findings below.

Precursors. In general, evidence from studies examining the relationships between principal precursors (such as principals’ experience and educational attainment) and student achievement was positive. However, the evidence from studies on principal preparation programs, also a precursor, provided mixed results.

Behaviors. Evidence from studies examining the relationships between principal behaviors (such as instructional management, internal relations, organizational management, administrative duties, and external relations) and student achievement was mixed. Results suggested positive relationships between student achievement and principals’ instructional management, internal relations, and organization management. However, only qualitative findings suggested a relationship between principals’ external relations and student achievement.

Leadership styles. Several studies examined the relationships between student achievement and principals’ leadership styles such as distributive, collaborative, collective, collegial, learning centered, and transformational. Findings were mixed.

In one experimental study students who engaged in individual achievement–based conversations with the principal before the state English language arts test achieved higher scores than their predicted achievement levels compared with students who engaged in conversations after the test and their predicted achievement levels

Precursors: Conditions that shape leadership behaviors

Leadership precursors are described as experience, knowledge, personal traits, and values and beliefs (Murphy et al., 2006). This section presents findings on precursors⁵ that shape leadership behaviors, broadly categorized as:

- Principals' experience.
- Principal preparation programs.
- Principals' personal traits (educational attainment).

Principals' experience

Seven studies addressed the relationship between principals' experience and student achievement (Braun, Gable, & Kite, 2011; Clark, Martorell, & Rockoff, 2009; Grissom & Loeb, 2011; Jacobson, Brooks, Giles, Johnson, & Ylimaki, 2007; Knoeppel & Rinehart, 2008; Ruff & Shoho, 2005; Vanderhaar, Munoz, & Rodosky, 2006).⁶

Principals' experience was defined in various ways:

- Years of experience in education.
- Teaching experience prior to becoming a principal.
- Years of experience as an assistant principal at current school prior to becoming a principal at the school.
- Years of experience as a principal.

Study results in these subcategories were mixed. The exception was years of experience in education, where the results showed no relationship.

Years of experience in education. Knoeppel and Rinehart (2008) defined experience as the number of years the principal spent in the field of education (roles were not specified). They found that experience in education, when analyzed with other variables, was not associated with student achievement.

Teaching experience prior to becoming a principal. The effect of a principal's years of experience as a teacher on improving student achievement was mixed. Clark et al. (2009) found that the number of years of teaching experience was not associated with student achievement. By contrast, Vanderhaar et al., (2006) found that achievement was higher among students whose principals were in the middle of their careers. Students whose principal had 9–17 years of teaching experience had higher achievement than students whose principal had less than 9 years ($r = .13$) or more than 17 years of experience ($r = .35$). This finding suggests a relationship between a specific range of teaching experience (9–17 years) and student achievement, but why that specific range would matter was not examined.

Years of experience as an assistant principal at current school prior to becoming a principal at the school. One study examined years of experience as an assistant principal at the principal's current school. This narrow definition of experience was significantly related to student achievement for inexperienced principals but was not significant for experienced principals, suggesting that over time the importance of having been an assistant principal at the same school diminishes (Clark et al., 2009).

The effect of a principal's years of experience as a teacher on improving student achievement was mixed

Years of experience as a principal. The six studies that focused on years of experience as a principal showed mixed results. While three quantitative studies suggested no significant relationship between length of experience as a principal and student achievement (Jacobson et al., 2007; Knoeppel & Rinehart, 2008; Vanderhaar et al., 2006), one study showed that experience as a principal was the only significant demographic predictor of student academic growth (Grissom & Loeb, 2011).⁷ Two qualitative studies suggested a positive association (Braun et al., 2011; Ruff & Shoho, 2005).

Principal preparation programs

Principal preparation is an important factor in perceptions of school leadership effectiveness. Eight studies addressed the relationships between aspects of principal preparation programs and student achievement (Braun et al., 2011; Clark et al., 2009; Corcoran, Schwartz, & Weinstein, 2012; Donmoyer, Yennire-Donmoyer, & Galloway, 2012; Kaplan, Owings, & Nunnery, 2005; Knoeppel & Rinehart, 2008; Owings, Kaplan, & Nunnery, 2005; Vanderhaar et al., 2006). Three categories of principal preparation programs were studied:

- Types of preparation programs.
- University- and district-based programs.
- Content of preparation programs.

Types of preparation programs. The two studies that examined the possible effect of a principal being prepared through a specific type of program on student achievement yielded mixed results. One found that students at schools where the principal was a Cahn Fellow (a professional development program for principals with at least four years of experience in high-performing schools) had marginally significantly higher English language arts ($r < .01$) and math ($r = .01$) scores (Clark et al., 2009). In the same study, researchers found no relationship between principals participating in New York City's Aspiring Principals Program (a leadership development program to prepare leaders for instructional improvement efforts in the city's highest needs schools) and improvement in student achievement. Further, it found that education credentials (for example, selectivity of the school where principals received their degree) did not influence student achievement. In another study examining the Aspiring Principals Program, the effect size for annual gain in overall school achievement was approximately $r = .01$ (negligible) for schools with a new Aspiring Principals Program principal compared with schools with a new nonprogram principal (Corcoran et al., 2012).

University- and district-based programs. No relationship was found between the principal preparation program attended and student achievement, even controlling for principal experience and school contextual factors (Vanderhaar et al., 2006).

Content of preparation programs. Five studies examined the content of preparation programs.

In one study, researchers found a positive relationship between the date principals received their certification and student achievement (Knoeppel & Rinehart, 2008). Principals were categorized by whether they received their certification prior to, during, or after implementation of standards-based reform in their state, which corresponded to the content of the preparation programs. Prior to implementation, principals were not assessed for specific leadership skills; during implementation, they were required to show proficiency in

The two studies that examined the possible effect of a principal being prepared through a specific type of program on student achievement yielded mixed results

organization-related knowledge; and after implementation, principal preparation emphasized the role of principals as instructional leaders. Principal preparation was a positive predictor of student achievement growth ($r = .10$), and principals who were trained after implementation as organizational and instructional leaders showed qualitatively larger, although not significant, mean achievement growth than principals who did not receive training related to instructional leadership.

Three studies found evidence to support the inclusion of Interstate School Leaders Licensure Consortium standards in principal preparation programs (Kaplan et al., 2005;⁸ Knoepfel & Rinehart, 2008; Owings et al., 2005).⁹

In a qualitative study, Donmoyer et al. (2012) found that the overall influence of principal preparation programs on student achievement was mixed. One school in the study showed declines, another school showed gains, and the remaining two schools showed both gains and declines in student test scores. There was evidence that the use of cohort design, group case activities, and an emphasis on collaborative leadership in principal preparation programs had positive impacts on principals' job performance.

One study found a positive relationship between the content and delivery (as a combined construct) of principals' training and student achievement ($r = .10$; Braun et al., 2011). The aspects of content included:

- Emphasizing instructional improvement.
- Emphasizing improving school and student achievement.
- Engaging participants in problem-based learning.
- Aligning preparation to standards of practice.
- Covering areas needed for success in the first year of leadership.
- Adapting preparation to participants' individual needs.

The aspects of delivery included:

- Providing an excellent mentor.
- Using cohorts.
- Requiring reflection of participant practice and how to improve it.
- Conducting performance assessments of skill development and leadership competencies.
- Requiring an internship that is an excellent learning experience for becoming a principal.

Principals' personal traits (educational attainment)

Two studies addressed the relationship between principals' educational attainment and student achievement (Young, Vang, & Young, 2008; Valentine & Prater, 2011) with mixed results. Young et al. (2008) found that a principal's education level was not a significant independent predictor of student achievement. In contrast, Valentine and Prater (2011) found that a principal's education level had the strongest relationship to student achievement among principal personal traits.¹⁰

Three studies found evidence to support the inclusion of Interstate School Leaders Licensure Consortium standards in principal preparation programs

Behaviors: Domains of principal action

This section describes the literature on principal behaviors linked to improved student achievement. Principal behaviors are defined according to Grissom and Loeb (2011), who used survey data from administrators, principals, and teachers in Miami–Dade County Public Schools in 2008 to investigate principal efficacy, leadership tasks, and the effects of principal efficacy on student achievement and other factors. They divided 42 principal tasks into five broad domains of principal action:

- *Instructional management.* The promotion, support, and improvement of classroom instruction and school curricula.
- *Internal relations.* Building strong interpersonal relationships with students, teachers, and parents.
- *Organizational management.* Overseeing the budget, resources, facilities, and environment of the school.
- *Administrative duties.* Routine, day-to-day tasks such as completing paperwork and managing schedules of discipline.
- *External relations.* Working with stakeholders beyond the school.

Instructional management

Eighteen studies addressed the relationships between instructional management and student achievement. The four types of instructional management behaviors (Grissom and Loeb, 2011) and the research associated with each are discussed below. The behaviors include:

- Monitoring and providing feedback to teachers and students.
- Having a vision for learning.
- Providing support and professional development to teachers.
- Using data to drive decisionmaking.

Monitoring and providing feedback to teachers and students. In addition to the experimental study conducted by Silva et al. (2011), four studies found positive effects of principals monitoring and providing feedback. Chappelle & Price (2012) and Fancera & Bliss (2011) found that principals' monitoring of and feedback to teachers were associated with improved student achievement. Fancera & Bliss (2011) found a relationship between student achievement and the principal instructional management behaviors of supervising and evaluating instruction and monitoring student progress ($r = .19-.29$). Protection of instructional time was also significantly related to student achievement ($r = .04-.33$). These findings were consistent with Williams et al.'s (2008) findings. Ovando and Ramirez (2007) interviewed exemplary principals and assistant principals across elementary, middle, and high school grade levels in Texas to identify how they perceive their instructional leadership actions in appraising teachers. The results were consistent with the broader findings of the relationships between instructional management behaviors and student achievement.

Having a vision for learning. Four studies found positive effects between principals' having a vision for student learning and improved student learning.

The first study found that promoting high standards for student learning ($r = .55-.61$) and having a rigorous curriculum ($r = .42-.47$) were most highly correlated with English

Three studies found positive effects of principals monitoring and providing feedback, and four studies found positive effects between principals' having a vision for student learning and improved student learning

language arts achievement in grades 3–5 and that performance accountability was significantly correlated in grade 3 ($r = .37$; Reardon, 2011).

A similar study revealed a positive relationship between teachers' ratings of principals' frequency of promoting the school learning climate and student achievement in English language arts ($r = .39$) and math ($r = .34$; O'Donnell & White, 2005).

Sebastian & Allensworth (2012) found a significant positive indirect effect of principal leadership on student achievement ($r = .26$) and grade point average ($r = .26$), through the principals' influence on the learning climate, which influenced classroom instruction, which in turn influenced student achievement. This evidence supports the theory that principals' indirect effect on student achievement may be stronger than their direct effect.

The fourth study (Brown, Benkovitz, Muttillio, & Urban, 2011), which was qualitative, supported the findings of the three quantitative studies: the principal having a vision for learning was positively associated with student achievement.

Providing support and professional development to teachers. Research supports a relationship between principals providing support for professional development and student achievement. For example, Supovitz, Strinides, and May (2010) investigated the relationships between principal leadership, peer influence, and change in instruction, and student achievement. Findings suggest a negligible indirect effect ($\beta = .03$) of principal leadership on English language arts scored.¹¹ Qualitative studies found that successful leaders:

- Personalize instructional practices (Sherman & Crum, 2007).
- Manage changes in the school environment (Crum & Sherman, 2008).
- Encourage staff involvement in professional development (Borko, Wolf, & Simone, 2003; Crum & Sherman, 2008; Sanzo, Sherman, & Clayton, 2011).
- Practice distributive, instructional, and transformational leadership (Masumoto & Brown-Welty, 2009; see box 2 for definitions of key terms).

Using data to drive decisionmaking. Findings from three qualitative studies support using data to drive decisionmaking. Through interviews with principals and teachers, researchers explored a range of actions principals could engage in to drive instruction and staffing decisions. Their research supported emphasizing data-driven decisionmaking (Cohen-Vogel, 2011; Crum, Sherman, & Myran, 2010; Sherman and Crum, 2007).

Internal relations

Nine studies addressed the relationships between internal relations and student achievement. Eight found a positive relationship (Silva et al., 2011; Leana & Pil, 2006; Horvat, Curci, & Chaplin, 2010; Crum & Sherman, 2008; Egley & Jones, 2005; Louis, Dretzke, & Wahlstrom, 2010; Sanzo et al., 2011; Sherman & Crum, 2007). Six of the nine studies are highlighted below.

Silva et al. (2011) found a direct effect of school leadership on student achievement through interactions with students. Egley and Jones (2005) found a positive relationship among teachers' perceptions of their principal's professionally and personally inviting behaviors, school climate, and the accountability rating of their school. Specifically, teachers rated principals higher on professionally inviting behaviors (for example, high levels

Research supports a relationship between principals providing support for professional development and student achievement

of expectations from coworkers, communicating high expectations to students) than on personally inviting behaviors (for example, politeness and optimism). Both scales were significantly correlated with student achievement ($r = .16$ for professionally inviting behaviors and $.09$ for personally inviting behaviors).

Leana and Pil (2006) examined the effects of internal social capital (relations with teachers) and external capital (relations between the principal and external stakeholders) on organizational performance as measured by student achievement on English language arts and math tests in 2000/01 and 2001/02. They found that internal social capital was significantly related to English language arts and math scores. Effect sizes for these correlations ranged from $r = .16$ to $r = .50$, depending on the year, subject, and internal relationship studied.

Other researchers identified common behaviors of successful school principals, such as engaging parents and the community while maintaining overall authority of the school (Horvat et al., 2010) and communicating and developing a rapport with teachers and students (Crum & Sherman, 2008). These findings are consistent with the findings of the quantitative studies.

However, one study did not find a relationship between principal behaviors regarding internal relations (for example, district support or diversity of the building council) and student achievement (Gordon & Louis, 2009).

Organizational management

Five studies addressed the relationships between principals' time spent on and the effectiveness of their organizational management tasks and student achievement (Bloom & Owens, 2013; Cohen-Vogel, 2011; Grissom & Loeb, 2011; Horng, Klasik, & Loeb, 2010; May, Huff, & Goldring, 2012).

Three of the five studies found that the percentage of time principals spent on organizational management tasks was positively associated with student achievement (Horng et al., 2010) and principals' effectiveness at organizational management tasks (Grissom & Loeb, 2011). For example, Grissom and Loeb's (2011) study found that organizational management was the only significant predictor of school accountability performance ($r = .15$) and school accountability performance gains ($r = .13$). Organizational management was also a significant predictor of student achievement in English language arts ($r = .01$) and math ($r = .01$), though the effect size was negligible. May et al. (2012) also found a positive relationship between the amount of time principals spent on school finance and personnel issues and student achievement.

Qualitative findings from two studies provided support for principals' engagement in organizational management tasks, such as staffing decisions and school funds (Bloom & Owens, 2013) and using student achievement data to make staffing decisions (Cohen-Vogel, 2011).

Administrative duties

None of the studies in the review provided direct evidence for relationships between administrative duties and student achievement. However, in examining the relationship between teachers' perceptions of principal leadership and student achievement, Williams

Three of the five studies that addressed the relationships between principals' time spent on and the effectiveness of their organizational management tasks and student achievement found that the percentage of time principals spent on organizational management tasks was positively associated with student achievement

(2009) found that student achievement was significantly correlated with planning and organization ($r = .04$) and school climate ($r = .05$). This may provide support for indirect relationships between administrative duties and student achievement.

External relations

Three studies examined the relationships between external relations and student achievement with mixed results (Gordon & Louis, 2009; Horvat et al., 2010; Leana & Pil, 2006). Gordon and Louis (2009) did not find any significant relationship between site council diversity, district support, or the principal's openness to the community and student achievement. By contrast, Masumoto and Brown-Welty's (2009) qualitative cross case study of the practices of leaders of successful, high-poverty, rural schools showed that school–community links that address the school's mission enhance student achievement. This finding is consistent with Horvat et al.'s (2010) finding that engaging parents and the community enabled principals to leverage their resources and increase the leadership power to improve student achievement.

None of the studies in the review provided direct evidence for relationships between administrative duties and student achievement

Leadership styles

This section describes principals' leadership styles and their potential relationships to student achievement. Researchers have linked principals' leadership styles to improved student achievement. While the studies examined in this review largely fit within Grissom and Loeb's (2011) instructional management domain, 13 studies explored different aspects of leadership styles (Griffith, 2004; Hallinger & Heck, 2010a, 2010b, 2011; Heck & Hallinger, 2009, 2010a, 2010b; Heck & Moriyama 2010; Leithwood & Jantzi, 2008; Leithwood & Mascall, 2008; Marks & Printy, 2003; Tschannen-Moran, Parish, & DiPaola, 2006; Twigg, 2008). Within these studies, there was considerable overlap in leadership styles as well as mixed evidence of effects on student learning. (See box 2 for definitions of leadership styles.)

Distributive, collaborative, and learning-directed leadership

In 2009 Hallinger, Heck, and others began publishing a series of studies modeling the effects of learning-directed leadership broadly,¹² and distributed or collaborative leadership specifically, on student achievement. The studies focused on leadership¹³ related to:

- Making collaborative decisions focusing on education improvement.
- Emphasizing school governance that empowers staff and students and encourages commitment.
- Implementing broad participation and shared accountability for student learning.
- Emphasizing efforts to evaluate school academic development based on student achievement in the context of educational effectiveness research.

Each study used a random sample of data from a larger dataset of public elementary schools measuring student achievement beginning in grade 3 for three years. Yearly survey data on teacher perceptions of school leadership and academic capacity were also included.

Collectively, the studies found no evidence of a direct effect of collaborative or distributed leadership on student achievement but consistently found significant indirect effects. Specifically, they found that changes in collaborative or distributed leadership had a significant effect on changes in school academic capacity. That change in academic capacity in turn had a significant effect on growth in student achievement in English language

arts (Hallinger & Heck, 2010a, 2010b, Heck & Hallinger, 2010b) and math (Hallinger & Heck, 2010a; Heck & Hallinger, 2009, 2010a, 2010b). Heck and Moriyama (2010) produced similar findings showing a significant indirect effect of distributed leadership on added year effects in and English language arts and math via instructional practice.

Additionally, the researchers found that the aforementioned effects were reciprocal and reinforcing. That is, the change in achievement directly affected change in school academic capacity which affected change in leadership in a feedback loop (Hallinger & Heck, 2010a; Heck & Hallinger, 2010a).

Additional research on leadership styles

Other researchers (Leithwood & Jantzi, 2008; Leithwood & Mascall, 2008; Marks & Printy, 2003) used leadership styles to investigate the relationships between school leadership and student achievement. Leithwood and Jantzi (2008) examined the relationships between leadership self-efficacy and leadership collective efficacy and student achievement. Leadership self-efficacy measures school leaders' beliefs about their own ability to drive school improvement; leadership collective efficacy measures school leaders' beliefs about the efficacy of a district leadership's role in school improvement. Combined, leadership efficacy was significantly correlated with the percentage of students reaching proficiency in English language arts and math but not with mean achievement gain in 2003–05. Significant positive indirect effects of school leader behavior ($\beta = 0.24$) and leadership collective efficacy ($\beta = 0.32$) were found on student achievement.¹⁴ Leadership self-efficacy had significant negative indirect effects on student achievement; however, the effects were very small ($\beta = -0.01$). Similar research found that collective leadership, defined as “combined effects” of various sources of school leadership, was associated with student achievement ($r = .34$; Leithwood & Mascall, 2008).

The studies found no evidence of a direct effect of collaborative or distributed leadership on student achievement but consistently found significant indirect effects

Other research studies emphasized transformative and collegial school leadership. For example, Tschannen-Moran et al. (2006) used an organizational climate framework to investigate the relationships between teachers' perceptions of school climate variables (that is, collegial leadership, teacher professionalism, academic press, and community engagement) and student achievement. Collegial leadership, which is characterized as supportive behavior of teachers and collegiality between school leaders and teachers, was not significantly correlated with student achievement.

Other researchers found evidence suggesting that a transformational leadership style positively affects student achievement (Marks & Printy, 2003; Griffith, 2004; Twigg, 2008). Marks and Printy (2003) measured the effects of different leadership styles on student achievement and instructional quality. Schools with a higher level of integrated leadership (that is, transformational and shared leadership) had higher academic achievement ($\beta = 0.56$) than schools with a lower level of integrated leadership.¹⁵ In examining the effects of transformational leadership behaviors on school staff turnover and student achievement, Griffith (2004) found that transformative leadership indirectly, yet significantly, predicted student achievement. In exploring the extent to which transformative leadership influenced student achievement and teachers' citizen behaviors (for example, attending nonrequired development functions, speaking well of the school), Twigg (2008) found that transformative leadership had a significant indirect effect on student achievement through perceived organizational support, self-esteem, and citizen behaviors, with a total indirect effect of $\beta = 0.32$.¹⁶

Implications for state and local education agencies

These findings can guide discussions about variations in principal effectiveness. Understanding which principal characteristics are associated with student achievement can provide insight into why some principals are more effective than others. Given the number of principals' roles, responsibilities, and tasks, it is beneficial to know specifically which factors have the most impact on student achievement.

School leaders can also benefit from research on the outcomes of their time and effort. For example, Silva et al. (2001) found that having discussions with students about their performance prior to state assessments had a positive impact on their achievement. Although this activity may seem time consuming, it may have more effect on student achievement than other tasks, such as administrative duties.

Findings from this review can also inform policies on professional development for aspiring (preservice) and practicing (inservice) school leaders. Evidence reported in this review suggests that the training content of principal preparation programs is influenced by state standards for certification at the time. Evidence also supported the inclusion of specific content and activities in principal preparation programs. State and districts might consider reviewing and modifying programs to include aspects of preparation programs that are associated with increased student achievement. Practitioners who want to apply these findings should review the individual studies cited to better understand their unique characteristics (see appendix D for more details on each study).

More research is needed on whether the benefits of specific characteristics might vary in different settings and contexts. Relevant questions to drive this research might include: are the relationships the same in large versus small, rural versus urban, or elementary versus high school settings? The evidence base would benefit from rigorous studies examining precursors and behaviors for principals serving in these multiple settings. Similarly, more research is needed on effective characteristics of school leaders in other settings (for example, virtual classrooms, charter schools, and alternative schools).

Understanding which principal characteristics are associated with student achievement can provide insight into why some principals are more effective than others

Study limitations

Despite the large amount of research conducted on school leadership and student achievement, only a few studies met the rigor necessary to recommend application in practice or policy. Only one study was a randomized controlled trial (Silva et al., 2011). That study stands out because experimental studies are the only type of study that can provide credible evidence on whether an intervention is effective. Further, it demonstrates that although there are many challenges to using experimental designs in research on principal effectiveness, it is possible to design research that can test experimentally the relationships between principal behaviors and student achievement.

The search criteria included only studies that had been subject to peer review. Therefore, studies such as technical reports that were subject to peer review were included, but dissertations and the like were not. Thus, publication bias is a limitation because unpublished works—which often have nonsignificant or otherwise nondesirable negative results—were not included.

Appendix A. Results of previous reviews and meta-analyses

This appendix provides supplemental tables reporting results of previous systematic reviews or meta-analyses.

Table A1. Mean correlation of five leadership dimensions with student achievement and nonacademic outcomes

| Leadership dimension | Meaning of dimension | Mean effect size |
|--|--|------------------|
| Establishing goals and expectations | Setting, communicating, and monitoring learning goals, standards, and expectations and involving staff and others in the process so that there is clarity and consensus about goals. | $r = .40$ |
| Resourcing strategically | Aligning resource selection and allocation to priority teaching goals and providing appropriate expertise through staff recruitment. | $r = .30$ |
| Planning, coordinating, and evaluating teaching and the curriculum | Being directly involved in the support and evaluation of teaching through regular classroom visits and the provision of formative and summative feedback to teachers. Having direct oversight of curriculum through schoolwide coordination across classes and year levels and alignment to school goals. | $r = .40$ |
| Promoting and participating in teacher learning and development | Not only promoting but also directly participating with teachers in formal or informal professional learning. | $r = .69$ |
| Ensuring an orderly and supportive environment | Protecting time for teaching and learning by reducing external pressures and interruptions and establishing an orderly and supportive environment both inside and outside classrooms. | $r = .26$ |

Source: Robinson, Hohepa, & Lloyd, 2009.

Table A2. Mean correlation of Balanced Leadership Framework’s 21 principal responsibilities with student achievement, matched with Cotton’s 25 principal practices

| Balanced Leadership Framework’s 21 responsibilities with associated Cotton’s (2003) 25 practices | Balanced Leadership Framework responsibility description: The extent to which the principal... | Mean effect size |
|--|---|------------------|
| <i>Affirmation</i> Rituals, ceremonies, and other symbolic actions Recognition of student and staff achievement | Recognizes and celebrates accomplishments and acknowledges failures | $r = .19$ |
| <i>Change agent</i> Support of risk taking | Is willing to challenge and actively challenges the status quo | $r = .25$ |
| <i>Contingent rewards</i> Rituals, ceremonies, and other symbolic actions Recognition of student and staff achievement | Recognizes and rewards individual accomplishments | $r = .24$ |
| <i>Communication</i> Communication and interaction Shared leadership, decisionmaking, and staff empowerment | Establishes strong lines of communication with and among teachers and students | $r = .23$ |
| <i>Culture</i> Positive and supportive school climate Collaboration | Fosters shared beliefs and a sense of community and cooperation | $r = .25$ |
| <i>Discipline</i> Protecting instructional time | Protects teachers from issues and influences that would detract from their teaching time or focus | $r = .27$ |
| <i>Flexibility</i> Support of teacher autonomy | Adapts his or her leadership behavior to the needs of the current situation and is comfortable with dissent | $r = .28$ |
| <i>Focus</i> Vision and goals focused on high levels of student learning High expectations for student learning Ongoing pursuits of high levels of student learning Norm of continuous improvement Monitoring student progress and sharing findings | Establishes clear goals and keeps those goals in the forefront of the school’s attention | $r = .24$ |
| <i>Ideals/beliefs</i> Self-confidence, responsibility, and perseverance | Communicates and operates from strong ideals and beliefs about schooling | $r = .22$ |
| <i>Input</i> Visibility and accessibility Shared leadership, decisionmaking, and staff empowerment | Involves teachers in the design and implementation of important decisions and policies | $r = .25$ |
| <i>Intellectual stimulation</i> Norm of continuous improvement Discussion of instructional issues | Ensures faculty and staff are aware of the most current theories and practices and makes the discussion of these a regular aspect of the school’s culture | $r = .24$ |
| <i>Involvement in curriculum, instruction, and assessment</i> Instructional leadership Classroom observation and feedback to teachers Role modeling | Is directly involved in the design and implementation of curriculum, instruction, and assessment practices | $r = .20$ |
| <i>Knowledge of curriculum, instruction, and assessment</i> Instructional leadership Role modeling | Is knowledgeable about current curriculum, instruction, and assessment practices | $r = .25$ |

(continued)

Table A2. Mean correlation of Balanced Leadership Framework’s 21 principal responsibilities with student achievement, matched with Cotton’s 25 principal practices (continued)

| Balanced Leadership Framework’s 21 responsibilities with associated Cotton’s (2003) 25 practices | Balanced Leadership Framework responsibility description: The extent to which the principal... | Mean effect size |
|---|--|------------------|
| <i>Monitoring/evaluating</i> Classroom observation and feedback to teachers Monitoring student progress and sharing findings Use of student progress data for program improvement | Monitors the effectiveness of school practices and their impact on student learning | $r = .27$ |
| <i>Optimizer</i> Vision and goals focused on high levels of student learning Self-confidence, responsibility, and perseverance Ongoing pursuits of high levels of student learning | Inspires and leads new and challenging innovations | $r = .20$ |
| <i>Order</i> Safe and orderly school environment | Establishes a set of standard operating procedures and routines | $r = .25$ |
| <i>Outreach</i> Parent and community outreach and involvement | Is an advocate and spokesperson for the school to all stakeholders | $r = .27$ |
| <i>Relationships</i> Communication and interaction Emotional and interpersonal support | Demonstrates an awareness of the personal aspects of teachers and staff | $r = .18$ |
| <i>Resources</i> Professional development opportunities and resources | Provides teachers with materials and professional development necessary for the successful execution of their jobs | $r = .25$ |
| <i>Situational awareness^a</i> | Is aware of the details and undercurrents in the running of the school and uses this information to address current and potential problems | $r = .33$ |
| <i>Visibility</i> Visibility and accessibility Emotional and interpersonal support | Has quality contact and interactions with teachers and students | $r = .20$ |

a. Marzano et al. (2005) do not identify any of Cotton’s (2003) leadership practices that align with situational awareness.

Source: Marzano et al., 2005.

Table A3. Essential school leadership preparation practices and supporting literature

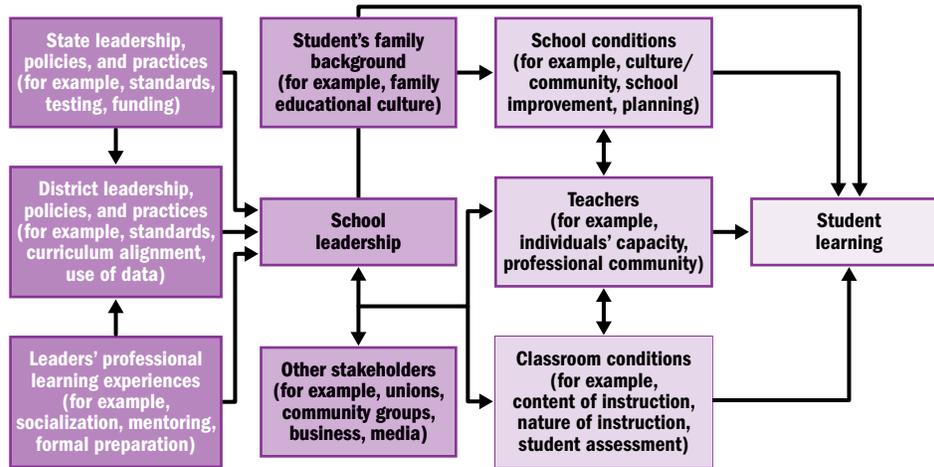
| Practice | Supporting research |
|--|--|
| Structure | |
| Partnerships between universities and districts | Darling-Hammond, LaPoint, Meyerson, Orr, & Cohen, 2007; Jackson & Kelley, 2002; Milstein & Krueger, 1997; Murphy, 1993a, 1993b, 1999; Orr, 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |
| Program developers' commitment | Darling-Hammond et al., 2007; U.S. Department of Education, 2004 |
| Rigorous entrance requirements for strong and diverse candidates | Bredeson, 1996; Darling-Hammond et al., 2007; Hart & Pounder, 1999; Leithwood & Jantzi, 1996; Milstein & Krueger, 1997; Murphy, 1993a, 1993b; Murphy et al., 2006; Orr, 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |
| Financial support, release time for participants | Darling-Hammond et al., 2007; Leithwood & Jantzi, 1996; Milstein & Krueger, 1997; Southern Regional Educational Board, 2006 |
| Supportive district and state infrastructure | Darling-Hammond et al., 2007; Orr, 2006; Southern Regional Educational Board, 2006 |
| Program monitoring for improvement | Lauder, 2000; Leithwood & Jantzi, 1996; Milstein & Krueger, 1997; Murphy, 1999; Orr, 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |
| Content | |
| Standards-based content | Darling-Hammond et al., 2007; Jackson & Kelley, 2002; Lauder, 2000; Orr, 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |
| Coherent and relevant curriculum | Darling-Hammond et al., 2007; Jackson & Kelley, 2002; Milstein & Krueger, 1997; Orr, 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |
| Individualized content | Jackson & Kelley, 2002; Lauder, 2000; Leithwood & Jantzi, 1996; Murphy, 1993a |
| Focus on shared instructional leadership | Elmore, 1999; Jackson & Kelley, 2002; LaPoint, Meyerson, & Darling-Hammond, 2005; Leithwood & Jantzi, 1996; McCarthy, 1999; Murphy, 1993b, 1999; Orr, 2006; Southern Regional Educational Board, 2006 |
| Focus on school reform or social justice | Jackson & Kelley, 2002; LaPoint et al., 2005; Leithwood & Jantzi, 1996; McCarthy, 1999; Murphy, 1993b, 1999; Orr, 2006; Southern Regional Educational Board, 2006 |
| Delivery | |
| High-quality internship | Bredeson, 1996; Darling-Hammond et al., 2007; Hart & Pounder, 1999; Jackson & Kelley, 2002; Lauder, 2000; Leithwood & Jantzi, 1996; Leithwood, Louis, Anderson, & Wahlstrom, 2004; Milstein & Krueger, 1997; Murphy, 1993b, 1999; Murphy et al., 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |
| Problem-based learning | Darling-Hammond et al., 2007; Hart & Pounder, 1999; Jackson & Kelley, 2002; Lauder, 2000; Leithwood & Jantzi, 1996; Leithwood et al., 2004; McCarthy, 1999; Murphy, 1993a, 1993b, 1999; Orr, 2006; Southern Regional Educational Board, 2006 |
| Mentoring or coaching | Darling-Hammond et al., 2007; Jackson & Kelley, 2002; Lauder, 2000; Leithwood & Jantzi, 1996; Milstein & Krueger, 1997; Murphy, 1993a; Southern Regional Educational Board, 2006 |
| Cohort structure | Darling-Hammond et al., 2007; Hart & Pounder, 1999; Jackson & Kelley, 2002; Leithwood & Jantzi, 1996; McCarthy, 1999; Milstein & Krueger, 1997; Murphy, 1993b; U.S. Department of Education, 2004 |
| Habit of reflection | Davis, Darling-Hammond, LaPoint, & Meyerson, 2005; LaPoint et al., 2005; Lauder, 2000; Leithwood & Jantzi, 1996; Milstein & Krueger, 1997; Murphy, 1993b; Southern Regional Educational Board, 2006 |
| Performance assessments | Hart & Pounder, 1999; Jackson & Kelley, 2002; Lauder, 2000; Leithwood & Jantzi, 1996; Murphy, 1993b; Orr, 2006; Southern Regional Educational Board, 2006; U.S. Department of Education, 2004 |

Source: Braun et al., 2011.

Appendix B. Theoretical frameworks

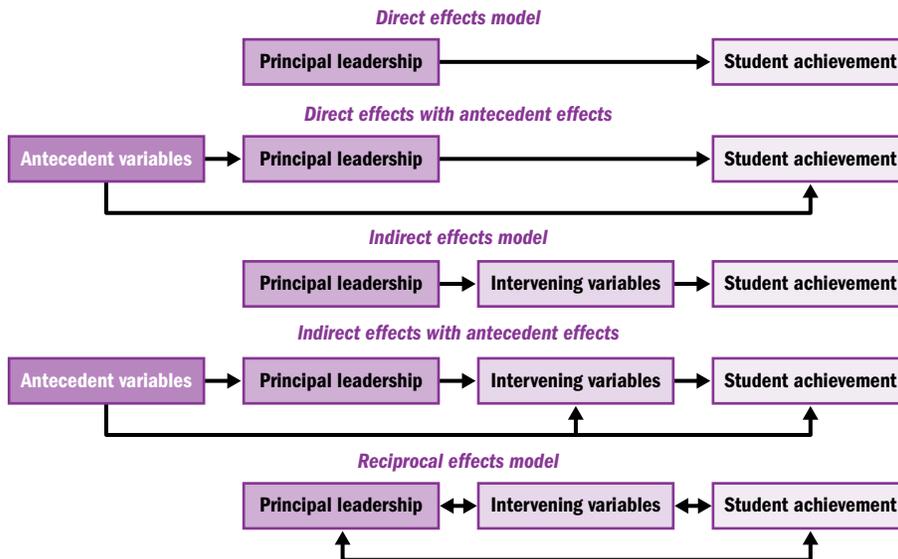
The figures in this appendix depict the theoretical frameworks that guided this systematic review.

Figure B1. Theoretical research framework linking leadership to learning



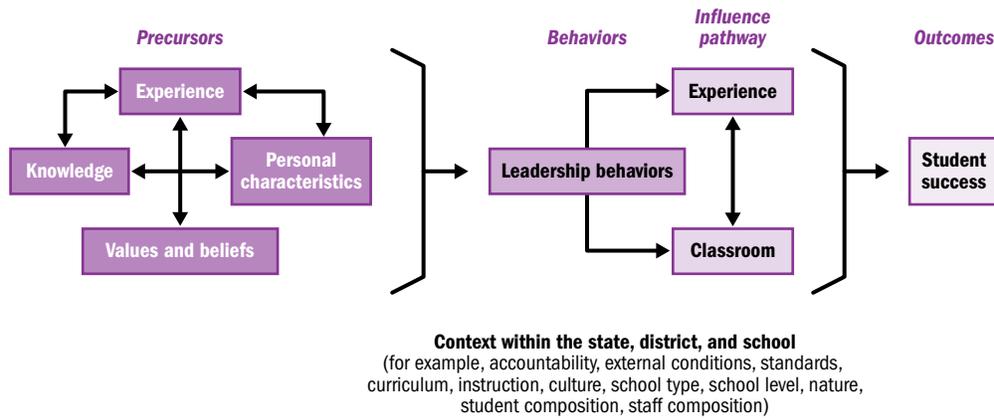
Source: Leithwood et al., 2004.

Figure B2. Direct, indirect, and reciprocal effects models of principal effects



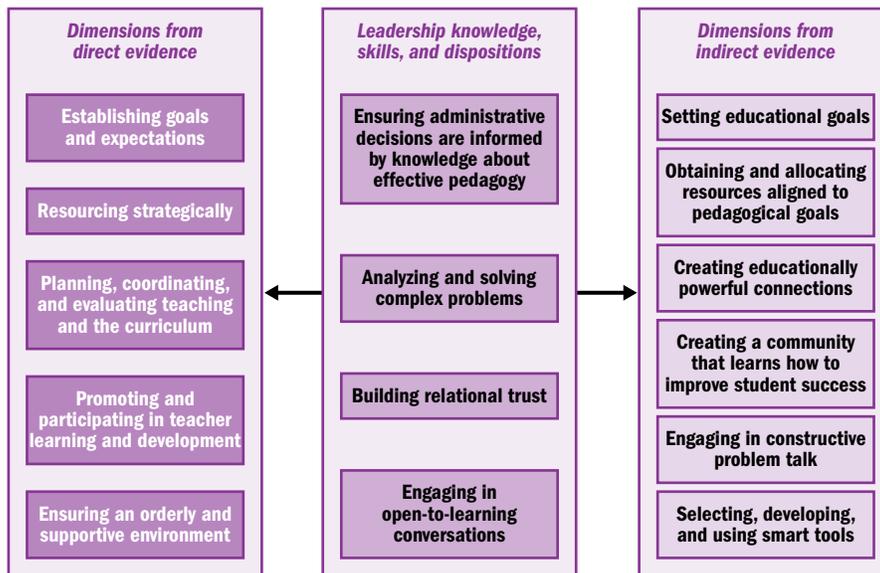
Source: Adapted from Hallinger and Heck (1998).

Figure B3. Learning-centered framework explaining the precursors to leadership behaviors with a potential influence pathway to student outcomes



Source: Murphy et al., 2006.

Figure B4. Leadership knowledge, skills, and dispositions that support effective leadership



Source: Robinson et al., 2009.

Appendix C. Systematic review protocol

This appendix describes the methodology used to complete this systematic review.

Eligibility criteria

To be included in the review, a study had to meet several relevance criteria:

Language relevance. The literature had to be written in English.

Outcome relevance. The study had to:

- Focus on quantifiable student achievement; student achievement could be aggregated to the school level.
- Include an observable principal characteristic that was quantified, operationally defined, or sufficiently described so that it would be replicable.

Sample relevance. The sample had to include both students and principals in the K–12 system. Studies that focused only on principal characteristics without an analysis linking principal characteristics to student achievement were excluded. Studies that focused exclusively on specific subpopulations (for example, only female principals, English learner students, or students in the juvenile justice system) or exclusively on unique school settings (for example, juvenile justice system schools, special education–only schools, alternative schools, or charter schools) were excluded.

Study design relevance. Study design and focus were limited to empirical studies using quantitative or qualitative methods that illuminate relations between principal characteristics and student achievement. While experimental design research is the “gold standard” in education research, the questions addressed by this literature review were correlational in nature. For that reason, it was not expected that many, if any, experimental studies would be included. However, the review team found one experimental study. The review team also found 51 correlational quantitative research and descriptive qualitative research studies that identified relationships between principal characteristics and student achievement.

Timeframe relevance. The most recent comprehensive meta-analysis on principal effectiveness, conducted by Waters et al. (2003) included research from the 1970s through 2001. Thus, the current systematic review included research only from 2001 to the present.

Topic relevance. The study had to include at least one principal characteristic related to student achievement in the K–12 system. The study was required to focus on the direct effect of the principal characteristic, not the potential indirect effect.

Literature search strategy

The literature that was reviewed came from two sources. First, the Florida Department of Education provided a list ($n = 82$) of literature used to develop the Florida Principal Leadership Standards. Second, the review team conducted an independent literature search, including database searches, ancestral searches, and hand searches.

Keyword search. The following Boolean parameters were used in computer database searches: (“Education* leader*” OR “principal”) AND (“student achievement” OR “student outcomes”), limited to publication years between 2001 and 2012. Applying the Boolean search in full-text yielded far too many irrelevant citations, so the search was applied only to the fields of title, abstract, and keyword. Where possible, results were limited to peer-reviewed citations. The following electronic databases were used in the database search:

- Campbell Collection.
- Education Index Retrospective and Education Full Text.
- ERIC.
- ISI Web of Knowledge.
- JSTOR.
- PsychINFO.

Ancestral search. The following meta-analyses and literature reviews were used to identify previously reviewed literature and literature that has subsequently cited the meta-analyses and literature reviews:

- Cotton, K. (2003). *Principals and student achievement: What the research says*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Davis, S. H., Darling-Hammond, L., La Point, M., & Meyerson, D. (2005). *School leadership study: Developing successful principals*. Stanford, CA: Stanford University, Stanford Educational Leadership Institute.
- Marzano, R. J., Waters, T., & McNulty, B. A. (2005). *School leadership that works: From research to results*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Mills, L. B., McDowelle, J. O., & Rouse, W. A. (2011). A meta-analysis of research on the mediated effects of principal leadership on student achievement. In E. H. Reames & M. Barakat (Eds.), *Southern Regional Council on Educational Administration 2011 yearbook: Leading in the decade of challenges and opportunities* (pp. 23–30). Auburn, AL: Auburn University.
- Robinson, V. M. J., Hohepa, M., & Lloyd, C. A. (2009). *School leadership and student outcomes: Identifying what works and why*. Wellington, New Zealand: Ministry of Education.
- Robinson, V. M. J., Lloyd, C. A., & Rowe, K. J. (2008). The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. *Educational Administration Quarterly*, 44(5), 635–674.
- Waters, T., Marzano, R. J., & McNulty, B. (2003). *Balanced leadership: What 30 years of research tells us about the effect of leadership on student achievement*. A working paper. Denver, CO: Mid-continent Research for Education and Learning.
- Witziers, B., Bosker, R. J., & Krüger, M. L. (2003). Educational leadership and student achievement: The elusive search for an association. *Educational Administration Quarterly*, 39(3), 398–425.

Hand search. The following list of educational leadership and policy journals were hand searched for additional literature:

- *American Educational Research Journal*.
- *American Journal of Education*.
- *Educational Administration Quarterly*.
- *Educational Evaluation and Policy Analysis*.
- *Educational Policy*.

- *International Journal of Educational Management.*
- *Journal of Educational Administration.*
- *Journal of Education Finance.*
- *Journal of Education Policy.*
- *Journal of School Leadership.*
- *School Effectiveness and School Improvement.*

Screening strategy

References were collected and stored in EndNote X4 software during the search process. Citations and full-text documents were imported into EPPI-Reviewer4 software for screening and coding. Screening was led by the second author. All sources were double screened on title and abstract, and, if necessary on full text. Discrepancies in screening and coding were resolved through discussion.

Coding strategy

Sources selected for inclusion were double coded for study characteristics (that is, methodology, settings, participants, and measures), study focus, principal characteristics, student achievement measures, and results. Coding was done in EPPI-Reviewer4 software. Interrater reliability was calculated on 20 percent of studies; Cohen's kappa ranged from .93 to 1.0.

Review strategy

In advance of the search and review efforts, the review team anticipated needing to group studies according to common themes to make this report useful to policymakers and practitioners. In part, the more studies that pertain to a characteristic, the more confidence the review team could have about the results. While a guiding framework was used, the review team did not limit the groups according to older research categories; the groups were not predefined but were developed during the coding of the literature.

Effect size formulas

Although the most common effect size is the standardized mean difference, or Cohen's *d*, in this review the relationships between principal characteristics and student achievement are of interest, so the preferred effect size is *r*, which estimates the magnitude of the relationship between two variables rather than the magnitude of group differences on a single variable. Throughout this review, *r* is provided when applicable. Basic formulas for calculating *r* are presented below. A variety of algebraically equivalent formulas are available to calculate effect sizes using other study-reported statistics; see Lipsey and Wilson (2001) for a full list of effect size formulas.

Correlational effect size. The magnitude of the relationship between variables can be calculated as a correlational effect size, *r*, using the covariances between the two variables and their respective standard deviations. Equation C1 displays the basic Pearson product-moment correlation effect size using covariances and standard deviations:

$$r_{xy} = \frac{\sigma_{xy}^2}{\sigma_x \sigma_y} \tag{C1}$$

Fisher's z-transformation. Some studies report the correlational effect size as a Fisher's z . Fisher's z can be transformed back to an r effect size using equation C2:

$$r = \frac{e^{2Z} - 1}{e^{2Z} + 1}. \quad (\text{C2})$$

Standardized mean difference effect size. For calculating standardized mean difference effect size (Cohen's d) group means, standard deviations, and n 's are the most commonly reported and used statistics. Equation C3 displays the basic formula for calculating the d effect size using group means, standard deviations, and n 's:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{s_{pooled}} \quad (\text{C3})$$
$$s_{pooled} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}.$$

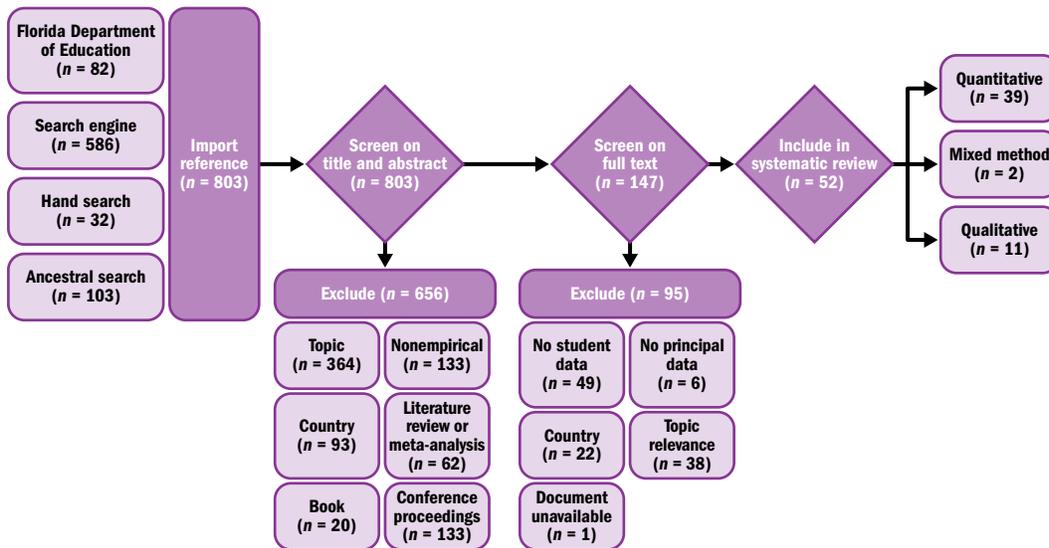
Converting Cohen's d to r . Some studies report an effect size as a Cohen's d . Cohen's d can be transformed back to an r effect size using equation C4:

$$s_{pooled} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}. \quad (\text{C4})$$

Appendix D. Summary of the search and screening process and included studies

This appendix provides additional information on the literature search and screening process (figure D1) and details of the studies included in this systematic review (table D1).

Figure D1. Flow chart of literature search and screening process



Source: Authors' construction.

Table D1. Characteristics of included studies

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|--|--------------|-------------------------------------|-------------------------|------------------|---------|-------------------|--|--|---|
| Bloom & Owens, 2013 | Quantitative | Correlational: Regression | Up to 1 | Nationwide | Urban | High school | • Principal $n \approx 14,000$ | • Self-report | School-level, state test |
| Borko, Wolf, & Simone, 2003 | Qualitative | Qualitative: Case study | Up to 1 | Washington State | Mixed | Elementary school | • School $n = 2$ • Principal $n = 2$ • Teacher $n = 2$ | • Self-report • Teacher or staff report • Student report • Direct observation | School-level, state test: Essential Academic Learning Requirements, Washington Assessment of Student Learning |
| Braun, Gable, & Kite, 2011 | Quantitative | Correlational: Regression | Up to 1 | Rhode Island | Mixed | K–8 | • Principal $n = 88$ | • Self-report | School-level, state test: New England Common Assessment Program, English language arts |
| Brown, Benkovitz, Muttillio, & Urban, 2011 | Qualitative | Case study | Up to 1 | Southeast Region | — | Elementary school | • District $n = 1$ • School $n = 24$ • Principal $n = 16$ • Assistant principal $n = 24$ • Teacher $n = 48$ • Parent $n = 24$ | • Self-report • Teacher or staff report • Parent report | School-level, state test: English language arts and math |
| Chappelear & Price, 2012 | Quantitative | Correlational: Analysis of variance | Up to 1 | Ohio/Region 12 | — | High school | • District or region $n = 1$ • School $n = 44$ • Teacher $n = 213$ | • Teacher or staff report | School-level, state test: Ohio Achievement Assessment, Ohio Graduation Test |
| Clark, Martorell, & Rockoff, 2009 | Quantitative | Correlational: Regression | Up to 6 | New York City | — | Grades 3–8 | • Principal $n =$ more than 1,000 | • District or state data | School-level, state test: English language arts and math |

Table D1. Characteristics of included studies (continued)

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|--|--------------|---|-------------------------|---------------|---------|-------------------|--|---|--|
| Cohen-Vogel, 2011 | Qualitative | Case study | Up to 1 | Florida | Mixed | Elementary school | <ul style="list-style-type: none"> • District $n = 5$ • School $n = 5$ • Superintendent or deputy superintendent $n = 8$ • Human resource director $n = 5$ • Assistant principal or principal $n = 15$ • Teacher $n = 27$ • Parent $n = 6$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Parent report | School-level, state test: Florida accountability model |
| Corcoran, Schwartz, & Weinstein, 2012 | Quantitative | — | 3 | New York City | Urban | Grades 3–8 | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 440$ • Principal $n = 440$ | • District or state data | School-level, state test: New York State exams in English language arts and math |
| Crum & Sherman, 2008 | Qualitative | Case study | Up to 1 | Virginia | — | High school | • Principal $n = 12$ | • Self-report | School-level, state test: Virginia's Standards of Learning accountability system School-level, other: School accreditation, adequate yearly progress recognized |
| Crum, Sherman, & Myran, 2010 | Qualitative | Case study | Up to 1 | Virginia | Mixed | Elementary school | • Principal $n = 12$ | • Self-report | School-level, state test: Virginia's Standards of Learning accountability system School-level, other: School accreditation, adequate yearly progress recognized |
| Donmoyer, Yennire-Donmoyer, & Galloway, 2012 | Mixed method | Correlational: Correlations only Qualitative: Case study | Up to 2 | — | Urban | Elementary school | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 4$ • Principal $n = 4$ • Teacher $n = 167$ • Staff member $n = 72$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Other: School and program documents | School-level, state test: English language arts, math, and science |

(continued)

Table D1. Characteristics of included studies (continued)

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|-----------------------|--------------|---|-------------------------|------------|----------|-------------------------------------|---|--|---|
| Egley & Jones, 2005 | Quantitative | Correlational: Analysis of variance | Up to 1 | Florida | Mixed | Elementary school | <ul style="list-style-type: none"> • District $n = 30$ • School $n = 645$ • Teacher $n = 708$ | <ul style="list-style-type: none"> • Teacher or staff report | School-level, state test: Florida accountability model |
| Fancera & Bliss, 2011 | Quantitative | Correlational: Path analysis | Up to 1 | New Jersey | Mixed | High school | <ul style="list-style-type: none"> • County $n = 18$ • School $n = 53$ • Teacher $n = 1,083$ | <ul style="list-style-type: none"> • Teacher or staff report | School-level, state test: New Jersey High School Proficiency Assessment on English language arts and math School-level, other standardized test: SAT critical reading, writing, and math School-level, other: Student participation in advanced placement courses |
| Gordon & Louis, 2009 | Quantitative | Correlational: Latent variables and regression | 3 | — | Mixed | Elementary, middle, and high school | <ul style="list-style-type: none"> • State $n = 9$ • District $n = 45$ • School $n = 180$ • Principal $n = 157$ • Assistant principal $n = 103$ • Teacher $n = 4,491$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Other: stakeholders at all levels including state, district, community including parents, business members, and community group members, and school. | School-level, state test: English language arts and math |
| Griffith, 2004 | Quantitative | Correlational: Structural equation modeling, hierarchical linear model | Up to 1 | — | Suburban | Elementary school | <ul style="list-style-type: none"> • School $n = 117$ • School-based staff $n = 3,291$ • Student $n = 25,087$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Student report | School-level, state test: English language arts and math |

(continued)

Table D1. Characteristics of included studies (continued)

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|----------------------------|--------------|---|-------------------------|---|---------|-------------------------------------|--|---|---|
| Grissom & Loeb, 2011 | Quantitative | Correlational: Regression | Up to 1 | Miami–Dade County Public Schools, Florida | Urban | Elementary, middle, and high school | <ul style="list-style-type: none"> • State $n = 1$ • District $n = 1$ • Principal $n = 314$ • Assistant principal $n = 585$ • Teacher $n = 15,842$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Parent report | School-level, state test: Florida accountability model |
| Hallinger & Heck, 2010a | Quantitative | Correlational: Latent change analysis | 4 | West Region | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 198$ • Student $n = 13,000+$ | <ul style="list-style-type: none"> • Teacher or staff report | Student-level, state test: English language arts and math |
| Hallinger & Heck, 2010b | Quantitative | Correlational: Latent change analysis | 4 | — | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 192$ • Student $n = 12,480$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report | Student-level, state test: SAT-9 reading |
| Hallinger & Heck, 2011 | Quantitative | Correlational: Latent curve analysis, latent class analysis | 4 | West Region | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 193$ • Teacher $n = 4,152$ • Student $n = 13,391$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Student report | Student-level, state test: SAT-9 math |
| Heck & Hallinger, 2009 | Quantitative | Correlational: Latent change analysis | 4 | West Region | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 195$ • Teacher $n = 4,152$ • Student $n = 13,389$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Student report | Student-level, state test: math |
| Heck & Hallinger, 2010a | Quantitative | Correlational: Latent change analysis | 4 | — | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 195$ • Student $n = 13,391$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Student report | Student-level, state test: SAT-9 math |
| Heck & Hallinger, 2010b | Quantitative | Correlational: Latent change analysis | 4 | West Region | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 197$ • Student $n = 13,391$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Student report | Student-level, state test: SAT-9 math and reading |
| Heck & Moriyama, 2010 | Quantitative | Correlational: Structural equation modeling and path analysis | 4 | West Region | — | Elementary school | <ul style="list-style-type: none"> • State $n = 1$ • School $n = 198$ • Student $n = 25,173$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Student report | Student-level, state test: SAT-9 math and reading |
| Horg, Klasik, & Loeb, 2010 | Quantitative | Correlational: Regression | Up to 1 | Miami–Dade County Public Schools, Florida | — | Elementary, middle, and high school | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 65$ • Principal $n = 65$ • Teacher $n = 15,842$ | <ul style="list-style-type: none"> • Teacher or staff report • Parent report • Direct observation | School-level, state test: Florida accountability model |

(continued)

Table D1. Characteristics of included studies (continued)

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|---|--------------|---|-------------------------|----------------------------|---------|--|---|---|--|
| Horvat, Curci, & Chaplin, 2010 | Qualitative | Case study | 30 | — | Urban | Grades K–8 | <ul style="list-style-type: none"> • School $n = 1$ • Principal $n = 3$ • Staff $n = 1$ • Teacher $n = 5$ • Student $n = 2$ • Parent $n = 21$ | <ul style="list-style-type: none"> • Self-report • Teacher or staff report • Parent report • Direct observation | School-level, other: Archival achievement data |
| Jacobson, Brooks, Giles, Johnson, & Ylimaki, 2007 | Mixed method | Correlational: Correlations only Qualitative: Case study | Up to 1 | New York | Urban | Elementary school | <ul style="list-style-type: none"> • School $n = 3$ • Principal $n = 3$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Parent report • Student report | School-level, state test: New York State Education Department report cards and reports of school improvement |
| Kaplan, Owings, & Nunnery, 2005 | Quantitative | Correlational: Analysis of variance | Up to 1 | Virginia | Mixed | Prekindergarten, Elementary, middle, and high school | <ul style="list-style-type: none"> • School $n = 160$ | <ul style="list-style-type: none"> • Other administrator report • Direct observation | School-level, state test: Virginia Standards of Learning |
| Knoepfel & Rinehart, 2008 | Quantitative | Correlational: Analysis of covariance, regression | 3 | Kentucky | Mixed | Elementary school | <ul style="list-style-type: none"> • School $n = 349$ • Principal $n = 349$ | <ul style="list-style-type: none"> • District or state data | School-level, state test: Commonwealth Accountability Testing System using the Kentucky Core Content Test |
| Leana & Pil, 2006 | Quantitative | Correlational: Regression | 1.5 | Northeast & Islands Region | Urban | Elementary, middle, and high school | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 88$ • Principal $n = 88$ • Teacher $n = 2,167$ • Parent $n = 5,130$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Parent report • Direct observation | School-level, state test: English language arts and math |
| Leithwood & Jantzi, 2008 | Quantitative | Correlational: Structural equation modeling and path analysis | 3 | Nationwide | Mixed | Elementary, middle, and high school | <ul style="list-style-type: none"> • State $n = 9$ • District $n = 45$ • School $n = 96$ • Teacher $n = 2,764$ | <ul style="list-style-type: none"> • Self-report • Teacher or staff report | School-level, state test: English language arts and math |
| Leithwood & Mascall, 2008 | Quantitative | Correlational: Structural equation modeling/path analysis | 3 | Nationwide | Mixed | Elementary, middle, and high school | <ul style="list-style-type: none"> • State $n = 9$ • District $n = 45$ • School $n = 90$ • Teacher $n = 2,570$ | <ul style="list-style-type: none"> • Teacher or staff report | School-level, state test: English language arts and math |

(continued)

Table D1. Characteristics of included studies *(continued)*

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|-----------------------------------|--------------|---|-------------------------|------------|---------|-------------------------------------|---|---|--|
| Louis, Dretzke, & Wahlstrom, 2010 | Quantitative | Correlational: Structural equation modeling | 3 | Nationwide | Mixed | Elementary, middle, and high school | <ul style="list-style-type: none"> • State $n = 9$ • District $n = 43$ • School $n = 106$ • Teacher $n = 4,491$ | <ul style="list-style-type: none"> • Self-report • Teacher or staff report | School-level, state test: math |
| Marks & Printy, 2003 | Quantitative | Correlational: Hierarchical linear model | Up to 1 | Nationwide | Mixed | Elementary, middle, and high school | <ul style="list-style-type: none"> • State $n = 16$ • District $n = 22$ • School $n = 24$ • Teacher $n = 910$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Direct observation | Student-level, other: Academic achievement is a measure of authentic student performance, specifically, the sum of averaged student scores in math and social studies on three standards of intellectual quality: analysis, disciplinary concepts, and elaborated written communication. |
| Masumoto & Brown-Welty, 2009 | Qualitative | Case study | Up to 1 | California | Rural | High school | <ul style="list-style-type: none"> • District $n = 3$ • School $n = 3$ • Superintendent $n = 3$ • Principal $n = 4$ • Counselor $n = 2$ • Advisor $n = 1$ • Teacher $n = 9$ | <ul style="list-style-type: none"> • Self-report • Other administrator report • Teacher or staff report • Parent report • Direct observation | School-level, state test: English language arts and math School-level, other: meet adequate yearly progress; academic performance index scores above the state median, above average proficiency rates for English language arts and math; graduation rates above the state average, lower than average four-year dropout rates; above average 2004 A–G (course requirements for University of California admission) completion rates |

(continued)

Table D1. Characteristics of included studies *(continued)*

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|---------------------------------|--------------|--|-------------------------|--------------------|----------|-------------------------------------|---|---|---|
| May, Huff, & Goldring, 2012 | Quantitative | Correlational: Hierarchical linear model | 3 | Southeast Region | Urban | Grades 1–8 | <ul style="list-style-type: none"> District $n = 1$ School $n = 39$ Principal $n = 39$ Student $n = 38,510$ | <ul style="list-style-type: none"> Self-report: principal diary | Student-level, state test: Achievement scores from the state assessment in English language arts and math |
| O'Donnell & White, 2005 | Quantitative | Correlational: Regression | Up to 1 | Pennsylvania | — | Grades 5–8 | <ul style="list-style-type: none"> School $n = 75$ Teacher $n = 250$ | <ul style="list-style-type: none"> Self-report Teacher or staff report | School-level, state test: English language arts and math as measured by the Pennsylvania System of School Assessment |
| Ovando & Ramirez, 2007 | Qualitative | Case study | Up to 1 | Texas | — | Elementary, middle, and high school | <ul style="list-style-type: none"> District $n = 1$ Principal $n = 3$ Assistant principal $n = 3$ | <ul style="list-style-type: none"> Self-report Teacher or staff report Direct observation | School-level, state test: Texas Assessment of Academic Skills |
| Owings, Kaplan, & Nunnery, 2005 | Quantitative | Correlational: Analysis of variance | Up to 1 | Virginia | — | Elementary, middle, and high school | <ul style="list-style-type: none"> School $n = 160$ Principal $n = 160$ Superintendent $n = 160$ | <ul style="list-style-type: none"> Other administrator report | School-level, state test: Virginia Standards of Learning |
| Reardon, 2011 | Quantitative | Correlational: Regression | Up to 1 | Virginia | Suburban | Elementary school | <ul style="list-style-type: none"> School $n = 31$ Principal $n = 31$ | <ul style="list-style-type: none"> Self-report | School-level, state test: Virginia Standards of Learning in English language arts |
| Ruff & Shoho, 2005 | Qualitative | Case study | Up to 1 | San Antonio, Texas | Urban | Elementary school | <ul style="list-style-type: none"> School $n = 3$ Principal $n = 3$ Teacher $n = 6$ | <ul style="list-style-type: none"> Self-report Teacher or staff report Direct observation Other—document review | School-level, state test: Texas Academic Excellence Indicator System |
| Sanzo, Sherman, & Clayton, 2011 | Qualitative | Case study | Up to 1 | Virginia | — | Grades 6–8 | <ul style="list-style-type: none"> Principal $n = 10$ | <ul style="list-style-type: none"> Self-report | School-level, other: Virginia accreditation standards; those whose schools met the federal No Child Left Behind accreditation standards |

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Table D1. Characteristics of included studies *(continued)*

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|--|--------------|---|-------------------------|-------------------|----------|-------------------------------------|---|--|---|
| Sebastian & Allensworth, 2012 | Quantitative | Correlational: Structural equation modeling and path analysis | Up to 1 | Chicago, Illinois | Urban | High school | <ul style="list-style-type: none"> Principal $n = 1$ School $n = 99$ Teacher $n = 3,529$ | <ul style="list-style-type: none"> Teacher or staff report | School-level, other: unweighted student grades and gains on the Education Planning and Assessment System. |
| Sherman & Crum, 2007 | Qualitative | Grounded theory | Up to 1 | Southeast Region | Suburban | Elementary school | <ul style="list-style-type: none"> State $n = 1$ District $n = 2$ Principal $n = 10$ | <ul style="list-style-type: none"> Self-report | School-level, other: Schools passed state accountability tests in English language arts, schools nationally recognized for school improvement |
| Silva, White, & Yoshida, 2011 | Quantitative | Randomized controlled trial | Up to 1 | Pennsylvania | Suburban | Grades 6–8 | <ul style="list-style-type: none"> District $n = 1$ School $n = 1$ Principal $n = 1$ Assistant principal $n = 2$ Student $n = 41$ | <ul style="list-style-type: none"> Random assignment to condition | Student-level, state test: English language arts as measured by the Pennsylvania System of School Assessment |
| Supovitz, Sirinides, & May, 2010 | Quantitative | Correlational: Structural equation modeling | Up to 1 | Southeast Region | Urban | Grades 2–8 | <ul style="list-style-type: none"> District $n = 1$ School $n = 38$ Teacher $n = 721$ Student $n = 11,397$ | <ul style="list-style-type: none"> Teacher or staff report | School-level, state test: English language arts and math |
| Tschannen-Moran, Parish, & DiPaola, 2006 | Quantitative | Correlational: Regression | Up to 1 | Virginia | Mixed | Grades 6–8 | <ul style="list-style-type: none"> School $n = 82$ | <ul style="list-style-type: none"> Teacher or staff report | School-level, state test: Virginia Standards of Learning in English language arts, writing, and math |
| Twigg, 2008 | Quantitative | Correlational: Structural equation modeling and path analysis | Up to 1 | Southeast Region | Mixed | Elementary, middle, and high school | <ul style="list-style-type: none"> District $n = 1$ School $n = 31$ Principal $n = 31$ Faculty $n = 363$ | <ul style="list-style-type: none"> Self-report Other administrator report Teacher or staff report | School-level, state test |
| Valentine & Prater, 2011 | Quantitative | Correlational: Analysis of variance, regression | Up to 1 | Missouri | Mixed | High school | <ul style="list-style-type: none"> School $n = 131$ Principal $n = 131$ Teacher $n = 443$ | <ul style="list-style-type: none"> Teacher or staff report | School-level, state test: Missouri Assessment Program Performance Index |

(continued)

Table D1. Characteristics of included studies *(continued)*

| Study | Methodology | Type of analysis | Length of study (years) | Location | Setting | Grade level | Participants | Principal data source | Student data source |
|------------------------------------|--------------|--|-------------------------|------------------|---------|-------------------------------------|---|---|--|
| Vanderhaar, Munoz, & Rodosky, 2006 | Quantitative | Correlational: Multivariate analysis of variance, regression | Up to 1 | Midwest Region | Urban | Elementary, middle, and high school | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 91$ • Principal $n = 91$ | • District or state data | School-level, state test: Total Academic Index, and Comprehensive Test of Basic Skills Total Battery |
| Williams, Persaud, & Turner, 2008 | Quantitative | Correlational: Analysis of variance, regression | Up to 1 | Atlanta, Georgia | Urban | Elementary school | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 81$ | • Teacher or staff report | School-level, state test: grade 4 Georgia Criterion Referenced Tests English language arts scores |
| Williams, 2009 | Quantitative | Correlational: Regression | Up to 1 | Georgia: | Urban | Elementary school | <ul style="list-style-type: none"> • District $n = 1$ • School $n = 81$ • Teacher $n = 3,952$ | • Teacher or staff report | School-level, state test: grade 4 Georgia Criterion Referenced Tests English language arts scores |
| Young, Vang, & Young, 2008 | Quantitative | Correlational: Regression | Up to 1 | California | Mixed | Elementary school | • Principal $n = 260$ | <ul style="list-style-type: none"> • Self-report • District or state data | School-level, state test: California Academic Performance Index |

— is not available.

Source: Authors' compilation.

Appendix E. Summary of the findings

The study findings of principal characteristics were organized into three categories: precursors (table E1), behaviors (table E2), and leadership styles (table E3). This appendix shows the studies in each category.

Table E1. Precursors: Conditions that shape leadership behavior and supporting literature

| Precursor | Supporting research |
|---|---|
| Principals' experience | Braun, Gable, & Kite, 2011; Clark, Martorell, & Rockoff, 2009; Grissom & Loeb, 2011; Jacobson, Brooks, Giles, Johnson, & Ylimaki, 2007; Knoeppel & Rinehart, 2008; Ruff & Shoho, 2005; Vanderhaar, Munoz, & Rodosky, 2006 |
| Years of experience in education | Knoeppel & Rinehart, 2008 |
| Teaching experience prior to becoming a principal | Clark, Martorell, & Rockoff, 2009; Vanderhaar, Munoz, & Rodosky, 2006 |
| Years of experience as an assistant principal at current school prior to becoming a principal at the school | Clark, Martorell, & Rockoff, 2009 |
| Years of experience as a principal | Braun, Gable, & Kite, 2011; Grissom & Loeb, 2011; Jacobson, Brooks, Giles, Johnson, & Ylimaki, 2007; Knoeppel & Rinehart, 2008; Ruff & Shoho, 2005; Vanderhaar, Munoz, & Rodosky, 2006 |
| Principal preparation programs | Braun, Gable, & Kite, 2011; Clark, Martorell, & Rockoff, 2009; Corcoran, Schwartz, & Weinstein, 2012; Donmoyer, Yennire-Donmoyer, & Galloway, 2012; Kaplan, Owings, & Nunnery, 2005; Knoeppel & Rinehart, 2008; Owings, Kaplan, & Nunnery, 2005; Vanderhaar, Munoz, & Rodosky, 2006 |
| Types of preparation programs | Clark, Martorell, & Rockoff, 2009; Corcoran, Schwartz, & Weinstein, 2012 |
| University- and district-based programs | Vanderhaar, Munoz, & Rodosky, 2006 |
| Content of preparation programs | Braun, Gable, & Kite, 2011; Donmoyer, Yennire-Donmoyer, & Galloway, 2012; Kaplan, Owings, & Nunnery, 2005; Knoeppel & Rinehart, 2008; Owings, Kaplan, & Nunnery, 2005 |
| Personal traits (educational attainment) | Valentine & Prater, 2011; Young, Vang, & Young, 2008 |

Source: Authors' analysis.

Table E2. Behaviors: Five domains of principal action and supporting literature

| Behavior | Supporting research |
|--|---|
| Instructional management | Borko, Wolf, & Simone, 2003; Brown, Benkovitz, Muttillio, & Urban, 2011; Chappellear & Price, 2012; Cohen-Vogel, 2011; Crum & Sherman, 2008; Crum, Sherman, & Myran, 2010; Fancera & Bliss, 2011; Grissom & Loeb, 2011; Masumoto & Brown-Welty, 2009; O'Donnell & White, 2005; Ovando & Ramirez, 2007; Reardon, 2011; Sanzo, Sherman, & Clayton, 2011; Sebastian & Allensworth, 2012; Sherman & Crum, 2007; Silva, White, & Yoshioda, 2011; Supovitz, Sirinides, & May, 2010; Williams, Persaud, & Turner, 2008 |
| Monitoring and providing feedback to teachers and students | Chappellear & Price, 2012; Fancera & Bliss, 2011; Ovando & Ramirez, 2007; Silva, White, & Yoshioda, 2011; Williams, Persaud, & Turner, 2008 |
| Having a vision for learning | Brown, Benkovitz, Muttillio, & Urban, 2011; O'Donnell & White, 2005; Reardon, 2011; Sebastian & Allensworth, 2012 |
| Providing support and professional development to teachers | Borko, Wolf, & Simone, 2003; Crum & Sherman, 2008; Masumoto & Brown-Welty, 2009; Sanzo, Sherman, & Clayton, 2011; Sherman & Crum, 2007; Supovitz, Sirinides, & May, 2010 |
| Using data to drive decisionmaking | Cohen-Vogel, 2011; Crum, Sherman, & Myran, 2010; Sherman & Crum, 2007 |
| Internal relations | Crum & Sherman, 2008; Eglely & Jones, 2005; Gordon & Louis, 2009; Horvat, Curci, & Chaplin, 2010; Leana and Pil, 2006; Louis, Dretzke, & Wahlstrom, 2010; Sanzo, Sherman, & Clayton, 2011; Sherman & Crum, 2007; Silva, White, & Yoshioda, 2011 |
| Organizational management | Bloom & Owens, 2013; Cohen-Vogel, 2011; Grissom & Loeb, 2011; Horng, Klasik, & Loeb, 2010; May, Huff, & Goldring, 2012 |
| Administrative duties | Williams, 2009 |
| External relations | Gordon & Louis, 2009; Horvat, Curci, & Chaplin, 2010; Leana & Pil, 2006; Masumoto & Brown-Welty, 2009 |

Source: Authors' analysis.

Table E3. Leadership styles and supporting literature

| Leadership style | Supporting research |
|--|--|
| Leadership styles | Griffith, 2004; Hallinger & Heck, 2010a, 2010b, 2011; Heck & Hallinger, 2009, 2010a, 2010b; Heck & Moriyama 2010; Leithwood & Jantzi, 2008; Leithwood & Mascall, 2008; Marks & Printy, 2003; Tschannen-Moran, Parish, & DiPaola, 2006; Twigg, 2008 |
| Relationship between distributive, collaborative, and learning-directed leadership and student achievement | Hallinger & Heck, 2010a, 2010b, 2011; Heck & Hallinger, 2009, 2010a, 2010b; Heck & Moriyama 2010 |
| Other research on relationship between leadership styles and student achievement | Griffith, 2004; Leithwood & Jantzi, 2008; Leithwood & Mascall, 2008; Marks & Printy, 2003; Tschannen-Moran, Parish, & DiPaola, 2006; Twigg, 2008 |

Source: Authors' analysis.

Notes

Special thanks to Stephan Cooley and Cameron Lindahl, graduate research assistants, for research and analytic support. Also, special thanks to Connie Verhagen and John Hughes for technical support.

1. Marzano et al. (2005) identified 21 principal leadership responsibilities as having a significant correlation ($r = .18-.33$) with student achievement.
2. Meta-analysis examining the relationships between types of school leadership (that is, instructional, transformational, variety of combined theories) and students' academic achievement and nonacademic outcomes (for example, self-concept or participation in school activities) from 1978 to 2006 suggested that the effect of instructional leadership ($r = .40$) was nearly four times the effect of transformational leadership ($r = .11$; Robinson et al., 2008).
3. Murphy et al. (2006) theorized the learning-centered framework. It explains that experience, knowledge, personal characteristics, and values and beliefs are precursors to the principal's leadership behaviors, which in turn, influence the overall school experience (for example, standards, curriculum, culture) and specific classroom experiences (for example, teacher practices) of the student, which affect student success (see figure B3 in appendix B)
4. Some studies—such as Leithwood and Jantzi (2008), Leithwood and Mascall (2008), Hallinger and Heck (2010a, 2010b, 2011), Heck and Hallinger (2010a, 2010b), and Heck and Moriyama (2010)—appear to use the same sample or subsamples. Therefore, the samples may not be independent, and the number of participants reported may overestimate the number of unique districts and schools.
5. Precursors in this review are defined as conditions that shape principal behavior, as conceptualized by Murphy et al. (2006). However, the precursor categories identified in this review are distinct categories and are not intended to be directly aligned with the definitions of Murphy et al. (2006) precursor categories.
6. The number of studies that examine particular variables are quantified by variable; however, in some instances authors examined more than one variable (such as teaching experience, years of experience as a principal). For example, Vanderhaar et al. (2006) examined both teaching experience and principal experience. Those findings are reflected in both applicable sections of the report, which, in some cases, impacts the overall counts.
7. Effect sizes could not be calculated; Grissom and Loeb (2011, p. 1115) state, “While not shown, we find no relationship between principal characteristics and student performance, except for principal experience, which shows positive associations with test score growth in both subjects.”
8. Findings of this study, which examined the relationships between principal quality, socioeconomic status of students at the school, and student achievement, revealed that principals in the upper two quartiles of principal quality—as measured by the Interstate School Leaders Licensure Consortium principal quality rubric—led schools with higher student achievement. The association between principal quality and student achievement was significant in grades 3 ($r = .48$) and 5 ($r = .49$) but not in grade 9 or for end-of-high-school course exams.
9. While Kaplan et al. (2005) and Owings et al. (2005) are two separate publications, identical study results are reported in both publications.
10. Insufficient data were provided to calculate effect sizes.

11. Insufficient data were reported to calculate effect size so only the standardized regression coefficient as reported as a direct effect from a structural equation model is reported here.
12. Learning-directed leadership was characterized as distributed or collaborative leadership combined with the development of school capacity to support teaching and learning. In turn these styles supported the capacity to improve instruction for improved student achievement (Heck & Moriyama, 2010).
13. Leadership components were used for both distributed and collaborative leadership styles.
14. Insufficient data were provided to calculate effect sizes so only standardized regression coefficients are reported here.
15. Insufficient data were reported to calculate an effect size so only the standardized regression coefficient is reported here.
16. Insufficient data were provided to calculate effect sizes so only the total effect was calculated and reported as a standardized regression coefficient.

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