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Investigation of The Relationship Between High Schools' Instructional Capacity and Academic Achievement

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Cover Page Footnote

We are grateful to the teachers and principals who contributed to the research.

An Investigation of the Relationship between High Schools' Instructional Capacity and Academic Achievement*

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Abstract

The purpose of this study was to examine the relationship between high schools' instructional capacities and students' achievement gains. Designed using a relational screening model descriptive research method, the study draws upon the statistical data on students' high school and UPE success scores obtained from Ministry of National Education and Center for Evaluation, Selection, and Placement as well as teachers' responses to the data collection tool in this study. The Instructional Capacity Scale (ICS) was the data collection instrument the researchers developed. The ICS has six subscales, including instructional management practices, teacher quality, quality and quantity of curriculum and materials, instructional climate, students' readiness to learn, and financial resources. The data were analyzed using multilevel structural equation modeling (ML-SEM) to determine the direct or indirect relationships between dependent variables and independent variables. The findings show that teacher quality and students' readiness to learn affect students' achievement directly, while there is an indirect relationship between instructional climate and instructional management practices. There is also evidence to suggest that the previous achievement level of students is the most effective variable for predicting academic achievement. The findings have confirmed the model presenting that instructional capacity components affect the academic achievement of the students either directly or indirectly. In this sense, the most effective variable on the students' academic achievement was the previous academic achievement level (SBS base scores). Several limitations and recommendations for future research are provided.

Keywords: Instructional capacity, academic achievement, high school, vocational high school, two-level analysis

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Introduction

Many scholars consider capacity building as a cornerstone for school improvement (Darling-Hammond, 2005; Fullan, 2010; Hargreaves, 2001). For several decades, there has been compelling evidence from research on school improvement that a school's instructional capacity is the leading school-related factor impacting reform initiatives directed to quality of education, student learning, and achievement gains (Cohen & Ball, 1990; Murphy, 2015; Neufeld & Roper, 2003; Talley & Keedy, 2006). First referred in the Coleman Report, instructional capacity, broadly conceived, refers to the capability of a school to facilitate well-designed instruction, thereby boosting students' learning (Talley, 2002, p.17).

Crawford (2016) conceptualizes instructional capacity as the development of understanding, experience, and skills to accomplish curriculum objectives and organizational goals. Newmann et al. (2000) define it as the collective power of human and material sources to enhance student achievement gains.

Recent studies on effective schools focus on exploring intra- and inter-school differences, and they examine the relationships between "explanatory" and "outcome" factors by using appropriate models (Capperucci, 2015). In this sense, it is essential to be aware of the current instructional capacity of schools and its effect on student achievement in terms of fulfilling the educational reforms in the national and international context. School principals and teachers play key roles in building a high-level instructional capacity. However, there is little evidence indicating to what extent instructional capacity will further increase student achievement. This can be seen as a gap in the literature to be filled. In this regard, this research is expected to contribute to the literature by delving into the relationship between the instructional capacities of schools and their effects on student achievement gains. Policy-makers and decision-makers can draw some conclusions from the results of this research as to the educational reforms implemented in the Turkish context.

Previous researchers have investigated how to build instructional capacity (Jackson, 2010; Talley, 2002; Talley & Keedy, 2006) and the effects of instructional capacity on educational reforms and decision-making processes (Coggins et al., 2003; Lyons, 2009; Talley, 2002). Researchers have focused their efforts on revealing the substantial school factors that indicate how instructional capacity can further boost student achievement. However, these descriptive studies have yet to provide conclusive evidence about the indicators that can be employed while measuring instructional capacity levels of school organizations. Rather, researchers have delved into grasping how to build instructional capacity and its effects. Researchers, however, should address the dimensions of instructional capacity, including instructional climate, quality of teachers, financial resources, and quality of curriculum. This study is an attempt to fill this void in the literature through testing the validity of using instructional capacity components—implementation of instructional management, qualifications of the teacher, students' readiness to learn, instructional climate, quality and quantity of curriculum and materials, and financial resources—as indicators of student achievement gains.

Capacity building is the process encompassing structures, processes, and behaviors that facilitate learning among school staff (Darling-Hammond, 2005). In this sense, this research rests on the model offered by Hallinger (2011) and called the Leadership for Learning Model, highlighting the importance of school leadership behaviors for student outcomes mediated by people's capacity, academic structures and processes, and vision and goals. In this study, student achievement is determined as an outcome. Based on Hallinger's model, we treat the

students' readiness to learn and teacher quality as human capacity in the school organization. Further, we regard the quality and quantity of curriculum and materials, instructional climate, and financial resources as academic structures and processes in the model. In this context, the core purpose of this research was to measure the relationship between instructional capacities of high schools and students' academic achievement gains based on the responses of teachers.

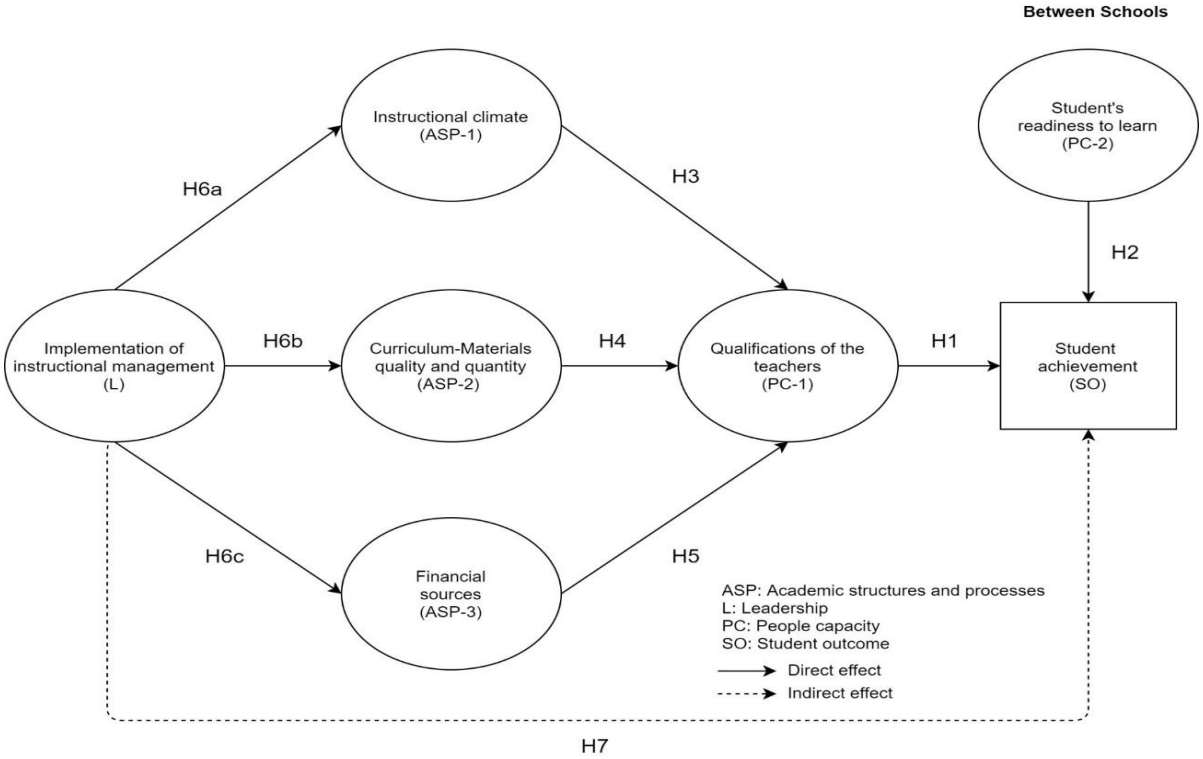


Figure 1. Two-level structural equation model used in the research (Model 1)

Figure 1 indicates that schools' instructional capacity can increase students' achievement through a direct effect on qualification of teachers and the students' readiness to learn. In what follows, we include information about instructional capacity and its subdimensions displayed in the model. We also provide the theoretical and empirical roots of each concept. We tested seven hypotheses in the study. The hypotheses formulated are as follows:

H_1. Teacher quality will directly affect student achievement.

H_2. Students' readiness to learn will directly affect student achievement.

H_3. The instructional climate will directly affect the qualifications of the teachers.

H_4. The quality and quantity of curriculum and materials will directly affect the qualifications of the teachers.

H_5. Financial resources to learn will directly affect the qualifications of the teachers.

H_6. Principals' instructional management practices will directly affect instructional climate, quality and quantity of curriculum and materials, and financial resources.

H_7. Principals' instructional management practices will indirectly affect student achievement.

Literature Review

Instructional Capacity

Instructional capacity is often cited as a critical component of effective teaching, quality learning, and school development (Bain et al., 2011). Previous research on instructional capacity has focused on determining the components of capacity and instructional environments (Cohen & Ball, 1999; Corcoran & Goertz, 1995; Newmann & Wehlage, 1995; Newmann et al., 1997). There is evidence that relations among instructional materials, staff, and students contribute to the capacity of a school and enhance student learning (Adams, 2013). However, for the last two decades, the scientific interest has been shifted into building instructional capacity in schools (Spillane & Louis, 2002), policies affecting instructional capacity building (Darling-Hammond, 2005; Fullan, 2010), and models of instructional capacity (Crowther, 2011). There has been more evidence that instructional capacity consists of resources in schools boosting teacher effectiveness and social processes fostering professional learning and the building of knowledge (Adams, 2013).

Instructional capacity is divided into subdimensions at the class and school levels. Knowledge, skills, and preparation of the teachers (Cohen & Ball, 1999; Corcoran & Goertz, 1995; Massell, 1998a, 1998b), motivation and availability for student learning (Massell, 1998a, 1998b), and instruction program materials for both students and teachers (Massell, 1998a, 1998b) are considered class-level subdimensions. The number and variety of people supporting the classroom (Massell, 1998a, 1998b), quality and quantity of the social relationships (Cohen & Ball, 1999; Corcoran & Goertz, 1995; Massell, 1998a, 1998b), educational materials (Corcoran & Goertz, 1995; Massell, 1998a, 1998b), and allocation of school and district resources (Massell, 1998a, 1998b) are seen as school-level subdimensions. Other variables emphasized in other studies on instructional capacity include human capital, which expresses the intellectual knowledge and skills and abilities of the teachers and school employees; quality and quantity of instructional materials, which includes instructional time; and class dimension or social organization of instructional culture (Corcoran & Goertz, 1995; Darling-Hammond, 1995; O'Day et al., 1995). School principals are key levers in fostering instructional capacity. According to Jaquith (2012), school administrators should establish teachers' teams and improve conditions for effective teaching and learning to increase the instructional capacity and create a learning culture.

Qualifications of Teachers

Research has supported necessity of having well-educated and professional teachers in every class (Baker et al., 2010). McKinsey and McKinsey (2007) express the importance of providing the right individuals to be teachers and making them effective teachers. Sunar and Geban (2012) reveal some qualifications of well-qualified teachers, including transferring information to students, narrating lessons willingly, being just and respectful, and having classroom management skills. Hopkins and Stern (1996) describe the aspects of highly qualified teachers, including commitment, love of children, expertise on different teaching models, sense of humor, collaboration with other teachers, and capacity for self-reflection.

The qualifications of a teacher comprise one of the most vital variables for instructional capacity. Recent studies have expressed that teacher quality is affected by factors such as student achievement, school starting age, size of class, teacher experience, and teacher character (Darling-Hammond, 2000; Ferguson, 1991a; 1991b; Ferguson & Ladd, 1996; Goe

& Stickler, 2008; Hanushek et al., 1998; Harris & Sass, 2011; Rowan et al., 1997; Strauss & Sawyer, 1986). Based on evidence addressed above, the first hypothesis of this study is:

H_1. Teacher quality will directly affect student achievement.

Students' Readiness to Learn

The point underlined in the definitions of students' readiness to learn is that a student is open to learning psychologically, physically, and mentally (Massell, 1998a, 1998b). Capperucci (2015) states that in research on school effectiveness, students' individual characteristics have a greater effect than school characteristics on academic achievement. The Primary Education Policy Paper published by the World Bank (1990) highlights these individual characteristics and emphasizes the importance of nutrition and health in student learning. Additionally, Massell (1998a, 1998b), draws attention to students' motivation and readiness to learn as variables at the classroom level. Studies have also indicated that responding to the essential health, social, and emotional needs of students contributes to readiness to learn and student achievement (Boissiere, 2004). Additionally, Sorensen and Hallinan's (1977) model of learning claims that schools should give chances to students to improve their skills, capacity, and learning opportunities. If schools do not give these chances to students, they will not improve themselves and will have low scores.

Effort and ability align with students' readiness to learn, and opportunities to learn relate very closely to the instructional capacity of the school. The other factors examined by the educational policy analysts include individual characteristics of students, family background, and social characteristics also affect the students' readiness to learn. In addition to these, students' intelligence score is an essential factor of readiness (Boissiere, 2004). Based on the evidence addressed above, the second hypothesis of this study is:

H_2. Students' readiness to learn will directly affect student achievement.

Instructional Climate

Instructional climate includes the efforts of teachers in a school to shape their students' attitudes and behaviors toward teaching and learning (Hallinger et al., 1996). This study discusses the concept of teaching climate as teachers working in cooperation with each other for student success and effectively conducting learning processes. A positive educational environment is a vital factor to improve teacher quality. Moreover, educational climate includes opportunities to develop and update teachers' professional competencies. Teachers who have high professional autonomy and a cooperative school culture show a high level of professional cooperation and have instructional leadership qualities, participate in more in-school development activities, and are more involved in activities impacting teaching practices (OECD, 2014).

The studies on instructional climate explain the term as a factor that ensures the development of the school in technical, cultural, and political dimensions (Jones et al., 2008). Newmann and Wehlage (1995) found that all of the individuals in a school should focus on a common goal and make an effort together. Barth (2006) states that a collective movement based on collegiality at a school has great importance for instructional climate. The cooperation among school actors can be considered a component of a shared sense of responsibility. In collaborative cultures, colleagues often visit, communicate, and learn together (Conzemius &

O'Neill, 2001). Cooperation between teachers includes teachers planning lectures together, developing measurement and assessment tools, and collaborating in the implementation of curriculum (DuFour et al., 2005). On the other hand, although many teachers do not want to cooperate with their colleagues, this cooperation takes place due to pressure from and assignment by school administrations (Bloom & Vitcov, 2010). Based on the evidence addressed above, the third hypothesis of this study is:

> H_3. The instructional climate will directly affect the qualifications of the teachers.

Quality and Quantity of Curriculum and Materials

Curriculum is an essential part of student achievement (Boissiere, 2004). A curriculum should be designed to facilitate the work of teachers conscientiously and effectively (Ball & Cohen, 1996). Studies related to instructional capacity indicate that school leaders should pay attention to instructional materials to develop student learning (Murphy, 2015; Spillane & Louis, 2002). Instructional materials affect an instructional program directly, including educational goals and the assessment and evaluation of academic outcomes. Curriculum developers consider instructional material a means to shape what students learn and to respond to teachers' needs (Ball & Cohen, 1996). In other words, the higher the quality of curriculum and materials is, the better the instructional exercises are. School principals should provide well-qualified materials and well-built curricula in their schools for the sake of effective classroom activities (Blase & Blase, 2004; Eilers & Camacho, 2007).

In one study, teachers reported that enhanced quality and quantity of material brought about a favorable change in their teaching practice (Li et. al., 2009). Moreover, the presence of quality curriculum and materials in school leads teachers to improve themselves professionally. For example, the presence of technological tools in the classroom has encouraged teachers to learn how to use them (Atar, 2014). Kulm and Li (2009) report that planning a lesson is both a process of preparing for teaching lessons and a professional development process of learning from materials, curriculum, and colleagues. The most serious common aspect in various research results is that textbooks and teaching materials have a high impact on improving school outcomes in many developing countries (Boissiere, 2004). Based on the evidence addressed above, the fourth hypothesis of this study is:

> H_4. The quality and quantity of curriculum and materials will directly affect the qualifications of teachers.

Financial Resources

Studies have revealed significant and positive relationships between a school's financial resources and student achievement (Boissiere, 2004; Finn & Achilles, 1999; Pritchett & Filmer, 1999). This finding points to the importance of the efficient use of resources allocated to education rather than to the amount of funding allocated to education. In other words, how to use financial sources is more important than how much funding schools have. However, many studies reveal that there is no significant relationship between the quality of educational outcomes and the resources allocated to education (Hanushek, 2003; Hanushek et al., 1998; McKinsey & McKinsey, 2007). According to the results of international studies, the fact that countries spend very high amounts on education does not mean that student success will be high (Döş & Atalmış, 2016; OECD, 2007). Although the Heyneman/Loxley effect indicated that socioeconomic level (SES) did not affect student achievement, it is a vital factor in

developing countries, such as Turkey, in explaining academic achievement (Gurria, 2016; Heyneman & Loxley, 1983).

Qualified teachers are more willing to work in schools with high socioeconomic levels (Boyd et al., 2005; Buddin & Zamarro, 2009; Hanushek & Rivkin, 2006). In addition, several studies have revealed that the reason for this is that when they work in schools in regions with low socioeconomic levels, they often face problems outside of education itself, so their motivation, performance, and effort decrease (Kavak & Ekinci, 1994; Ömür, 2016; Yıldız & Balyer, 2019). In short, studies show that when schools' financial resources are high, teachers' qualifications and performances also increase (Haycock, 2001; Ingersoll, 2005; Murnane & Steele, 2007). Based on the evidence addressed above, the fifth hypothesis of this study is:

H_5. Financial resources to learn will directly affect the qualifications of the teachers.

Instructional Management Practices

The term "instructional management" refers to the processes that focus on teaching and learning activities, keeping strong relationships between teachers, setting goals for education and school, creating a supportive learning climate, and providing resources for learning processes (Hallinger, 2005, 2011; Scheerens, 2000). The contemporary research on Educational Management and Leadership tries to explain effective school principals' leadership roles and practices and measure their influence on school processes, structures, and outcomes (Çoban et al., 2020).

Researchers have introduced several models to understand the implementation of instructional management, and they have mainly focused on the relationship between leadership and student achievement (Bossert et al., 1982; Hallinger & Heck, 1996, 1998, 2010; Leithwood & Levin, 2005; Pounder et al., 1995). Although researchers found a direct relationship between leadership and student achievement in early studies on school leadership (Nettles, 2005; Silva et al., 2011), recent studies have indicated that school leaders impact student achievement indirectly via creating instructional climate, implementations of the teacher in classroom, instructional organization, allocating financial resources, supporting teacher professionalism, etc. (Bossert et al., 1982; Dwyer et al., 1987; Hallinger et al., 1996; Hallinger & Heck, 1998; Krüger et al., 2007; Leithwood et al., 2008; Leithwood & Levin, 2005; Mulford & Silins, 2003; Özdemir, 2019). Scholars have emphasized that instructional management impacts teachers' qualification by supporting their professional learning (Cheng, 2009; Hallinger et al., 2014; Lam, 2004). Additionally, recent studies have indicated that instructional management affects instructional climate by making classroom observations, giving feedback to teachers, supporting a collaborative atmosphere, and improving teacher practices (Çoban et al., 2020; Hallinger & Heck, 2010). Besides this, the financial management skills of the school administrator are important for the school to achieve its specified goals and to effectively manage financial resources for the development of education and training quality (Alpay, 2011; Mestry, 2004; Mestry & Bisschoff, 2009). Marzano et al. (2005) emphasize that the principal should provide the necessary material support and professional development opportunities for teachers to successfully carry out their duties.

Studies have classified four inclusive school conditions through which school leaders indirectly impact student achievement. In our study, we also track these factors (Leithwood et al., 2004; Leithwood & Jantzi, 2008):

School structures: school size, school type, ratio of male/female students, student/teacher ratio, student/class ratio;
School culture: instructional climate;
Instructional services: supports for instruction, sufficient support for students with special needs, adequate curriculum and materials; and
Human resources: qualifications of the teachers, students' readiness to learn.

The following hypotheses address these factors:

H_6. Principals' instructional management practices will directly affect instructional climate, the quality and quantity of curriculum and materials, and financial resources.

H_7. Principals' instructional management practices will indirectly affect student achievement.

Method

This study was designed following a relational screening descriptive research model, as its main premise is to delve into the relationship between the instructional capacities of high schools and students' achievements. The instructional capacities of schools and students' achievements are the dependent variables. The independent variables are as follows: school type, schools' base point in high school placement test (SBS exam), school size, ratio of female students, ratio of students to class, ratio of students to teachers, instructional management practices, teacher quality, quality and quantity of curriculum and materials, students' readiness to learn, instructional climate, and financial resources.

Turkish Context

The Ministry of National Education (MNE) in Turkey has made new regulations to raise student enrollment rates and quality of schools for the last decade. For example, compulsory school attendance was set at 12 years in 2012, curriculums were updated, and a project was initiated called the FATİH Project (Fırsatları Artırma Teknolojiyi İyileştirme Hareketi [Increasing Opportunities and Improving Technology Movement]), which provides schools, teachers, and students with technological tools and services like interactive boards, tablet computers, and internet networks. These attempts, however, have not yielded the expected results in terms of student achievement gains. In fact, Turkish students have been far from the expected and targeted academic achievements in international examinations such as PISA and TIMSS (OECD, 2018). The University Placement Exam (UPE) is another means of student evaluation in Turkey. These high-stakes exams are held by ÖSYM (Ölçme, Seçme ve Yerleştirme Merkezi [Center for Evaluation, Selection, and Placement]). Similar low performance trends can be seen in national university placement exams across the country (ÖSYM, 2016). Students from vocational high schools often perform worse compared to other types of high schools (Yalçın & Tavşancıl, 2014). Another evaluation system of student achievement in Turkey is the Examination of the Transition to Higher Education (ETH). There are severe problems with students' performance according to the results of exams on the high school level (ÖSYM, 2016). Students at vocational high schools are particularly less successful compared to other high schools on these achievements (Yalçın & Tavşancıl, 2014).

Sampling Procedure

Although there have been numerous reforms of public high schools in the last 20 years, high schools nevertheless remain an ongoing concern to educational researchers (Green, 2015). Therefore, through a proportionate stratified sampling method, we recruited teachers working at high schools and vocational high schools in the Altındağ, Çankaya, Gölbaşı, Keçiören, Mamak, and Yenimahalle districts of Ankara Province and senior students studying in these schools. Considering the hierarchical nature of the study design, the data were obtained through two stages: the data on schools (stage 1) and the data on students (stage 2). Therefore, the sampling process was performed as two stages as well. First, we selected the schools via stratified random sampling from the districts of Ankara Province. To achieve this, we selected 35 general high schools and 30 vocational high schools. Second, we analyzed 30 students' high-stakes exam data in each school and recruited 29 teachers from each school. Table 1 summarizes the figures of target population and sample.

Table 1

Target population and sample

	Population	Sampling
Number of schools	205	65
Number of general high schools (ratio)	92 (%45)	35 (%54)
Number of vocational high schools (ratio)	113 (%55)	30 (%46)
Number of students	22 511	1 950
Number of teachers	11 076	1 885

As Table 1 shows, there are 205 schools in total across the research area. By using proportionate stratified sampling, we selected 65 schools (35 general high schools and 30 vocational high schools). We analyzed 30 students' data from each school and recruited 29 teachers from each school to conduct the survey.

Data Collection and Instrumentation

The data draws upon the statistical data on students' high school and UPE success scores and teachers' responses to the data collection tool in this study. First, for control variables, we collected the lowest score in the high school entrance exam, called SBS (high school placement exam), which students completed in 2013, when they enrolled in high school. The lowest score on the high school placement exam was based on the database of the e-Okul system, designed by MNE. This database includes all information on students from the very beginning their educational life. Second, we obtained the UPE success scores in 2017 from ÖSYM. The data collection tool was applied to teacher participants between April and June during the 2016–2017 academic year.

Instructional Capacity Scale (ICS)

The data collection tool called the instructional capacity scale (ICS) was developed by the researchers themselves in this study so that the instructional capacity of the schools could be measured based on the teachers' responses. ICS has six subscales: instructional management practices (12 items), students' readiness to learn (6 items), financial resources (6 items), teacher quality (8 items), instructional climate (6 items), and the quality and quantity of curriculum and materials (5 items). ICS is based on a 5-point Likert-type scale (1=Strongly

Disagree, 2 =Disagree, 3=Partly Agree, 4=Agree, 5=Strongly Agree). Table 2 displays subscales and some sample items. The full version of the scale is presented in Appendix I.

Table 2

Subscales and sample items

Factor	Sample item
Instructional management practices (items 1-12)	School management sets instructional goals with us to increase student achievement.
Teacher quality (items 13-20)	The teachers in this school respond to student questions about the subjects taught in the lessons.
The quality and quantity of curriculum and materials (items 21-25)	There are materials for instructional activities that are to be carried out in this school.
Instructional climate (items 26-31)	Relations in this school are based on mutual respect and trust.
Students' readiness to learn (items 32-37)	In this school, students are concerned with lessons
Financial resources (items 38-43)	In this school, teachers can obtain financial support for the instructional activities they want to perform.

To address reliability and validity issues, we performed exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to test the reliability and validity of the scale. Following EFA and CFA, the Cronbach's alpha value of 43 items was calculated to be 0.96. The internal reliability of each factor (Cronbach's alpha) was also calculated. The first factor was .94, the second was .90, the third was .95, the fourth was .94, the fifth was .90, and the factor was .87. The confirmatory factor analysis (CFA) measurement model for ICS indicated a reasonably good model fit: x2=2149.4, df=845, RMSEA=.054, GFI=.84, CFI=.99, NFI=.98, RMR=.043, SRMR=.045. These statistics on the scale indicate that ICS can be used to determine the instructional capacity of high schools based on the teachers' responses.

Cronbach's alpha reliability coefficients of this study were as follows: implementation of instructional management = 0.94, qualifications of the teachers = 0.90, quality and quantity of curriculum and materials = 0.95, instructional climate = 0.94, students' readiness to learn = 0.90, and financial resources = 0.87. We tested the validity and reliability of the scale and observed that the results were at an acceptable level.

Control Variables

Previous literature shows that advanced statistical techniques, including multi-level path analyses or hierarchical linear modeling, are employed to measure the effect of school leadership based on control factors such as SES, school size, student-teacher ratios, and composition (De Maeyer et al., 2007; Hallinger & Heck, 2010; Heck & Hallinger, 2009; Louis et al., 2010; Supovitz et al., 2010). We used several control variables to measure their precise effect in model I and model II: school type, schools' base point in high-school placement test (SBS exam), school size, the ratio of female students, the ratio of students per class, the ratio of students to teachers, the instructional management practices, teacher quality, the quality and quantity of curriculum and materials, students' readiness to learn, the instructional climate, and financial resources.

Data Analysis

Using multilevel structural equation modeling (SEM) based on cross-sectional data, we tested our hypotheses. Theoretically, the nature of data in this study is hierarchical, reflecting a multilevel structure (schools and students nested within schools). Therefore, the hypotheses of the study were formulated as two-level analyses (Level 1: Achievement; Level 2: ICS). We used Mplus 6.12 software to perform the analyses.

The data showed normal distribution based on the examination of the skewness and kurtosis coefficients and histogram, box-line, and Q-Q graphs. Based on this, the scores did not show a significant deviation from the normal distribution. The analysis of the research hypotheses were started with a null model with no predictors to examine the composition of the variance in student achievement related to individuals and schools. The correlations among student scores within the school unit were examined using the intraclass correlation (ICC). SEM was used to determine the relationships between the subscales of the schools' instructional capacity and student achievement (see Figure1).

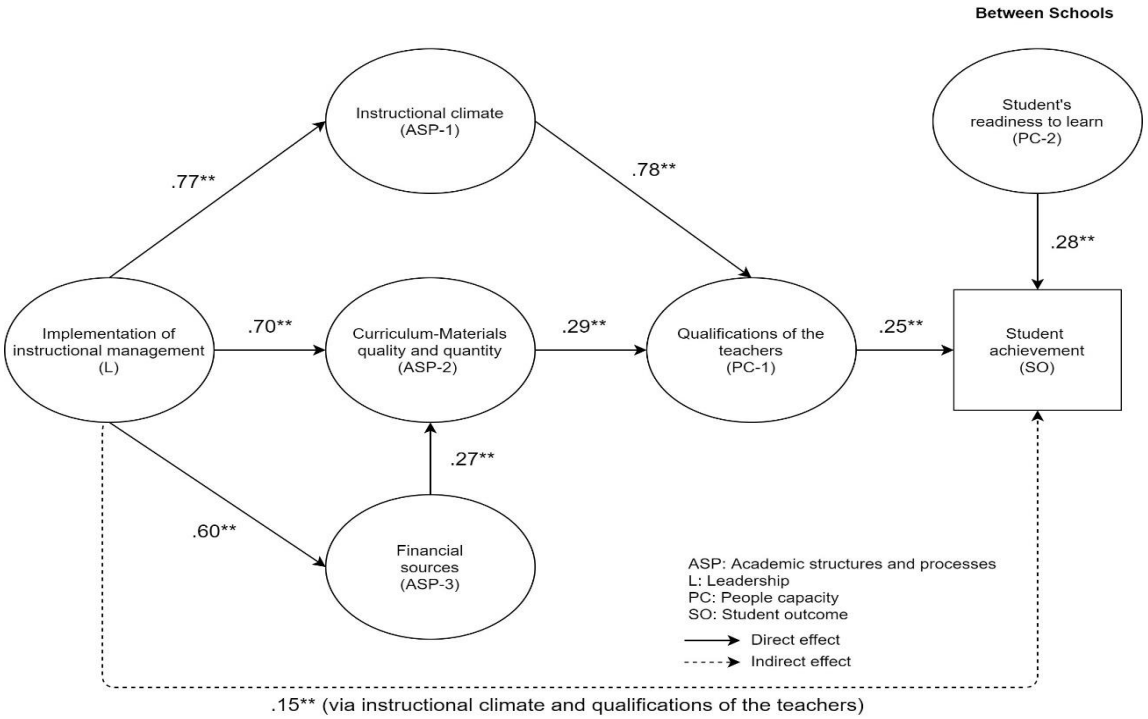
Findings

Before presenting the findings on our hypotheses, we first examined the relationships among the subscales of ICS. Then, we checked the data set in terms of the convenience for multi-level analyses. The results showed that the data had a hierarchical structure, and we tested our hypotheses using multi-level analyses.

The results show positive and high-level relationships among the subscales of the instructional capacities of schools. There was a high level relationship between instructional management practices ($r=.88$, $p<.01$), teacher quality ($r=.78$, $p<.01$), the quality and quantity of curriculum and materials ($r=.83$, $p<.01$), instructional climate ($r=.82$, $p<.01$), students' readiness to learn ($r=.74$, $p<.01$), and financial resources ($r=.73$, $p<.01$). The highest relationship was between teacher quality and instructional climate ($r=.76$, $p<.01$), and the lowest one was between teacher quality and financial resources ($r=.76$, $p<.01$).

Schools showed variances in terms of average achievement scores of the students according to the results of the analysis ($t(64)=14.054$, $p<.001$). However, the average score of the schools was 45.16, with a standard error of 3.21 ($x2=6138.542$, $p<.001$). The reason for this difference between the average achievement scores arises from the types of schools (76%) and the characteristics of students (24%).

The proposed model focuses on the indirect pathways from instructional capacity's components to students' achievements. The compliance values of the research are that the x2/df value is lower than 5, the RMSEA value is lower than 0.05, the SRMR value is lower than 0.05, the CFI value is higher than 0.95, and the TLI value is higher than 0.90. In this scope, we primarily examined the effect of control variables on the components of instructional capacity and the achievement of students. Table 3 shows the results of the analysis. In the next step of the study, we investigated the direct and indirect effects of instructional capacity components on student achievement, and the results of the analysis of the two-level structural equation model was formed within the scope of the fourth sub-problem sentence of the study (see Figure 2).



*p > .05, **p < .01, x^2= 24.293 Se= 13, x^2/df=1.87, p=,000, RMSEA=.020

Figure 2. Two-level structural equation model results (Model 2)

Table 3

The effect of control variables on the result of structural equality model

	SA		IMI		TQ		CMQQ		IC		RSL		FR	
Variances	β	Se	B	Se	B	Se	B	Se	B	Se	B	Se	β	Se
1. School Type	-.18*	.073	-.08	.222	-.01	.089	.23*	.106	-.05	.098	-.17	.136	-.27	.156
2. Base point in high school placement test (SBS)	.63**	.076	.31	.180	-.03	.078	.20	.138	-.11	.119	.68**	.117	-.03	.132
3. School size	.06	.054	.01	.110	-.04	.053	-.01	.064	.08	.063	.05	.080	.17	.098
4. The ratio of female students	-.01	.034	.30**	.104	-.07	.046	-.05	.063	-.12	.073	.09	.072	-.04	.094
5. The ratio of students to teachers	-.02	.056	-.22	.173	-.07	.090	.07	.106	-.25**	.089	-.23*	.113	-.20	.139
6. The ratio of students to class	.06	.040	.15	.133	.04	.063	.05	.068	.26**	.084	.22*	.089	.24*	.115

Note: *p < .05, **p < .01, SA: Student Achievement, IMI: Instructional Management Practices, TQ: Teacher Quality, CMQQ: Curriculum and Materials Quality and Quantity, IC: Instructional Climate, RSL: Readiness of the Student for Learning, FR: Financial Resources.

First, we analyzed the school-level control variables in the model. The type of school (β=-.18, p >.05) had a significant effect on the average achievement of the school. This means that being educated in vocational high school caused a .18-unit decrease in achievement score. Also, SBS base scores (β=.22, p <.001) had a significant effect on the achievement of schools. According to this, a one-unit increase in the SBS base score of the school caused a .22-unit increase in average school achievement. However, the size of the school, the rate of female students, and the number of students per teacher did not have a significant effect on the

average score of achievement of schools. The error variance decreased to 56.91 by including the school-level variables in the model. This result shows that 8% of variances that affect the average achievement of schools are not among the school-level variables. In other words, if the other variables are constant except school type and SBS achievement score, these variables caused 92% of changes in UPE success scores. Table 4 displays the summary of the status of the hypotheses formulated.

Table 4

Hypotheses acceptance and rejection

Hypotheses	Status
H_1. Teacher quality will directly affect student achievement.	ACCEPTED
H_2. Students' readiness to learn will directly affect student achievement.	ACCEPTED
H_3. The instructional climate will directly affect the teacher quality.	ACCEPTED
H_4. The quality and quantity of curriculum and materials will directly affect the teacher quality.	ACCEPTED
H_5. Financial resources will directly affect the teacher quality.	REJECTED
H_6. Principals' instructional management practices will directly affect instructional climate, the quality and quantity of curriculum and materials, and financial resources.	ACCEPTED
H_7. Principals' instructional management practices will indirectly affect student achievement.	ACCEPTED

Qualifications of teachers (β =.25, p <.01 for Hypothesis 1) and readiness of students (β =.28, p <.01 for Hypothesis 2) had a small, positive, and direct effect on student achievement. The variables of instructional climate (β =.78, p <.01 for Hypothesis 3) and quality and quantity of curriculum and materials (β =.29, p <.01 for Hypothesis 4) had a positive direct effect on qualifications of teachers. On the other hand, Hypothesis 5, which proposed positive relationships between across-school variation in qualifications of teachers and financial resources was not supported by the results (p >.05). However, the results showed that a one-unit increase in financial resources would predict a .27-unit increase in curriculum and materials quality and quantity (p <.01).

Principals with a better implementation of instructional management had a strong, positive, and direct effect on instructional climate (β =.77), curriculum and materials quality and quantity (β =.70), and financial resources (β =.60 for Hypothesis 6). Additionally, the results revealed that principals with a better implementation of instructional management affected student achievement indirectly via instructional capacity (β =.15, p <.01 for Hypothesis 7).

Results and Discussion

This study sought to examine the effect of several subscales of schools' instructional capacities on students' achievement gains. The results show that students in general high schools have higher scores than their peers in vocational high schools. This difference can be justified via school type differences, as the school-level variables have a more substantial impact on student success compared to the variances of the student level. This finding indicates that instructional capacity factors play crucial roles in student academic achievement. This may have resulted from the fact that students in general high schools are placed in secondary schools based on exam scores. Students in Turkey are required to take a placement exam to enroll in more successful secondary schools. Therefore, this leads to

inequalities in terms of access to educational services (Kondakci et al., 2016; Oldac & Kondakci, 2019). PISA and TIMSS scores also corroborated this finding (Shin et al., 2013; Yıldırım, 2012). However, there is a small percentage of resilient students who have succeeded against the odds in schools (OECD, 2018). School type is also a key factor in student achievement in other countries, such as Korea, Mexico, and the USA (Shin et al., 2013). Turkish students performed better in many school types in PISA 2018, but differences among schools still exist. For example, those studying in Anatolian high schools perform better than those in vocational and technical Anatolian high schools (MEB, 2019; Suna et al., 2020). There is evidence in the literature to support these findings (e.g., Cansız et al., 2019).

The present findings indicate that an increase in the national exam (SBS) score of the school has a positive and medium-level effect on student achievement. According to this finding, an increase in students' readiness to learn enhances students' success scores. Sarıer (2016) obtained similar results, finding that the most vital factors that affect students' academic achievement are the perception of self-efficacy and student motivation. Therefore, we propose that the most critical factors on achievement are the features of the students (SBS baseline scores, the readiness of the student to learn). Another finding of this study shows that teacher quality plays a significant role in student achievement. This result confirms that teacher quality is essential for student achievement (Ferguson, 1991a, 1991b; Ferguson & Ladd, 1996; Hanushek, 2011; Rivers & Sanders, 2002; Rowan et al., 1997; Strauss & Sawyer, 1986; Yeh, 2009). Teachers interact directly with the student. They are aware of the responsibility to improve students' achievement. They have the potential to meet their interests and needs. Additionally, previous research claims that policy-makers should know that teachers are key actors affecting the quality of the school and should invest primarily in teachers' professional development (Bogler & Somech, 2004; Moir & Gless, 2001; Owings et. al., 2012; Plecki, 2000). Therefore, it can be noted that improvements only in such issues as decreasing the number of classrooms, size of schools, number of students per teacher, and heterogeneity of schools are inadequate. In this context, teachers are essential for determining the quality of the school and must be supported in terms of professional development. Further, school leaders must pay utmost attention to teacher empowerment and teacher leadership in school organizations. This study showed that students' readiness to learn has a small, positive, and direct effect on student achievement. Similarly, Massell (1998a, 1998b) draws attention to students' motivation and readiness to learn as variables at the classroom level that affect the instructional capacity of schools. A possible explanation for this is that individual characteristics of students, family background, students' intelligence, and social characteristics affect the students' readiness to learn (Boissiere, 2004).

The instructional climate and the quality and quantity of curriculum and materials had a positive direct effect on the qualifications of teachers. The presence of quality curriculum and materials in school can urge teachers to improve their professional knowledge and skills. These may include animation, simulation, and other software and teaching materials and ease of access to these materials. The number and variety of these teaching materials on local and foreign websites are increasing day by day. These teaching materials may also have contributed to updating teachers' curriculum, performing assessments and evaluations, and increasing field knowledge (Atar, 2014).This finding is consistent with previous research (Barth, 2006; Bloom & Vitcov, 2010; Conzemius & O'Neill, 2001; Jones et al., 2008). Teacher collaboration, learning together, colleagues' classroom visits, and communication increase the quality of the teachers, as do the implementations of the school principal. Having strong relationships among teachers in school has a positive effect on the point of view of teachers in their schools.

In this study, there were no significant relationships between across-school variations in the qualifications of teachers and financial resources. However, the results showed that financial resources increased the quality and quantity of curriculum and materials. This result accords with the findings of previous studies, which have shown that the budget allocated to education did not have a direct effect on education outcomes (Gurria, 2016; Hanushek et al., 1998; Hanushek, 2003; McKinsey & McKinsey, 2007). Recent studies on teacher quality show that qualified teachers choose schools with high SES (Boyd et al., 2005; Buddin & Zamarro, 2009; Hanushek & Rivkin, 2006). In addition, the financial resources that these schools provided to teachers are important in revealing teachers' abilities. Considering also that teacher salaries are low in Turkey, it is difficult for teachers to participate in training, activities, and studies that improve their qualifications by their own means. This situation shows that in developing countries like Turkey, financial resources allocated to education are mainly used for material needs rather than improving the quality of education and teachers. Moreover, we think that in the Turkish educational system, there is a strict curriculum for schools, no performance evaluation system for teachers, and a limited variety of course materials, and these factors may have influenced this result.

Furthermore, according to the results of the research, it is evident that instructional implementations of a school's administration affect instructional climate, quality and quantity of curriculum and materials, and financial resources. These results are supported by findings of the meta-analysis performed by Witziers et al. (2003), which investigated the effect of educational leadership on student achievement. The results show that educational leaders working at the elementary school level affect students' achievement, but there is no relationship between educational leadership and achievement at the high school level.

According to another result of the research, implementations of instructional management had an indirect effect on students' achievement through the mediation of instructional climate and the quality of the teachers. This finding is consistent with the results of empirical studies that examine the indirect impact of the principal (Hallinger & Heck, 1998; Ozdemir, 2019).

Previous studies examining the indirect effects of school leadership on achievement used mission of school, vision and aims of education, motivation, teachers' classroom implementations, instructional organizations, culture, and participation of students as mediators (Hallinger et al., 1996; Hallinger & Heck, 1998; Krüger et al., 2007; Leithwood & Levin, 2005; Pounder et al., 1995). Potentially, these variables may also moderate the relationship between leader behaviors and conditions in the school as well as the relationship between leader and student achievement.

Finally, the results reveal that among all of the variables in this research, the SBS baseline score of a school has the most potent effect on the average achievement of the school. The effect of the other variables is at a low level or absent. Considering that the study was conducted using a survey model, the results reflect the present situation, not the cases that are supposed to be. In this context, future educational reforms should be planned by thoroughly analyzing the reasons for the current situation for reaching the desired level by both the schools and participants.

Limitations and Recommendation for Future Research

The present study used cross-sectional data. Concerning this limitation of the research, we suggest that different research should be planned and performed longitudinally to examine the development of schools' instructional capacity using data lasting more than one year. This study aimed to determine the direct and indirect effects of instructional capacity components of high schools on student achievement. New research can be conducted analyzing different variables at student, class, and school levels with instructional capacity.

In this study, the direct effect of the instructional climate variable of instructional capacity was the strongest predictor of teachers quality. Qualitative research that investigates the perceptions of school stakeholders can be conducted to determine the reasons for these results. Also, qualitative studies can be conducted to examine the demographic variables that reveal significantly different opinions on instructional capacity and its components, according to school type.

Implications

This study focused on school-level factors that were shown to be effective on the between-school variation of learning outcomes in Turkey, and it provided necessary implications. However, excellent research potential lies in examining the within-school variation of student achievement. Further studies should consider including other variables that may potentially explain within-school variation in learning outcomes. This study provides data related to the direct or indirect effects of dimensions of instructional management implementations, which include teacher quality, quality and quantity of curriculum and materials, instructional climate, the readiness of students to learn, and financial resources, on students' achievement. We recommend that policymakers and practitioners to focus on these variables.

Instructional implementations of school administrators have an essential effect on school climate and teacher quality and are also essential for increasing achievement. School administrators and teachers should present useful instructional leadership attitudes and develop implementations to turn their schools into learning organizations in order to have a positive effect on students' achievement. School administrators should provide personnel support to students and teachers for creating a confidential climate. Educational administrators should perform implementations that provide professional development to increase the quality of teaching and the instructional climate in schools.

Disclosure statement

No potential conflict of interest was reported by the authors.

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APPENDIX 1.
Instructional Capacity Scale

ITEMS	Degrees of Agreement				
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Implementation of instructional management					
1. School management sets instructional goals with us to increase student achievement.	①	②	③	④	⑤
2. School management conducts professional development studies for teachers according to the instructional needs of our school.	①	②	③	④	⑤
3. School management obtains information about teachers' knowledge, skills and competence.	①	②	③	④	⑤
4. School management monitors teachers' instructional practices in the classroom.	①	②	③	④	⑤
5. School management implements practices to raise expectations of families about academic achievement levels of students.	①	②	③	④	⑤
6. School management creates high expectations for success in students.	①	②	③	④	⑤
7. School management brings good examples of other schools related to academic studies to the school.	①	②	③	④	⑤
8. The school administration ensures that the education and instruction areas in the school are ready for use every day.	①	②	③	④	⑤
9. School management prepares areas for the students to study.	①	②	③	④	⑤
10. School management provides feedback related the lessons by meeting with the teachers.	①	②	③	④	⑤
11. School management monitors the academic development of students.	①	②	③	④	⑤
12. School management takes precautions against situations (discipline problems, noise, etc.) that will disrupt the instruction time in the school.	①	②	③	④	⑤
Qualifications of the teachers					
13. The teachers in this school respond to student questions about the subjects taught in the lessons.	①	②	③	④	⑤
14. Teachers at this school use instructional strategies that enable students to build their own knowledge.	①	②	③	④	⑤
15. Teachers in this school use strategies to cope with unwanted student behavior.	①	②	③	④	⑤
16. Teachers in this school arrive in class prepared for the lesson.	①	②	③	④	⑤
17. Teachers in this school participate in studies aimed at ensuring their professional development (in-service training, graduate, etc.).	①	②	③	④	⑤
18. The teachers in this school run the instructional activities at the speed they are planning.	①	②	③	④	⑤
19. Teachers at this school constitute a positive role model for their students.	①	②	③	④	⑤
20. Teachers in this school have up-to-date legislation regarding their duties and responsibilities.	①	②	③	④	⑤
Curriculum and materials quality and quantity					
21. There are materials for instructional activities that are to be carried out in this school.	①	②	③	④	⑤
22. This school has a curriculum that facilitates learning.	①	②	③	④	⑤
23. All the furnishing materials in this classroom are suitable for the age of students.	①	②	③	④	⑤
24. In this school the curriculum is adapted to the student's level.	①	②	③	④	⑤
25. In this school the technological infrastructure provides opportunities for technological applications in education.	①	②	③	④	⑤
Instructional climate					
26. Relations in this school are based on mutual respect and trust.	①	②	③	④	⑤
27. In this school, all staff take joint responsibility for student learning.	①	②	③	④	⑤

28. In this school, teachers are eager to develop instruction together.	①	②	③	④	⑤
29. In this school, teachers organize extracurricular activities for instructional purposes.	①	②	③	④	⑤
30. In this school, teachers share their teaching experiences with each other.	①	②	③	④	⑤
31. In this school, teachers cooperate to carry out effective teaching.	①	②	③	④	⑤
Students' readiness to learn					
32. In this school, students are concerned with lessons.	①	②	③	④	⑤
33. In this school, students have a willingness to take their own learning responsibilities according to their age.	①	②	③	④	⑤
34. In this school, students are eager to complete their previous learning deficiencies.	①	②	③	④	⑤
35. In this school, students do extra study to keep their grades high.	①	②	③	④	⑤
36. In this school, students have the prerequisite knowledge and skills to perform learning.	①	②	③	④	⑤
37. In this school, students have their basic needs (health, nutrition, sleep, etc.) for learning met.	①	②	③	④	⑤
Financial resources					
38. In this school, teachers can obtain financial support for the instructional activities they want to perform.	①	②	③	④	⑤
39. This school has financial resources that can operate staff when needed.	①	②	③	④	⑤
40. In this school, financial support is provided for teachers to undertake professional development studies.	①	②	③	④	⑤
41. There are financial resources in this school that can fulfill the desired instructional innovations.	①	②	③	④	⑤
42. In this school, teachers can access financial resources to enrich their instructional practices.	①	②	③	④	⑤
43. The parent-teacher association provides financial support in this school.	①	②	③	④	⑤