

Rethinking School Leadership: Are Soft Skills a Missing Element in Effective School Leadership?

Alexandra Gagnon

Department of Economics, University of Virginia

Distinguished Majors Program

Advised by Professor Sarah Turner

April 28, 2025

Abstract

Do school principals matter for student achievement? Principals are responsible for running daily operations, managing budgets, and overseeing staff. They act as a liaison between the county, teachers, parents, and students for their schools. Yet, the level to which and how they impact student outcomes remains unclear. Principals are, in effect, managers for schools, and in the domain of personnel economics there is established evidence that strong staff relations boost retention, effective communication improves coordination, and a positive culture fosters greater commitment to organizational goals. Drawing from research in the domain of economics of education, management, and labor, this paper examines the relationship between school leadership and student educational outcomes. Using regression analysis combined with principal component analysis this paper focuses on principals' soft skills and culture building capabilities, measured through the Virginia School Survey of Climate and Working Conditions. Across empirical specifications, this paper's analysis finds consistent evidence that leadership scores are a statistically significant explanatory variable for student outcomes. Student outcomes impacted by principal traits include both academic performance as measured by SOL score and behavioral measures such as chronic absentee rates. These results reveal traits of successful principals and prompts the question: can these traits be taught? This question lays the groundwork for future research and policy implementation.

Acknowledgements

First, I would like to thank my advisor, Professor Sarah Turner, for her detailed feedback and encouragement throughout the process. When I first entered the program, the only thing I knew for certain was I wanted to focus on education. I am lucky to have had her to guide me through this field and expand my network to professors at UVA such as Professors Brendan Bartanen and James Wyckoff.

Secondly, I would like to thank the leader of the Distinguished Majors Seminar, Professor Kerem Coşar. His dedication to the programming and student experience made the fall semester incredibly engaging. To my DMP cohort, thank you for all your support and all the laughs. We did it together.

Finally, I would like to thank my parents who have supported me not only through this thesis writing process but my entire education. From a young age they instilled in me a love of learning, a value deeply rooted in both of them. I could not ask for better role models.

I would like to acknowledge the use of ChatGPT and Claude AI for coding and proof-reading help throughout this project.

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Section 1: Introduction

Educational outcomes are strongly linked to long-term economic indicators, including lifetime earnings, employment rates, and health outcomes (Card & Krueger, 1992; Heckman et al., 2014; Ross & Wu, 1995). However, achievement gaps persist across the public school system in the U.S., despite substantial research efforts and public-policy implementation. Given these achievement gaps, there is increasing attention to how to improve productivity of schools to close the gap. This area of study can be categorized as investigating the “education production function.” There has been a great deal of attention to school resources in general (Rothstein & Schanzenbach, 2022), teacher inputs (Chetty et al., 2014), and student demographics (Okpala et al., 2000). Principals are the managerial element of the education production function, yet there has been less research on identifying and rewarding effective principals.

Principals hold critical responsibility in the everyday functioning of the school. In addition to overseeing daily operations, Virginia principals are in charge of discretionary spending and the monthly accounting report sent to their superintendent (Chapter 8. Public School Funds – Code of Virginia). Divisions and school boards employ principals to engage in instructional leadership, while implementing broader policy and regulations. Principals are responsible for managing school personnel and guiding learning practices. In Virginia there are over 2,000 public school principals, 329 of which are high-school principals. Within the entire United States there are over 91,000 public-school principals.

Despite their large roles within schools, there are many obstacles to understanding what makes a principal effective, including state and county education policy, lack of autonomy within the school, and various confounding variables. These limitations have complicated empirical analysis by making it more challenging to isolate principal’s impact from other factors such as

teacher effectiveness, student demographics, and district/community wide events. However, recent research in management economics has identified various strategies of leadership and culture that are associated with large gains in efficiency and production. While schools are different from private firms in structure and output, the parallel between manager and principal is evident. Both oversee a group of employees and work towards a larger organizational mission, despite limitations in resources and autonomy. This parallel provides specific direction for research into principals as I frame the principal as an organizational manager.

In this paper, I focus on the “soft” skills and culture building capabilities of principals. This differs from existing studies that focus on “hard” traits of principals, such as qualifications (degree or years of experience) or time allocation of day to day tasks in role. Virginia school evaluation initiatives, specifically the implementation of the School Survey of Climate and Working Conditions, offer a means to measure principal variation. The survey provides classroom instructors’ evaluation scores of school leadership on twelve questions that vary in theme and skill focus, however, measure more subjective traits. These scores serve as proxy variables for principals’ soft skills such as communication and relationship management.

The following analysis begins with a review of evidence on U.S. school principals, relevant educational research, and management studies that inform this paper’s methodology. In an attempt to evaluate the framework of management economics in an education setting, I frame the principal as an organizational manager. I focus on the state of Virginia, using the Virginia School Survey of Climate and Working Conditions results as a proxy for principal relational, communication, and culture-building capabilities — principals’ soft skills. To assess the impact of principals with high and low evaluation scores, I regress key student outcome variables (standardized test scores and chronic absenteeism rates) on instructor-reported leadership scores

and control variables. I run multiple regressions, utilizing a variety of empirical strategies. The approaches include first-difference, cross-sectional, and principal component analysis.

Empirical evidence shows that schools with higher-scoring principals are consistently associated with higher test scores, in all subjects, and lower chronic absenteeism rates. These results suggest that while difficult to measure, interpersonal relationships and soft skills play a critical role in principal effectiveness. These results also further the hypothesis that principals are a key component of the education production function, informing future policy and education reform. An open question for future research is how hiring practices or professional development programs can impact principals' soft skills.

Section 2: Research Context

Principals as Managers

School principals are, essentially, managers. Regarded as the leaders of their schools, principals are responsible for carrying out four general leadership functions: planning, organizing, leading, and monitoring (Lunenburg, 2010). That said, the role of school principal has changed dramatically from its original form. As single-room school houses evolved to modern schools with multiple classrooms, the school principal emerged as a key role needed to oversee teachers and other educational support staff. Over the course of the last fifty years there has been increased attention to principals as potential agents of organizational change, beyond the basic administration their role stemmed purpose in. This increased attention resulted in policy change. From 1975 to 1990, the number of states that required principal-evaluation programs increased from nine to forty (Hallinger & Heck, 1996). By the 1990s, policymakers saw the

principal as a key aspect of education policy and reform, despite the limited understanding of through what channels and to what extent principals impact students and school success.

While existing in different sectors, there is a clear parallel between a public school principal and a private firm manager. Research in management economics has found that the quality of managers has a great impact on firm productivity (Bloom et al., 2016; Lazear et al., 2015). Initial education research has found evidence that principals can have a similar impact, as discussed in the prior research section below.

Principal Qualifications, Compensation, and Constraints

Qualifications and Compensation

In the 2020-21 school year, there were 20,910 secondary public school principals in the United States. According to the National Center for Education Statistics in 2020-21, of all public school principals: 35% had 3 or fewer years of experience as a principal, 38% had 4 to 9 years of experience; 24 percent had 10 to 19 years of experience; and 4% had 20 or more years of experience. In general, of public high school principals in the United States, about, 2% had a bachelor's degree or lower, 63% had a master's degree, 23% could be considered Education Specialist (degrees or certificates awarded for at least one year of work beyond master's degree level), and 12% had a doctorate or first professional degree. Public school principals tended to have higher levels of education attainment than private school principals in 2020-21. The average annual salary of a public high school principal was \$118,800 in 2020-21 (All data from the National Center for Education Statistics).

Requirements to be a principal are dependent on each state's Department of Education's guidelines ([50-state comparison](#)). While a bachelor's degree is considered a minimum qualification, most (40) states require an advanced degree, and some require a valid classroom

teaching certificate. Candidates pair this educational background with required teaching or leadership experience. Each state has its own principal exam that is taken after a required state-specific principal preparation program. In the state of Virginia, for in-state candidates, an advanced degree, assessment, educational preparation program, field experience, and work experience, are required for school principal certification according to statute (8 Va. Admin. Code 20-23-620).

Salary scales/schedules for principals vary by state—both in terms of specification and whether they are set at a district or state level. In Virginia, for example, salary scales for public school principals are determined by school county. These salary scales have different “steps” of pay levels, which are generally determined by years of experience and degree level, however, specifics of this function vary by governing-jurisdiction and often include caps. In 2022-23, the lowest average high school public school principal salary was \$41,887 in Halifax County, the maximum was \$168,204 in Loudoun County, and the total average amongst all Virginia counties was \$103,681.

Principal Constraints

While they are leaders of their schools, principals’ autonomy and control are limited due to various exogenous factors. The specifics of these limitations also vary by state, county, and school demographics.

In Virginia, principals ultimately report to their division superintendent and the school board for their region. They are subject to standards and policies from both their district and state. They hold little autonomy in large decisions, as they cannot be made without approval from higher levels. For example, in regard to staff management operations, principals are only able to make recommendations to their superintendent, with whom the final decision resides.

Within rural counties in Virginia, there are additional challenges in hiring staff, managing limited budgets, filling multiple roles, limited collaboration with professionals in similar roles, and limited support provided by school districts (Wheeler, 2024).

Political and societal focus on education has increased the pressure placed on principals as agents of change. Following the passage of the 2002 federal “No Child Left Behind” legislation, a push for school accountability measures has been implemented across the United States. This has led to increased focus on the standardized testing and evaluation methods of schools, only intensifying the focus on the role of principals as schools are being more comparatively measured (West et al., 2010).

Principals and Managers: Similarities and Differences

Principals and firm managers hold very similar positions within their respective organizations. They fulfill the classic responsibilities of planning growth, organizing personnel and resources, leading staff, and monitoring productivity. Both roles play a pivotal role in shaping organizational culture. Culture and leadership quality have a direct effect on employee retention and productivity in both sectors (Lazear et al., 2015; Brown & Wynn, 2009). Both principals and managers have limited autonomy because they work under external constraints, whether that be district/state policy or shareholder instruction or regulatory bodies. They are also both evaluated through performance metrics such as profit and standardized tests. Finally, both roles revolve around managing people, and therefore depend on interpersonal relationships and leadership skills.

However, it is important to acknowledge that schools run differently than firms so the roles are not identical. The complexity of leadership in different contexts have kept theories evolving over time and led to the suggestion that there are significant restrictions on a concept of

a universal model for organizational behavior (Hallinger & Heck, 1996). The inputs in the education production function are more nuanced than those in a typical capital-and-labor manufacturing function, as they involve working with children who exhibit varying levels of ability, behavior, and other characteristics. Additionally, principals' significant lack of autonomy due to large school districts, county, and state policy add further extraneous conditions that interfere with the firm analogy.

Furthermore, while executives of accomplished firms often receive performance bonuses, this practice has only recently been implemented in the education arena in certain states and districts and take a different form since the product of schools is not profit. Principal incentive programs first began to gain traction in the mid-to-late 2000s, with the establishment of the Teacher Incentive Fund in 2006 and Race to the Top in 2009 and continues to be debated in current education policy decisions because of the difficulty measuring principal and teacher success without incorporating extraneous factors.

Section 3: Prior Research

Principals Effectiveness

Specific Practice

As research in economics of education expanded, the influence of principals and school management on student outcomes became a key focus. Helen Ladd, in her work "Education and Poverty: Confronting the Evidence" (2012), highlights the transformative effect strong school leadership can have on disadvantaged students. She advocates for increased accountability for internal policies and practices that are targeted at educational outcomes beyond test scores.

Recent research in economics of education has established that there is substantial variation in leadership effectiveness across schools, which is tied closely with principal practices. A meta-analysis, “The Impact of Leadership on Student Outcomes: An Analysis of the Differential Effects of Leadership Types” found that the more leaders focus on “relationships, their work, and their learning on the core business of teaching and learning, the greater their influence” (Robinson et al., 2008). Additionally, the meta-analysis suggested positive average effects of instructional leadership on student achievement (Robinson et al., 2008). Instructional leadership is defined broadly but often refers to hands-on leaders, engaged with students and teachers in curriculum settings (Hornig & Loeb, 2010).

In contrast, principal walk-throughs of classrooms, while once used as an example of instructional leadership, have been determined to be either ineffective or potentially harmful in subsequent studies. For the paper “Effective Instructional Time Use for School Leaders: Longitudinal Evidence from Observations of Principals”, Susanna Loeb, Jason Grissom, and Ben Master conducted unique observational research, observing full-day behavior of 100 urban principals over the course of three school years. They differentiated five key areas of instructional leadership activities: classroom walkthroughs, teacher coaching, evaluation of teacher instruction, professional development, and developing the school’s educational or curricular program. Classroom walkthroughs were the only one of these five to consistently have a negative relationship with various outcome measures, despite being the primary information source for finding out about teachers’ instructional practices (Loeb et al., 2013).

General Quality

Hanushek, Branch, and Rivkin (2013) found significant outcome improvement associated with principals of higher quality (determined by looking at a principal’s fixed effect, while

controlling for prior student achievement, student demographics, etc.), especially in high-poverty schools. Their results found that a principal one standard deviation above the average on the quality distribution will lead to student gains that are at least 0.05 standard deviations higher than average for all students in the school (measured on an annual basis). They measured principal quality by attributing it to be the differentiating factor of schools serving similar students with similar attributes along with incorporating past test scores. Although the value added by an effective principal may not surpass that of a high-quality teacher on an individual basis, the principal's broader and non-excludable influence on a larger number of students makes the aggregate of this impact substantial. In a related study, "The Lasting Impacts of Middle School Principals," Hanushek et al. (2024) found that a principal's ability to enhance cognitive skills correlates with long-term educational and economic success. Additionally, their capacity to improve non-cognitive skills is linked to lower rates of incarceration and fewer suspensions.

A general criticism in principal research within the economics of education is that many studies fail to account for confounding variables or ignore factors that could introduce bias. These factors could include high-quality principals matching to high-quality schools, principal quality influencing teacher quality, student demographics, etc. (Branch et al., 2009).

Teacher Value-Add

Value-Add Model

The effect of teachers on student achievement has been studied heavily in the fields of education and economics. Specifically, value-add style models have found that a high quality teacher has a large impact on student achievement both in the immediate and long-term outcomes (Chetty et al., 2014). The majority of existing research bases the value-add model on

students' test scores, and uses school fixed effects to compare teachers' individual impact.

Students who had high quality (high-value add) teachers are more likely to attend college, earn higher salaries, and experience lower rates of teenage childbearing (Chetty et al., 2014).

These positive impacts come with great economic value as well. While estimates and specific models vary, multiple longitudinal studies found large payoffs to society in the marginal increase of future earnings. In "The economic value of higher teacher quality," Hanushek (2011) estimated that there are gains over \$400,000 per twenty student class with a teacher one standard deviation above the mean in regards to effectiveness. Chetty et al. (2014) found similar results when estimating the marginal impact of switching a low quality teacher (bottom 5% of value-add) with an average teacher—specifically, a marginal increase of \$250,000 in total lifetime earnings per classroom. These results illustrate the importance, and relevance, of identifying factors that improve student outcomes. However, for reasons discussed in the Empirical Strategy section, value-add models are much more difficult to conduct for principals. Briefly, Loeb et al. explain that principal effectiveness is more difficult to measure than teacher effectiveness because principals are a "step-removed from the classroom," limiting their direct control of the environment (Loeb et al., 2015).

Non-Observable Attributes and Soft Skills in Teachers

The basis for the interest in less tangible principal/administrative characteristics comes from the development of research in teacher quality. When education research began to look at the value-add of high-quality teachers, researchers soon realized that determining what makes a "good" teacher was a complex task. The value-add models did not require direct identification of traits, rather used fixed effects for schools and other controls and attributed the residual to the teacher-value-add. Hanushek et al. (2005) found that teacher quality is unrelated to advanced

degrees, certification, and only related to experience when considering the first year of teaching. Subsequent research found that aspects of teachers' personalities, enthusiasm in the classroom, and motivations for teaching act as reliable predictors of teacher quality (Baier et al., 2018).

Managers and Firm Productivity

Management Effectiveness

In the private sector business context, Nicholas Bloom, has focused his recent work on the theory of management effectiveness. His research has spanned across various industries and argues that effective management practices can significantly increase a company's output and performance. In their working paper "Management as a Technology," he and his colleagues found strong empirical evidence for their theory and found that "differences in management practices account for about 30% of cross-country total factor productivity differences" (Bloom et al., 2016). While this data was largely taken from manufacturing industries in the United States, Bloom used these findings as a starting point in other sectors such as education.

In his paper "Does Management Matter in Schools" Bloom et al. (2014), demonstrated that higher management quality in schools is strongly correlated with better student performance, explaining approximately 25% of the variation in student achievement across several countries. This extension to education, however, focused less on the principals themselves and more so their description of management in operations, monitoring, target setting, and people. This wider lensed view made sense when evaluating such a diverse set of subjects (1,800 schools across 8 countries). However, it prevents deeper analysis on the immediate role of the principals in these settings.

Firms or divisions with higher quality bosses are associated with reduced turnover of employees and increased productivity (Lazear et al., 2015). This relationship has likewise been recognized in the educational setting. Principals that score highly on supportiveness and visions for growth scales are associated with higher retention rates of teachers (Brown & Wynn, 2009). The higher retention rates are especially important in broader discussion of the United States teacher shortage as attrition rates are a driving cause of the crisis (Geiger and Pivovarova, 2018).

Extension to Soft Skills

Deming et al. (2017) was one of the first to model social/communication skills in the workforce. His model was based on the concept that with higher levels of communication skills, workers would be able to “trade” tasks to optimize productivity based on each other’s comparative advantages in reference to various tasks. While the model does not incorporate managers or a vertical hierarchy of skills, the discussion touches on how it could be extended to do so. Furthermore, “relatable” managers have the ability to smooth various shocks to productivity by “efficiently reallocating low-performing workers” (Adhvaryu et al., 2014). A manager with high communication skills would potentially lower the coordination cost imposed on workers.

The importance of social/communication skills, often referred to as “soft skills,” has been briefly noticed in management literature, however its measurement and analysis is limited. Crosbie (2005) identified eight components of leadership soft skills: Leadership ability, communication skills, planning and organizing, personal effectiveness/mastery, presentation skills, initiative, and collaboration and teamwork. A Malaysian study of six high performing schools found that high leadership soft scores are associated with school improvement (Ngang et al., 2015). The unique impact of soft skills in school leadership capacity comes from their ability

to develop human capital and organize teachers in effective ways (Ngang et al., 2015). Though, this study's focus on only six high performing schools limits the findings, as they might not reflect broader populations or settings.

Firm Culture

While firm “culture” is a term often used in promotional or recruiting information, empirical evidence has shown it might in fact hold substantive weight, translating into higher relative firm productivity (Guiso et al., 2015). Specifically, culture in the firm setting refers to shared “assumptions, values, and beliefs that characterise an organisation and influence behavior” (Schneider et al., 2013). The influence of firm culture on productivity comes from a few different angles. Culture has been found to be a key indicator of practices that lead to institutional failures, showing the potential risk of “bad culture” (Reader & Gillespie 2023). On the other end, positive attitudes within the workplace are linked to higher levels of motivation and higher levels of job satisfaction (Lăzăroiu, 2015). Higher levels of satisfaction within a firm are associated with a higher commitment to the firm by the employee. This promotes efficiency and retention of employees. Additionally, culture facilitates synergy and higher collaboration success between departments when completing joint projects (Afsar & Umrani, 2019, as cited in Nzuva & Kimanzi, 2022). Nzuva and Kimanzi’s systematic review of culture within firms identifies weak leadership as a significant threat to culture development within a firm (2022).

The importance of culture has also been explored in education. Principals can play a pivotal role in promoting school culture which in turn aids teacher’s well-being and performance (Engels et al., 2008). Promoting positive culture is a broad reaching method for principals to impact student and teacher outcomes.

Synthesis of Research and Application in this Study

A production function serves to conceptualize the connection among various input factors—such as teacher quality, school leadership, financial resources, and demographic backgrounds—and educational outcomes, often measured in test scores (Hanushek, 2020). Early efforts to conceptualize educational leadership effectiveness initially prioritized quantifiable indicators, mirroring the methodological approach that was first used to evaluate teacher effectiveness. However, even in the analysis of teachers, researchers have identified the importance of measuring outcomes beyond test scores (Jackson, 2018). Additionally, broad insights about what qualities make a "good" teacher, beyond quantifiable factors like education level or experience, may extend to inform what marks a "good" principal. Additionally, the firm-focused economic research on culture and leadership interpersonal skills (Nzuva & Kimanzi, 2022; Schneider et al., 2013), including Nicholas Bloom's research on managers' impact on firm productivity (Bloom et al., 2016), reinforce this focus on soft skills.

The assessment of soft skills in principal effectiveness has been limited to date, this paper will attempt to bridge the gap in research and extend understanding of leadership effectiveness in schools. Based on the context explained above, this paper will analyze the significance of leaderships' soft skills on student outcomes, to determine if it plays an active role within the education production function. Theoretically, the function would look something like:

$$E = \alpha \cdot (1 + \lambda \cdot SS) \cdot f(T, R, S, D)$$

With the variables representative of the following E: educational outcomes (test scores, behavioral measures, etc.); α : baseline productivity coefficient; λ : multiplier that indicates how principals' soft skills augments other factors in the production function; SS: composite measure of school leadership soft skills; T: teacher quality; R: resources; S: student characteristics; D:

environmental/contextual factors. While this paper focuses on more exploratory analysis to evaluate the relationship between soft skills and achievement, this hypothesized production function captures the underlying theory.

Section 4: Empirical Strategy

Empirical Objectives

The objective of this study is to measure how principals' soft skills impact student outcomes. This presents several methodological challenges.

First, soft skills are not measured objectively. In a survey context, soft skills may reflect attempts to capture more intangible interpersonal and communicative capabilities. Unlike quantifiable metrics such as years of experience or level of education, soft skills must be measured indirectly. In private firm research, unobtrusive measures to evaluate culture (which is similar to soft skills as more intangible than strict criteria) have been developed including evaluations of online postings, language in company-wide meetings, etc., however, no coherent set of reliable indicators has been established (Reader & Gillespie 2023). Surveys remain the most typical measure of culture in the corporate world, despite the bias associated with surveys.

Second, principals impact students through indirect channels. Unlike teachers, who directly instruct and interact with students daily, principals influence student outcomes by enhancing teacher effectiveness, shaping school climate, and optimizing resource allocation. These channels are considered malleable school factors and the means to which principals can influence these, for example, are through their approach to professional development, program coherence, and interpersonal relationships (Sebastian & Allensworth, 2012). These malleable factors are the primary levers through which principals impact student outcomes and experience.

However, the extent to which principals can manipulate these levers varies greatly by school due to differences in school facilities, neighborhood, socioeconomic status of students and school staff, and other factors outside the control of principals or teachers (Bartanen et al., 2024). These school-specific factors are therefore not only confounding variables in principal effectiveness research itself, but also they also have the potential to directly constrain the extent of influence principals have. The principal figure can be thought of as part of a complex network, or “web,” of “environmental, personal, and in-school relationships that combine to influence organizational outcomes” (Hallinger & Heck, 1996, pg. 6). This observation highlights the potential difficulty of distinguishing between principal contribution and influences of other school factors when evaluating different outcomes.

Third, unlike firms where profit acts as a clear, bottom-line measure of success, schools produce multidimensional student outcomes spanning both academic achievement and behavioral. For this reason, I measure multiple outcome variables to capture the various ways principals might impact students.

While a value-added framework has been immensely important in the research literature on teacher effectiveness, it does not “port” to measuring principal effectiveness. The issue with measuring “principal effect” originates in the indirect manner principals interact with, and therefore impact, student outcomes (Hallinger & Heck, 1996). Unlike the teacher effect or teacher-value-add, which have been studied thoroughly in both economic and educational research, principals are detached from students' everyday learning and instruction.

The primary challenge in applying the value-add framework to principals is the standard of only one principal for a school. Researchers are unable to separate school fixed effects from principal effects as they can with teachers, where multiple teachers work within the same school

environment. Hanushek, Branch, and Rivkin (2013) attempted to work past this by sorting schools together based on similar attributes and using the school's previous test scores as a control. However, the inability to account for all characteristics not under the principal's control, likely overestimates the principal-effect. In contrast, the analytical method typically used in teacher-value-add studies compares teachers within their school so that fixed school effects do not confound the measurement of teacher effects.

Additionally, there are limited methods possible that would be analogous to the "pre" or lagged student score typically found in the value-added framework for teachers. Students often enter public high schools from a variety of feeder elementary and middle schools, making it difficult to establish consistent 'pre' scores for comparison. Similarly, because high school spans four years, students typically remain in the same school for a substantial portion of their education experience, adding to the difficulty of finding a "pre" score to use in analysis.

Similarly, leadership transitions are unlikely to be exogenous thus limiting the value of a measurement strategy based on changing principals. For these reasons, I employ an empirical strategy that utilizes survey data to measure leadership attributes in the context of a conditional-on-observable regression approach.

Empirical Specifications

Using a conditional-on-observables regression approach, I examine the relationship between principal soft skills and student outcomes. This approach identifies statistical associations between leadership measures and student performance after controlling for observable school and principal characteristics.

Causal interpretation relies on the conditional-on-observables assumption. A concern is that there is non-random sorting of principals to schools based on factors unobserved to the

researcher. High-quality principals may systematically match to high-quality schools, confounding attempts to measure their independent contributions to student outcomes (Branch et al., 2009).

Cross-sectional Analysis

The primary approach uses cross sectional analysis to evaluate the relationship between leadership scores and student outcomes. This model takes the form:

$$Y_i = \alpha + \beta \text{LeadershipScore}_i + X'_i \gamma + \varepsilon_i \quad (1)$$

where Y_i represents outcome measures (SOL scores or chronic absenteeism rates) for school i , LeadershipScore_i represents the leadership evaluation score derived from teacher-level responses to a battery of questions (discussed in section 4), and X'_i is a matrix of control variables including principal experience (exp), average principal salary in the district j (AvgSal_j), county unemployment rate (UE_j), county median household income (MedHHI_j), percentage of disadvantaged students for school i (PctDA_i), and demographic composition (percentages of Asian, Black, Hispanic, and other racial categories).

First-Difference Analysis

Given a legitimate concern that a component includes characteristics of the school that are non-related with both leadership score and the outcome, I also employ a first-difference estimation strategy.

First-difference analysis will be conducted on both the change in SOL scores and the change in chronic absenteeism rates from 2022 to 2024. This model takes the form:

$$\Delta Y_i = \alpha + \beta \Delta \text{LeadershipScore}_i + \varepsilon_i \quad (2)$$

where ΔY_i represents the change in outcome measures and $\Delta \text{LeadershipScore}_i$ represents the change in leadership evaluation scores between 2022 and 2024. Additional control variables are not added, as they are in the cross-sectional model to avoid obscuring the relationship between the two measures. First-difference analysis is valuable because it helps address potential omitted variable bias by focusing more on within-unit variation.

Section 5: Data

Data Sources

Virginia School Survey of Climate and Working Conditions

The Virginia School Survey of Climate and Working Conditions provides the primary measure of principal soft skills. While VDCJS publishes summary results, the specific granular response data used in analysis was obtained through a data-use agreement. The Virginia Department of Criminal Justice Services conducts this survey as part of the annual school safety audit submitted to the Virginia Center for School and Campus Safety.

The survey is conducted in even-numbered years (e.g., 2018, 2020, 2022) for public high schools, and in odd-numbered years for elementary and middle schools. This analysis uses data from the 2022 and 2024 survey administrations—corresponding to the 2021–2022 and 2023–2024 school years—to examine Virginia's public high schools.

The survey includes sections on General Questions, Teaching Position, Teaching and Learning Environment, School Supports, Safety, Well-being, and Summary. Within the School Supports section, a subsection on leadership provides the key variables for this study. As shown in Exhibit A, these questions assess classroom instructors' perceptions of school leadership on

dimensions including respect, communication, trust, evaluation procedures, feedback, and inclusivity.

L. SCHOOL LEADERSHIP

The word “teacher” collectively refers to all classroom instructors (teachers, teacher’s aides, and assistants).

How strongly do you agree or disagree with the following statements about this school? Mark one response per line.

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
71. I feel respected by this school’s administrators.	☐	☐	☐	☐	☐	☐
72. I feel comfortable raising issues and concerns that are important to me with school administrators.	☐	☐	☐	☐	☐	☐
73. I trust this school’s administrators to do what they say they will do.	☐	☐	☐	☐	☐	☐
74. The procedures for teacher evaluation are consistent.	☐	☐	☐	☐	☐	☐
75. My performance is assessed objectively.	☐	☐	☐	☐	☐	☐
76. I receive feedback that can help me improve my performance.	☐	☐	☐	☐	☐	☐
77. This school’s administrators communicate a clear vision for this school.	☐	☐	☐	☐	☐	☐
78. This school’s administrators understand how children learn.	☐	☐	☐	☐	☐	☐
79. This school’s administrators set high expectations for all students.	☐	☐	☐	☐	☐	☐
80. Staff are treated fairly regardless of their race, ethnicity, or culture.	☐	☐	☐	☐	☐	☐
81. My school is committed to providing an inclusive environment for individuals from varied racial, ethnic, and cultural backgrounds.	☐	☐	☐	☐	☐	☐
82. Teachers and administrators have a shared vision for this school.	☐	☐	☐	☐	☐	☐

Exhibit A: Image Excerpt of the Virginia School Survey of Climate and Working Conditions; Section L. School Leadership

Survey responses are converted to a numerical scale with Strongly Disagree: -3; Disagree: -2; Slightly Disagree: -1; Slightly Agree: 1; Agree: 2; Strongly Agree: 3, with 0 designated as neutral.

I utilized three methods to build a composite leadership score for soft skills. The first is the most generalized, an unweighted average of the twelve questions. The second method was grouping the questions into four categories: Trust and Communication, Fairness and Inclusion,

Instructional Leadership, and Performance Management and Feedback. I manually sorted these categories based on management styles referenced in literature and by themes the different questions encapsulated (Kuráth et al., 2023; Cherkowski, 2010; Blase & Blase, 2002; Cannon & Witherspoon, 2005). These four categories ended up being highly correlated together, so for analysis only one was included per model. Finally, I use principal component analysis to provide an empirical determination of the prevalence of distinct factors.

The multiple leadership questions in the survey are highly correlated, raising the question of whether they measure a singular dimension of leadership or multiple distinct components. To explore this issue, I employ principal component analysis (PCA), which identifies the underlying dimensions of variation in the data. This technique reduces the dimensionality of leadership measures while preserving the variance structure, allowing for identification of latent factors that may influence student outcomes.

Principal component analysis was conducted on the twelve survey items. The scree plot and eigenvalue distribution indicated that only the first component should be retained in both 2022 ($\lambda_{2022} = 10.17$), accounting for 84.72% of total variance and 2024 ($\lambda_{2024} = 10.35$), accounting for 86.24% of total variance. This reveals that the first principal component captured the majority of the total variance in the data for both years. This is consistent with the “Halo effect.” The Halo effect refers to a phenomenon in which survey results tend to portray a general sentiment rather than specific, differentiated results dependent on the question. See the Appendix, Figures A6 and A7, for scree plots. The survey questions load into the component variable somewhat evenly. In both years, most questions’ component loading range from about 0.28 to 0.30. See Appendix, Tables A3-4, for component loading tables for 2022 and 2024 results.

In the Empirical Analysis section, I use this principal component as the local regressor in place of “Leadership Skills” in the regressions defined by (1).

$$Y_i = \alpha + \beta \text{principalcomponent}_i + X_i' \gamma + \varepsilon_i \quad (3)$$

This approach allows for a more nuanced understanding of which dimensions of leadership quality are most strongly associated with student outcomes.

Student Outcome Measures

As discussed earlier, successful school outcomes are multidimensional—including both academic and behavioral outcomes. For this reason, this analysis observes both SOL scores as a measure of academic success and chronic absenteeism as a measure of behavioral attitude.

Student outcomes are measured using data from the Virginia Department of Education:

1. SOL Scores: End-of-course Standards of Learning exam scores for the 2021-2022 and 2023-2024 school years obtained from the VDOE Test Results Build-A-Table resource. Scores are analyzed as school-level averages across all subjects, as well as separated into STEM subjects (math and science) and humanities (reading, writing, and history).
2. Chronic Absenteeism: The percentage of students classified as chronically absent (missing 10% or more of school days) for each school, obtained from the VDOE School Quality Profile.

Control Variables

To control for factors of the school environment that may also impact outcomes, I include measures of principal and student characteristics. Principal Experience (exp): Years the principal has held in their current position as of 2024. I collected this data through manual research of

school websites, social media accounts, newsletters, local news, and county announcements. Principal Salary (AvgSal): Average salary of secondary school principals by county from the Superintendent's Annual Report for Virginia. Average by county was the most granular publicized data. County Economic Indicators: Unemployment rates for 2023 (UE23) and median household income (MedHHI) at the county level from the US Department of Agriculture's Economic Research Service. Student Demographics: Percentage of disadvantaged students (PctDA) and racial composition (percentage of Asian, Black, Hispanic, and other races within school) from the VDOE Test Results Build-A-Table resource.

Sample Selection

The sample includes all public high schools in Virginia. I select Virginia as the focus of this analysis because of the potential for observation that came from the School Survey of Climate and Working Conditions. For analytical purposes, several exclusions to the sample were made.

Governors' schools and alternative high schools (those specialized for special education, criminal justice, etc.) are excluded due to their specialized populations. Schools with interim principals during the 2022-2024 period are excluded as these administrators would have different levels of autonomy and goals in their roles. Several schools are excluded because they were either merged with another school or closed between 2022 and 2024. Finally, any school that is missing data points for any of the variables listed above, are excluded from analysis. Depending on the model, this left the sample size ranging from 240 schools to 269, the majority of the missing schools being removed for lacking data points.

Descriptive Statistics

Table 1: Table of Summary Statistics for Principals and High Schools in Virginia 2022 and 2024

Variable	Descriptive Statistics			
	Mean	Std. Dev.	Min	Max
Leadership Score 2022	1.47	.5	-.22	2.65
Leadership Score 2024	1.55	.55	-.99	2.65
Average SOL Score 2022	430.03	19.72	341.6	514.25
Average SOL Score 2024	428.43	18.23	367.2	509
Percent Chronically Absent 2021-22	25.78	11.17	4.8	68.5
Percent Chronically Absent 2023-24	19.59	9.44	2.3	79
Years Principal in Position	4.46	4.08	0	23.5
Average Salary per County (<i>in \$1,000s</i>)	120.35	25.78	41.89	168.2
Percentage Disadvantaged	44.77	17.18	4.39	100
Median Household Income 2022 (<i>in \$1,000s</i>)	86.26	35.49	39.65	167.6
County Unemployment Rate 2023	3.01	.54	2.1	5.4
%White	52.56	27.53	.78	99.56
%Asian	5.47	8.89	.13	63.26
%Black	21.51	21.94	.18	96.12
%Hispanic	15.55	15.95	.34	85.23

Note: Sample is all Virginia Public High Schools, excluding unique circumstances or ones lacking data points. Data collected from various sources (See Data Sources).

On average, 55 classroom instructors responded to the survey per high school, with response rates varying across schools. Within-school variation in survey responses decreases as the sample size increases, suggesting more consistent measures in larger schools, see Figure A1, found in the Appendix.

The average high school principal in Virginia has held in their position for 4.4 years. The distribution of experience is very positively skewed. See Figure 1. This variable is of interest because principals may develop skills on the job over time, the lag it often takes for principals' policies to take effect and have impact, and the difference between a consistent, long-lasting

administration vs. a new administration has on culture. 50% of principals of public high schools in Virginia have 3.5 or less years of experience and 75% have 6.5 or less.

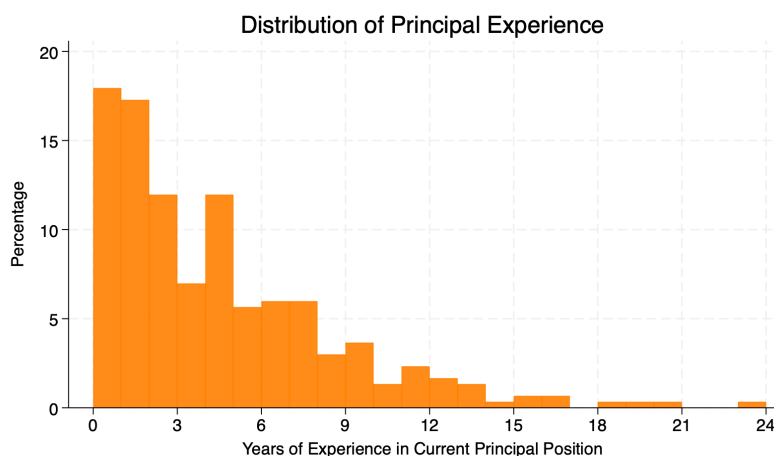


Figure 1: Distribution of Principal Experience (years in current position)

Note: Data collected manually from online publishing, see Data section for details. Sample includes all public high school principals in Virginia in 2024.

Variables for First-Difference Analysis Characteristics

Table 2: Table of Summary Statistics for Change (Leadership and Outcome) Variables from 2022 to 2024

Variable	Descriptive Statistics			
	Mean	Std. Dev.	Min	Max
Change in Leadership Score 2022-2024	.09	.53	-2.29	2.35
Change in Chronic Absenteeism Rate 2022-2024	-6.2	8.78	-48.6	22.1
Change in Average SOL Score 2022-2024	-1.59	10.85	-66.05	47.6

Note: Leadership Score from VDCJS; Chronic Absenteeism data calculated from VDOE's School Quality Profiles; SOL score data calculated from the VDOE's Build-A-Table tool.

The distribution of Change in Leadership Score (dLT) exhibits near-normal characteristics, with substantial concentration near zero, see Figure 2. A challenge for the first-differences strategy is that there is simply very little variation in the change measure. For

reference, a 1-point score change would be changing from slightly agree to agree, so an average of 0.089 with heavy concentration suggests most school leaderships do not have major shifts in their evaluation scores.

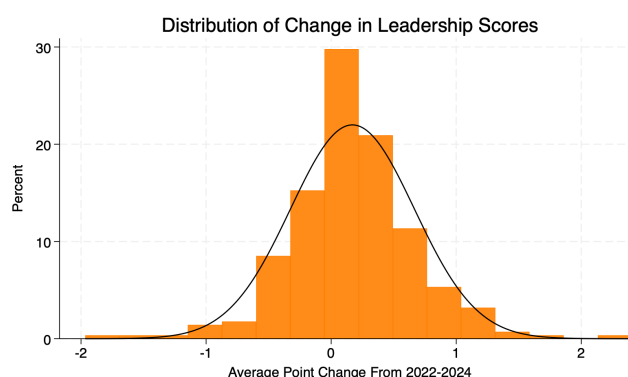


Figure 2: Distribution of Change in Explanatory Variable (Leadership Score) from 2022 to 2024

Source: Virginia Department of Criminal Justice Services, Virginia School Survey of Climate and Working Conditions. Change in leadership scores calculated by author by differencing 2024 and 2022 average Leadership Score.

As mentioned in the Data Sources section, for part of my analysis I categorize the survey questions into four groups. Distributions of those changes from 2022 to 2024 can be found in the Appendix, Figures A2-A5.

In regards to response variables, dSOL and dCA, both have relatively normal distributions, dCA being more negatively skewed, see Figure 3. On average, each high school's average SOL score decreased by 2.15 points and each high school's chronic absentee percentage decreased by 6.14 points. This stronger trend in decreasing chronic absenteeism reflects a national trend following the Covid-19 pandemic. During the pandemic chronic absenteeism skyrocketed, and remained at high in the years following, but is slowly decreasing as time passes (Malkus, 2024).

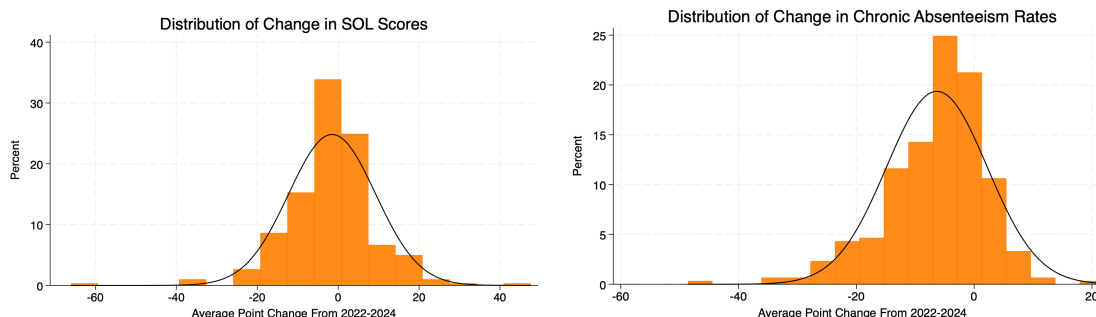


Figure 3: Distributions of Change in Response Variables from 2022 and 2024, (Change in SOL Scores left, Change in Chronic Absenteeism Rate right)

Note: SOL data from Virginia Department of Education (VDOE) Build-a-Table tool; Chronic Absenteeism data from VDOE School Quality Profiles. Change in outcome values calculated by author by differencing 2024 and 2022 values.

Section 6: Empirical Analysis

Cross-Sectional Results

Cross-sectional analysis highlights significant insights to the relationship between leadership evaluation scores and student outcomes. To interpret the coefficient on Leadership Score as causal one must assume it is not correlated with other unobserved factors also related to performance outcomes (e.g. more experienced teachers, funding levels). However, this assumption may be too strong in the context of this study, so the results should be interpreted as associational rather than causal.

SOL Scores - Survey Questions Broken into Categories

For initial analysis, I divide the survey statements into four categories of leadership evaluation. These categories are based on emphasized traits in education leadership and general management skills.

1. Trust and Communication (TC22 and TC24)

- a. I feel respected by this school's administrators.
- b. I feel comfortable raising issues and concerns that are important to me with school administrators.
- c. I trust this school's administrators to do what they say they will do.
- d. This school's administrators communicate a clear vision for this school.
- e. Teachers and administrators have a shared vision for this school.

2. Fairness and Inclusion (FI22 and FI24)

- a. Staff are treated fairly regardless of their race, ethnicity, or culture.
- b. My school is committed to providing an inclusive environment for individuals from varied racial, ethnic, and cultural backgrounds.

3. Instructional Leadership (IL22 and IL24)

- a. This school's administrators understand how children learn.
- b. This school's administrators set high expectations for all students.

4. Performance Management and Feedback (PMF22 and PMF24)

- a. The procedures for teacher evaluation are consistent.
- b. My performance is assessed objectively.
- c. I receive feedback that can help me improve my performance.

While each of these categories focus on different aspects of management, it is important to note the multicollinearity of these categories that prevent them from being included in a single regression. My initial hypothesis was that these factors might have different impacts on student outcomes. However, pairwise correlations range from 0.785 to 0.956 in 2022 and from 0.805 to 0.96 in 2024.

Strong correlation across individual questions and these defined categories could suggest that the responses are driven by an overarching perception of school leadership—consistent with the phenomenon known as the “Halo Effect,” a well documented occurrence seen in surveys where results tend to portray a general sentiment rather than specific, differentiated answers across questions. The “Halo Effect” has been found to bias performance ratings in the context of public administration subordinate evaluations (Belle et al., 2017). Therefore, the focus of the regression later on will be on general Leadership Score (LT22 or LT24) which is the unweighted average of all of the survey questions, in the cross-sectional analysis and first difference review

(Change in Leadership Score from 2022 to 2024). Further analysis of variation between the individual statements is also conducted through principal component analysis.

As a starting point, I present results with the disaggregated groupings. See Table 3 for results.

Table 3: Cross-Sectional Regression of Broken-Out Survey Categories on Student SOL Performance

VARIABLES	Year 2022				Year 2024			
	(1) SOL22	(2) SOL22	(3) SOL22	(4) SOL22	(5) SOL24	(6) SOL24	(7) SOL24	(8) SOL24
Trust and Communication 2022	4.718*** (1.226)							
Fairness and Inclusion 2022		7.731*** (1.973)						
Instructional Leadership 2022			6.362*** (1.345)					
Performance Management and Feedback 2022				6.621*** (1.636)				
Trust and Communication 2024					4.101*** (1.335)			
Fairness and Inclusion 2024						4.404** (2.229)		
Instructional Leadership 2024							5.257*** (1.322)	
Performance Management and Feedback 2024								6.332*** (1.629)
Principal: Years in Position	-0.219 (0.176)	-0.220 (0.176)	-0.235 (0.173)	-0.229 (0.176)	-0.0875 (0.198)	-0.0811 (0.201)	-0.0633 (0.195)	-0.117 (0.196)
Average Principal Salary (Division)	0.0210 (0.0498)	0.00316 (0.0496)	0.0277 (0.0492)	0.0177 (0.0496)	0.0619 (0.0543)	0.0469 (0.0547)	0.0701 (0.0537)	0.0582 (0.0535)
Unemployment Rate (County) 2023	-1.059 (1.278)	-1.292 (1.276)	-0.978 (1.261)	-1.205 (1.274)	-2.377* (1.425)	-2.104 (1.438)	-2.289 (1.404)	-2.277 (1.406)
Median Household Income (County) 2022	-0.0645 (0.0408)	-0.0575 (0.0407)	-0.0601 (0.0402)	-0.0655 (0.0407)	-0.120*** (0.0459)	-0.117** (0.0464)	-0.121*** (0.0453)	-0.116** (0.0453)
% of Disadvantaged Students (School)	-0.521*** (0.0641)	-0.519*** (0.0640)	-0.525*** (0.0633)	-0.526*** (0.0640)	-0.634*** (0.0811)	-0.630*** (0.0820)	-0.629*** (0.0800)	-0.628*** (0.0801)
% of Student Population Asian	0.596*** (0.107)	0.557*** (0.108)	0.572*** (0.106)	0.593*** (0.107)	0.458*** (0.124)	0.440*** (0.125)	0.454*** (0.122)	0.456*** (0.122)
% of Student Population Black	-0.288*** (0.0416)	-0.291*** (0.0414)	-0.284*** (0.0410)	-0.283*** (0.0416)	-0.170*** (0.0473)	-0.176*** (0.0480)	-0.167*** (0.0465)	-0.159*** (0.0470)
% of Student Population Hispanic	-0.334*** (0.0665)	-0.366*** (0.0651)	-0.314*** (0.0660)	-0.333*** (0.0662)	-0.269*** (0.0731)	-0.309*** (0.0720)	-0.251*** (0.0721)	-0.270*** (0.0711)
Constant	462.4*** (6.784)	457.3*** (7.253)	458.8*** (6.826)	459.6*** (6.971)	466.2*** (7.701)	464.9*** (8.622)	463.0*** (7.702)	461.5*** (7.869)
Observations	269	269	269	269	240	240	240	240
R-squared	0.699	0.700	0.707	0.701	0.621	0.612	0.631	0.630

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Categories manually sorted from the Virginia School Survey of Climate and Working Conditions. Virginia public high schools serve as the sample. Control variables source information found in the Data section.

All categories of leadership focus are found to be statistically significant, with the majority at the 1% level and one at the 5% level. A possible takeaway from this analysis comes with looking closely at the Fairness and Inclusion measure in 2022 and 2024. In 2022 it has the largest coefficient of the various categories. In 2024, this relationship drops in significance (however, still significant at the 5% level) and in coefficient size. This highlights how the weight of categories might change over time depending on the needs of a school. For instance, Fairness and Inclusion might have been the most important variable in the 2021-2022 year as schools were coming out of the pandemic and heightened social justice movements but might be less important in 2023-2024—though, this is just a theory. Overall, each relationship appears to be very similar between 2022 and 2024, with this consistency affirming the connection between soft skills and student academic achievement.

SOL Scores - Survey Averaged

In both 2022 and 2024, the leadership total average score was a statistically significant predictor of SOL scores in regression analysis, see Table 4. Not only is it significant at the 1% level, but it also maintains the highest coefficient of all the control variables incorporated into the model. While this does not prove a causal relationship, the consistency of this relationship from 2022 to 2024 suggests on a reliable basis that leadership evaluations are closely linked to students' performance in public high school in Virginia. This is consistent with my theory that leadership that results in positive culture and relationships with instructors plays a pivotal role in student academic achievement.

Table 4: Cross-Sectional Regression of Student Average SOL Scores, Math and Science Scores, and English and History Scores on Leadership Score for 2022 and 2024

VARIABLES	(1) Average SOL 2022	(2) Average SOL 2024	(3) STEM SOL 2022	(4) STEM SOL 2024	(5) Humanities SOL 2022	(6) Humanities SOL 2024
Leadership Score 2022	6.291*** (1.484)		6.521*** (1.707)		6.207*** (1.820)	
Leadership Score 2024		5.367*** (1.561)		4.911*** (1.393)		5.478** (2.125)
Principal: Years in Position	-0.234 (0.175)	-0.0946 (0.197)	-0.603*** (0.201)	-0.239 (0.176)	0.0121 (0.215)	0.0123 (0.268)
Average Principal Salary (Division)	0.0204 (0.0495)	0.0614 (0.0539)	0.0325 (0.0569)	0.0397 (0.0482)	0.00422 (0.0607)	0.0701 (0.0734)
Unemployment Rate (County) 2023	-1.098 (1.270)	-2.331 (1.416)	0.0654 (1.461)	-0.869 (1.264)	-1.893 (1.557)	-3.708* (1.928)
Median Household Income (County) 2022	-0.0638 (0.0405)	-0.119*** (0.0456)	-0.156*** (0.0466)	-0.151*** (0.0407)	-0.000446 (0.0497)	-0.106* (0.0621)
% of Disadvantaged Students (School)	-0.525*** (0.0638)	-0.632*** (0.0807)	-0.326*** (0.0734)	-0.435*** (0.0720)	-0.658*** (0.0782)	-0.764*** (0.110)
% of Student Population Asian	0.585*** (0.107)	0.454*** (0.123)	0.669*** (0.123)	0.577*** (0.110)	0.529*** (0.131)	0.518*** (0.168)
% of Student Population Black	-0.284*** (0.0414)	-0.165*** (0.0471)	-0.323*** (0.0476)	-0.190*** (0.0421)	-0.263*** (0.0508)	-0.156** (0.0642)
% of Student Population Hispanic	-0.330*** (0.0660)	-0.266*** (0.0724)	-0.265*** (0.0759)	-0.193*** (0.0646)	-0.379*** (0.0810)	-0.320*** (0.0986)
Constant	459.7*** (6.895)	463.4*** (7.858)	446.7*** (7.928)	451.4*** (7.014)	469.7*** (8.453)	474.2*** (10.70)
Observations	269	240	269	240	269	240
R-squared	0.703	0.625	0.550	0.580	0.676	0.557

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Calculations based on survey data from the Virginia School Survey of Climate and Working Conditions (Virginia Department of Criminal Justice Services) and student performance data from the Virginia Department of Education's Build-A-Table tool. Control variables source information found in the Data section.

Holding all else equal, a one point improvement in leadership score, in 2022, is associated with a 6.29 increase in average SOL score for a school. This converts to a one standard deviation increase in leadership scores being associated with a 12.49 point increase. In 2024, holding all else equal, a one point improvement in leadership score is associated with a 5.37 improvement in average SOL school. Meaning a one standard deviation increase in leadership scores is associated with a 9.84 increase in SOL scores in 2024, all else constant.

Noticeably, other indicators of principal status such as years of experience in the current role and salary do not have statistically significant results for either of the years. Given the high

level of turnover in the principal position, I would expect the years of experience of the principal in their current role to be a significant indicator of principal influence or quality, but this is not the case. Additionally, the average salary for principals within a county (AvgSal) is not significant. Within Virginia, public school principals are paid on county level salary scales, this varies based on policy and general cost of living within different areas of Virginia. This suggests that the fluctuation of principal salary, not accounting for variance in price of an area (controlled for with median household income), does not indicate anything regarding student achievement on SOL tests.

Leadership score (LT22 and LT24) was a statistically significant predictor of both math and science SOL scores and English and history SOL scores across 2022 and 2024, see Table 4. Holding all else constant, a one point improvement on leadership scores for a school's administration is estimated to be associated with a 6.52 increase in 2022 and a 4.91 increase in 2024 in math and science SOL scores, both at a 1% significance level. This converts to a single standard deviation improvement in leadership scores being associated with 12.94 and 9.01 math and science SOL score increase, respectively. Similarly, all else constant, a one point improvement on leadership scores for a school's administration is estimated to be associated with a 6.21 increase in 2022 and a 5.48 increase in 2024 in English and history SOL scores, at a 1% and 5% significance level respectively. Converting to one standard deviation increase for leadership scores being associated with a 12.32 and 10.05 score increase on average for English and history SOL scores.

Chronic Absenteeism

In cross-sectional analysis of chronic absenteeism rates in both 2021-2022 (CA21) and 2023-2024 (CA22) school years, leadership scores were a statistically significant predictor. In the

2021-2022 school year, all else constant, a one point improvement in leadership scores is estimated to correspond with a drop in chronic absenteeism rates by 2.948 points, at a 5% significance level. See Table 5 for results. This translates to a one standard deviation increase in leadership score in 2022 is associated with a 5.85 point decrease in chronic absenteeism rates, all else held constant.

Table 5: Cross-Sectional Regression of School Chronic Absenteeism Rates on Leadership Score for 2022 and 2024

VARIABLES	(1) Chronic Absenteeism Rates 2021-2022	(2) Chronic Absenteeism Rates 2021-2022
Leadership Score 2022	-2.948** (1.182)	
Leadership Score 2024		-4.912*** (0.860)
Principal: Years in Position	0.325** (0.139)	0.168 (0.109)
Average Principal Salary (Division)	-0.0401 (0.0394)	-0.0297 (0.0297)
Unemployment Rate (County) 2023	1.792* (1.012)	0.723 (0.780)
Median Household Income (County) 2022	-0.00785 (0.0323)	0.0491* (0.0251)
% of Disadvantaged Students (School)	0.272*** (0.0508)	0.333*** (0.0444)
% of Student Population Asian	-0.170** (0.0849)	-0.0211 (0.0679)
% of Student Population Black	0.00623 (0.0330)	-0.0318 (0.0260)
% of Student Population Hispanic	0.0851 (0.0526)	0.0542 (0.0399)
Constant	16.25*** (5.492)	9.133** (4.328)
Observations	269	240
R-squared	0.366	0.451

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Calculations based on survey data from the Virginia School Survey of Climate and Working Conditions (Virginia Department of Criminal Justice Services) and student performance data from the Virginia Department of Education's School Quality Profiles. Control variables source information found in the Data section.

In the 2023-2024 school year, this relationship between absenteeism and leadership scores became more prominent. All else constant, in 2023-2024, a one point improvement in

leadership scores is estimated to be associated with a 4.91 point decrease in chronic absenteeism rates, at a 1% significance level. Meaning, a one standard deviation improvement to leadership scores is associated with a 9.01 point decrease in chronic absenteeism rates, all else constant. The only other consistent predictor variable across the years was the percentage of disadvantaged students within a school. This variable was statistically significant at a 1% level of significance across both years, notably the only other statistical predictor that is consistent across years.

Principal Component Analysis

The individual questions in the 2022 survey and 2024 survey are highly correlated with one another, see Appendix Tables A1-A2 for piecewise correlation tables. PCA analysis identifies patterns of variance across variables, allowing for latent dimensions of principal evaluation to be uncovered. While I initially grouped the statements into themed variables informed by education/leadership topics in the cross sectional analysis, PCA will allow the data to speak for itself.

First, to establish the number of components to include in each model, I generated and analyzed a scree plot for both years of the survey. In each case, only one component had an eigenvalue greater than one, and therefore was included, as discussed in Section 5: Data. See the Appendix, Figures A6 and A7, for scree plots. While only one component was established as needed, it is still beneficial to use this to conduct PCA analysis. This one component will be an optimal summarized variable for general leadership score. Rather than a single evenly weighted average, PCA weights variables according to their relative role in the pattern.

Table 6: Cross-Sectional Regression Using Principal Component, Evaluating Effects on SOL and Chronic

Absenteeism 2022 and 2024				
VARIABLES	(1) Average SOL 2022	(2) Average SOL 2024	(3) Chronic Absenteeism 2021-2022	(4) Chronic Absenteeism 2023-2024
Principal Component Standardized 2022	3.162*** (0.747)		-1.449** (0.595)	
Principal Component Standardized 2024		2.874*** (0.850)		-2.663*** (0.468)
Principal: Years in Position	-0.235 (0.175)	-0.0965 (0.197)	0.324** (0.140)	0.171 (0.109)
Average Principal Salary (Division)	0.0196 (0.0495)	0.0602 (0.0540)	-0.0396 (0.0394)	-0.0288 (0.0297)
Unemployment Rate (County) 2023	-1.120 (1.270)	-2.321 (1.417)	1.803* (1.012)	0.717 (0.780)
Median Household Income (County) 2022	-0.0637 (0.0405)	-0.119*** (0.0457)	-0.00798 (0.0323)	0.0490* (0.0252)
% of Disadvantaged Students (School)	-0.524*** (0.0638)	-0.633*** (0.0807)	0.271*** (0.0508)	0.333*** (0.0445)
% of Student Population that is Asian	0.585*** (0.107)	0.454*** (0.123)	-0.170** (0.0849)	-0.0206 (0.0679)
% of Student Population that is Black	-0.284*** (0.0414)	-0.165*** (0.0472)	0.00620 (0.0330)	-0.0325 (0.0260)
% of Student Population that is Hispanic	-0.331*** (0.0660)	-0.268*** (0.0724)	0.0862 (0.0526)	0.0556 (0.0399)
Constant	469.1*** (6.450)	471.9*** (7.302)	11.83** (5.139)	1.427 (4.021)
Observations	269	240	269	240
R-squared	0.703	0.624	0.365	0.450

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Regressions use principal component scores derived from leadership-related items in the Virginia School Survey of Climate and Working Conditions (Virginia Department of Criminal Justice Services). Outcome data on average SOL scores sourced from the Virginia Department of Education's Build-A-Table tool and School Quality Profiles. All models include control variables as described in the Data section. Principal component scores are standardized to mean zero and unit variance for interpretability.

SOL Scores

In both 2022 and 2024 cross sectional analysis using the principal component analysis generated leadership score variable, leadership score statistically significant at 1% as a predictor of SOL score. In 2022, the results can be interpreted as a one unit increase in the principal

component standardized variable (2022 specific) is associated with a 3.16 point improvement in SOL score, all else equal. In 2024, the results can be interpreted as a one unit increase in the principal component standardized variable (2024 specific) is associated with a 2.87 improvement in SOL score, all else equal. See Table 6 for results.

While these coefficients are smaller than the non-PCA cross sectional analysis, it is important to acknowledge that PCA analysis standardized the variable which naturally will make the coefficients smaller as the scale has changed.

Chronic Absenteeism

Similar to the SOL score regression above, the principal component analysis variable is a statistically significant predictor of chronic absenteeism rates for a given year. In 2022 this is at a 5% significance level and in 2024 this is at a 1% significance level. In 2022, the results can be interpreted as a one unit increase in the standardized principal component for 2022, and is associated with a 1.45 percentage point decrease in chronic absenteeism rates, all else equal. In 2024, the results can be interpreted as a one unit increase in the standardized principal component for 2024, and is associated with a 2.66 percentage point decrease in chronic absenteeism rates, within a school. See Table 6 for results.

Model Fit and Explanatory Power

I calculate the R-squared value for both the cross-sectional models (average Leadership score and PC). For regressions focused on chronic absenteeism rates, R-squared is approximately 0.36 for 2022 and 0.45 for 2024, across both models. For regressions focused on SOL scores, R-squared is approximately 0.70 for 2022 and 0.623 for 2024, across both models. These results indicate that the models created are better at explaining variance in SOL schools than chronic

absenteeism rates. Additionally, the almost identical R-squared results across models indicate that PCA did not significantly change the models' explanatory power.

First-Difference Results

While the cross-sectional analysis provides important information regarding the existence of a relationship between Leadership Scores, and therefore leadership's soft skills, there are potential sources of bias. For example, there are plenty of confounding variables that were unable to be included in the model, for instance—principal sorting, teacher-retention rate within the school, etc.—that might be influencing student achievement. These confounding variables can be attributed to “fixed” differences across schools, which is where the advantages of first-difference analysis come into action. First-difference analysis allows direct investigation into within-school variation by differencing out the school level fixed effect.

Change in Leadership Score (dLT) is not a statistically significant predictor of Change in Average SOL Scores from 2022 and 2024, see Table 7 for results. A key note, however, is SOL scores from 2022 and 2024 are highly correlated, and the difference is on average very small. With little variation between years in both the response and explanatory variable, insignificant results are not a surprise and do not contradict the stronger results found in cross-sectional analysis.

Table 7: First-Differential Regression of Change Student Outcome Measures (SOL and Absenteeism) on Change in Leadership Score

VARIABLES	(1)	(2)
	Change in SOL Score (2022-2024)	Change in Chronic Absenteeism Rates (2022-2024)
Change in Leadership Score (2022-2024)	-0.560	-2.415**
Constant	(1.199) -2.098*** (0.639)	(0.997) -5.921*** (0.531)
Observations	272	272
R-squared	0.001	0.021

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Regression variables are generated by subtracting the 2022 value from the 2024 value. Leadership Score comes directly from the Virginia School Survey of Climate and Working Conditions (unweighted average score).

Outcome data measures on average SOL scores are sourced from the Virginia Department of Education's Build-A-Table tool and School Quality Profiles. Control variables were not included in this analysis since it accounts for school fixed-effects.

However, change in Leadership Score (dLT) is statistically significant at the 5% level as a predictor of change in chronic absenteeism rates (dCA). The interpretation of this regression is, all else constant, a one point improvement on leadership total average score is associated with an estimated decrease of 2.42 percentage points in chronic absenteeism rates in the same high school, measured two years apart, see Table 7. This can also be interpreted as for every one standard deviation increase in change in leadership score, there is an associated decrease in chronic absenteeism rates of 4.58 percentage points, all else constant. As schools' leadership scores increase, their rate of chronic absenteeism should decrease. While an inverse relationship, this is a social positive as it is associated with the number of chronically absent students going down – a measure often associated with positive student outcomes.

Note, the larger variation in chronic absenteeism rates from 2022 to 2024 is associated with the recovery of schools from the Covid-19 pandemic, where chronic absenteeism peaked. Since 2021, chronic absenteeism rates have slowly decreased across the country (Malkus, 2024).

This evidence further supports identifying a relationship between principal soft skills, as proxied by leadership scores, and chronic absenteeism. The first-difference style analysis satisfies some concerns regarding lack of causality in the cross-sectional analysis, however suffers from somewhat limited power.

Section 7: Discussion/Conclusion

Key Findings

Empirical analysis finds evidence of a positive relationship between the Virginia School Survey of Climate and Working Conditions Leadership Section (as completed by classroom instructors), and high school student outcomes, both behavioral and academic. The survey was selected to act as a proxy for principals' soft skills because of the survey's focus on communication, relational, and culture building skills and its general ability to capture instructor's attitudes towards school leaders.

In relation to chronic absenteeism, leadership scores are found to be statistically significant predictors both in a first-differences analysis and a cross-sectional analysis (across measures for the leadership score—unweighted average, categorized, and principal component). Higher leadership scores are associated with lower chronic absenteeism rates within a school. For SOL scores, leadership scores are found to be a positive significant predictor in cross-sectional (across leadership score measures) for average SOL scores and subject-focused

scores. However, in first-difference analysis, change in leadership score was not a statistically significant predictor.

Other control variables incorporated into analysis, such as percentage of students classified as disadvantaged (SOL scores and chronic absenteeism) and racial demographics (SOL scores), proved to also be consistently significant in cross sectional analysis, corroborating existing understanding of the relationship between these variables within education literature.

Limitations

While the empirical analysis conducted in this study found compelling results, it is not without substantial limitations. Measurement bias is introduced when using a survey as the main data source. The survey itself is focused on school “leadership”, without specific reference to the principal’s role (“Leadership” or “Administration” could cover vice principals, district managers, etc.). Additionally, surveys are not an objective measure and response rates vary by school.

Additionally, as discussed, studying principal effects present unique challenges when evaluating educational inputs. The structural baseline of one principal per school makes it challenging to measure fixed effects. It is difficult to isolate the principal effect from confounding variables because principals have their effect on their students through intermediaries (teachers, policy, etc.).

Future Research and Policy Implications

Soft skills are uniquely valuable when looking at principal impact because they are present regardless of autonomy restrictions—a factor that creates large barriers to studying principal effect. Future research utilizing different measures for principals’ soft skills would benefit the literature, potentially including students and parents in the response sample or

utilizing expert evaluations as a more objective measurement. Longer panel series data would expand the work done in this study through first-differences, especially if coupled with principal transitions. Expanding the sample to elementary schools is also a worthwhile direction, considering how critical those ages are for education intervention.

This analysis has further added to literature that principals play a key role as managers in the education production function. While school culture and leadership quality has been difficult to quantify, evidence from the analysis suggests integrating classroom instructor leadership evaluation responses into principal evaluation methods could be an effective tool to promote culture, teacher effectiveness and motivation, and student outcomes. Furthermore, hiring practices and professional development programs can be updated to place an emphasis on these communication and relationship oriented (“soft”) skills in school leadership.

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Appendix

Within-School Variation

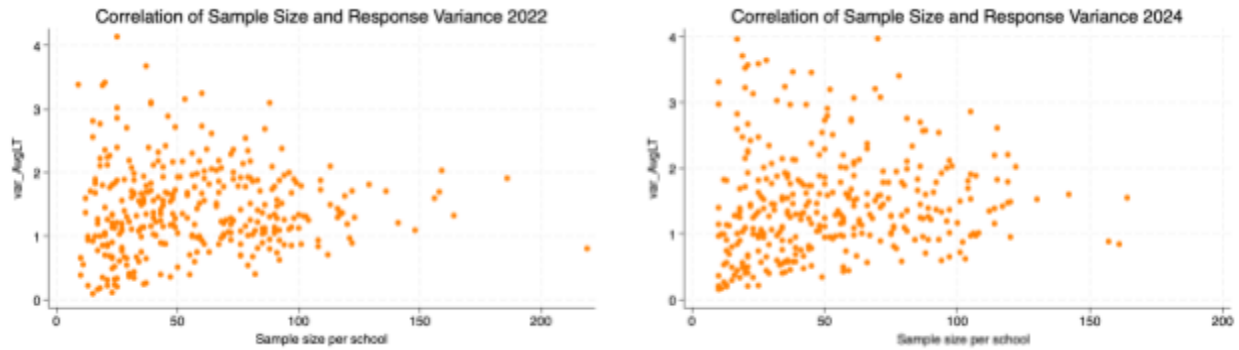


Figure A1. Scatter Plots to display correlation between # of classroom instructor responses per school and variation in responses on -3 to 3 point scale

Note: Data taken from the Virginia School Survey of Climate and Working Conditions 2022 and 2024 files. In 2022 the total sample size was 312 Virginia public high schools. In 2024 the total sample size was 276 Virginia public high schools. As the sample size per school increases, the variance of responses tends to decrease, aligning with the typical assumption of statistics that larger sample sizes are preferable.

Distribution of Score Changes

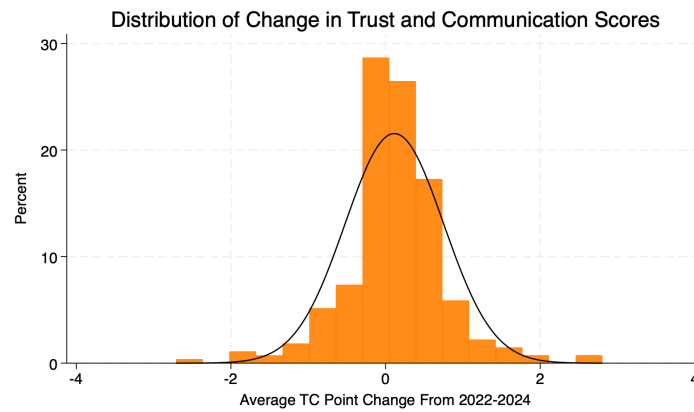


Figure A2: Distribution of the Change in Trust and Communication Scores from 2022 to 2024.

Note: Sample includes 272 observations. Calculated by author by differencing Trust and Communication 2024 scores and 2022 scores. Trust and Communication is a manually created category by the author. The mean change in trust and communication scores between 2022 to 2024 was 0.1139 points. In the negative direction, the most the score moved was 2.709 points, in the positive direction, the most the score moved was 2.803 points.

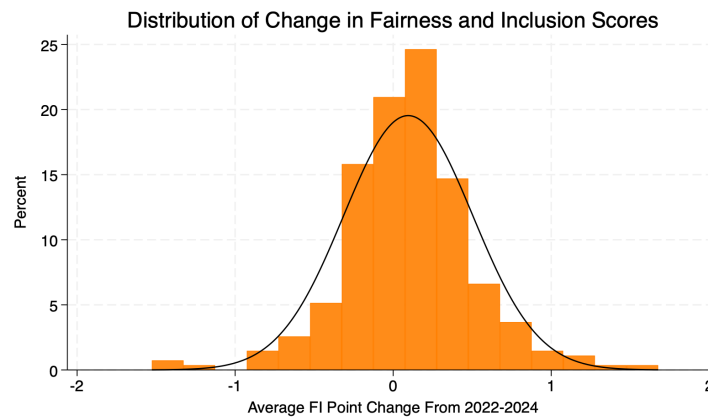


Figure A3: Distribution of the Change in Fairness and Inclusion Scores from 2022 to 2024.

Note: Sample includes 272 observations. Calculated by author by differencing Fairness and Inclusion 2024 scores and 2022 scores. Fairness and Inclusion is a manually created category by the author. The mean change in fairness and inclusion scores between 2022 to 2024 was 0.0952 points. In the negative direction, the most the score moved was 1.5267 points, in the positive direction, the most the score moved was 1.6768 points.

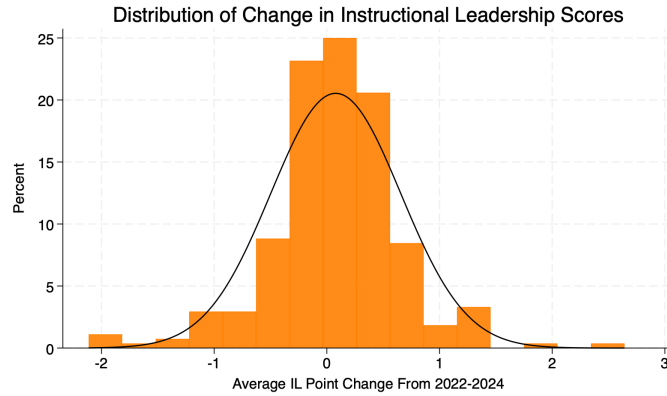


Figure A4: Distribution of the Change in Instructional Leadership Scores from 2022 to 2024.

Note: Sample Includes 272 observations. Calculated by author by differencing Instructional Leadership 2024 scores and 2022 scores. Instructional Leadership is a manually created category by the author. The mean change in instructional leadership scores between 2023 to 2024 was 0.0792 points. In the negative direction, the most the score moved was 2.1133 points, in the positive direction, the most the score moved was 2.6414 points.

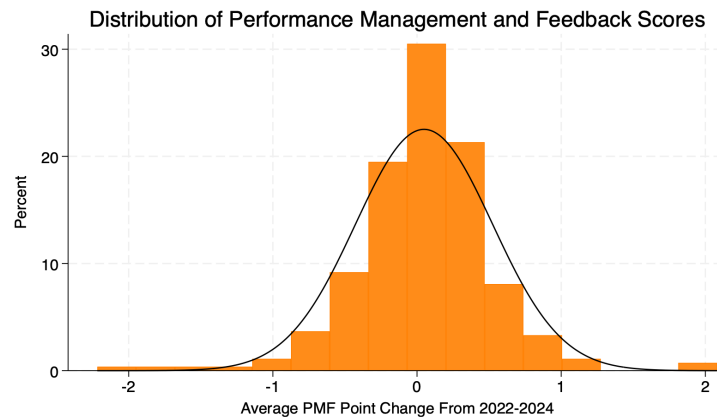


Figure A5: Distribution of the Change in Performance Management and Feedback Scores from 2022 to 2024.

Note: Includes 272 observations. Calculated by author by differencing Performance Management and Feedback 2024 scores and 2022 scores. IPerformance Management and Feedback is a manually created category by the author. The mean change in instructional leadership scores between 2023 to 2024 was 0.0486 points. In the negative direction, the most the score moved was 2.2178 points, in the positive direction, the most the score moved was 2.0808 points.

Survey Correlation Tables

Table A1: Pairwise Correlation Table of 2024 School Leadership Survey Questions

Pairwise correlations												
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Q1_24	1.000											
(2) Q2_24	0.966 (0.000)	1.000										
(3) Q3_24	0.935 (0.000)	0.929 (0.000)	1.000									
(4) Q4_24	0.831 (0.000)	0.822 (0.000)	0.876 (0.000)	1.000								
(5) Q5_24	0.864 (0.000)	0.841 (0.000)	0.862 (0.000)	0.944 (0.000)	1.000							
(6) Q6_24	0.820 (0.000)	0.797 (0.000)	0.861 (0.000)	0.934 (0.000)	0.928 (0.000)	1.000						
(7) Q7_24	0.881 (0.000)	0.868 (0.000)	0.933 (0.000)	0.886 (0.000)	0.848 (0.000)	0.872 (0.000)	1.000					
(8) Q8_24	0.916 (0.000)	0.912 (0.000)	0.932 (0.000)	0.862 (0.000)	0.864 (0.000)	0.835 (0.000)	0.914 (0.000)	1.000				
(9) Q9_24	0.811 (0.000)	0.807 (0.000)	0.902 (0.000)	0.842 (0.000)	0.792 (0.000)	0.818 (0.000)	0.921 (0.000)	0.869 (0.000)	1.000			
(10) Q10_24	0.853 (0.000)	0.834 (0.000)	0.821 (0.000)	0.788 (0.000)	0.800 (0.000)	0.765 (0.000)	0.817 (0.000)	0.830 (0.000)	0.741 (0.000)	1.000		
(11) Q11_24	0.746 (0.000)	0.732 (0.000)	0.745 (0.000)	0.724 (0.000)	0.730 (0.000)	0.711 (0.000)	0.772 (0.000)	0.768 (0.000)	0.706 (0.000)	0.831 (0.000)	1.000	
(12) Q12_24	0.907 (0.000)	0.899 (0.000)	0.942 (0.000)	0.878 (0.000)	0.854 (0.000)	0.861 (0.000)	0.956 (0.000)	0.939 (0.000)	0.924 (0.000)	0.826 (0.000)	0.795 (0.000)	1.000

Note: Data collected from the Virginia School Survey of Climate and Working Conditions 2024. Answers converted to numeric value by the author on a consistent scale. Includes 276 observations per question.

Table A2: Pairwise Correlation Table of 2022 School Leadership Survey Questions

Pairwise correlations												
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Q1_22	1.000											
(2) Q2_22	0.936 (0.000)	1.000										
(3) Q3_22	0.922 (0.000)	0.911 (0.000)	1.000									
(4) Q4_22	0.835 (0.000)	0.825 (0.000)	0.853 (0.000)	1.000								
(5) Q5_22	0.871 (0.000)	0.849 (0.000)	0.852 (0.000)	0.934 (0.000)	1.000							
(6) Q6_22	0.841 (0.000)	0.834 (0.000)	0.883 (0.000)	0.914 (0.000)	0.899 (0.000)	1.000						
(7) Q7_22	0.871 (0.000)	0.857 (0.000)	0.929 (0.000)	0.812 (0.000)	0.816 (0.000)	0.867 (0.000)	1.000					
(8) Q8_22	0.903 (0.000)	0.892 (0.000)	0.924 (0.000)	0.826 (0.000)	0.839 (0.000)	0.852 (0.000)	0.890 (0.000)	1.000				
(9) Q9_22	0.825 (0.000)	0.822 (0.000)	0.910 (0.000)	0.770 (0.000)	0.760 (0.000)	0.820 (0.000)	0.881 (0.000)	0.855 (0.000)	1.000			
(10) Q10_22	0.865 (0.000)	0.845 (0.000)	0.830 (0.000)	0.798 (0.000)	0.838 (0.000)	0.765 (0.000)	0.794 (0.000)	0.818 (0.000)	0.721 (0.000)	1.000		
(11) Q11_22	0.691 (0.000)	0.672 (0.000)	0.694 (0.000)	0.657 (0.000)	0.691 (0.000)	0.661 (0.000)	0.729 (0.000)	0.674 (0.000)	0.641 (0.000)	0.771 (0.000)	1.000	
(12) Q12_22	0.896 (0.000)	0.892 (0.000)	0.947 (0.000)	0.841 (0.000)	0.842 (0.000)	0.887 (0.000)	0.946 (0.000)	0.923 (0.000)	0.910 (0.000)	0.802 (0.000)	0.706 (0.000)	1.000

Note: Data collected from the Virginia School Survey of Climate and Working Conditions 2022. Answers converted to numeric value by the author on a consistent scale. Includes 312 observations per question.

Scree Plot of Eigenvalues for PCA Analysis

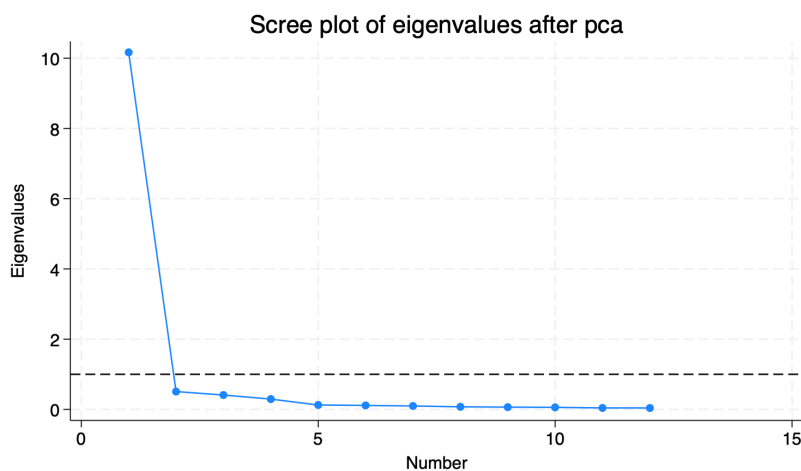


Figure A6: Scree Plot 2022

Note: Generated by author from PCA performed on the 2022 Virginia School Survey of Climate and Working Conditions, Section L. School Leadership

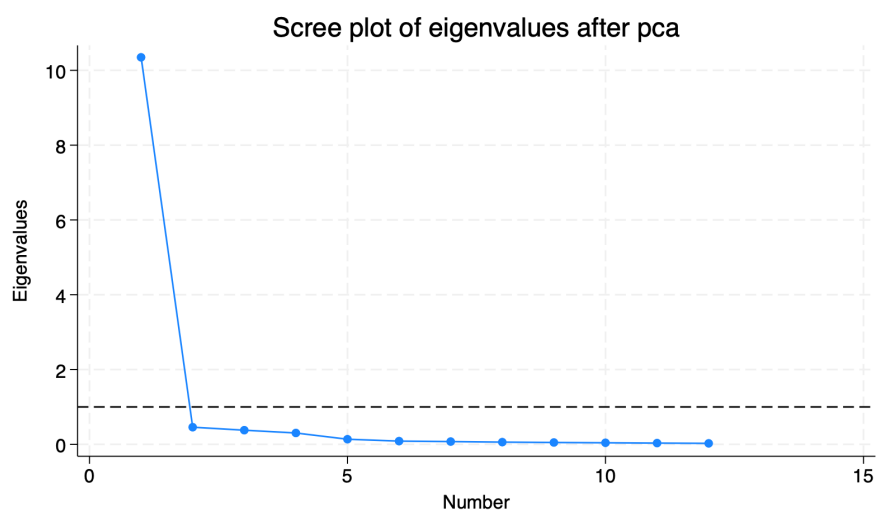


Figure A7: Scree Plot 2024

Note: Generated by author from PCA performed on the 2024 Virginia School Survey of Climate and Working Conditions, Section L. School Leadership

Principal Components Tables

Variable	Comp1
Q1_22	0.2976
Q2_22	0.2943
Q3_22	0.3034
Q4_22	0.2863
Q5_22	0.2898
Q6_22	0.2910
Q7_22	0.2956
Q8_22	0.2960
Q9_22	0.2822
Q10_22	0.2793
Q11_22	0.2420
Q12_22	0.3016

Table A3: Component Loading Scores for Principal Component Analysis, 2022

Note: Generated by author from PCA performed on the 2022 Virginia School Survey of Climate and Working Conditions, Section L. School Leadership

Variable	Comp1
Q1_24	0.2942
Q2_24	0.2908
Q3_24	0.3001
Q4_24	0.2901
Q5_24	0.2883
Q6_24	0.2849
Q7_24	0.2980
Q8_24	0.2973
Q9_24	0.2831
Q10_24	0.2759
Q11_24	0.2574
Q12_24	0.3012

Table A4: Component Loading Scores for Principal Component Analysis, 2024

Note: Generated by author from PCA performed on the 2024 Virginia School Survey of Climate and Working Conditions, Section L. School Leadership