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The Relationship between Universal Non-Classroom Variables of Student Achievement and the Multiple Measurement Rating System for Minnesota Public High Schools: An Analysis of Systems Accountability

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**The Relationship between Universal Non-Classroom Variables of Student
Achievement and the Minnesota Multiple Measurement Rating for Minnesota
Public High Schools: An Analysis of System Accountability in Minnesota.**

BY

Paul M. Henn

A Dissertation

In Partial Fulfillment of the

Requirements for the Degree of Doctor of Education,

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ABSTRACT

Current accountability trends in education require targeted strategic action planning (SAP) and school improvement planning (SIP). Data collected on student outcomes effectively informing SAP and SIP planning requires an understanding of relationships between internal classroom variables and external non-classroom variables of achievement. Minnesota's multiple measurement rating (MMR) is a universal student outcome measurement used as the dependent variable that correlations from universal non-classroom factors of achievement can be based upon and will be the student outcome measurement for the current research. This study will examine the influence that five universal non-classroom factors of achievement have on student outcomes in Minnesota high schools. The two stage study, using simple correlations, regressions and repeated measures found a relationship between five universal non-classroom variables on MMR composites scores. The results found establish a format and measurement relevant for school leadership, educational consultants, and lawmakers to establish priorities based on the current reality of schools, effectively prioritizing planning based on actual need versus assumption. Scholar's future research focused on greater understanding of classroom and non-classroom factors of student achievement on student outcomes potentially deepens the understanding of the continuous improvement and strategic action planning process delivering meaningful, prioritized, and usable results.

Keywords: Minnesota Multiple Measurement Rating (MMR), free and reduced lunch, per-pupil expenditure, Q-Comp, school leadership, school enrollment, systems accountability

DEDICATION

This dissertation and research is dedicated to all of the committed educational professionals across the country. The complex system of education today has become difficult to navigate, but what you do every day is critical. Your learners, communities, and organizations count on you. You make a difference every day, and we are fortunate to do what we do every single day. Continue to promote learning, equity, and the value of critical thought to all learners we have the privilege to serve in our communities.

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CHAPTER ONE: INTRODUCTION

Introduction

The leadership challenges that schools currently face vastly differ from those encountered decades ago. Programs intended to increase professional development, strengthen evaluation standards, and retain quality teachers are prevalent in Minnesota's educational landscape (State of Minnesota, 2009). The goal of mandated initiatives is to have a highly qualified and trained educational workforce that supports improved educational achievements. As a result, leadership faces the challenge of establishing focused and data-informed strategic and school improvement planning. The actions need to align with internal and external mandates and must provide equitable opportunities for all learners.

In the age of educational accountability, an awareness of the factors that influence student achievement is an essential component for strategic action planning and professional development, as well as for informing the school improvement process. Student achievement is complex, with no single internal or external variable causing individual growth and success. Factors distinguishing over-performing and under-performing schools result from multiple internal classroom variables and external non-classroom variables that affect student outcomes. Researchers' definitions of student outcomes—i.e., regarding proficiency and growth and what constitutes positive and negative gains—greatly differ.

This study will focus on the non-classroom factors of student achievement and their relationship to the Minnesota Multiple Measurements Rating (MMR) in southwest metropolitan Minnesota high schools. The implementation of Quality Compensation (Q-Comp), i.e. Minnesota's pay for performance program (P4P) implementation, was a means to improve

student outcomes through monetary incentives and to provide an alternative pay system based on merit. The relationship between universal and Minnesota-specific non-classroom factors of student achievement and student outcomes serves as the framework for the research. The introduction to the current research study explains the importance of the research for the field, addresses universal non-classroom factors of achievement, and illustrates the universal non-classroom factors of student achievement within Minnesota high schools. This chapter also describes the significance of the problem relative to strategic action planning and school improvement, and it provides an overview of the methodology used to collect, analyze, and synthesize relevant data and results.

In contrast to existing research related to student achievement, the researcher conducted this study using a scale based on five non-classroom factors of achievement. The achievement variable, MMR scores, accounts for multiple measures that create an overall composite score and establish a rating for Minnesota schools. MMR allows for a global or specific view of student outcomes relative to non-classroom factors of student achievement (Minnesota Department of Education, 2014). Established universal and Minnesota-specific variables include socioeconomic status (SES), per-pupil expenditure, Q-comp enrollment, the years of building leadership, and school enrollment size. MMR composite scores for Minnesota high schools account for four areas: student proficiency, student growth, graduation rate, and achievement gap closure based upon qualifying subgroups. MMR composite scores range from 0 to 100; each category of the composite accounts for 25 possible points toward the overall MMR composite.

Background

According to existing research, classroom variables of achievement such as teacher quality, programming and curriculum, and class size provide insight into classroom influences on

student achievement. However, gaps in the literature exist due to changes in accountability that resulted from the adoption of the No Child Left Behind (NCLB) legislation, and changes to the prioritization of student outcome variables ensued. Non-classroom variables became prevalent in schools' ability to improve student results and close gaps in achievement. Funding streams, leadership, changes in teacher compensation, and changes in tenure structures drive educational improvement agendas. Non-classroom variables established through external mandates alter the landscape of what influence student outcomes. Labeling the performance of schools as over- or under-performing increases the need to prioritize and target improvement and strategic planning due to increased public and legislative scrutiny. Issues connected to non-classroom variables of achievement, and the aim to establish relationships between universal variables linked to MMR composite scores, drive the current research effort. Deeper understandings of relationships between non-classroom variables of achievement and student outcomes influence those in leadership roles and policy-makers. This control enhances the processes of strategic planning, professional development, and priority setting at the legislative and district levels.

NCLB's accountability movement forced research to focus strictly on non-classroom variables of student achievement. Recent research has identified non-classroom variables of achievement as a key predictor of student success (Hampden-Thompson & Johnston, 2006). Existing factors, which districts and organizations prioritize based on the current reality and need, remain as universal and influential in determining school and student success. The professional responsibility to understand the data and make it usable remains key to successful strategic planning, intervention and enrichment programming, and professional development that influences student outcomes. Specific targets in Minnesota include the reduction of gaps in

achievement, increased student proficiencies, and gains in student growth as indicators of the top priorities at the state and district levels (State of Minnesota, 2009).

A variety of case studies, correlational research, and a limited number of causal-comparative studies frame the background data on non-classroom variables of student achievement and are typically focused on individual variables. Research gaps exist when looking at the role multiple-variables play in overall student performance and outcomes. Research gaps create the need for studies that take into account multiple and universal non-classroom variables of achievement. The suggestion for a more equitable view of achievement exists within the research, thus creating a fair apple-to-apple comparison. The comparison focuses on gains in achievement based on schools with similar demographics and geographies (McCoach, Goldstein, Behuniak, Reis, Black, Sullivan, & Rambo, 2010). For the purpose of equity, relevant research applied to particular demographics and geographies has helped districts target priorities and best practices based on results obtained from comparable schools.

Statement of the Problem

The essence of the problem is to determine the extent of the relationship between non-classroom variables of student achievement and student outcomes using a multi-variable approach for analysis. The accurate prediction of student outcomes based upon relationships that exist between student achievement variables and student outcomes creates a difficult task for educational stakeholders. Focusing on single variables related to issues offers a limited snapshot; a multi-variable approach provides deeper insight into how effective planning and program development influence equity among student outcomes. Predictions made regarding student outcomes that are informed by equitable factors provide greater insight into the action planning and school improvement process. The challenging part of these processes exists in

identifying universal non-classroom variables of student achievement, i.e. variables that provide evidence of a connection with student outcomes. Minnesota high schools share specific variables that provide such insight into student results and offer a standard measurement tool, inclusive of a ratings scale that takes into account multiple measures. The various measurements allow for the identification of priorities in areas of critical importance, thus influencing the improvement and strategic action planning processes of comparable schools.

Based on a review of relevant literature, there is evidence of common and universal non-classroom variables of student achievement. The identification of socio-economic status (SES) appears within the literature the most frequently, followed by financial issues, leadership, and school enrollment. The current study will focus on per-pupil expenditures, with Q-comp as an additional monetary variable. Q-comp, which is Minnesota's P4P program, increases per-pupil expenditures due to the ability of districts to direct funds towards additional human capital, which influences student outcomes due to improved teacher quality, teacher resources, and professional development.

Indications of a strong correlation between independent variables and student outcomes, through data analysis, outline a framework for the commitment of monetary and intellectual resource investment targeted for school improvements. Districts' priorities will vary based on their demography and geography. For example, the same research model applied to urban or rural areas highlights differentiations that exist due to diverse circumstances. The same model is applicable to schools based on enrollment counts in addition to demography and geography. An apple-to-apple comparison increases equitability and reduces the variability of the results by establishing common measurements of success in achievement, growth, and the ability to predict outcomes with a substantial degree of accuracy.

Research Question

An investigation of the literature revealed universal non-classroom variables of student achievement common to Minnesota high schools. Based on the review of literature and the necessity to understand the influence non-classroom factors of performance have on student outcomes, the primary research question for the current research is as follows:

What is the relationship between universal non-classroom factors of student achievement and Minnesota MMR scores in Minnesota high schools?

The Minnesota MMR composite includes four components, which are outlined in Table 1. The MMR composite score is used as the student achievement measure for the research due to its commonality among all high schools as an accountability measure and because of its inclusion of multiple measurements.

Table 1: *Minnesota Multiple Measurement Rating*

<u>Category</u>	<u>Explanation</u>	<u>Score Range</u>
Proficiency	Proficiency calculation maintains a weighted percentage of student groups reaching proficiency.	0-25
Growth	Growth domains are calculated using normal curve equivalents (NCE) followed by a z-score using a formula set by MDE.	0-25
Achievement Gap Reduction	Achievement gap reduction domains are calculated using NCE equivalents followed by a z-score using a formula set by MDE.	0-25
Graduation Rate	Graduation rate calculation maintains a weighted percentage of student groups achieving graduation.	0-25

Note. The Minnesota Multiple Measurements Rating explanation is from the Minnesota Department of Education (2014).

MMR scores signify the metric the researcher used as the dependent student achievement variable. The independent variables include five non-classroom variables of achievement that previous research had identified as universal: SES, as measured by free and reduced lunch (FRL) percentages; per-pupil expenditures; Q-comp enrollment; the term of building level school leadership; school enrollment. The inclusion of school enrollment rather than class size, in light of recent research, indicates a significant relationship between enrollment counts and student outcomes. FRL percentage as the socio-economic metric provides a universal measurement for gap grouping by the state of Minnesota.

Significance to the Field

Careful attention to the details driving student achievement creates an effective way to set district priorities associated with professional development, programming and curriculum, resource allocation, and strategic action planning. Education has become a mandated field that is closely scrutinized in regard to the improvement of student outcomes. External forces, including non-classroom variables of achievement, continually influence district, teacher, and student outcomes. The ways that priorities and initiatives are set, based on internal and external variables, continue to serve as important data points for leadership planning and program development and to provide appropriate intervention, enrichment, and growth opportunities.

Minnesota shares a close connection with the influence of non-classroom variables of achievement. With one of the largest cultural and socio-economic achievement gaps in the nation, Minnesota schools continue to look at all aspects, variables, and means to improve student outcomes. Minnesota high schools, in particular, must connect with relevant data that

correlate predictor variables to student outcomes. High school trends nationwide indicate less growth than their elementary and middle school counterparts from grades four through eight (McCoach et al., 2010).

Gaps among students of greater socio-economic disparity in Minnesota have become an educational area of concern. As a relevant area of interest, the closing of such gaps continues to be a priority within all subgroups defined by the Minnesota Department of Education formula for student achievement. The funding formula's per-pupil allocations by the legislature, teacher tenure, and alternative pay programs are emerging trends in education, extending to schools in Minnesota and nationwide. Understanding the trend data and establishing the extent of the relationship between variables and student outcomes allow for an accurate cost-benefit analysis of expenditures, P4P programs, and other factors that influence student outcomes and school performance.

Definitions of Key Terms

In consideration of the varying definitions of terms related to achievement outcomes, it is important to detail how the researcher of the current study defines such terms. Table 2 presents a list of the terms and definitions specific to the current research.

Table 2: *Definitions of Key Terminology*

<u>Key Term</u>	<u>Definition</u>
Minnesota Multiple Measurement Rating (MMR)	The student achievement metric used as the dependent variable. The MMR will include a composite score that encompasses proficiency, growth, gap reduction, and graduation rate.
Quality Compensation	Minnesota's alternative pay for performance (P4P) program.
Student Achievement	Interchangeable with the MMR composite rating score.
Socio-Economic Status	The use of a school's percentage of free and reduced lunch students.
Per-Pupil Expenditures	Those expenses that directly impact the students within the classroom including both human and physical capital as reported to the state of Minnesota by each district.
School Enrollment	The total number of students enrolled in the high schools among the sample. The number of grades within the high school may vary.
Leadership Term	The length of time a building principal has been established at a given high school.
Pay for Performance (P4P)	Any alternative compensation program, such as Q-Comp in Minnesota, that pays based on performance outcomes set by individual states or districts.

Assumptions

Various assumptions for this study are necessary for the understanding and implementation of the current research design. The first of these underlying assumptions pertains to the independent predictor variables, i.e. the five universal non-classroom variables of achievement. For the current study, there is an assumption that each variable applies to each of the high schools included in the sample. The absence of any independent variable creates a need for the modification or redesign of the research model. The variables, applying to the current realities of Minnesota high schools, are critical to the current research design. As an example, if the state legislature eliminated the Q-comp program, an alternative research design with the inclusion or exclusion of P4P programs would need to be considered.

Additionally, MMR composites and components of the composite establish the dependent criterion variable for the research. For the current research, it is assumed that MMR composites will continue to be utilized by the state of Minnesota as the accountability measurement for all schools, including high schools. Significant changes to components of the composites or calculations of the composite likely create the need for a change in the research design. Although other measurements of achievement exist, the MMR composite provides consistency among Minnesota high schools. The assumption of MMR composites as the criterion variable thus becomes an important factor in the research design and analysis.

A final assumption for the current research relates to the data collection. The researcher is assuming the data will remain open and available to the public through the Minnesota Department of Education and that all purchased public data, through third party vendors, will continue to be for sale. The ability to have a study applicable to different demographics and

geographies is reliant upon the availability of public data in this research design. The assumption that the achievement data will remain open and available exists as a component of the current research design.

Limitations

Limitations to the current research include a consideration of predictor and criterion variables of student achievement. Predictor variables have two primary domains within education: direct classroom variables of achievement including but not limited to teacher quality, programming, capital resources, and instructional methodology and indirect non-classroom variables including but not limited to the universal variables within the current research study. Research controlling for all possible classroom and non-classroom variables of achievement creates an unmanageable scope of research—one that includes difficulties in the design and analysis concerning the current reality of educational organizations. Narrowing the scope to universally relevant non-classroom variables of student achievement among high schools in Minnesota presents a broad range of variables based on previous research findings. The inclusion of multiple non-classroom variables allows for a comprehensive view of predictor variables with the understanding that controlling for all possible predictor variables is not feasible within the current research design.

Additionally, the selection of the MMR composite and its components specifically addresses one student achievement measurement common to Minnesota schools. As a result, the analysis of variables related to the MMR performance is generalizable to schools within Minnesota and excludes a broad national perspective. Achievement tests exist in many alternate forms at the state and national levels. For example, applications of the research design to a national test such as the ACT or SAT are likely to produce results generalizable to a larger

population. The study, focusing on high schools within Minnesota, provides a narrow scope for planning and priority setting to a particular population. Modifying the research design's criterion variable changes the generalizability of the research and has an effect on the limitation of the design.

A purposeful geographical sample limits the generalization of the current research studies results. The absence of random sampling reduces the variability for which random samples do not control, especially variation in expenditures and free and reduced lunch percentages that potentially skew results. The practical ability to strategically plan and prioritize the influence of predictor variables is a key outcome of the application of the current research design. Reducing the variability enables organizations of similar geographic and demographic characteristics to develop focused targets within strategic planning and improvement processes. The ability to apply the current design to multiple geographical and demographical samples as well as various grade levels beyond addresses the limitation; however, the current research will be generalizable to the current sample and population.

The current research includes data from five school years. Data collection begins in the 2011-2012 school year and extends through the 2015-2016 school year's student outcomes. Conditional variables within the current snapshot of time for each school within the sample continuously undergo change due to conditions, growth, and mandates. The consistency of change, in regard to the application of the predictor and criterion variables, helps control for conditional variables within the period. The addition or subtraction of years potentially changes the results of the study and thus creates an additional limitation. The inclusion of a sample of 16 schools with five years of achievement data creates enough data points for a valid quantitative research design.

Delimitations

The purpose of the current research is to explore the influence of non-classroom variables of achievement on student outcomes. The selection of this problem guides the researcher's aim to develop effective ways to identify priorities that influence strategic action planning and school improvement processes. The researcher recognizes that a variety of issues exist in the field of education and regards the selection of the current issue as adding to the body of literature, analyses, and discussions on small, targeted areas. The researcher acknowledges that the scope of this study will solely address the current research problem. The inclusion of identified non-classroom achievement variables and MMR as the student outcome variable corresponds with the purpose of the study and the research design. Additionally, the selection of high schools rather than middle and elementary schools creates a delimiting factor to reduce variability within the sample and provides an apples-to-apples analysis for educational organizations.

Participants in the study are limited to high schools in southwest metropolitan Minnesota. The precise geographical nature of the research adds a delimiting factor to the current research study. Generalizability, as a result, will be limited to schools; within the sample for southwest metropolitan Minnesota high schools are high schools that participate in the MMR accountability testing, high schools with composite scores for all five years indicated within the research, and educational conditions that exist for secondary schools within Minnesota. The geographical delimitation, in theory, addresses itself through the design of research applicable to varying geographies and demographics.

One additional delimiting factor includes the methodology and theoretical framework of the current research study. The present methodological design seeks to determine the extent to which non-classroom factors of achievement influence student outcomes. The establishment

of cause and effect will not be a part of the present research study since the researcher aims for more of an exploratory view of how variables work in coordination with each other versus in isolation of one another. Theoretically, having a post-positivist framework stages the understanding that nothing proved within the study is with 100% certainty. Within the scope of education, establishing 100% certainty, especially within a cause and effect model, remains elusive within current literature. Although a post-positivist perspective creates a delimiting factor, it serves well in adding depth to the discussion regarding the influence of variables on student outcomes. The selected methodology and theoretical framework are the most effective means for the researcher to achieve the current goals for the research and to sufficiently answer the research question.

CHAPTER 2: REVIEW OF LITERATURE

Review of Literature

The researcher conducted a review of relevant literature on universal non-classroom variables of student achievement, including studies on such variables' influence on student achievement. The review of literature explains the selection process of universal variables, reviewing the relationship that exists between variables and student outcomes. The review of empirical work connecting non-classroom variables of achievement to student outcomes outlines the rationale for the current research study. An understanding of relevant data from prior research studies is imperative to determine how each variable influences student outcomes. The present review identifies the current research metrics for socio-economic status, per-pupil expenditure, the number of years building principal leadership has been in place, pay for performance, and school

enrollment. The current research study identifies the above variables as the five non-classroom variables of student achievement common to Minnesota high schools. Due to existing gaps in research, specifically research focusing on Minnesota schools, some of the reviewed studies and anchor research dates back to the early 2000s. The current research study seeks to bring Minnesota's research, related to the universal non-classroom variables of student achievement, up to date.

Universal non-classroom factors of student achievement

Classroom and non-classroom variables that influence student outcomes vary based on organizational dynamics. When researching each of the five non-classroom variables individually, their effect on student outcomes has produced competing results. The identification of universal variables of achievement is standard practice within current research literature and among studies conducted in the area of student outcomes.

Universal non-classroom variables of achievement are variables that all schools have in common (Hampden-Thompson & Johnston, 2006; Lee, 2014; Sun, 2014). Based on the literature review, the researcher determined that previous studies have identified patterns of variables commonly found outside of the classroom. Current research has not overlooked the influence of direct classroom variables on student achievement. Direct classroom factors of student achievement include class size, teacher quality, and program quality; however, the current study aims to connect the relationship between non-classroom variables of achievement and student outcomes (Hampden & Johnston, 2006).

The non-classroom variables of achievement frequently identified in research studies include socio-economic status, funding measures that include per-pupil expenditures, revenues, and local levy dollars, school enrollment, and the influence of years

of experience in building educational leadership (Hampden & Johnston, 2006; McCoach et al., 2010; Sun, 2014). Although endless possibilities among student outcome variables exist, the above variables, along with Minnesota's alternative pay program Q-Comp, provide valuable data and insight concerning Minnesota's student achievement measurement system: the multiple measurements rating score composite. The framework for the current research reflects multiple studies conducted within the review of literature, including Sun's econometric study (2014) that establishes a baseline for the selection of universal non-classroom variables of achievement. The release of public data in Minnesota occurs annually through the Minnesota Department of Education, but the data fail to extend beyond a surface level view of performance.

In previous research, an impartial view of achievement is commonly present. The matter of contention and the subsequent discussion on universal non-classroom variables of achievement focus on school quality and school improvement. Selecting samples that limit the variability, while being replicable across multiple demographics, ensures an equitable view of student performance by limiting outliers that skew the overall results (McCoach et al., 2010; Sun, 2014). The current research methodology outlines two studies with the first looking at a random sample of 100 Minnesota high schools over one year in order to establish the existence of relationships that may exist between the non-classroom variables of achievement. The second study, applying the existence of any significant statistical relationships found, will use repeated measures and an index applied to a smaller sample to limit outliers. According to McCoach et al. (2010), equity is vital within the sample, as gains in student outcome results and school improvement are deceptive when solely compared to mean scores. McCoach et al. (2010) did not find value-added

models that prove to be a reliable measurement of overall school success. The sections below outline the correlation each independent variable has with student outcomes, relative to the current study.

Socio-economic status. Historically, research has presented socio-economic status as the most significant non-classroom predictor of student success (Hampden-Thompson & Johnston, 2006; Sun 2014). For instance, when analyzing international assessment scores among 20 countries from the Program for International Student Assessment (PISA), Hampden-Thompson and Johnston (2006) found a consistent relationship between socio-economic status and student performance. The results for all 20 countries indicated higher student performance among students of a higher socio-economic status compared to lower socio-economic groups. Hampden-Thompson and Johnston (2006) also determined that small variations occurred within the individual characteristics used to measure socio-economic status between the United States and their foreign counterparts. Moreover, econometric research by Sun (2014) identified socio-economic status as a key universal indicator of lower student performance. Sun's regression model indicated that students who are eligible for a free and reduced lunch encounter a significant negative impact on achievement, with an estimated 0.471% decrease in math achievement at the $p=.001$ significance level. Additional correlational and case study research has confirmed the econometric findings of Sun's model (Morrisey, Hutchinson, & Winsler, 2014; Okapala, Okapala, & Smith, 2001). Measurements of socio-economic status vary among scholarly research; studies have included different variables to describe research methods and goals associated with the research process. Median income, parental employment, median home values, and eligibility for free and reduced lunch are commonly used metrics of socio-

economic status (Harwell & LeBeau, 2010). Free and reduced lunch status is defined in the current research study as students who qualify for free and reduced lunch versus students who do not meet the eligibility requirement. Eligibility income guidelines, set by the United State Department of Agriculture, are communicated annually to the Minnesota Department of Education and establish the local education agency requirement for free and reduced lunch eligibility (Minnesota Department of Education, 2017). As stated by Harwell and LeBeau (2010), a researcher must fully understand the eligibility requirements for free and reduced lunch, as differences may exist in eligibility requirements between sample groups.

The existing cultural achievement gap between students of color and white students and the existing socio-economic achievement gap in Minnesota have led to research that focuses on the influence socio-economic status has on student outcomes. At the state level, Minnesota's achievement gap is consistent with the results found in Hampden-Thompson and Johnston's (2006) PISA study that indicated a gap in achievement among students of higher and lower socio-economic status. It is important to note that various studies have established differences in their measurements of socio-economic status. The state of Minnesota establishes the common free and reduced lunch eligibility requirements, providing consistency among schools in the current research model in defining a measurement of socio-economic status. To date, results have proven inconclusive concerning race, especially African-American students in high poverty schools (Harwell & LeBeau, 2010; Myers, Kim, & Mandala, 2004). Sun's study (2014) showed an inverse relationship between free and reduced lunch percentages and student outcomes in Minnesota, which supported Sun's prior research findings, as well as findings for Minnesota schools (Myers, Kim, & Mandala 2004).

A relationship between socio-economic status and variables within the current study demonstrates the need for an in-depth analysis related to Minnesota high school student outcomes. Findings by Myers, Lindsay, Condon, and Wan (2014) indicated a statistically significant relationship between lower per-pupil expenditures and the availability of financial resources through local levies and revenues among schools with high poverty levels. Additionally, schools of higher poverty levels have experienced greater turnover in leadership and enrollment variation, thus supporting the need for continued research (Myers et al., 2014). Programming deficiencies due to a lack of funding, especially in the areas of early literacy, contribute to lower student outcomes among elementary grade levels. Poor performance in primary grade levels has a strong tendency to carry over to both intermediate and secondary schools (Morrisey et al., 2014).

Per-pupil expenditure. In addition to socio-economic status, the identification of per-pupil expenditures as a universal non-classroom factor of achievement has produced mixed results in terms of its influence on student outcomes, such as when expenditures are presented as isolated variables in research. Research on monetary variables includes data related to revenues and expenditures and their subsequent influence on student outcomes (Sun, 2014). For instance, Sun's (2014) research highlighted a positive correlation between school expenditures and student outcomes; however, Sun (2014) also discovered that the failure to distinguish between different types of per-pupil expenditures creates the possibility that certain expenditures result in dead-ends in performance outcome improvement. The supported view by economists contends that little evidence exists that connects inputs or expenditures to student outcomes (Hanushek, as cited in Myers, 2004). Other research has contradicted the viewpoints of the economists, outlining data that

illustrate per-pupil expenditures as having a slightly positive relationship with student outcomes (O'Connell-Smith, 2004; Sun, 2014). Additionally, Sun (2014) contended that direct classroom expenditures, such as instructional supplies, strengthen the relationship of expenditures on student outcomes. The use of different variables to determine or measure per-pupil expenditures is one explanation for why competing results have emerged.

Notably, O'Connell-Smith (2004) closely examined the relationship between per-pupil expenditures and math and reading scores for students in Minnesota. As a result, an acknowledgment of funding inequities developed, with perceived causes including a cost of living variation based on geography, collective bargaining agreements, and a community tax base (O'Connell-Smith, 2004). An estimated 60% of school financial resource spending goes directly to instructional expenditures that may include classroom resources, staffing, and other expenditures with a direct impact on classroom level learning (O'Connell-Smith, 2004). Average teacher salaries and regular instruction are closely associated with increased math and reading achievement in Minnesota schools, while instructional support services expenditures for principals and superintendents have failed to produce positive results (O'Connell-Smith, 2004). O'Connell-Smith's (2004) finding validates Sun's (2014) suggestion that certain expenditures may produce dead-ends in positive relationships to student achievement outcomes.

Variation in spending, including differences in resource spending, professional development spending, and staffing spending cause differences in per-pupil spending levels. The result leads to per-pupil expenditures that vary from district to district in

Minnesota. The differences in per-pupil expenditures in Minnesota schools affirm the inclusion of per-pupil expenditures within the current research.

Minnesota's alternative pay program: Q-Comp. For decades, salary schedules have established the pay structure commonly applied to K-12 public education. A national survey indicated that nearly 100% of schools employ teachers based on established salary schedules (Podgursky & Springer, 2007). The era of No Child Left Behind (No Child Left Behind, [NCLB], 2002) and its resulting measures of accountability prompted exploration into pay for performance initiatives among states and districts. The basis for payment among pay for performance models establishes criteria that include student outcomes, professional portfolios, administrative evaluation, and self-evaluation as means for compensation (Callier, 2010; Podgursky & Springer, 2007). Federal programs, including the Teacher Incentive Fund and Race to the Top, have accelerated the number of states and districts that have piloted and implemented pay for performance initiatives.

Effective pay for performance initiatives operate under the assumption that a teacher's motivation relates to compensation and extrinsic incentives (Callier, 2010; Podgursky & Springer, 2007). Researched evidence of this hypothesis is inconclusive. Brodsky, DeCeasar, and Kramer-Wine (2010) stated that the success and sustainability of pay for performance programs, in relation to student outcomes, require a high level of teacher involvement in the plan design at the early stages of development. Plans that include merit compensation extending to factors in addition to standardized test scores have had successful outcomes (Brodsky et al., 2010). Minnesota's Q-comp program, created by the state legislature, is an example of a state plan that requires active involvement from teachers and that includes a provision for compensation that extends

beyond standardized test scores (Brodsky et al., 2010; State of Minnesota, 2009). Creating plans in Minnesota is a district decision, and plans vary among districts enrolled in the Q-comp program.

The student achievement impact of pay for performance programs, including Minnesota's Q-comp plan, is largely inconclusive. Q-comp went through the process of a legislative audit in 2009. The legislative auditors' report addressed the need for additional time and a larger sample to determine the program's effectiveness. Results from the audit showed that schools whose participation started at the inception of the program demonstrated the greatest gains, when compared to schools enrolling after 2005. Enrollment time in pay for performance programs serves as a key indicator of program success, in relation to student outcomes (Brodsky et al., 2010; Sojourner, Mykerezi, & West, 2014). Sojourner, Mykerezi, and West (2014) found that the dynamic of effect for schools on the Minnesota Comprehensive Assessment Reading exam increases, on average, 0.023 above each prior year when compared to never-adopting districts at a 95% confidence interval. As Sojourner et al.'s (2014) study showed, math results have been ambiguous and less precise. Additional research, seeking more longitudinal data, is an ongoing process of review for Minnesota's Q-comp initiative. Goals for Q-comp, according to the legislative audit (2009), include incentives improving achievement, productivity, professional knowledge, professional development, and skills related to instruction. Results have indicated slight positive correlations between the length of time enrolled and the specific Q-comp goals in the legislative audit and student outcomes (Choi, 2015; Sojourner et al., 2014). Notably, less than 20% of schools have enrolled in the Minnesota program since its

inception; as such, correlational data for schools re-enrolling versus those that have yet to adopt is difficult to analyze (Choi, 2015).

Years of principal leadership within their school. Similar to socio-economic status, the effect of educational leadership appears significant. Variation in leadership's relationship to student outcomes, however, carries different interpretations among reviewed research. Leadership engages in decision-making processes that determine student outcomes. Examples of leadership's engagement include hiring and retaining teachers, establishing a positive learning climate, providing instructional leadership, and the professional development of staff (Dhuey & Smith, 2014). Scholars have found significant positive results in student outcomes, including the area of achievement gap reduction, due to the effective building of leadership (Dhuey & Smith, 2014). As the demands of school leadership have become more complex, new programs have been established that evaluate leaders' effectiveness regarding school improvement and student outcomes. Minnesota specifically enacted changes in leadership evaluation prior to revising the teacher evaluation statute in 2011 (Dhuey & Smith, 2014; Muenich, 2014). As noted in the research literature on the effect of school leadership, studies on leadership's relationship to student outcomes has been far less extensive than studies on teacher quality (Dhuey & Smith, 2014). Dhuey and Smith (2014) determined that teacher quality research was far more frequent, as teacher quality and building leadership share a direct connection with staff hiring and retention processes. Current research targets this research gap, specifically building leadership terms and student outcomes.

In their meta-analysis on balanced leadership, Marzano, McNulty, and Waters (2003) found a highly significant relationship between leadership and student outcomes,

indicating an average effect size of .25 when expressed as a correlation between leadership and student achievement. Additionally, it is important to note that in the Marzano et al. (2003) study, this relationship could be correlated positively, marginally, or negatively based on the effectiveness of school leadership in all areas of leadership. The establishment of a positive learning climate that affects teacher quality, staffing, and student outcomes requires an investment of time to establish positive changes. In reference to the literature on socio-economic status, some of the issues within high poverty schools stem from frequent turnover in high poverty school leadership. Relationships between leadership and student outcomes are widely considered indirect; different mediating variables influence student outcomes, including the length of a building leader's term (Bruggencate, Luyten, Scheerens, & Slegers, 2012). Typically, school leaders share the responsibility for school improvement planning—the development of which, when directly related to student outcomes, demonstrates a significant positive correlation to student performance. Significant positive correlations frequently occur in schools considered as under-performing, where leadership consistency is established (Huber & Conway 2015). Connections between district strategic planning and the school improvement process require a time investment of three to five years, illustrating the significance of school leadership's time investment.

Due to the principal program evaluation model implemented in 2011, the state of Minnesota is at the forefront of significant research on the relationship between leadership and student outcomes. Minnesota principals share with its teachers the mandatory 35% achievement component of the performance evaluation. Minnesota joins 34 other states nationwide in an initiative to include student outcomes as a component of principal

evaluation (Muenich, 2014). Continued diligence in developing the body of research on the influence of leadership on student outcomes is critical due to the mandated connection of evaluation and student results.

School enrollment. Scholarly research has closely examined school enrollment and class size, as well as their relationship to student achievement. For the current study, school enrollment is defined as the number of students enrolled in a school building. Recent studies have investigated the effect of school enrollment on student achievement, as enrollment numbers affect school staff's ability to develop foundational relationships with students. However, enrollment research contrasts with class size research, as class sizes across all schools can be similar, regardless of school enrollment. As contemporary research has shown, schools with smaller enrollments demonstrate a stronger positive correlation to student achievement when compared to schools with larger enrollments (Cho, Glewwe, & Whitley, 2010; Sun, 2014; Treaster, 1996). Additionally, research in this area has demonstrated a slight positive correlation in achievement in schools with smaller enrollments versus schools with larger enrollments when a metric of student outcomes establishes the dependent variable (Sun, 2014). Student mobility, specifically students who frequently change schools, plays a significant role in achievement outcomes. Districts that experience major shifts in incoming or outgoing students observe a significant change in achievement outcomes related to mobility, enrollment count, and student outcomes (Grigg, 2012).

A key aspect of the literature on school enrollment, where positive relationships with student achievement outcomes exist, is an established climate of close relationships between students and staff within a building. Cotton's (2001) research found school,

family, and community partnerships in smaller school communities demonstrate a direct link to improved student outcomes. Smaller schools within large urban areas such as New York, Denver, and Chicago, have demonstrated a reduction in achievement gaps between minority students and low-income students. Moreover, school climate improvements in larger urban areas have been positively linked to improved student success (Cotton, 2001). Economic efficiency plays a role in a school's ability to reduce enrollment sizes. Evidence illustrating positive correlations between enrollment and student outcome become dependent upon districts' ability to be in an economic position to make such reductions (Alspaugh, 2003; Fowler & Wahlberg, 1991).

Studies establishing a positive correlation between smaller school enrollments and increased student outcomes warrant its inclusion as a non-classroom factor of achievement in the current research study. The limited body of research in Minnesota related to enrollment, as opposed to class size reductions, requires additional focus in order to establish a strong body of literature relative to the influence of enrollment on student outcomes. The current study will concentrate on the high school level.

Discussion

The researcher's discussion covers the relationship that non-classroom factors of student achievement have with the Minnesota multiple measurement composite rating and its components. Qualitative correlational research, using a Pearson and Spearman correlation, multiple regressions, and repeated measures analysis establishes the relationship between variables. Following the discussion on the relationship to the research question, a review of the implication of themes and factors takes place inclusive of the researcher's steps to take when moving forward. The basis of the researcher's proposal

stems from the current review of literature and an analysis of data from similar studies on non-classroom variables of achievement. The researcher's purpose establishes the framework for the methodology and subsequent research conducted within the current study.

Relationship to the research question

The identification of non-classroom factors of student achievement considered unique or universal to Minnesota schools, shared through the review of relevant literature, highlights the influence each variable in isolation has on student outcomes. As identified in Chapter 1, the research question is as follows:

What is the extent of the relationship between non-classroom factors of student achievement and high school Multiple Measurement Rating scores?

The possibility exists that any single independent variable correlates with student performance and student outcomes. The current study does not investigate causation; instead, its focus is on the strength of the relationship between non-classroom variables scaled together in relation to student outcomes. Table 3 reviews data found within the reviewed research connecting non-classroom variables to student outcomes, based on the consideration of the variables isolated from one another in prior scholarly research (Hampden-Thompson & Johnston, 2006; Lee, 2014; Sun, 2014).

Table 3: *Relationship of non-classroom factors of achievement based on the review of literature*

<u>Non-Classroom Factor</u>	<u>Relationship with Student Outcomes</u>
Socio-Economic Status	Significant negative effect on achievement.
Per-Pupil Expenditures	As per-pupil expenditures decrease, there is a slightly negative effect on student achievement.
Q-Comp Enrollment	Most likely to affect student achievement in districts with a longitudinal history of enrollment in the program.
School Leadership Term	Slight positive relationship with student outcomes as years of leadership increase.
School Enrollment	Slight negative effect on student achievement. The negative effect correlates with a larger enrollment size.

Note. Variables identified in research conducted by Hampden-Thompson and Johnston (2006), Lee (2014), and Sun (2014).

Using multiple non-classroom variables of achievement as well as an outcome measurement inclusive of multiple measurements, such as the Minnesota multiple measurement rating, reduces the current study's limitations. Additionally, because Minnesota's multiple measurement rating takes into account four different outcomes, drawing additional correlations between variables strengthens the discussion and validity of the current research.

The motivation behind the researcher's design is the desire to gain a better understanding of how non-classroom variables influence student outcomes. The current study fills a gap in existing research by looking at the variables in combination with one another versus in isolation. The researcher's intent is to closely examine the extent of the relationship of indexed variables over time, thus allowing leadership to clearly prioritize

and analyze initiatives when strategic action planning is based upon their current realities. The result reflects the efforts of professional development and resource utilization to maximize the likelihood of gains in student outcomes and educational advancement.

Implications

Based on the review of relevant literature, significant data exists that demonstrate that multiple non-classroom variables influence student outcomes. The current study provides professionals and stakeholders with a better understanding of how non-classroom variables influence student outcomes as well as how such influences are unique based on demography and geography. The ability to reasonably predict student outcomes drives the capacity to develop focused and targeted strategic planning and school improvement planning, especially when shifts in leadership, funding, and demography occur.

The researcher takes a personal interest in the development of an effective predictor model for student outcomes. Leadership in districts dealing with transitions due to enrollment growth, funding, and demographic shifts require models to effectively meet those challenges. Each challenge involves reprioritizing resource capital and human capital, the cost of which may or may not reinforce the predicted benefit. Due to resource scarcity and competition between schools, a proactive approach toward understanding these factors helps to reduce gaps and effectively target challenges that districts face within the evolving educational dynamic.

Recommendations

After a comprehensive review of relevant literature on the connection between non-classroom factors of student achievement and student outcomes, the researcher seeks to

compile new data that will show the relationship that multiple non-classroom variables have with high school multiple measurement rating composite scores. Minnesota legislators and school districts have made it a priority to improve Minnesota students' quality of education in order to reduce the achievement gaps that exist between students of color and their white counterparts. The researcher expects the results to be generalizable to high schools of similar demographics. The use of schools within a similar geographical regions—e.g., all suburban schools, all growing suburban districts, all urban districts, or all outstate districts—is not intended to generate biased research results. Similar demographics are used to reduce the variability, thus allowing for a comprehensive review of the results, as opposed to a review of the results solely related to the mean. The recommendation of apple-to-apple comparisons is important when identifying factors relating to student outcomes.

Conclusion

Non-classroom factors of achievement must be an area of focused research and must be a factor in day-to-day school operations. A survey of teacher-of-the-year finalists indicated that non-classroom factors carry a high degree of influence on student outcomes and play a role in how teachers structure their classroom management and instruction (Layton, 2015). An in-depth analysis of the extent of this influence aims to fill gaps in the current literature and contribute data unique to Minnesota high schools. In coordination with existing literature, the goal of the current research is to find relationships that schools can reasonably use to predict student outcomes based on non-classroom indicators of achievement. The use of this data will benefit strategic planning and school improvement

planning. It will also create a more efficient way to influence student outcomes through an informed process.

CHAPTER 3: METHODOLOGY

Methodology

The current research investigates the extent of the relationship between multiple non-classroom variables of student achievement and Minnesota Multiple Measurement Rating outcomes in southwest metro Minnesota high schools. For the purpose of the current research, high school is defined as a district's secondary institution, including grades 9-12. The basis of the relationships is correlational coefficients; an investigation of cause and effect associated with each relationship will not be a part of the current research. Variable selection was a result of reviews of current literature obtained from real educational settings for measurement. All data for the research are available to the public, though the data do not include identifiable information that connects districts to individual results.

Research Methodology

The selection of correlational research as the method for the current study best fits the goals and outcome sought in relation to the research question. Correlational data enable the establishment of significant relationships between multiple independent and dependent variables in a way that would not be possible through an experimental research design. The extent of the relationships serves as a precursor for future causal-comparative research that investigates cause and effect where necessary. The aim of this study is to develop a prediction model for educational organizational stakeholders based on non-classroom variables of achievement.

Research Design

In two separate stages, the current study investigates the relationship between the non-classroom variables of student achievement and a measurement of student outcomes specific to Minnesota; the Minnesota Multiple Measurement Rating composite. The development of correlations for the current research will involve two methods that correspond with the research question and research hypothesis. Throughout the research process, the development and the subsequent investigation of secondary research hypothesis will occur as needed, based on the collection and analysis of relevant data. The first stage of the research study investigates the strength of the relationship using a Pearson correlation between non-classroom factors of student achievement and the Minnesota Multiple Measurement rating composite with a random sample size of 100 (N=100) high schools across Minnesota to determine if a significant relationship exists. The second stage, based upon results from stage one will use a modified 10-point Likert scale index score based on predictor variables, using a repeated measures regression analysis, to closely examine the relationship between the scale scores and student outcomes for schools within a common geographical region (N=16)-- i.e., outcomes defined as Multiple Measurement Rating composite scores. Five years of data will be collected for the second stage spanning from the 2011-2012 school year through the 2015-2016 school year. The repeated measures in stage two will also be used to determine if the changes within the index correlate with changes across time in the Minnesota Multiple Measurement Rating. The selection of a Spearman model correlation in addition to a Pearson model for the simple correlation accounts for the rank order nature of the independent variables within the index. The validation of the index, and the rank order of

non-classroom variables, stem from previous studies reference to the effect size of the universal non-classroom variables of achievement. To address additional threats to the validity of the index, if necessary, an assessment using pilot surveys of building leadership reinforces or modifies the rank order of each variable of the scale.

The research design allows two discussions to take place because of the correlational data created. First, stage one allows discussion on the strength of the relationship between the variables, adding depth to the prioritization conversation as it relates to the influences of independent variables on student outcomes and the dependent variable at the state and local level. The second stage of the design accounts for the variability within different geographies and demographics by reducing the variability that exists when looking at heterogeneous populations and samples. The second discussion, because of the design, accounts for the nature of the relationship. The reality of the influences within the educational arena plays a major role in the analysis phase of the research. The current research design, focusing on the strength of the relationship, as well as the nature of the relationship, is necessary from the standpoint of understanding non-classroom variables' influence on student outcomes and the appropriate prioritization for school improvement and strategic action planning.

Dependent variables. The research design for this study uses MMR composite scores as well as components of the MMR composite as the dependent variables. For high schools, elements of the MMR composite include four areas: student proficiency, student growth, achievement gap reduction, and graduation rates. The current research design, which involves a prediction model, regards the measurement of student outcomes as the criterion variable for the study. MMR scores as the criterion variable provide a shared and

equitable measurement of student outcomes used by Minnesota high schools and account for multiple outcome variables within the composite. The multi-variable perspective reduces some of the limitations and considers that the definition of student outcomes varies within the reviewed literature.

Changes in the calculations of the MMR composite and components of the composite have occurred within the longitudinal data analyzed for the study. Addressing this fact takes place within the limitations; however, the application of a calculation change is consistent among every school within the study. The MMR composite, as the dependent criterion variable, assigns each domain 25 points. The current research design that is applicable to high schools has four domains totaling 100 points. The total MMR becomes a 0-100 percentage for all schools rated in Minnesota (Minnesota Department of Education, 2014). The MMR calculation divides the number of points earned by the total number of points possible to generate a school's percentage.

Proficiency domain. Proficiency domains of the MMR earn points based on student groups' annual meeting of established targets annually by the Minnesota Department of Education. The weighting for the student groups takes into account the group size and requires a minimum of 20 to 40 students to qualify in the proficiency rating. The proficiency target is the 50% reduction of the achievement gap by the end of 2017 (Minnesota Department of Education, 2014).

Growth domain. The growth domain of the MMR represents the number of students within a school exceeding the predicted growth. School growth, according to the Minnesota Department of Education (2014), becomes an average of scores, with positive growth scores indicating improvement of the rating. Growth scores account for a student's

last assessment result and a student's current assessment being above or below the predicted growth. The average scores for reading and math create one school growth score average; z-score calculations turn into normal curve equivalents (NCEs) and are divisible by four to calculate the total points within the domain (Minnesota Department of Education, 2014).

Achievement gap reduction. The achievement gap reduction domain of the MMR examines the average growth scores of the seven Annual Yearly Progress (AYP) groups defined by No Child Left Behind legislation. The groups include student growth scores for Native Americans, Asians, Hispanics, African Americans, free and reduced lunch students, special education students, and English language learners (ELL). Depending on the year, groups required a minimum of 20 or 40 students to qualify as a sub-group within the calculation. Different from growth calculations, a negative score within the gap reduction domain indicates success within the domain calculation (Minnesota Department of Education, 2014). The use of NCEs, in the same manner as the calculation of growth scores, assigns points for the gap reduction domain.

Graduation rate. According to the MDE (2014), the graduation rate domain uses student groups to measure and determine adequate graduation rates or adequate improvement from year to year. Points within this domain establish which student groups are meeting graduation rate targets or demonstrate improvement from the prior year. MDE indicates graduation rate targets for all students and each student sub-group as 90%. Consistent with other domains, student groups, depending on the year, require a minimum of 20 or 40 students to be included in the domain score (Minnesota Department of Education, 2014).

Independent variables. Independent variables for the study include the selection of five non-classroom variables of student achievement. The definition of the variables as universal, factors common to all schools, serves as a key component in the selection of the predictor variables for the research. As mentioned in previous literature, selected predictors serve as independent variables, indicating different influences on student outcomes when measured in isolation. The five non-classroom variables for the current research include free and reduced lunch percentages, per-pupil expenditures, Q-comp enrollment status, the length of a building leadership term, and school enrollments. Note that stage one includes all variables except leadership term, which is added to the scale in stage two of the current research study. Each variable contains a specific metric used for measurement and a rationale for metric selection for the current research. Stage one of the research will use Multiple Measurement Rating data from the 2016 school year. The independent variables build the framework for the scale score in stage two of the study using a modified Likert scale. Table 4 defines the index score for each variable used in the Spearman correlation, which examines the variables together as opposed to in isolation as they relate to student outcomes. The index scores individually measure five school years beginning with the 2011-2012 school year and ending with the 2015-2016 school year.

Table 4: *Index scoring scale for independent variables in stage 2*

<u>Independent Variable</u>	<u>Criteria</u>	<u>Scale Score</u>
Free and Reduced Lunch %		0-5
Per-Pupil Expenditures		0-2
Q-Comp Enrollment		0-1
Building Leadership Term		0-1
School Enrollment		0-1
Total Scale Score		0-10

Free and reduced lunch percentage. Free and reduced lunch percentages provide a common metric of SES among the schools within the sample. The selection of southwest metro high schools geographically aims to reduce high variability and distorts the overall outcomes of the research. Though multiple measurements of SES exist, free and reduced lunch percentages serve as a common, accessible, and reliable metric that previous studies applied as an individual predictor variable of student outcomes with a high effect size. The effect size is accounted for within the scale; free and reduced lunch percentage accounts for the possible points within the scale.

Per-pupil expenditure. Per-pupil expenditure joins Q-comp as a monetary component common to Minnesota schools. As indicated in the literature review chapter, expenditures, especially those directly related to students and classrooms, demonstrate an influence on student outcomes. Variable inclusion aims to define the degree to which, in coordination with other variables, expenditures influence student outcomes. For the current research, expenditures will have a broad focus and include all per-pupil expenditures factored into MDE's regular instructional expenditures.

Q-comp enrollment. The influence pay-for-performance programs nationwide have on student outcomes drives the inclusion of Q-comp as an independent variable in the current research study. Q-comp represents Minnesota schools' version of a P4P initiative, and results thus far have been inconclusive as a single measure of student outcomes. Because Q-comp dollars indirectly relate to per-pupil expenditures, enrollment and the addition of Q-comp dollars from a pupil expenditure perspective merit additional research. Schools have a choice in enrollment; enrollment in the Q-comp's alternative pay program in

Minnesota is not a requirement. The sample group contains participating and nonparticipating districts for all enrollment sizes within the sample.

Building leadership term. As established by the review of the literature, leadership is not only universal to schools but also unquestionably a factor in student outcomes. Leadership, through a variety of assignments, drives the mission and vision of their buildings. Hiring, retention, professional development, and evaluation are leadership influences on student outcomes. With three to five years required to institute change, the term of leadership from a consistency standpoint becomes a critical component of student success. The strength of the relationship, based on reviews of relevant literature, indicates it has slightly less influence on outcomes when compared to free and reduced lunch percentages and financial expenditures when compared in isolation.

School enrollment. School enrollment and class size are two measures, as indicated in the literature review, that influence student outcomes. Class size effect, according to the literature, decreases in schools of smaller enrollment. Schools with the larger student population, regardless of average class size, observe a slightly negative correlation to student outcome measurements. Enrollment size assists in bringing the relational aspects of staff and students into play when looking at student outcomes. The scale indicates its lower impact when compared individually to other variables within the study.

Research hypothesis and the null hypothesis

The current research will focus on an operational hypothesis and null hypothesis, driven by the Pearson correlation, the scale score, and the Spearman correlation. The formation of a secondary hypothesis, considering the geographical element of the research and the multiple linear regression of variables, is investigated and discussed through the

data collection and analysis components of the research. The operational research hypothesis for stage one of the current research will be as follows:

A significant relationship exists between the Minnesota Multiple Measurement Rating composite scores and the four non-classroom factors of student achievement in Minnesota high schools.

The accompanying null hypothesis for stage one of the research is as follows:

No significant relationship exists between the Minnesota Multiple Measurement Rating composite scores and the four non-classroom factors of student achievement in Minnesota high schools.

The operational research hypothesis for stage two will be as follows:

A positive correlation exists between the MMR composite score and the higher scale score based on the five non-classroom factors of student achievement in southwest metro high schools.

The accompanying null hypothesis for stage two of the research is as follows:

A negative or no correlation exists between the MMR composite score and the scale score based on the five non-classroom factors of student achievement in southwest metro high schools.

The additional regression allows the additional secondary hypothesis to form relative to the composite MMR and the four components of the MMR composite. The following are examples of an additional secondary hypothesis that result from the current research:

Higher free and reduced lunch percentages have a strong negative correlation to MMR proficiencies and MMR growth in southwest metro schools.

Example secondary null hypothesis:

A positive or no correlation exists between MMR growth and free and reduced lunch percentages in southwest metro high schools.

Additional secondary hypothesis examples form and are investigated as result of the data collected through all regressions. The researcher understands the likelihood of an additional inquiry based on data collected through the Spearman correlation and the linear regression.

Selection of Subjects

The sample selected for stage one includes of the research study of 100 randomly selected high schools and stage two of the current research includes 16 Minnesota high schools. The research focuses on specific geographical regions to reduce variability that skews data and thus may provide less specific information in the strategic and improvement processes. As a goal of the development of an index, and the research study itself, is to produce a predictor model for student outcomes that is usable for strategic planning and school improvement planning, it is important to have a homogenous sample for an apples-to-apples comparison. The research model intends to be repeatable among varying geographies and demographics, while producing results that are consistent and generalizable among schools of similar characteristics.

Population. The population for the current research is Minnesota public high schools; all public high schools measured through Minnesota Multiple Measurement score composites statewide. The population would include all public high schools; however, it does not include private high school and charter school data. Private schools and charter schools are excluded from the population, as they do not receive Minnesota Multiple Measurement scores based on statewide accountability tests, which are not a requirement

for private high schools. Charter schools are excluded from the population on the basis that the goal of the research is to provide apples-to-apples comparisons based on available data. Additionally, a population of middle and elementary schools could apply the same research design using a common measurement of student outcomes such as Multiple Measurement composites and components specific to grade levels.

Sample. The initial sample for stage one will include 100 Minnesota high schools in order to establish valid correlations using a regression for the independent and dependent variables. The sample for stage two includes 16 southwest metro suburban high schools. Geographically, the sample for stage two includes all schools within Carver and Scott counties as well as a small number of schools within Hennepin County. The per capita median incomes within the counties are similar, and some schools, especially those with smaller enrollments, are located in the rural/suburban outer ring of the metro area. School enrollments will vary from small to large and will be classified in groupings as small schools, intermediate schools, and large schools. Each grouping will include a minimum of four schools, and five years of public, non-identifiable student and demographical data collection is included in the sample. Table 5 will indicate how the schools separate themselves by size, based upon school enrollments. School coding takes place in the analysis to maintain confidentiality in data reporting; however, all information is available to the public.

Table 5: *School enrollment groupings in stage 2*

<u>Small Schools</u>	<u>Intermediate Schools</u>	<u>Large Schools</u>
Central Schools (Norwood-Young America)	Waconia	Eden Prairie
Belle Plaine	Delano	Wayzata
Jordan	Orono	Shakopee
Watertown-Mayer	New Prague	Prior Lake
	Mound-Westonka	Minnetonka
	Eastern Carver County (Chaska & Chanhassen H.S.)	

Note. Schools grouping criteria is based on the mean high school enrollment statewide as of 2016.

Instrumentation Plan

This study requires the use of public data for analysis purposes. Data were accessible from two main sources for the current research and data retrieval took place prior to running the Spearman correlation and the multiple linear regression. Data published and open sourced to the public by the MDE comprised the first of the two sources. MDE data provide the necessary dependent variable data used to measure student outcomes as well as independent variable data on school enrollments, Q-comp enrollments, and free and reduced lunch percentages. For the consistency of data, MDE databases define the source of valid and reliable measurements for student outcomes, school enrollments, Q-comp enrollments, and free and reduced lunch percentages, and regular instruction expenditure percentages for each school within the sample. Leadership term data are collected through school websites and the human resource departments of schools within the sample.

Data collection and recording. Source consistency will be a critical component for the collection of valid and reliable data for the current research study. No additional

databases other than those listed will be used to maintain the consistent and accurate quantitative collection of data as it relates to dependent and independent variables for the current research. Data pulls from the selected databases assist the researcher in the collection and ethical reflection of the school data within the sample. All data pulled will be sorted within the researcher's Excel document prior to the uploading of the data into SPSS and R analysis software. After the research is completed, and in accordance with IRB policy, the researcher will remove all personal records and spreadsheets from his files. It should be noted that by obtaining data from public sources, the possibility of decoding the data for each school still exists. However, no risk exists for individual subjects, as data on individuals are not included in the study.

The collection of data also formulates the index score assigned for each independent variable within the study for each year of longitudinal data used. The collection of data reflects student outcome data from the 2011-2012 school year through the 2015-2016 school year. Due to the rank order of the independent variable index score data, using a modified Likert scale, each year will be recorded in a separate column of the file. Index scores for each year compute an overall index score used in the final analysis. The annual index score will be reflected in the data recordings, as will the cumulative five-year index score for each of the 16 schools within the sample.

Data analysis. The analysis of data for the research study will occur in two phases, allowing analysis of the influence each independent variable has on MMR composites based upon the rank order nature of the variables in the design and allowing each independent variable's influence to be measured for strength with all components of the composite. Stage one uses a Pearson correlation to determine the relationship of non-classroom

variables of achievement and Minnesota Multiple Measurement composite scores. The index scores derived from the data in stage two used a Spearman and Pearson correlation and a repeated measures analysis to determine the effect of the variables' scale scores on MMR composite scores. The relationship will be determined through the Spearman correlation in a monotonic relationship versus the linear correlational relationship provided by a Pearson correlation. For both stages of the study, the correlational coefficient strength is indicated by r 's, ranging from 0 to +1.00. An r 's of .70 or higher indicates a high correlation, and an r 's less than .30 indicate a low correlation between the scale scores and the criterion variable. The intent of the Pearson and the Spearman correlational analysis is the creation of a strong predictor model that applies scales of multiple independent variables to the criterion dependent variable, student outcomes, indicated by MMR composites. The running of all data and calculations takes place using SPSS and R analytical software.

Both stages of the data analysis included the use of multiple regressions to determine a correlation between the dependent criterion variables and the combination of independent predictor variables. In stage two of the research, repeated measures will be used to analyze the relationship between variables over time. A regression analysis is critical for setting priorities based on the analysis of the data for strategic action planning and school improvement. The regression step meets one goal of the current research in coordination with the simple correlations provided by the Pearson correlation analysis and the Spearman analysis of the index. Regressions are run using MMR composites as well as individual components of the MMR composite: proficiency, growth, achievement gap reduction, and graduation rates. The coefficient of multiple correlations signified by r

indicates the strength between the predictor and criterion variables, ranging from 0 to +1.00. An r of .70 or higher is considered a strong correlation, and an R less than .30 is considered a low correlation. Coefficients of determination within the regression, signified by r^2 , indicate variability percentages within the regression model. A higher r^2 indicates more of the variability accounts for itself within the current research. The percentage of variability determined improves the strategic planning and school improvement planning processes that result from research conducted using the current research design. It also highlights the effect size of the universal variables selected following the review of the literature. SPSS and R analytics run the regression, delivering the data reported in Chapter 4.

Using analyzed data accomplishes two main goals for the research study. First, using the index of multiple variables allows for a prediction model anchored by non-classroom variables determining student outcomes. The model of index is beneficial due to its influence on resource priority and programming priority. Second, using the regression allows for the prioritization of each school's current reality. Steering away from one-size fits all models using targeted data and apples-to-apples comparisons creates a means for schools to engage the most effective model of planning and data analysis for their organizations.

Assumptions

Various assumptions for this study are necessary for the understanding and implementation of the current research design. The first of these basic assumptions pertains to the independent predictor variables, i.e., five universal non-classroom variables of achievement. For the current research, there is an assumption that each variable applies

to each of the high schools included within the sample. The absence of any independent variable creates a need for the modification or redesign of the research model. The variables applying to the current realities of Minnesota high schools are critical to the current research design. As an example, if the state legislature's elimination of the Q-comp program occurs, an alternative research design with the inclusion or exclusion of P4P programs would need consideration.

Additionally, MMR composites and components of the composite are used as the dependent criterion variable for the research. For the current research, it is assumed that the state of Minnesota will continue to utilize MMR composites as the accountability measure for all schools, including high schools. Major changes to components of the composites or calculations of the composite likely create the need for a change in the research design. Although other measurements of achievement exist, the MMR composite provides consistency among Minnesota high schools. The assumption of MMR composites as the criterion variable thus becomes an important factor in the research design and analysis.

A final assumption for the current research relates to the collection of the data. The assumption is that the data will remain open and available to the public through the Department of Education. The ability to have a study applicable to different demographics and geographies is reliant on the availability of public data in this research design. The assumption that district achievement data remain open and available serves as a component of the current research design.

Summary

A wide range of issues for research exists within today's educational arena. Issues facing schools in Minnesota include a variety of variables connected to student outcome measurements. A need at the statewide level to determine if bias exists in the composite among schools allows stakeholders the ability to design accurate measurements of student outcomes among all student groups and subgroups. The accountability for student outcomes falls to educational organizations, and a targeted focus based on our data is necessary and expected within today's educational climate. The development of the current research model aims to add to the current body of literature in terms of how predictor variables influence student outcomes, the degree to which they influence outcomes based upon an apples-to-apples comparison, and how variables can be appropriately prioritized and addressed through strategic planning and school improvement planning.

The current research design expands upon research that has examined variables in isolation and offers a view of how predictor non-classroom variables coordinate an impact on student achievement outcomes. The grouping and scaling of the variables create a targeted way to prioritize and plan. Moreover, looking at a more narrow scope of demographics and geographic data reduces the variability that skews the results of a broad random sample. Through the current research design, the expectation of contributing to the body of literature by presenting an effective means to group variables and understanding their influence on student outcomes remains an important outcome. This serves as an outcome that provides an equitable and manageable way for educators and

leadership to build strong models of strategic action planning and school improvement planning.

CHAPTER 4: RESULTS AND FINDINGS

Results

The intent of the research study was to evaluate if relationships existed between universal non-classroom variables of student achievement and student outcomes using the Minnesota multiple measurement rating composite as the dependent outcome variable. The study established two stages of research, the first, cross-sectional, looking at a random sample of 100 Minnesota high schools, and the second, repeated measures longitudinal, looking at 16 high schools over five years across schools and within schools. In order to establish an index score that examined how the coordinated variables worked as predictors of student outcomes, non-classroom variable relationships were first analyzed individually to check for correlations and statistical significance to the outcome variable. The 100 schools in stage 1 provided more statistical power to detect the significance between variables. Individual checks, along with the review of related literature and the repeated measures analysis on the index scores established reliability for stage two of the current study. The focal point of the research looked specifically at how multiple non-classroom factors of student achievement influenced student outcomes at the secondary level of educational organizations, the secondary level being defined as public high schools grades 9-12.

The results of the current research study were obtained in two stages. These results stemmed from the relevant statistical analyses described in the methodology chapter of the study. Instead, the interpretations of the data analysis will be discussed in Chapter 5. The ensuing results will reflect the researcher's attempt to answer the following research question:

What is the extent of the relationship between non-classroom factors of student achievement and high school multiple measurements rating (MMR) scores?

Stage One Results

Stage one of the research study involved a correlational analysis using Pearson correlations to estimate the relationship between non-classroom variables of achievement and student outcomes. The data set used during this stage of the research is available in the appendix. The sample size for the research study included 100 randomly selected Minnesota public high schools (N=100) during the 2015-2016 school year. In addition to the simple Pearson correlational data collected, a regression analysis in stage one added depth to the significance of the data. Specifically, it provided evidence of the variance for which the independent variables accounted when examining the Minnesota multiple measurements ratings of schools in the sample. The researcher used a measurement of percentage for per-pupil expenditure rather than a measurement of raw dollars. The selection of the percentage of overall expenditures, made in collaboration with the dissertation committee, served as a more accurate measurement related to per-pupil expenditure when compared to measurements that solely used raw dollar expenditures.

Descriptive statistics. Stage one of the current research study examined 100 (N=100) Minnesota public high schools for correlations between the Minnesota multiple measurements rating composite, which served as the dependent variable, and four predictor variables. The included independent predictor variables were the schools' free and reduced lunch percentage, the schools' percentage of total expenditures on regular instruction (serving as the measurement of per-pupil expenditure), the schools' Q-Comp enrollment status (N=0 and Y=1), and the schools' student enrollment. For clarity, Q-Comp enrollment includes schools that have been enrolled in Minnesota's pay for performance program during the 2015-2016 school year. Table

6 provides a visual layout of the descriptive statistics that derived from stage one of the research study.

Table 6: *Stage 1 descriptive statistics*

	<u>Mean</u>	<u>Standard Deviation</u>	<u>Number (N)</u>
Multiple Measurements Rating Composite	.559	.169	100
Free and Reduced Lunch %	32.42	15.81	100
Regular Instruction % of Total Expenditures	38.10	4.28	100
Q-Comp Enrollment	.30	.461	100
School Enrollment	746.90	703.18	100

Note. SPSS analysis software provided all statistical values for the research study's stage 1 analysis. Stage 2 analyses were completed using SPSS for the correlational analysis and R for the repeated measures.

Pearson correlational data. The Pearson correlation examined linear relationships between the independent predictor variables and the dependent outcome variable. Table 7 presents the correlations between student achievement outcomes, using the Minnesota multiple measurements rating, and the non-classroom factors of student achievement. The correlational data between dependent and independent variables showed the varying degrees of positive and negative relationships that existed between the four non-classroom factors of student achievement and student outcomes. The first step in stage one involved a focus on the relationship that exists between dependent and independent variables in isolation. The regression analysis results highlight the combined impact of the independent variables.

Table 7: *Pearson correlations with the Minnesota multiple measurement rating*

	Free and Reduced %	Regular Instruction as % of Operating Expenditure	Q-Comp	School Enrollment
Pearson's Correlation	-.474	.177	.295	.279
Significance (two-tailed)	.000	.078	.003	.005
N	100	100	100	100

Free and reduced lunch percentage. A review of relevant literature showed that the free and reduced lunch percentage had the most substantial correlations as a predictor variable of student outcomes (Sun, 2014; Hampden-Thompson & Johnston, 2006). The results of the current study of Minnesota high schools also indicate that the free and reduced lunch percentage is the most statistically significant non-classroom variable among the included variables. Of the three most significant variables, including Q-Comp and school enrollment, free and reduced lunch percentage had the highest *r-coefficient* at -.474. The -.474 value indicates a negative correlation between free and reduced lunch percentages and student outcomes in Minnesota high schools. The *r-coefficient* was more moderate compared to previous studies that used dependent achievement measurements that were more proficiency-based. Notably, in this study, the dependent variable included an essential feature: 50% of the multiple measurements rating composite was growth-based (growth z-score and gap reduction measurement), while only 25% of the measurement was proficiency-based (students who met or exceeded state-level standards in reading and math). The negative relationship, however, was consistent with previous research.

Per-pupil expenditure. Of the four independent variables used as predictors for the current research study, per-pupil expenditure, based on the percentage of total operating expenditures spent on regular instruction, was the only variable that was not significant at the .05 level (two-tailed significance of .078). The relationship indicated by $r = .177$ was consistent with the findings described in the literature review chapter, indicating a slightly positive relationship between per-pupil expenditure and student outcomes, but was not quite statistically significant in the study of 100 high schools. Although the current research study applied a regular instruction percentage of overall expenditures as the recognized measurement for the research, raw dollars were also investigated as part of the study. When analyzing the raw dollars spent on regular instruction for Minnesota high schools, a correlation of $-.171$ and was also not statistically significant. The difference between the two measurements and the rationale behind choosing one per-pupil measurement in lieu of the other are discussed in Chapter 5.

Q-Comp enrollment. The reviewed literature on Q-Comp had been highly inconclusive as to its impact on student achievement in part because the impact research had occurred too close to the implementation. The current research study examined schools enrolled in Q-Comp during the 2015-2016 school year. Schools in the sample included districts that enrolled in Q-Comp's adoption in 2005 through schools that had newly enrolled in the 2015-2016 school year. The results of the current research study on Minnesota high schools demonstrated a slightly positive relationship between students' multiple measurements ratings and schools that are enrolled in the Q-Comp program ($r = .295$). The result of enrollment in the Q-Comp program demonstrated a two-tailed significance at the .003 level. Schools that were part of the sample were enrolled in the program for various lengths of time. The result found within the current research among high schools' in Minnesota should be emphasized as the result establishes

significance between Q-comp enrollment and student outcomes in the sample. The current result differs from reviewed literature in that a positive relationship existed at the high school level where prior research produced competing results as to the relationship between Q-Comp and student outcomes. The current study indicated a significant positive relationship solely for high schools whose districts had enrolled in the Q-Comp program as of the 2015-2016 school year. This study did not examine the relationship of time in Q-Comp with MMR results.

School enrollment. The researcher based the selection of school enrollment on current trends in the literature that demonstrated that schools with a smaller enrollment size saw significant positive results in student achievement outcomes (Cho, Glewwe, & Whitler, 2010; Sun, 2014; Treaster, 1996). Minnesota high schools' trends produced results that compete with the current trends in the reviewed literature. High schools in Minnesota, in fact, showed a slightly positive relationship between high school enrollments and multiple measurements rating scores ($r = .279$). The result had a two-tailed significance at the $p = .005$ level. It is important to note that results of this study are generalizable only at the high school level for Minnesota school districts. The researcher did not take primary grade levels into account in the research design or in the analysis of the data.

Regression analysis results. The research question ultimately focuses on how the variables work in coordination with each other versus in isolation of each other. The Minnesota multiple measurements rating as the dependent variable of achievement outcomes already takes into account four measurements of student outcomes for Minnesota high schools. The student achievement outcomes that factor into the composite include student proficiency, student growth, achievement gap reduction, and graduation rate. Due to the complexity of multiple variables that influence student outcomes, the researcher of this study examined the ways that multiple

predictor variables impact a rating that accounts for multiple measures within its composite score. Table 8 provides a summary of the regression model outcomes. It features the four independent variables as the predictors and the Minnesota multiple measurements composite as the dependent variable for student outcomes.

Table 8: *Regression analysis model summary*

R	R ²	Adjusted R ²	Std. Error of the Estimate	R ² Change	F Change	Degrees of Freedom 1	Degrees of Freedom 2	Significant F Change
.504	.254	.222	.149	.254	8.075	4	95	.000

As the model summary for the regression analysis shows, for Minnesota high schools, the four independent predictor variables had a statistically significant influence on student outcomes at the $p < .000$ levels. However, the adjusted R^2 value of .222 also indicates that, for Minnesota high schools, the selected variables account for only a small portion of the variance influencing student outcomes.

Note that the current research study focused on non-classroom factors of student achievement rather than on classroom factors such as teacher quality, classroom resource, and other direct classroom variables. Additionally, the regression analysis concentrated on a sample group of Minnesota public high schools and did not include private high schools, charter schools, or primary grades. The sample group for the regression and the Pearson correlational analyses derived from the 2015-2016 school year. Table 9 illustrates the correlations for the current study's regression model. Table 10 presents the regression coefficients for the current model.

The regression coefficients, similar to the findings of Sun's (2014) econometric analysis, highlights that free and reduced lunch is the variable sharing a substantial amount of unique

variance with the outcome variable, the Minnesota multiple measurement composite. This finding, as also stated by Sun's (2014) analysis, is important when looking at combined variables as the variables outside of free and reduced lunch may not add any additional predictive power not already contained in the free and reduced lunch variable.

Table 9: *Stage 1 Pearson correlational analysis*

		Multiple Measurements Rating Composite (MMR)	Free and Reduced %	% of Total Operating Expenditures	Q-Comp Numeric	School Enrollment
Pearson Correlation	MMR	1	-.474***	.177*	.295***	.279**
	Free and Reduced %	-.474	1	-.264	-.290	-.416
	% of Total Operating Expenditures	.177	-.264	1	.123	.114
	Q-Comp Numeric	.295	-.290	.123	1	.516
	School Enrollment	.279	-.416	.114	.516	1
	Sig 1-Tail	MMR		.000	.039	.001
Free and Reduced %		.000		.004	.002	.000
% of Total Operating Expenditures		.039	.004		.111	.129
Q-Comp Numeric		.001	.002	.111		.000
School Enrollment		.003	.000	.129	.000	
N		MMR	100	100	100	100
	Free and Reduced %	100	100	100	100	100
	% of Total Operating Expenditures	100	100	100	100	100
	Q-Comp Numeric	100	100	100	100	100
	School Enrollment	100	100	100	100	100

Table 10: *Regression coefficients*

Model 1	Unstandardized Coefficients		Standardized	t	Significance
	B	Std. Error	Coefficients		
(Constant)	.606	.154		3.949	.000
FRL%	-.004	.001	-.406	-4.027	.000
Per-pupil Expenditure	.002	.004	.048	.521	.604
Q-Comp Enrollment	.059	.038	.160	1.536	.128
School Enrollment	5.208E-6	.000	.022	.198	.843

Note. Dependent Variable: Minnesota multiple measurements rating

Stage Two Results

The findings from stage one established enough significance in the results to proceed with stage two of the study. The data set for stage two of the research is available in the appendix. The repeated measures analysis in Stage two established a look at the variance across schools as well as the variance within schools. Stage two specifically focused on the indexing of non-classroom variables of student achievement and the use of the index score as a means to predict student achievement outcomes. Additionally, in stage two, the researcher determined whether changes in the index score over time led to changes in student achievement outcomes. The rationale for stage two of the research corresponded with the concept that variables measured together add more strength as predictors compared to variables reviewed in isolation. The criteria for each non-classroom variables index score are listed in Table 11. The index scores are based on the review of literature, stage one data, and various state averages and percentages for each year, arranged longitudinally to establish a modified Likert scale in which scores range from 0-10 among high schools within the sample. Please note, for stage two of the

current research, the duration of school leadership (principal leadership) was added as an additional independent variable and was not included in the stage one analysis.

Table 11: *Index score criteria*

<u>Index Score Variable</u>	<u>Criteria for Index Score</u>
Free and Reduced Lunch %	0-5% = 5
	5.1-10% = 4
	10.1-15% = 3
	15.1-20% = 2
	20.1-25% = 1
	Greater than 25% = 0
Per-Pupil Expenditure (% of overall expenditures)	Above State Average = 2
	Equal to State Average = 1
	Below State Average = 0
Q-Comp Enrollment	Enrolled = 1
	Not Enrolled = 0
School Enrollment	Above State Average = 0
	Below State Average = 1
Length of Leadership Term	Less than 5 Years = 0
	Greater than 5 Years = 1

The establishment of a significant relationship between the universal non-classroom variables of student achievement and the Minnesota multiple measurements rating provided the foundation for the investigation of results of the results at stage two. In stage two, the researcher specifically examined 16 schools over a five-year period, from 2012 to 2016. The sample selected was southwest metropolitan Minnesota high schools—i.e., the 16 public high schools in the selected area. In selecting this sample, the researcher sought to focus on a population that lessened the possibility of outliers, which could skew the results of the research. However, geographically, the index can be applied to high schools in rural, suburban, or urban settings.

Correlation analysis results. Tables 12 and 13 outline the correlational data derived from stage two of the research. Due to the rank-order of the index scores, both a Pearson correlation and Spearman rho correlation were used when analyzing the data. Spearman rho's calculation accounts for the rank order nature of the index composite score. As illustrated in the tables below, the results of the Pearson and Spearman correlations are highly significant. Table 15 outlines the descriptive statistics for the multiple measurements rating composite score and the total index scores for the sample population. Notably, in the stage two analysis, when the index score was higher, the risk factors that existed for each of the high schools in the sample were lower.

Table 12: *Pearson's correlational analysis between MMR composite and total index score*

	<u>MMR Composite</u>	<u>Total Index Score</u>
Pearson Correlation		
MMR Composite	1	.364***
Significance (two-tailed)		.001
N	80	80

Note. ***. Correlation is significant at the $p = .001$ level.

Pearson's correlation demonstrated a positive relationship between the index score and Minnesota multiple measurements rating scores. The correlation for the high schools in the sample, i.e. 16 schools over five years, was found to be highly significant at the $p = .001$ level.

Table 13: *Spearman's rho correlational analysis between MMR and total index score*

<u>MMR Composite</u>	<u>MMR Composite</u>	<u>Total Index Score</u>
Correlational Coefficient	1	.345***
Significance (two-tailed)	.000	.002
N	80	80

Note. ***. Correlation is significant at the $p = .001$ level.

Similar to the Pearson correlation, and considering the rank-order nature of the index score, Spearman's rho correlational coefficient also indicated a positive relationship between the Minnesota multiple measurements rating and the index score of non-classroom variables. The

results from the Spearman rho and the Pearson correlation established consistency in the relationship among the non-classroom variables of achievement and student outcomes, regardless of the rank-ordering the variables, due to the weighting of the index score. The Spearman rho correlational coefficient was also found to be highly significant at the $p = .001$ level.

Table 14: *Stage two descriptive statistics*

	<u>Mean</u>	<u>Std. Deviation</u>	<u>N</u>
MMR Composite	73.23	14.95	80
Total Index Score	4.3	1.96	80

Note. The number 80 indicates data collected from the same 16 southwest metropolitan schools over a five-year period.

In addition to the significance of the total index score for each school, three additional individual index scores were found to be significant. In stage two, the Q-Comp enrollment index demonstrated the strongest positive correlation at .393 significance at the $p = .001$ level. Next, free and reduced lunch percentages had a correlation of .364 and were significant at the .001 level (two-tailed). Finally, per-pupil expenditure, as a percentage of overall expenditures, had a correlation of .228 and was significant at the $p = .05$ level. The enrollment index and the leadership index score showed slightly negative relationships with the multiple measurements rating, although neither variable was significant (two-tailed).

Repeated measures analysis. In order to thoroughly analyze the data, the researcher specifically looked for any significance in change over time between multiple measurements rating scores across time as well as changes in the index score related to the multiple measurements rating over time. The selection of the model that best fit the data was critical to the analysis of change over time. During the initial repeated measure analysis, a linear model that included repeated measures for the sample group of high schools showed a lack of

significance, which indicated that the model might not be the best fit for the data analysis. A visual inspection of the individual plots of change over time indicated that a polynomial trend line would be a better fit than a linear trend line. The appendix includes the model analysis for each individual school's change over time. In addition to the visual inspection of individual school trends, the results of a group analysis highlighted a non-linear trajectory across time. Tables 15 and 16 present a summary of results for the linear model of the multiple measurements rating over time. Tables 17 and 18 provide an overview of the index score's relationship with the multiple measurements rating over time.

Table 15: *Linear model of MMR composite, fixed effects over time*

	<u>Value</u>	<u>Std. Error</u>	<u>DF</u>	<u>t-value</u>	<u>p-value</u>
(Intercept)	73.891	4.105	63	18.002	.000
Years	-.329	1.316	63	-.250	.803

Table 16: *Linear model of MMR, random effects over time*

	<u>Standard Deviation</u>	<u>Corr</u>
(Intercept)	14.489	
Years	4.22	-0.754
Residual	9.97	

Table 17: *Linear model of MMR composite with total index score predictor, fixed effects*

	<u>Value</u>	<u>Std. Error</u>	<u>DF</u>	<u>t-value</u>	<u>p-value</u>
(Intercept)	65.717	5.959	62	11.029	.000
Years	-.236	1.350	62	-.175	.862
Total index score	1.858	1.028	62	1.808	.076

Table 18: *Linear model of MMR with total index score, random effects*

	<u>Standard Deviation</u>	<u>Corr</u>
(Intercept)	13.37	
Years	4.34	-0.808
Residual	10.19	

A polynomial model of the multiple measurements rating composite and the index score's relation with the multiple measurements rating over time proved to be the best fit. The curvilinear relationship between the multiple measurement composites and time were statistically significant using a polynomial model. The model's graph, which appears in the appendix, highlights the non-linear relationships found over time and visually supports the need for a polynomial model. The polynomial analyses have shown statistically significant relationships between the variables over time among the group of sampled high schools. Tables 19-22 provide a summary of the polynomial model for the multiple measurements rating score's change over time and the index score's relationship to the multiple measurements rating over time.

Table 19: *Polynomial model of MMR composite over time, fixed effects*

	<u>Value</u>	<u>Std. Error</u>	<u>DF</u>	<u>t-value</u>	<u>p-value</u>
(Intercept)	68.022	4.234	62	16.066	.000
Years	11.410	2.459	62	4.639	.000
I(years ²)	-2.935	.519	62	-5.649	.000

Table 20: *Polynomial model of MMR over time, random effects*

	<u>Standard Deviation</u>	<u>Corr</u>
(Intercept)	15.27	
Years	4.65	-0.757
Residual	7.77	

Table 21: *Polynomial model of MMR composite with total index score predictor, fixed effects*

	<u>Value</u>	<u>Std. Error</u>	<u>DF</u>	<u>t-value</u>	<u>p-value</u>
(Intercept)	59.218	5.827	61	10.163	.000
Years	11.926	2.516	61	4.739	.000
I (years ²)	-3.039	.530	61	-5.738	.000
Total index score	1.953	.938	61	2.082	.042

Table 22: *Polynomial model of MMR composite with total index score predictor, random effects*

	<u>Standard Deviation</u>	<u>Corr</u>
(Intercept)	14.21	
Years	4.79	-0.810
Residual	7.89	

In this study, the significance of the repeated measure analysis of the results reinforces two key details that are related to the research question. The first detail is that the index score itself over time shows a significant positive relationship with multiple measurements rating composites. This relationship is important because it establishes the validity and reliability of the variables in the index as well as the weighting of the variables within the index. This validates previous research in that the universal variables carry different weights in relation to student achievement. Notably, the influence of the variables in isolation and indexed together is observable in the various analyses conducted during stage one and stage two.

Additional data, including the full model linear and polynomial model analysis and graphs, are provided in the appendix. The validity and reliability of the index were key components of the findings in stage two of the research. Moreover, it is important to note that the index can be applied to multiple groupings of high schools across different demographical regions. Any adjustments to the index should be based on the sample population being researched. The researcher of this study selected a sample from a homogenous region to limit

some of the variance and to allow stakeholders to view results through the lens of comparable buildings. Stage one's methods and results provide a framework for generalizing of the overall high school population.

CHAPTER 5: DISCUSSION AND IMPLICATIONS

Discussion

The Minnesota multiple measurement rating (MMR) defines an era of systems accountability for Minnesota high schools under the No Child Left Behind legislation that has been replaced by the Every Student Succeeds Act. MMR was used as the benchmark for the student outcome variable in both the cross-sectional analysis of the current research as well as the repeated measure longitudinal analysis. The outcome variable, MMR, was critical to this research in that it gave all Minnesota high schools a common student outcome variable that used multiple measures to form its composite, allowing for an apple-to-apples comparison of student outcomes. The current study provided a retrospective view that included some of the challenges that systems accountability faced under the MMR. As practitioners move forward under the new North Star accountability system in Minnesota, educational stakeholders can gain perspective on the strengths, weaknesses, and biases to avoid under the new statewide system of accountability. An important component of the discussion for this study includes a reflection on the research question. The research question for the current study was as follows:

What is the extent of the relationship between non-classroom factors of student achievement and high school multiple measurements rating (MMR) scores?

The overall findings of the research confirmed that a relationship existed between universal non-classroom variables of achievement and the multiple measurement rating for Minnesota high schools. The research included an equity check that involved individual variables influence on student outcomes and analysis that looked directly at the influence independent variables have on outcomes when indexed together. The research by Sun (2014), Lee (2014), and Hampden-Thompson & Johnston (2006) defined the common variables

considered universal non-classroom factors of achievement. Sun specifically provided the context for looking at combined variables, while Okapala, Okapala, and Smith (2001) provided the context for looking at apples-to-apples comparisons among schools when prioritizing school and strategic improvement. Sun and Okapala's findings are reflected in the discussion involving the two stages of this research. The discussion framework focused on guiding leaderships' and stakeholders' application of non-classroom factors of achievement as a predictive point of reference, without losing the focus on the improvement of student outcomes, advancing professional development, and developing targeted strategic and school improvement planning based on multiple variables of influence on student outcomes.

The multiple measurements rating composite (MMR) took into account four index scores for accountability. The index score included proficiency in math and reading, student growth in math and reading, achievement gap reduction, and graduation rates giving schools an overall composite score with a maximum value of 100 points. The current research and the method applied involved a set of variables that occurred outside of the classroom. Identifying the classroom and non-classroom factors of achievement may have some universal influence among all schools or may be best described within the current realities of individual districts or districts of similar demographics (Lee, 2014; Sun, 2014). The research study was applicable at the high school level, but it cannot be considered as a one-size-fits-all approach to determining the variables that should be regarded as universal or to improving student outcomes. A one-sized-fits-all approach, as described by Okapala et al., (2001), fails to allow for equitable comparisons when investigating the relationship between variables. Using different metrics for the current non-classroom variables of achievement or using different parameters of student outcomes was likely to produce results that support and/or contrast with the current study's results. Competing

results were inevitable due to the dynamic nature of student outcome variable selection. For example, Hampden-Thompson & Johnston (2006) and Lee's (2014) outcome variables stemmed from the Program for International Student Assessment (PISA). The importance of their research was in the fact that each study included math and reading as a part of the results, similar to a significant portion of the MMR composite used by Minnesota public high schools. The human element that existed beyond establishing relationships through quantitative research deserved consideration and certainly has its place in a discussion based on the results stemming from multiple reviews of research studies on non-classroom and classroom factors of student achievement.

Summary of findings

Stage one summary. Stage one's analysis stemmed from the purpose of determining the extent of the relationship between non-classroom factors of student achievement and student outcomes. The purpose led to a cross-sectional analysis of 100 randomly selected high schools and established the power necessary for the second stage of the study. The effects of the human elements related to each variable, as well as the causes of such effects, were not a part of this research study and are noted when analyzing or reflecting on its findings. The two stages of the study focused on public high schools, non-classroom variables of achievement, and student outcomes as measured by the MMR. When looking to apply the current research to entire districts or primary grade levels, individuals should consider other research methodologies and perhaps even other variables. Okapala et al., (2001) and Lee (2014) discussed multiple possible variables that could define socio-economic status. The relationship between primary and secondary grade levels in a school district was not strictly linear. However, the intensity to

which variables influence student outcomes and performance may significantly vary based on the cognitive differences of primary and secondary students and their respective age groups.

The use of a Pearson correlation in the first stage established a simple correlation for the influence each predictor variable had on the Minnesota multiple measurements composite scores for Minnesota high schools. The method in stage one was similar to the methods used in research studies such as Sun's (2014) econometric analysis. The findings however, are applicable to Minnesota high schools and used the simple correlations and regressions to look at the relationship between individual variables and variables combined. The end result, similar to Sun's (2014) research, found in the regression a positive correlation between all variables and outcomes as well and establishing free and reduced lunch as the variable with the most statistical significance. Lee (2014), Hampden-Thompson & Johnston (2006), Sun (2014), and the current study were all in agreement when it came to variables of poverty or socio-economic status having negative correlations with student outcomes.

The multiple measurements composite rating for high schools considered four different student outcome variables in its composite, two of which are focused specifically on growth. The growth variables included student growth from their previous test and achievement gap reduction in addition to student proficiency and graduation rate. The growth z-score was based on two factors; the student's last assessment result and the student being above or below predicted growth (Minnesota Department of Education, 2014). The benefit of such a composite was that it took into account multiple aspects of student outcomes. However, the measurement itself was difficult to explain because of the confusing calculation in creating the composite through multiple variables. The metric of student achievement undoubtedly had an effect on

school leadership and stakeholders in terms of how to strategically plan for the improvement of student outcomes.

The application of the Pearson correlation did not sufficiently answer the current research question. The current research study prioritized looking at combined variables versus solely examining individual variables and outcomes. In order to look at the combined influence of the independent predictor variables, a regression analysis and repeated measures analysis was needed in addition to the Pearson correlation to answer the research question. However, the Pearson correlation was necessary in order to determine the estimated relationship of each of the selected independent variables. In stage one, significant relationships existed between the multiple measurements composite and three of the four predictor variables considered as universal in the current research study. The fourth variable, per-pupil expenditures as a percentage of overall expenditures, although not significant at the $p = .05$ level required to establish significance in the current research study, was certainly at a level of significance that merits its inclusion in the modified Likert scale score and repeated measures model found in stage two of the current study. Notably socio-economic status, a measurement based on the percentage of students who qualified for free and reduced lunches, proved to be the most significant indicator of student outcomes.

Stage one of the research, establishing a cross-sectional analysis of schools, accomplished two essential aims related to the research question. First, stage one served as an equity check and closely examined the separate contribution of each variable to the prediction of MMR scores. Checking for separate contribution of each variable individually in stage one, to the knowledge of the researcher, was a significant addition to the current body of literature related to MMR composite scores. Second, stage one established that there was enough power in

the relationship between the universal non-classroom variables of achievement and student outcomes so that grouping the independent variables and creating an index score may serve as a way to predict student outcomes. Cross-sectional analysis and the combining of predictor variables have been researched by Sun (2014), Hampden-Thompson (2006), and Lee (2014) where the outcome variables also included math and reading in the analysis. The predictability of student outcomes served as the essential component for leadership and the district, building, and classroom levels. Moreover, the check on the contribution of each variable towards the predictability of the MMR, at the state leadership and district level leadership levels, served as an indicator of how we can reasonably assess student outcomes based on a set of independent variables that are common to all high schools. The current research then serves as a measurement of predictability used at both the macro levels and the micro levels of educational stakeholder circles.

Stage two summary. Stage two used a repeated measures regression which looked at variance across schools and variance within schools over time. To the knowledge of the researcher, based on reviewed literature, the method used in stage two of the study was a unique analysis adding new depth to the body of literature. As a secondary hypothesis, the index score correlation to the student outcome variable (MMR) in stage two provided a statistically significant predictor of student outcomes and does not support the idea that the variables could be prioritized differently based on homogeneous characteristics that may exist based on district geography and demography. From a decision-making standpoint, this highlighted the need to continue to examine all of the universal variables as a part of the decision-making process, to some extent, regardless of geography. However, based on pre-existing research including Lee (2014), Sun (2014) and Okapala et al., (2001) as well as the current study, it was not surprising

that both poverty metrics and measurements of direct and indirect classroom expenditures continued to be the predictive measurements that are prominent in research models. Based on the findings in stage 2 of the current research Q-Comp enrollment, which carries additional state funding, served as the variable most statistically significant individual variable when looking at student outcomes. Q-Comp's result competes directly with the results of the Minnesota Legislative Auditors report (2009) and findings from research conducted by Choi (2015), which found the adoption of Q-Comp to have mostly inconclusive results on student outcomes. Although there may be less geographical variation among schools in terms of demographical percentages and the ability to generate revenues, universal non-classroom factors of achievement unquestionably continue to affect student outcomes based on stage two's findings in the current research.

Stage two focused on change over time and resulted in an interesting curvilinear relationship between the multiple measurements rating and time and the multiple measurements rating composite and index score over time. The polynomial repeated measures regression used in this study highlighted the statistical significance of the curvilinear relationship over time. Moreover, the significance of the curvilinear relationship highlighted the additional need to determine why the accountability composite began to level off at a certain point, especially considering that the sample group itself had no significant shifts in index scores over the five-year period. This study, however, involved an analysis of the relationship between variables and time; it did not focus on causation.

Combined variable model summary. The focus of stage one and stage two on non-classroom factors of achievement also served the purpose of determining the extent to which inconsistent variables (i.e., those that are not present in the classroom on a daily basis) influence

student learning. The stages of the research were complimentary in nature and not a comparison of the findings within the two stages. In general, two spheres of influence in education seemingly existed. Stakeholders have less control over non-classroom variables of achievement at the classroom level, while the classroom variables of achievement including teacher quality, high-quality professional development, and high-quality resources can be better controlled. According to the Minnesota Legislative Auditors report on Q-Comp (2009), the classroom variables of achievement listed matched the outcome goals established for statewide educational improvement. The regression analysis in stage two, non-classroom variables of achievement accounted for only 20% to 25% of the overall variance influencing student outcomes. The results reinforced the idea that when prioritizing and planning at the micro level, the direct classroom variables of achievement must be a top priority. At the macro level, however, it is important to further address continued direct classroom investment as a means to establish an allocation of scarce resources at the state level. From an equity perspective, the findings indicate that, for Minnesota to effectively work toward reducing gaps in achievement, direct classroom influences warrant consideration.

Individually, both cross-sectional and longitudinal analyses found significant correlations. The research conducted by Sun (2014), Lee (2014), and Hampden-Thompson (2006) included measurements that examined math and reading and share similar findings with this research study. Notably, this study's findings highlighted the differences between high schools within the district enrolled in Q-Comp and high schools in districts that are not enrolled in the program. As discussed in Chapter 2, previous studies, such as Choi (2015) and the Minnesota Legislative Audit on Q-Comp (2009), had mixed results. Specifically, several researchers found no significant relationships and low effect sizes on Minnesota's pay for

performance program and student outcomes across primary and secondary grade levels. This study, which again focused solely on high schools, found a slightly positive relationship between Q-Comp enrollment and student outcomes at the high school level, and this relationship was statistically significant. The fact that a difference existed could influence how the funding for pay-for-performance programs are allocated based on where the funding is most likely to have a positive effect on student outcomes. An example may include the allocation of Q-Comp dollars to all schools under the teacher evaluation statute allowing for additional professional development and instructional coaching positions.

Q-Comp enrollment was the only trend that differed from previous studies' findings. Combined with the significance found in stage one's regression, in which the percentage of money spent on per-pupil expenditures was a component of total spending, enrollment in programs such as Q-Comp may contribute to the allocation of statewide funding as a regular practice instead of providing such funding only to those districts that choose to enroll. Per-pupil expenditures as a percentage of overall expenditures have changed very little over time. For example, O'Connell-Smith's (2004) research found that approximately 60% of overall expenditures were related to special education instruction expenditures (approx. 20%) and regular instruction expenditures (approx. 40%) in Minnesota schools. Schools in both sample groups of the current research reflected similar percentages in the regular instruction percentages as of 2016, more than a decade later, and Q-Comp enrollment, or the reallocation of Q-Comp dollars, may provide a needed boost in regular instruction expenditures for high schools seeking to maintain or increase dollars that have direct influence inside of the classroom.

Limitation of the study

Limitations were found in both stages of the research study. Stage one of the study included the limiting factor of not having years or term of building leadership included in the correlational analysis. The feasibility of including leadership for the 100 school random sample is what caused the researcher to leave leadership out of stage one of the study. Leadership terms for building principals were added to stage two of the study, however, leadership was the only variable not found to have a statistically significant relationship. Using the MMR as the dependent outcome variable in each stage of the research also served as a limiting factor, as Minnesota made a change to its accountability measurement following the 2017-2018 school year. School year 2016-2017 served as the last year of use for the MMR by Minnesota high schools as the statewide measure of student accountability. Additionally, the study was only applicable and generalizable to public high schools; primary grades, non-public high schools, and charter high schools were not included in the sample in either stage one or stage two of the research.

Stage two included a smaller targeted sample size that served as a limitation for the study. The selection of 16 schools over five years of time provided a limited data set and was designed to limit outliers within stage two of the research. Stage one analysis had more power to detect significant correlations between independent and independent variables than the limited data set in stage two. Stage two found the index score to be a statistically significant predictor of student outcomes, however, it did not include a check for validity or reliability of the index score thus serving as an additional limitation in the research. Stage two's repeated measures longitudinal study spanned years where adjustments were made to the MMR calculations and where adjustments were made to the achievement tests in reading and math. Although considered a

limitation of the study, all adjustments were applicable to all schools within the study but necessitate understanding by researchers using MMR as an outcome variable.

Interpretation of the findings

Relationship to the research question. This section addressed this study's ability to answer the following research question:

What is the extent of the relationship between non-classroom factors of student achievement and high school multiple measurements rating scores?

The results of stage one and stage two can be viewed as complementary to each other, however the two stages are not meant to be compared. Stage one consisted of a larger cross-sectional sample size, and its results established the statistical power for correlational relationships between the independent and dependent variables needed for stage two's findings.

Based on the findings of this study, there was a significant relationship between non-classroom variables of achievement and Minnesota multiple measurements rating scores, including when non-classroom variables are indexed or combined versus analysis in isolation of one another. However, individual variables such as poverty, per-pupil expenditures, pay-for-performance programs, school enrollment, and leadership terms did not have the same level of influence on student outcomes. Findings from Sun (2014), Lee (2014), and Hampden-Thompson (2006) all confirmed that individual variables have different relationships with and effect sizes on student outcomes. The fact that all variables did not uniformly influence student outcomes should guide the establishment of a framework for how to effectively index predictor variables. It also provided stakeholders and decision makers a framework for prioritizing planning, staff development, and evaluation to have the highest likelihood of school and organizational improvement related to achievement. Each area was outlined by the Minnesota Department of

Education in the Minnesota Legislative Audit (2009) as essential to improve outcomes and reduce the achievement gaps that exists between our most disadvantaged students.

The findings provided a usable set of variables and measurements that individuals can incorporate into their planning at the state level, such as when establishing reliable and equitable accountability measurements. Universal variables can be used at the district, building, and classroom levels, such as when establishing a targeted and focused strategic and improvement plan as well as high leverage professional development planning at all levels of leadership. Notably, this study's results are generalizable at the high school level. The outcome variable used as the dependent variable may influence the same research methodology and analysis for other studies. Examples of dependent variables differences include ACT or SAT composite scores or locally used diagnostic testing as a measurement of student outcomes. The new North Star accountability system established during the 2018-2019 school year or measurements such as ACT composites, SAT composites, or ACCESS for ELL students could be influenced to different degrees using the same universal independent variables. The North Star accountability system, as did the MMR, will continue to use Minnesota Comprehensive assessment tests in reading and math to determine student achievement.

Context of the findings

Starting with the significance of the findings and how they contributed to the established body of literature, it is important to remember that one of the primary goals in the field of education is to promote and achieve equitable learning outcomes for all learners of all demographics in schools. All research in the field should reflect this broader purpose—i.e., equity in learning based on the factors that influence learning outcomes. Educational institutions such as Minnesota high schools are autonomous institutions, and they encounter different

circumstances based on a variety of variables. Ransdell (2012) highlighted not only the importance of improving teaching and learning at the classroom level, but also equitably addressed the expected amounts of social deficit a school may experience. For Minnesota schools, which are in the process of undergoing an accountability system change to meet updated requirements at the federal and state levels, a retrospective review of the Minnesota multiple measurement composite served the purpose of reviewing the influence of individual non-classroom variables predictability in the MMR accountability measurement. This study offered relevant and timely data that can be used to ensure a system that promotes fairness in analyzing student learning as well as valid learning data that multiple stakeholders can use for strategic and improvement planning. The current study also provided data relevant to student performance on the Minnesota Comprehensive Assessment III test (MCA III), as data prior to 2012 such as Myers, Kim, Condon, and Mandala's (2004) study analyzed the MCA II exam.

Research studies that applied a multiple-variable approach when developing an understanding of how universal non-classroom variables influence on student outcomes were critical to the context of this study. Although each of the universal non-classroom variables individually influences outcomes to different degrees, the limited body of research that established methods to examine variables in coordination added depth to the argument that addressing single variables did not provide all of the answers to improving student outcomes. Sun's (2014) econometric analysis on factors affecting student achievement and Hampden-Thompson & Johnston (2006) focus on the relationships between non-classroom variables and student achievement confirmed the need to analyze multiple variables at once as means to understand how each school's outcomes are influenced based on their current realities related to their non-classroom influences. During the review of such research, it was clear that specific

variables became universal, with “universal” being defined as common to all of the schools within the sample of Minnesota high schools. The dependent outcome variable, i.e. the Minnesota multiple measurement rating, had already taken into account multiple measurements of outcomes, including proficiency, growth, achievement gap reduction, and graduation rates for Minnesota public high schools. Looking at a multiple measurement outcome variables alongside of multiple variables that influence outcomes serves to further reduce the variance within the current research.

This study offered a critical viewpoint that reinforces the importance of direct classroom variable analysis, as larger, more resource-rich schools demonstrated a relationship that differed from Sun’s (2014) econometric analysis which took the same cross-sectional approach that was used in stage one of the research study. As school enrollments increased in Minnesota high schools, student outcomes increased, and the results were significant. This differed from the findings of previous studies such as Sun’s analysis and Weiss, Carolan, and Baker-Smith’s (2008) review of big schools versus small schools and math achievement. Weiss’s et al., (2008) study included a range of school enrollments from under 300 students to over 2,000 students and included analysis on overall school enrollment and cohort sizes within buildings. Stage one and two of the current study solely focused on enrollment size of high schools, which could account for a portion of the differences between the studies. However, this phenomenon may indeed be limited to the high school level where the dynamic of learning differs from that at the primary grade levels.

Implications

The implications of the current research are essential in that they enable educational stakeholders and practitioners to approach the policy, practice, and application of school

accountability in an equitable and meaningful way. Moreover, the stages of this study have direct and indirect implications on two critical areas of accountability and practice. The first critical area of implication is equity in the system itself based on variables, such as classroom and universal non-classroom influences on student outcomes. The second area of implication includes the unintended consequences that changes in variables, made by state and local education stakeholders and policy makers, have on student outcomes. Assessments and conclusions can be made from the current research related to equity as well as consequences in Minnesota's accountability system. Additionally, the use of the assessments provided guidance and a framework for improvement at all levels of accountability, from the state level to the classroom. An important note to remember is that educational organizations are not simplistic organizations. Instead, educational organizations are complex systems that exert strong, far-reaching influence on all levels of accountability and stakeholder involvement. In such organizations, no single variable changes the course of student outcomes, school readiness, career and college readiness, or the development of civically responsible individuals.

Equity in accountability. The equity conversation is one that dominates the current landscape of education. At the system accountability level, including the era of No Child Left Behind (NCLB) and the Every Student Succeeds Act (ESSA), the efforts towards equity in educational accountability have been reviewed and revised at the federal, state, and local levels. The discussions had focused specifically on students receiving equal learning opportunities and whether such opportunities have led to positive results, as measured by proficiency and growth in areas such as reading, math, and science. Minnesota, for instance, commits resources, time, and policy efforts in an attempt to reduce gaps in learning and to stabilize education outcomes across educational organizations.

Stage one of the current research emphasized the need for correlational awareness when looking at variables of student outcomes. The Minnesota multiple measurements rating (MMR) uniquely encompassed four indicators of student outcomes within its composite score for high schools. The academic measurements, in the composite, included proficiency and growth metrics as a part of the overall composite. In fact, 50% of the MMR composite focused on growth measurements, including the overall growth score composite and the overall achievement gap reduction measurement. Minnesota's new accountability system, North Star, contrasts with the MMR in that system-level accountabilities will now be measured based on proficiencies and shifts across various levels of proficiency.

From the standpoint of policy and practice, it will be interesting to determine how a rating composite such as the MMR compares with the North Star accountability system in relation to equity among schools using the universal non-classroom factors of achievement as predictors of success. For educational districts and organizations with higher levels of poverty, which this study considered in stages one and two, the movement from a growth-based model of accountability such as the MMR to a proficiency weighted system such as the new North Star system could exemplify where the balance of equity is influenced due to a modification within the system. Pay-for-performance programs, such as Minnesota's Q-Comp program, served as another example. Notably, this study indicated there is a significant relationship between this program type and student outcomes at the high school level. As a practical implication, it is important to determine whether such results lead stakeholders at the state and local levels to expand the practice as a best practice versus one that relies on voluntary enrollment. The resource, in the form of human capital established through funding professional development and additional staffing, may prove to be an across-the-board practice in education from an equity

perspective. Essentially, based on this study and on previous research, the underlying equity in accountability systems requires close monitoring to ensure fairness and, more importantly, accurate measurements for growth and improvement for educational organizations. Universal non-classroom variables of student outcomes, and how we address variables at the federal, state, and local levels are only a part of one component of the discussion on equity.

Unintended consequence. All systems of accountability should undoubtedly be subject to review and modification in an effort to improve equity and accuracy. However, it is important to note that all adjustments have the potential to result in positive and negative consequences that are difficult to account for proactively. The significant curvilinear relationship between the MMR composite and time has led to the discovery of unintended consequences of practice and policy in our accountability systems. In this current study, MMR composite ratings over time, as a whole, seemed to peak around the mid-point of the year longitudinal sample in stage two before returning to levels found at the beginning of the sample. As systems of accountability are established, researchers and practitioners would likely expect to find positive linear relationships as organizations establish practices that promote growth in learning and an understanding of the standards assessed. As a result of the significant curvilinear relationship, one can contemplate a variety of reasons as to why this result in outcomes occurred at the high school level. It is likely that several variables, classroom and non-classroom, contributed to this particular outcome.

Minnesota, however, made one significant adjustment around the stage two's mid-point sample of schools that serves as a specific example of how adjustments may lead to changes in student outcomes. At the policy level, Minnesota removed what it referred to as the Graduation Required Assessment for Diploma (GRAD), where students demonstrated a minimum level of proficiency in reading and writing in order to receive a diploma. The GRAD standard for math

was removed prior to the years measured in the current sample. Although the conversation surrounding high stakes testing would need to be the result of a different literature review and subsequent research, based on the current study, one can reasonably speculate that the removal of the student accountability component may have played a significant role in the curvilinear relationship.

The timing of the result and the event seemed to correlate closely enough that practitioners and researchers need to account for such changes as a part of any retrospective analysis or comparison of the MMR accountability rating system. As this study demonstrates, practical implications related to unintended consequences signify that accountability adjustments at all levels and including the student accountability level should, at a minimum, had some level of monitoring to assess how this circumstance influences the relationship between variables and outcomes. Such decisions, in particular, may influence the non-classroom aspects of achievement more so than the direct classroom variables that influence student outcomes. Unintended consequences, positive as well as negative, are difficult if not impossible to predict. However, an equitable system can be closely monitored and maintained ensuring fairness as adjustments are made at any given point in time.

In the short term, the implications of the findings in the two stages of the current research study allowed for the review of the MMR system accountability influences on student outcomes based on the universal non-classroom variables of achievement. The fact that the models used in stage one and stage two provided significant results when looking at all variables in coordination with each other provides an idea or a framework from which improvements can be made in the transition to the new system of accountability. In the long term, the findings highlighted the critical need for equity checks in system accountability measurements that include the close

monitoring of changes and adjustments made throughout the lifespan of accountability measurements. Monitoring should include an examination of the classroom level and beyond, as accounting for multiple variables in achievement produces a higher likelihood that policy, practice, and, ultimately, learning have positive results with minimal negative consequences.

Recommendations for future research

As the current study serves as a timely retrospective in the transition between the Minnesota multiple measurements rating composite and the North Star system of accountability, several recommendations can be made moving forward. Further research has the potential to reach other conclusions, because Minnesota will have implemented the North Star accountability rating system for all of its schools, including public high schools. Future researchers' reflection on and analysis of the current research study should keep their desired outcomes in mind. Researchers' should also ensure that the metrics and processes they consider essential for achieving preferred result are applicable.

When reviewing the research question of this study, it is important to remember that the focus was only the high school level. Unique differences exist across the scope of K-12 education that warrant continued research efforts to discover the role of classroom and non-classroom variables at the primary and intermediate levels of education. Equity in accountability should not be limited to monitoring across school districts and organizations; such checks should also include monitoring within educational organizations. Moreover, from a research perspective, it is important for more studies to focus on primary and secondary K-12 education.

Additionally, considering that Minnesota is undergoing an accountability transition from the No Child Left Behind era to the Every Student Succeeds Act, research that compares the aspects of these policies would be valuable. From an accountability standpoint, ensuing research

on Minnesota's accountability systems should explore the transition and differences through a lens of equity and opportunity. The view should provide a perspective on the impacts and differences between accountability systems that have primarily different foci: the MMR, which includes student growth as a component and the North Star, which is strictly proficiency-based. Although accountability systems are developed to meet federal and state requirements, such research in the future will establish a body of literature that helps determine the fairness of the new measurement, especially when including poverty as a variable. After all, the current research study and literature review demonstrate that poverty remains a significant component when predicting student outcomes in Minnesota and nation-wide. With the relationship between universal non-classroom variables of achievement and student outcomes being established, now would be an excellent time to engage more deeply in a discussion and research on causation. Causation research will contribute to educational stakeholders improved insight when looking at priorities such as systems accountabilities, spending, the merits of pay-for-performance systems, and the role that consistent leadership plays in learner outcomes. Additional research is necessary to understand non-classroom variables' role across the educational spectrum—pre-kindergarten through high school. It is important for future studies to further investigate the possibility that Q-Comp's generation of additional revenues increases the overall percentage of per-pupil regular instruction expenditure. Specifically, researchers should investigate whether pay for performance programs lead to more statistically significant results at the high school level versus gains that may be observed at the non-secondary level as was found in the current study. Through such an analysis, decision makers will be well equipped to determine the positive impact of outcomes regardless of the organizational make-up of learners and incentive bases afforded to staff across the schools system. The Legislative Auditors report (2009)

suggested that not enough time had passed to truly draw conclusion on Q-Comp and student performance. The study analyzed performance differences between schools enrolled versus schools not enrolled in an effort to determine if there were statistically significant differences. Because the study looked at districts where there may be multiple primary and secondary schools included within the program, a cross-sectional review of only primary schools or only secondary schools may bring additional clarity to competing results between studies.

Final Thoughts

Ultimately, based on the current research study, two conclusions can be drawn from the answers to the research question. The first conclusion is that non-classroom factors have a relationship to student outcomes and, as a result, they need to be monitored when setting policy and practice priorities at the macro and micro levels of education. The relationship that exists should drive educational practitioners and stakeholders to continue to find acceptable and equitable outcomes for learners that take into account classroom and non-classroom factors. The second conclusion, drawn from the regression analyses in stage one and stage two, is that while non-classroom factors have their place, when looking at the multiple non-classroom variables that influence outcomes, such factors only account for a small amount of the overall variance. As a result, it remains reasonable to conclude that what occurs in the classroom, as well as stakeholders' direct and indirect influence, still account for the majority of student outcomes that are achieved in educational organizations. This fact cannot be overlooked in the overall discussion on investments in human capital and high leverage educational resources. Ultimately, every learner in the classroom should remain a priority as districts and organizations revise strategic and school improvement agendas.

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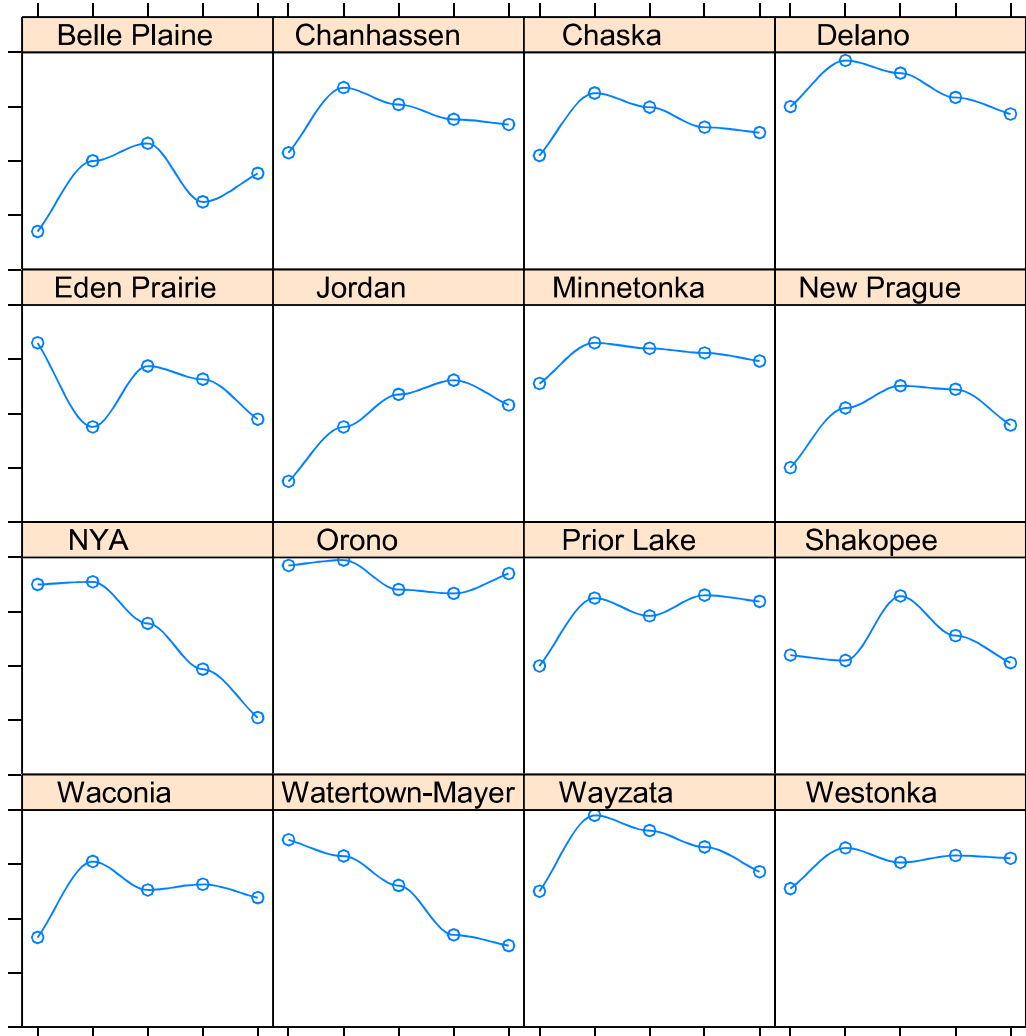
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Appendix 1

Plot of MMR scores by years with trend lines.

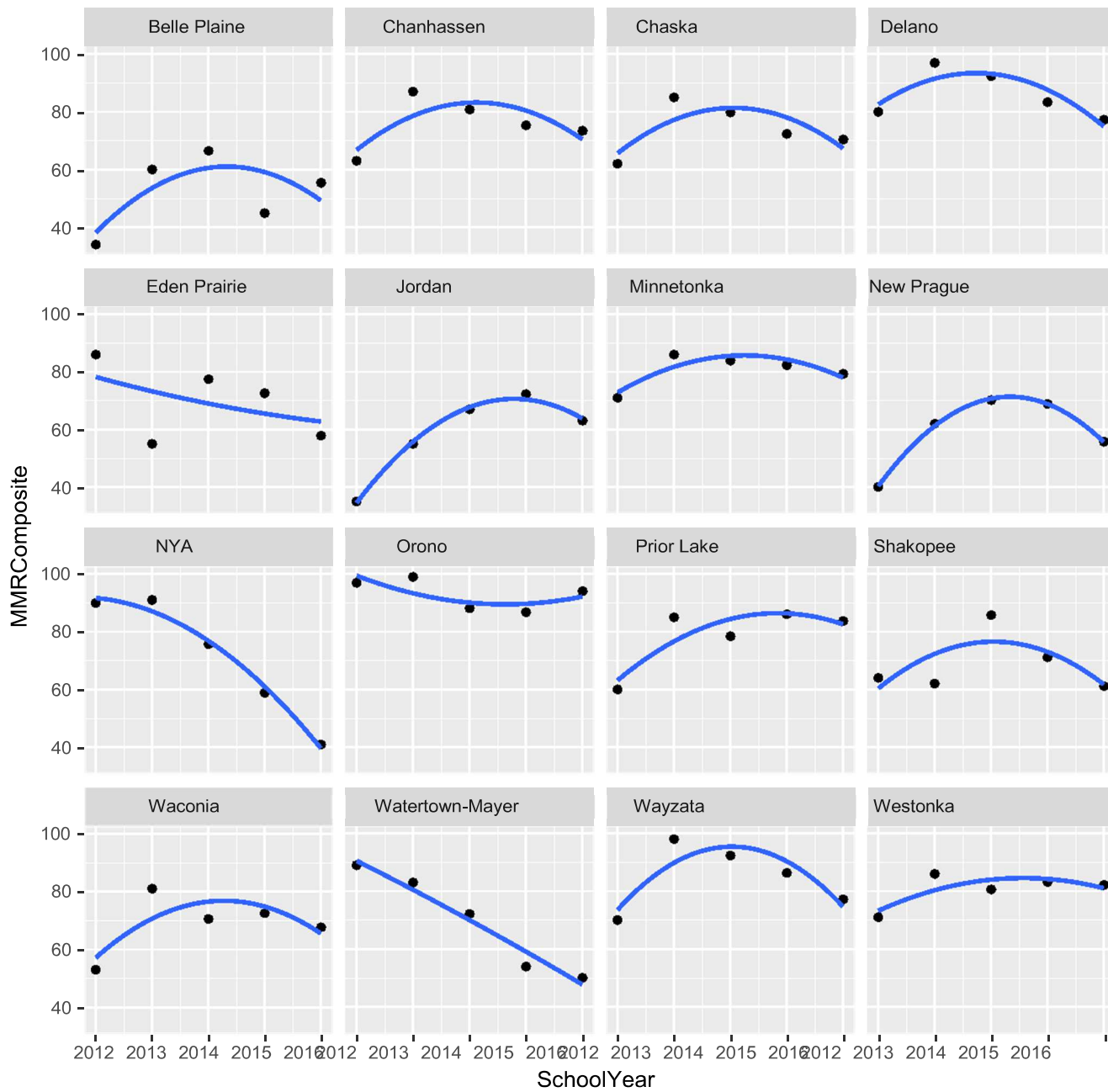
Plot of MMR scores by years with trend lines.



Appendix 2

Plot of MMR composite scores by years with mean polynomial lines.

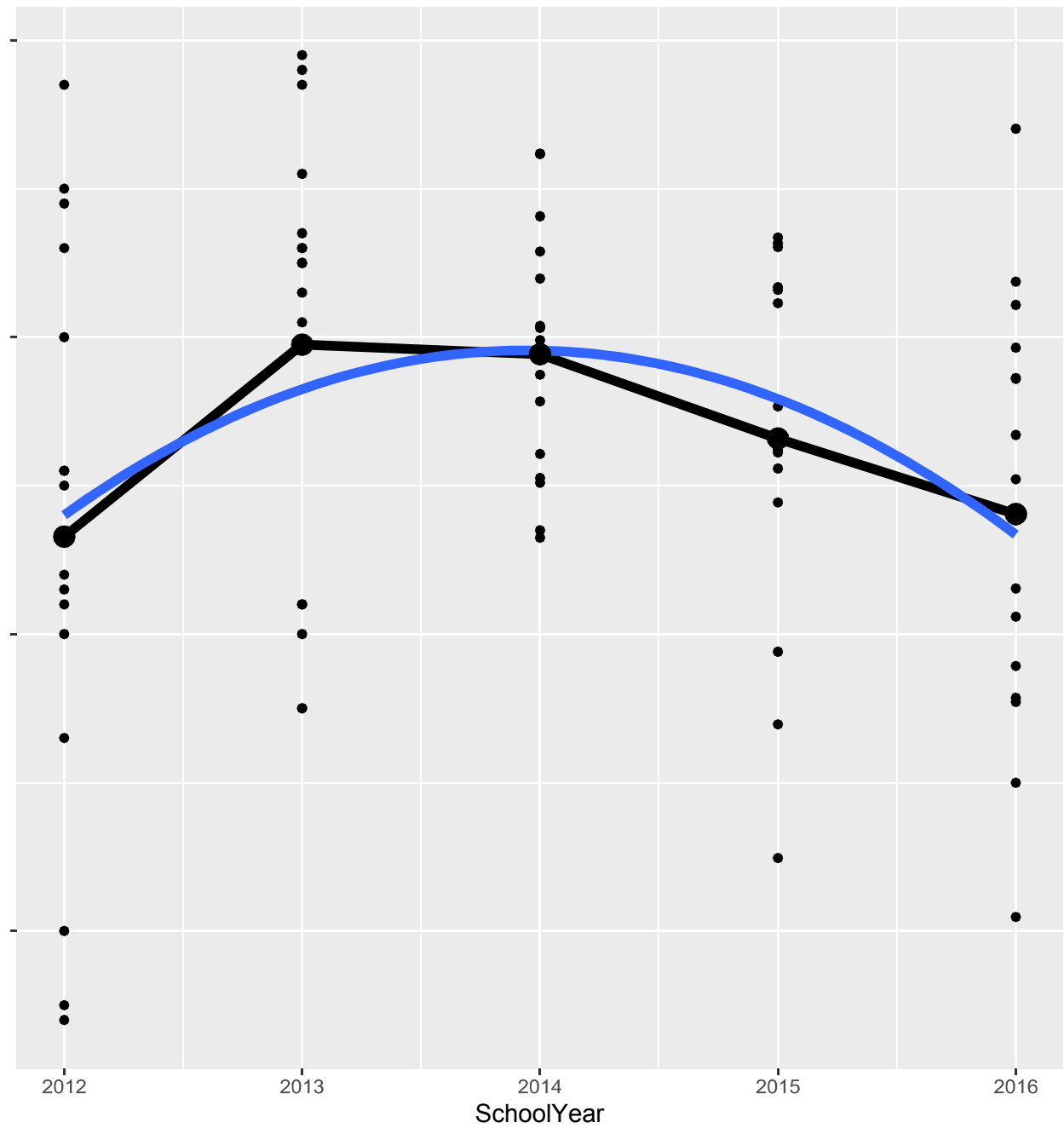
Plot of MMR composite scores by years with mean polynomial lines.



Appendix 3

Plot of MMR composite scores by years with predicted polynomial line and group means.

Plot of MMR composite scores by years with predicted polynomial line and group means.



Appendix 4

Plot of MMR composite scores by year with individual predicted polynomial lines.

Plot of MMR composite scores by year with individual predicted polynomial lines.

