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School Leadership Capacity and Student Achievement: A Study of High Schools

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Abstract: Organizationally, what does not get measured is not prioritized or improved. Unlike student outcomes, the leadership environment that produces the results is rarely examined for its merit and impact. In this study, a quantitative survey gathered information to investigate the impacts of leadership capacity constructs on academic achievement. Principals from 161 public high schools and their schools provided the data (leadership capacity, demographics, and reading and math scores). Data were analyzed using descriptive, correlational, and regression statistics. Findings indicated significant high correlations among leadership capacity variables, significant relationships between school demographics (total school enrollment, percentage of low-income students, average class size, and attendance) and reading and math scores, and non-significant correlations between leadership capacity and academic achievement. The study delineated specific leadership capacity behaviors within the constructs that predicted student academic achievement in math and reading. The study suggests increased capacity and practice of these leadership behaviors to improve work setting and student achievement.

Keywords: *High schools, leadership capacity, school demographics, student achievement.*

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Introduction

Public education in the United States has contributed immensely to the prosperity and well-being of its people, but it is constantly under attack from multiple directions and stakeholders (Philip, 2012) for different reasons. Criticisms range from matters affecting students and educators to historical factors, institutionalized ideologies, and systemic structures. School leadership has not been spared (Bryk et al., 2010; Jacobson & Ylimaki, 2011); neither has it been measured consistently to determine its impact on students' experiences (Louis & Murphy, 2018). Measuring student outcomes and organizational constructs like leadership would not only enable schools to identify what works and what does not (Louis & Murphy, 2018), but it would validate leadership as a necessary construct, and provide a template for areas needing elimination or improvement. Leadership "is not only about making organizational members feel affirmed, supported and more motivated in their work – it is also associated with important indicators of group productivity" (Louis & Murphy, 2018, p. 172). While school leadership has expanded over the years; limited research has quantified it and its impact. Thus, questions of effectiveness, and how or whether school leadership influences student outcomes persist (Louis & Murphy, 2018; Paunesku & Farrington, 2020; Wallace Foundation, 2011).

In 1983, The National Commission on Excellence in Education (1983) noted an erosion of academic excellence that placed America at risk. Special attention was directed toward school processes that produce results including content, standards and expectations, time, teaching, fiscal support, and leadership. Germane to this report was the role of school leadership in establishing the characteristics of teaching and learning environment. The report identified principals' and superintendents' roles as critical to articulating and executing reforms. Leadership was defined as the art of persuasion to reach a community consensus on school goals and getting various constituent groups to work together (National Commission on Excellence in Education, 1983). This definition challenged the existing practice of bureaucratic leadership structures where school principals operated as instructional leaders with managerial responsibilities and therefore limited time to focus on instruction and student achievement. Recommendations for standards-based reforms required a shift of focus to strategies for shared decision-making with teachers (Shellard, 2003). According to Scribner et al.

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(2007), expanding the leadership shifted the roles of principals and the decision-making processes from a single individual to groups of people working collaboratively.

In this collaborative model, the effectiveness of a school principal was now determined by the capacity of the expanded school leadership to improve student achievement and other supplemental agencies. This determination aligned with Rutter's (1983) argument that school processes, collectively (funding, attendance, teacher quality, and school leaders) defined the capacity and accountability of school leadership, not an individual. The collective leadership, it was assumed would then be a stronger predictor of student outcomes than any one of the processes (Louis & Murphy, 2018). This hypothesis provided context for investigating the relationships among school leadership capacity as defined by Lambert (2003) and Louis and Murphy (2018), academic outcomes as defined by the state-standardized tests, and school demographics (class size, school enrolment, attendance rates, and socio-economic status).

Literature Review

School Leadership and Academic Achievement

The persistent low academic achievement, specifically among children from poverty and minority backgrounds, likely led to the inception of the No Child Left Behind (NCLB) reform. NCLB pushed states to develop and build accountability systems and intervention supports (Darling-Hammond et al., 2016) that would enable school leaders to be accountable for the performance of every child in their care. This accountability called for increased capacity for school leadership that included personnel, teacher empowerment, and distribution of roles while focusing on the sustainability of student achievement and teacher growth (Hashim, 2020; Slater, 2008). However, as Creemers et al. (1989) and Paunesku and Farrington (2020) found, school leaders tend to focus on efforts that improve aspects of education that are measured over environmental factors that create the values or ethos for that improvement. Creemers et al. have gone as far as suggesting that schools measure not only academics but also contextual environmental constructs to discover where the cause-effect relationships exist for purposes of targeted improvement.

Over the years, limited empirical quantitative studies have quantified learning environmental factors (school leadership) that exist to affect student achievement (Louis & Murphy, 2018; Paunesku & Farrington, 2020; Stein & Spillane, 2005). Findings from research investigating the relationships between leadership constructs and student achievement are neither consistent nor proven to the extent of identifying leadership practices that have a significant influence on student achievement. Marzano et al. (2005), in a meta-analysis, synthesized the findings of 69 independent studies and calculated the combined estimated effect of leadership on student achievement. The studies involved 2,802 schools, approximately 1.4 million students, and 1,400 teachers. This analysis found a low but significant positive correlation ($r = 0.25$) between the leadership behavior of the principal and the overall student achievement. Other researchers found that positive school leadership indirectly increased student achievement (Erwin et al., 2011; Louis & Murphy, 2018; Ovando & Cavazos, 2004). The Penlington et al.'s (2008) study of high-performing schools noted the consistent practice of behaviors associated with high leadership capacity such as setting and communicating vision, sharing leadership, and building leadership capacity and collective responsibility. Jacobson (2011) through a qualitative study confirmed earlier claims that leadership constructs of setting direction, developing people, and redesigning organizations improved student achievement. In a report, Leithwood et al. (2004) indicated that leadership is second to teaching in its influence on student learning among school-related factors.

Generally, these studies focused on leaders as individual actors as opposed to the broad and collective leadership that encompasses collective accountability (Bennett et al., 2003; Chirichello, 2001; Paunesku & Farrington, 2020). These studies tended to be qualitative and did not quantify leadership capacity. Earlier, Edmonds (1983) argued that the characteristics of effective schools go beyond school leaders as individuals to include a broad and collective understanding of instructional focus, a conducive and safe climate for teaching and learning, high expectations for all children, and using student achievement measures as the basis for program evaluation. Such leadership requires a network of relationships and interactions among stakeholders that would provide opportunities for everyone in the school community to contribute to the shared knowledge (Pugh, 2002; Scribner et al., 2007; Spillane, 2005). The dynamics created by a network of individuals working together have been found to alter the capacity of leadership and the culture of schools from who is doing to what people are doing (cause) (Hartley, 2007; Scribner et al., 2007; Spillane, 2005). In other words, what people are doing as opposed to who is doing the work is inclined to influence the goals and the school outcomes (Hartley, 2007; Phelps, 2008). Though significant, these findings suggest the need for quantifying leadership capacity that has changed, relating it to student outcomes, and identifying best practices.

Leadership Capacity

By design, schools have the greatest opportunities to exemplify leadership capacity because of their structures, functions, personnel, and who they serve. Schools play a crucial role in serving diverse communities by providing education, support, and resources to students, families, and staff. Collaboration among various stakeholders within and outside the school system is essential to ensure the effective functioning and success of educational institutions. Leadership capacity in schools encompasses teacher empowerment, distributed roles, and community engagement. Some functions demonstrating

leadership capacity in schools include the presence of instructional coaching, professional leadership teams, department chairs, and other specialists (Spillane, 2005). In addition, leadership capacity embraces the social and collaborative influence of individuals within and outside of the organization (Creemers et al., 1989; Scribner et al., 2007), and their intellectual capital which is the source of ideas and knowledge that drives improvement (Hickey & Harris, 2005) and activates responses to ongoing challenges. Thus, building leadership capacity requires that principals decentralize or share both knowledge and authority across stakeholders (Chirichello, 2001; Pugh, 2002; Slater, 2008) to enhance diverse approaches, influences, and meaningful participation in school improvement activities. Decentralizing authority empowers teachers and other stakeholders to identify issues and concerns regarding student achievement and current teaching/learning practices, reliably (Harris & Townsend, 2007; Hickey & Harris, 2005). Lambert's leadership capacity model combined distributed leadership, stakeholder engagement, and student achievement. However, Lambert defined academic achievement as improvement, development, and performance as opposed to standardized test scores. Her leadership capacity model was presented as a continuum of leadership skillfulness and stakeholder participation in an L-shape (Skillfulness on the vertical and participation on the horizontal lines) (Table 1). The model also predicts that high leadership capacity should lead to high student achievement. This study tested the efficacy of this relationship using standardized test results in math and reading.

According to Lambert (2003), levels of leadership skillfulness and participation range from low to high. Low levels of leadership skillfulness include norms of compliance, none to spotty innovation, top-down, and controlled school vision. High leadership skillfulness includes organizational relationships and engagement at all levels, low bureaucracy, inquiry-based learning, high rates of student achievement, and shared leadership (administrators, teachers, students, and parents). Low levels of participation are demonstrated by a one-way flow of information, rigid criteria, low or slow rates of student achievement, and pockets of leadership groups. Comparatively, high levels of participation are characterized by greater information flow, high levels of collaboration, static to improved student achievement, and greater reflective practice (Lambert, 2003).

Table 1. Leadership Capacity Matrix

	Low Degree of Participation	High Degree of Participation
Low Degree of Skill	<ul style="list-style-type: none"> a) Principal as autocratic manager b) One-way flow of information; no shared vision c) Codependent, paternal/maternal relationships; rigidly defined roles d) Norms of compliance and blame; technical and superficial program coherence e) Little innovation in teaching and learning f) Poor student achievement or only short-term improvements on standardized tests 	<ul style="list-style-type: none"> a) Principal as "laissez-faire" manager; many teachers develop unrelated programs b) Fragmented information that lacks coherence; programs that lack shared purpose c) Norms of individualism; no collective responsibility d) Undefined roles and responsibilities e) "Spotty" innovation; some classrooms are excellent while others are poor f) Static overall student achievement (unless data are disaggregated)
High Degree of Skill	<ul style="list-style-type: none"> a) Principal and key teachers as purposeful leadership team b) Limited use of school-wide data; information flow within designated leadership groups c) Polarized staff with pockets of strong resistance d) Efficient designated leaders; others serve in traditional roles e) Strong innovation, reflection skills, and teaching excellence; weak program coherence f) Student achievement is static or shows slight improvement 	<ul style="list-style-type: none"> a) Principal, teachers, parents, and students as skillful leaders b) Shared vision resulting in program coherence c) Inquiry-based use of data to inform decisions and practice d) Broad involvement, collaboration, and collective responsibility reflected in roles and action e) Reflective practice that leads consistently to innovation f) Highly or steadily improving student achievement

Table 1 adapted with permission from "Leadership Capacity for Lasting School Improvement," by Linda Lambert, 2003, p. 3. Copyright 2003 by the Association for Supervision and Curriculum Development.

Table 1 presents a four-quadrant matrix that explains the leadership capacity model. In general, schools that demonstrate low levels of participation and low levels of leadership skillfulness are placed in Quadrant 1 (Quadrant 1 Schools).

Leaders in Quadrant 1 schools are described as autocratic principals with low leadership capacity to manage schools. The schools tend to have a hierarchical structure, a culture based on uniformity, and low expectations. Teachers in these schools rarely assume responsibility for students' poor outcomes, schools experience low parental support, and noticeable laxity in what is required of them. According to Lambert (2003), Quadrant 1 schools are low in alignment with relationships that would create a reciprocal culture.

Quadrant 2 includes schools with high levels of participation and low levels of skillfulness. In these schools, formal leadership positions operate in laissez-faire and unpredictable ways. Although these schools may offer many programs to students, the systems are fragmented or uncoordinated, diminishing student outcomes. Schools in this quadrant lack focus on their mission (Lambert, 2003). Quadrant 3 schools have pockets of innovation, some skilled leaders, some strong resistance, and some progress in reform. They are high-skilled and low-participation schools. These schools may have a leadership team to work on school improvement; however, over time, the resistance may cause polarization in the school, impairing teamwork and restricting reciprocity among members of the school community and collaborative leadership (Lambert, 2003).

Quadrant 4 encompasses schools with high levels of participation and high levels of skillfulness. High levels of participation reflect high leadership capacity, high levels of collaboration, and inclusive leadership. In Quadrant 4 schools, all constituents have a stake and are actively engaged with the school. High leadership skillfulness is defined by the fact that members work together in teams, understand their assumptions, initiate and share new ideas, and implement innovations. Leadership is skillfully distributed among teachers, parents, community members, and students. In these schools, teachers engage in inquiry and participate in action research and other engaging activities. These schools focus on mission with all members working towards improvement (Lambert, 2003).

Each of the quadrants has six components that reflect leadership skillfulness and participation and constitute Lambert's Leadership Capacity School Survey which has been used to assess leadership capacity in schools. The six components are: a) broad-based, skillful participation in the work of leadership participation; b) shared vision that results in program coherence; c) inquiry-based use of information to inform decisions and practice; d) roles and actions that reflect broad involvement, collaboration, and collective responsibility; e) reflective practice that consistently leads to innovation; and f) high or steadily improving student achievement and development (Edmonds, 1983; Lambert, 2003). According to Lambert, Quadrant 4 signifies high levels of leadership capacity (high skillfulness, high participation, and high levels of academic achievement).

The literature review shows that leadership capacity is the collective construct of leadership distributed among stakeholders through networks and relationships and is likely to improve school outcomes. However, research examining the relationships between leadership and student outcomes has tended to focus on the leader, in the traditional sense finding indirect and low positive correlations between school leaders' actions and student achievement. Limited in the literature are studies that have quantified leadership capacity, discerned constructs of leadership as defined by leadership capacity, and tested the efficacy of the influence of leadership capacity on student academic achievement.

Methodology

A quantitative approach was used to examine leadership capacity among high schools in the state of Illinois. The variables included the six components of leadership capacity, school demographics, and student achievement. Pertinent information was gathered using a survey instrument. The survey requested information from high school principals on perceived leadership capacity in their schools, while student achievement data (Illinois Prairie State Achievement Examination (PSAE reading and math)), were collected from the Illinois Report Card (IRC, n.d.). At the time of data collection, PSAE reading and math were reported as a percentage of students meeting or exceeding the state standards. In other words, for a school to be on target, its average score had to be 70% or better on the standardized tests (PSAE). In addition, all high schools had to have 70% of the students tested meet or exceed the benchmark standard.

Data used in this study came from 161 of 470 public high schools and principals via electronic survey. School demographics including total school enrollment, attendance rates, class size, and % low income were retrieved from IIRC data (state-run website). The survey used in collecting data on school capacity was adapted from Linda Lambert and can be found in the book, *Leadership Capacity for Lasting School Improvement*, published by the ASCD in 2003. The survey consisted of 30 randomized self-report questions representing the six components of leadership capacity. Before the surveys were sent out, each principal was matched with his or her school to facilitate the gathering of school data from the IRC (n.d.). The surveys were coded to ensure confidentiality. Information from the IRC was gathered before the principals' responses were accessed. The coded responses were then matched with the school data. The IRC contained information regarding aggregate student achievement.

Each respondent gave a score of 1-5 for each question. A high score of 5 indicated that this is a part of the everyday practice in the school and could be considered exemplary. Scores associated with each question were aggregated based on their representative component. An average score was then calculated to represent the component as it relates to the school and overall leadership capacity was average of all components. The final averages were then tallied and used to

determine the average ranking of leadership capacity in the school or total leadership capacity. Presented in Table 2 are definitions of what a high score is relative to a 1-5 rating.

Table 2. Leadership Capacity Component High Score Definitions

Leadership Capacity Component	High Score Defined (Lambert, 2003)
Broad-based, skillful participation in the work of leadership	Administrators, teachers, parents, and students are all involved in the work of leadership.
Shared vision that results in program coherence	A shared vision based upon the core values that lead to various constituents realizing their commitment and dreams for the organization and to the development of coherent programs.
Inquiry-based use of information to inform decisions and practice	A generative approach to discovering problems, reflecting, and determining the best action based on collected findings.
Roles and actions that reflect broad involvement, collaboration, and collective responsibility	Expanding roles of the participants; shifting people from being the subject of a study to partners in problem-solving.
Reflective practice that consistently leads to innovation	Being able to think about the methods, strategies, and procedures used. Reflection allows organizations to seek continuous improvement as they tackle new questions.
High or steadily improving student achievement and development.	Multiple measures of student achievement are obtained. This includes measures of development and performance.

Reliability and Construct Validity of Instrument

In a study, Pierce (2007) determined the reliability and construct validity of the Leadership Capacity School Survey designed by Lambert. The Cronbach's alpha indicated the reliability factors for all six subscales were high, ranging from .87 to .92. For this study, the original 30 questions were used in the survey. A test of reliability was performed. The Cronbach for each of the six components of leadership capacity ranged between .85 and .78 (broad-based decision-making - .85; inquiry - .84; Shared vision - .82; Roles and responsibilities - .81; Reflective practice - .83; Student achievement - .78).

Data Analysis

High schools were the unit of analysis. Descriptive statistics were used to explore initial trends in the data based on the survey and IIRC data. Statistical relationships between the variables of leadership capacity, school demographics, and student achievement were assessed using correlation analysis. The output of Q-Q plot indicates a normal distribution of data. To determine the relative effect of leadership capacity on student achievement (PSAE math and reading), multiple regression analysis was utilized.

Findings

Presented in Table 3 are descriptive statistics for demographic, leadership capacity, and student achievement data. The scores for leadership capacity constructs were based on the average score of items associated with each construct.

Table 3. Means and Standard Deviations of Data from Surveyed Schools

	N	Minimum	Maximum	Mean	Std. Deviation
Total School Enrollment	161	100	4419	1233	988.03
Average Class size	161	9.80	29.5	18.24	3.87
% Low Income	161	0.00	87.5	25.83	18.13
Attendance rate	161	54.10	96.4	93.10	4.03
PSAE Reading	160	9.10	87.4	60.97	13.64
PSAE Math	160	4.00	89.1	55.28	15.82
Broad-Based Decision-making	161	2.91	3.61	3.12	.82
Shared vision	161	2.91	3.53	3.19	.88
Inquiry based	161	3.01	3.40	3.18	.84
Roles and responsibilities	161	2.86	3.51	3.17	.88
Reflective practice	161	2.61	3.44	3.00	.89
Student achievement	161	2.96	3.44	3.15	.83

Based on Lambert's (2003) scale, schools with average scores of 0 to 2.4 on leadership capacity were placed in the high-needs category (Quadrant 1). Schools in the range of 2.5 to 4.4 met conditions stipulated in Quadrants 2 or 3. Schools scoring in the 4.5 to 5 range and therefore considered exemplary in their participation and leadership skillfulness were

placed in quadrant 4. Based on this classification, 120 schools (74.1%) scored moderately on leadership capacity, 6 schools (3.7%) scored high, and 36 schools (22.2%) scored low. In each of the leadership capacity components, fewer than 25% of the schools were placed in the high-needs category (quadrant 1).

To determine the extent of the relationship between school descriptive data (including PSAE scores) and leadership capacity, Pearson's coefficient correlations were computed. Table (4) presents a summarization of the Pearson correlation coefficient (r) between PSAE (reading and math) and school demographic data.

Table 4. Correlations Between School Demographics and PSAE (Reading and Math)

	% Low Income	Attendance Rate	Avg. Class Size	Total School Enrollment	PSAE Math
PSAE Reading	-.79**	.62**	.17**	.1	.90**
PSAE Math	-.75**	.57**	.29**	.25**	
Total School Enrollment	-.03	-.04	.67**		
Avg. Class Size	-.11	-0.09			
Attendance Rate	-.61**				

** = .01 level (2-tailed); * = .05 level (2-tailed).

Correlational analyses indicate that low income had negative effects on student achievement, especially reading, while attendance had a significant positive influence on student achievement. A high positive correlation ($r=.90^{**}$) was found between reading and math scores.

Table 5 presents a summarization of the correlations found between the components of leadership capacity, demographic variables, and student achievement.

Table 5. Correlation Among the Components of Leadership Capacity, School Demographic Data, and Student Achievement

	Avg. Class Size	Total Enroll	Total Capacity	Student Achieve	Reflect. Practice	Roles and Resp.	Inquiry Based	Shared Vision	Broad Based
PSAE Reading	.174*	.103	.067	.105	.067	.017	.104	.070	.003
PSAE Math	.281**	.252**	.106	.108	.108	.056	.140	.118	.046
Broad Based	.303**	.238**	.933**	.800**	.829**	.868**	.844**	.750**	
Shared Vision	.320**	.231**	.861**	.729**	.725**	.718**	.760**		
Inquiry Based	.209**	0.13	.925**	.827**	.798**	.823**			
Roles & Resp	.239**	.204**	.926**	.808**	.828**				
Ref. Practice	.274**	.293**	.907**	.750**					
Student Achieve	.172*	0.12	.899**						
Total Capacity	.279**	.225**							
Total Enroll	.671**								

** = .01 level (2-tailed); * = .05 level (2-tailed).

Findings show significant but low positive correlations between demographics and student achievement (reading and class size ($r=.174^{**}$)); math and class size ($r=.281^{**}$), and math and total enrollment ($r=.252^{**}$). Findings show no correlation between PSAE scores and any of the leadership capacity components including overall leadership capacity. However, components of leadership capacity were highly correlated ranging from $r=.718$ (shared vision and Roles and responsibilities) to $r=.868$ (Broad-based decision making and roles and responsibilities. Student achievement, one of the constructs of leadership capacity, and defined as actions taken toward improving student outcomes, not actual assessments (Lambert, 2003) had high significant positive correlations with all of the other leadership capacity constructs. According to Rutter (1983), measures of school processes are not only interrelated, the success of each also depends on the presence of the others.

Regression analyses were applied to the data to determine demographic and leadership capacity factors predicting student achievement in PSAE reading and PSAE math scores. The findings are presented on two models (Tables 6 and 7). Model 1 was regressed (using ENTER) percent low income, average class size, attendance rate, mobility rate, chronic truancy, and each of the 30 leadership capacity statements provided in the survey with the PSAE Reading scores as the independent variable. Model 2 regressed (using ENTER) percent low income, average class size, attendance rate, mobility rate, chronic truancy, and each of the 30 leadership capacity statements provided on the survey with PSAE math scores as the independent variable.

Table 6. Regression Model 1 of PSAE Reading and School Demographics and Leadership Capacity Constructs

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	-54.90	37.08		-1.48	.14
Low Income	-.46	.06	-.67	-8.03	.01
Class Size	.67	.21	.19	3.25	.01
Attendance Rate	1.22	.38	.36	3.19	.01
Inquiry- based question 3	2.939	1.143	.192	2.571	.01
Shared vision question 2	-2.519	1.041	-.192	-2.421	.01

Table 7. Regression Model 2 of PSAE Math and School Demographics and Leadership Capacity Constructs

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	-39.18	43.60		-.89	.371
Low Income	-.49	.07	-.56	-7.23	.01
Average Class Size	1.05	.25	.26	4.29	.01
Attendance Rate	.91	.45	.23	2.03	.04
Reflective practice question 3	-1.97	.83	-.15	-2.38	.01
Inquiry- based question 1	3.01	1.31	.19	2.29	.02

Models 1 in Table 6 ($F=9.959$, $p < 0.05$) and 2 in Table 7 ($F=9.589$, $p < 0.05$) indicate that the percentage of low-income students, average class size, and attendance rate in a school predict both PSAE reading and math scores. Based on the survey, inquiry-based statement 3 (schools that focus on student learning), and shared vision statement 2 (schools that have staff ask each other questions to keep on track with the vision) predict PSAE Reading scores. Inquiry-based statement 1 (schools that use a learning cycle that involves reflection, dialogue, inquiry, and action), inquiry-based statement 3 (schools that focus on student learning), and reflective practices statement 3 (schools that have joined with networks of other schools and programs, both inside and outside the district, to secure feedback on work) predict PSAE math scores. The summary of findings (correlational and regression analyses) is presented in Figure 1.

Figure 1 demonstrates the relationships emerging from this study's correlational and regression analyses. The six components of leadership capacity were positively and significantly correlated to each other. Regression analyses indicated that low income, class size, and attendance rates (demographic variables) predicted reading and math scores, and total school population predicted math scores.

Placed at the top of Figure 1, the average class size had a positive correlation with all six components of leadership capacity, while total school enrollment had a positive correlation with four of the six components (shared vision, broad-based participation, roles and responsibilities, and reflective practice). Bigger class sizes and total enrolment had positive effects on leadership capacity. However, this study did not find any significant relationships between leadership capacity or leadership capacity constructs and student achievement as measured by the PSAE reading and Math. Regression analyses identified specific items in shared vision and inquiry-based practice that predicted PSAE Reading; and specific items in inquiry-based practice and reflective practice that predicted PSAE math.

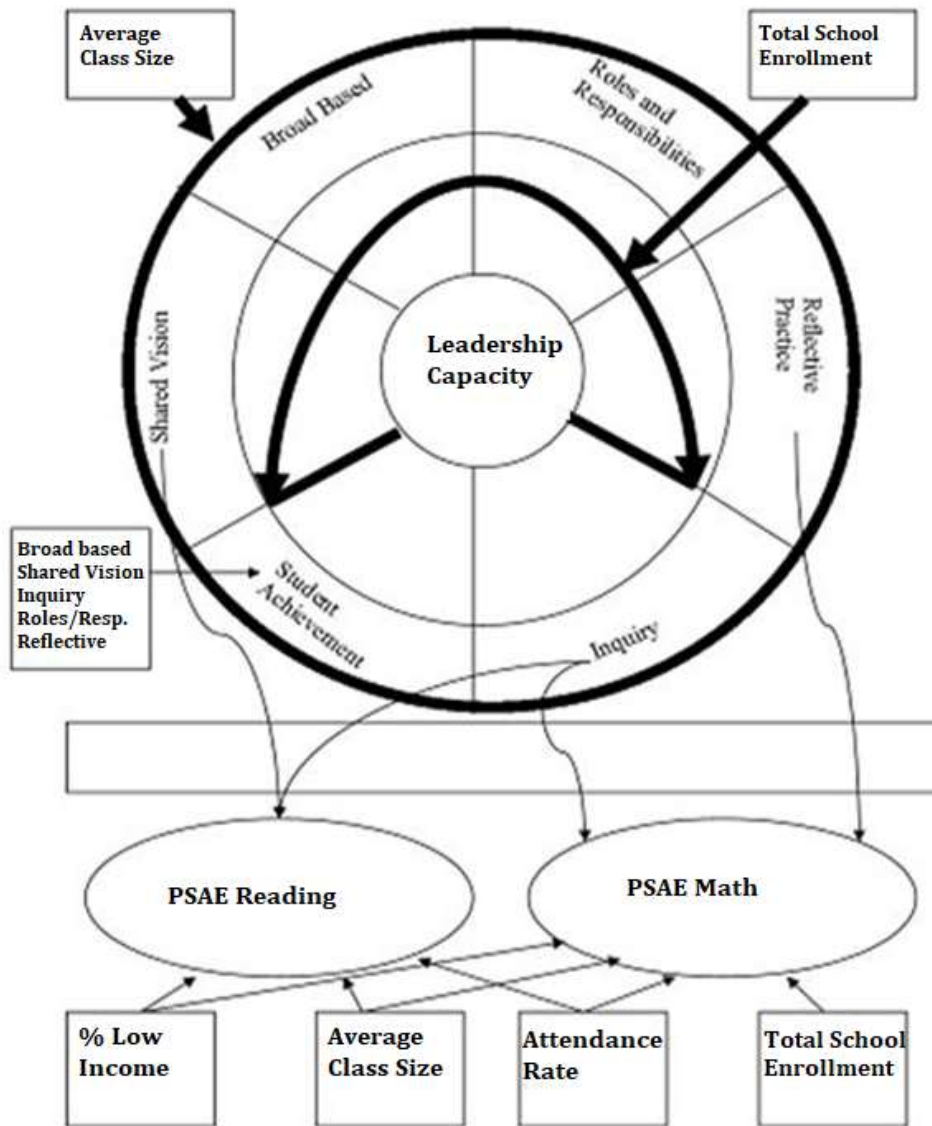


Figure 1. Relationships among Leadership Capacity, School Demographics, and Student Achievement in Reading and Math

Discussion

Emerging diverse approaches to leadership like distributed leadership, leadership theories like transformational leadership, public expectations like high student outcomes, and failures in obtaining anticipated school outcomes have influenced how schools are led. Lines of authority and decision-making have increasingly become blurred (Moller et al., 2001; Paunesku & Farrington, 2020; Terry, 1995). Concurrently, collective behaviors have engendered the distribution of accountability, inspiring teachers to become more considerate of taking risks and fostering collaborative environments (Hashim, 2020; Moller et al., 2001; Phelps, 2008; Terry, 1995). The product of collective behavior is what has been described as leadership capacity that should lead to an effective learning environment, self-actualization of a school community, the flattening of an organizational hierarchy, and high academic outcomes (Chin, 2007; Lambert, 2003; Louis & Murphy, 2018; Paunesku & Farrington, 2020). However, schools tend to measure academic outcomes while ignoring constructs that produce those outcomes. For this reason, the relationship between leadership and student achievement has not been quantified to the extent that this relationship can be used to improve leadership that enhances student achievement. This study indicated that most of the leadership constructs do not have a direct impact on student achievement, however, quantifying both academic achievement outcomes and the environments that cause the outcomes provided specific behaviors that predict academic achievement. In turn, this finding provided knowledge that can be used to determine areas for improvement, areas needing innovation, and areas to be discontinued to maximize the positive effects.

Leadership Capacity and Student Achievement

Leadership capacity was determined to encompass broad participation by stakeholders in planning, implementing, and evaluating school processes. Research indicates that broad participation transforms the characteristics of the work environment, climate, culture, and school academic outcomes (Chin, 2007; Erwin et al., 2011; Galey-Horn, 2020; Ross & Gray, 2006); however, research findings are not consistent when it comes to impact on student achievement. Ross and Gray's (2006) study of transformed leadership practices did not find a direct impact on student achievement. Galey-Horn (2020) and Hartley (2007) indicated that improved institutional capacities enhanced institutions' ability to respond to reforms/policies but demonstrated a negligible causal relationship with student achievement. Other research shows different results. Waters and Marzano (2006) found a range of relationships between leadership and student achievement.

In some studies, we found an effect size for leadership and achievement of .50. This translates mathematically into a one standard deviation difference in demonstrated leadership ability being associated with as much as a 19 percentile point increase in student achievement. In other studies, we found correlations as low as -.02. This indicates that schools where principals demonstrated higher competence in certain leadership areas had lower levels of student achievement. In these studies, a one standard deviation improvement in leadership practices was correlated with a one percentile point decrease in student achievement. (Waters & Marzano, 2006, p. 5)

Waters et al. described the variance as a differential impact, which could be due to the order of change taking place in the schools. First-order change is routine (less impact), while second-order change is more dramatic (observable impact). Thus, the order of change (routine or dramatic) could count for the statistical significance or lack thereof of the effects of leadership on student achievement (Waters & Marzano, 2006). In another meta-analysis using quantitative research, Chin (2007) stated that the "effect of transformational leadership on student achievement was found to be relatively smaller ... when the contextual factors, such as student SES and the attitudes of the community, are playing positive roles" (p. 174). And, in a qualitative study of schools ranked by academic excellence indicator system, Wooderson-Perzan and Lunenburg (2001) found that leadership qualities did not vary among the different categories of schools; instead, ethnicity and socio-economic status were the strong predictors of student achievement. Although these findings suggest some impact of leadership and leadership capacity on student achievement, there is a greater sense that it is indirect. Louis and Murphy (2018) stated that the effects of leadership on student achievement are not direct; instead, they change the teaching/learning environment which may be beneficial for student experiences in the school. Unlike the studies above, the current study identified leadership behaviors that have a direct influence on student achievement.

School Demographics and Student Achievement

Attendance Rates: In this study, attendance was a predictor of student achievement with significant positive correlations to PSAE reading and math. One of the oldest studies on attendance (Caldas, 1993) in Louisiana schools found that the percentage of school attendance and school size were determinants of achievement in central city schools. In comparing all of the input factors and their influence on student achievement at the secondary level, attendance accounted for the largest variance in student achievement at 5.5%. Other factors combined (school size, ethnicity, percentage of low income) accounted for 3% of the variance. In another study, Crone (1993) found that attendance rates were low in: 1) metropolitan areas, 2) middle and high schools, and 3) among schools serving children from low SES. Gottfried's (2010) study using a fixed effects framework and instrumental variable strategy, consistently found positive and statistically significant relations between attendance and student achievement. These results indicated that average levels of student attendance have a positive influence on student performance. This study supports previous findings while raising the question concerning how and what leadership should be doing about attendance to impact academic achievement? Considering the influence of attendance, the findings of this study suggest that school leadership should focus on improving attendance; children learn more when they come to school consistently. Roby (2003) found that the schools with the highest average test grades also had the highest average attendance.

Class and School Sizes: Class size is a significant determinant of student achievement (Caldas, 1993). Many studies out of the Tennessee STAR experiment in the 90's looked at class size and academic achievement (Small classes included 13-17 students, large classes of 22-26 students, and larger classes over 26 students plus a full-time teacher's aide) (Miller-Whitehead, 2003). Miller-Whitehead analyzed data by comparing the achievement of low- and high-achieving students in all classes using grade 5 science scale scores on Terra Nova. It was determined that schools with classes at or below the Tennessee mandate had the highest scores, unlike schools with over-sized classes. Nye et al. (2002) also noted that small class sizes affected both low- and high-achieving students. Small classes affected male students more positively. Regarding reading and math for low-performing students, class size had a significant effect on reading achievement. In this study, class size had low but significant positive effects on PSAE reading and math, while total enrolment had a low positive correlation with PSEA math.

In 2003, Crenshaw connected larger schools with high student achievement, but more importantly, she added that the more affluent schools tended to be larger with greater leadership capacity and resources. V. Lee and Loeb's (2000) study

in Chicago found that smaller schools with smaller organizational dimensions enabled personalized social interactions. The question then is what is the optimum school size? Lee and Smith (1997) determined a range for optimal school size. Using the 1988 National Educational Longitudinal Study, an analysis of school size and student achievement determined that school size had a greater effect on math than on reading (Lee & Smith, 1997). High schools in the range of 600-900 students had optimal learning, which drops off for schools smaller than 600 or greater than 900. The study found a direct negative relationship between SES and student achievement. When comparing schools, both low- and high-SES schools were determined to have optimal student achievement in the 600-900 student population. More striking was the finding that school size appears to matter more in schools that enroll fewer advantaged students.

Conclusion

Educational systems tend to focus on school factors that are assessed and quantified through various forms of measurement including standardized tests, assessments, and evaluations. However, those aspects that are not measured tend to be ignored. At the same time, matters that are prioritized and tracked influence actions and behaviors in schools. Studies showing that leadership constructs influence academic outcomes (Jacobson, 2011; Leithwood & Strauss, 2010; Louis & Murphy, 2018) are limited in scope and methods to establish clearly how and what leadership constructs maximize impact on student academic outcomes. It is problematic that studies rarely quantify leadership and leadership influence on academic outcomes to provide reliable actionable data.

This study measured leadership capacity and found specific leadership capacity behaviors (shared vision, inquiry, and reflective practices), and specific demographics (socioeconomic status, class size, and school population) that predict student achievement (reading and math). Although these results provide some indicators of leadership influence and what leaders should be doing as a collective, there is a need to not only broaden leadership capacity but also to study them to discern those that have the greatest or least influence for action. Leaders would then serve to influence students' academic outcomes by working with stakeholders collectively on constructs and behaviors that are proven to have positive influences or predict academic outcomes. Ultimately, leaders would prioritize best leadership practices if there were processes in place to measure leadership constructs and behaviors and determine those that have greater impacts on academic achievement. Based on this study, the influential and practical leadership behaviors, which can be layered through a broader base of supports to affect student achievement, are:

1. Focus on student learning
2. Opportunities for staff interactions with each other on vision
3. Learning cycle that involves reflection, dialogue, inquiry, and action
4. Networks with other schools and programs that provide feedback

According to Louis and Murphy (2018, p. 173), impactful leadership comes by "layering of leadership effects that build on a base of values, leader behaviors, positive state and work attitudes, and the development of the school". However, the effects can only be known and improved if they are measured and tested for impact.

Recommendations

This study has delineated leadership constructs that influence student achievement. Therefore, school leaders should focus on such constructs to maximize leadership's impact on student achievement. Importantly, they should also measure contextual constructs of leadership capacity to delineate effective practices and important indicators of group productivity, and support those. The authors also recommend similar studies at elementary and middle school levels and studies that explore the impacts of leadership capacity in diverse educational settings or use long-term designs to assess the long-term effects of leadership capacity on student achievement.

Limitations

Leadership capacity was based on self-reported information from principals. In other words, leadership capacity depended solely on how the principals perceived the function of leadership in their building.

Ethics statement

The study was approved through the Institutional Review Board at the University

Conflict of interest

This study was conducted without undue influence, anonymously, and without compensation that could create a conflict of interest.

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