ABSTRACT

Title of Document:	EXPLORING THE RELATIONSHIP BETWEEN MIDDLE-GRADE SCHOOL CONFIGURATION, SCHOOL CHARACTERISTICS, AND STUDENT ACADEMIC OUTCOMES
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The purpose of this study was to explore whether school grade configuration had a relationship with eighth-grade reading and mathematics proficiency and ninth-grade enrollment in a selective high school. I analyzed data for two cohorts of students enrolled in K-8 and 6-8 schools located in the Baltimore City Public School System. Since the early 20th century educators and researchers have identified the middle-grade years as potentially crucial for youth development. Findings from prior research on the impact of grade configuration on student achievement have been inconsistent. Some researchers identify clear, consistent academic advantages for students enrolled in K-8 schools. Other researchers identify no such performance difference.

Analytic methods consisted of both descriptive and inferential statistics. The primary analytic method was hierarchical generalized linear modeling (HGLM). Student-level variables included were gender, fifth grade reading proficiency, fifth grade

mathematics proficiency, over-age status, eligibility for free or reduced-price meals and the number of years enrolled in the same school between fifth and eighth grades. School-level variables included grade configuration, school size, student and teacher climate measures, the percent of over-age students, the percent of students eligible for free or-reduced price meals, cohort, and the percent of fully certified teachers. Student-level variables were consistent for all data models. I added school-level variables in stages.

Inferential analyses of student data revealed significant differences in the fifth-grade performance and demographic characteristics of students enrolled in K-8 and 6-8 schools. Compared with students enrolled in K-8 schools, 6-8 students in both cohorts were less likely to be proficient in mathematics and/or reading in fifth grade. Middle school students were more likely to be over-age for grade. At the school-level, there were few significant differences between the schools attended by cohort 1 and cohort 2 students. HGLM analyses revealed no unique, direct relationship between school grade configuration and the study outcomes once all variables were included in the model. Fifth grade proficiency levels were highly predictive of all outcomes. The study findings indicate that changing school grade configuration for middle-grade students may not be sufficient to improve student achievement in the absence of other conditions.

EXPLORING THE RELATIONSHIP BETWEEN MIDDLE-GRADE SCHOOL
CONFIGURATION, SCHOOL CHARACTERISTICS, AND ACADEMIC
OUTCOMES

By

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Dedication

To my family and friends, thanks for all of your love, patience, and support.

Acknowledgements

Table of Contents

List of Tables

List of Figures

Chapter 1: Is School Grade Configuration a Contributor to School Effectiveness for Middle-grade Students?

Which characteristics make a school more or less effective in helping students achieve at high levels? Educators, policymakers, and researchers have consistently identified some schools serving adolescents (students in grades five or six through eight) as failing to prepare students to achieve at high academic levels (Cuban, 1992; Gruhn & Douglass, 1956; Yecke, 2006). Concerns about the quality of education for middle-grade students stretch back to the early decades of the 20th century (Gruhn & Douglass, 1956) and persist today. Yecke (2006) described middle schools as "the place student academic achievement goes to die" (p. 20). Similarly, Balfanz and MacIver (2000) identified the middle grades as the "place where the battle for urban education is lost" (p. 137).

Such statements highlight the interconnectedness of school reform efforts across educational levels. The positive effects of reform efforts that begin in the primary or elementary grades may fade away during the middle grades if schools are unable to build on and extend them. Additionally, high school reform efforts may become more difficult to implement and maintain if entering students are ill-prepared for the academic and behavioral demands required for success. Moreover, if reform efforts initiated during the primary or elementary grades have not been successful in improving student academic performance, the middle grades may serve as the last opportunity to address academic or behavioral weaknesses and prepare students for success during high school and beyond (Williams, Kirst, & Haertel., 2010). Evidence suggests that seeds for phenomena such as dropping out of high school are planted well before students enter high school (Bryk & Thum, 1989; Jimerson, Egeland, Sroufe, & Carlson, 2000; Temple, Reynolds, & Miedel,

2000) and may be most apparent during the middle grade years (Balfanz et al., 2007; Haney et al., 2004; Roderick, 1994; Rumberger, 1995; Zarate, Ruzek & Silver, 2008).

Middle-grade schools may serve as a bridge between elementary and high school reform efforts, and given the developmental stage of middle-grade students, also may serve as a critical link between childhood and adulthood. A body of research identifies the middle-grade years as a transitional period or as a developmental *turning point* for adolescents (Carnegie Foundation, 1989; Graber & Brooks-Gunn, 1996; Hughes, 1998; Jessor, 1998; Laub & Sampson, 1993; Roeser, Eccles & Sameroff, 2000). Turning points are "transitional periods or events [which] have the potential to alter behavior, affect, cognition, or context, all of which could result in lifelong change" (Graber & Brooks-Gunn, 1996, p. 768). The attitudes and behaviors that students develop during this period may have a significant effect on later life outcomes; schools potentially play a critical role in helping to shape these attitudes and behaviors.

If one views the educational process as a series of stages or steps, then each stage of the process may be affected by prior stages and may affect future stages. Wheelock and Miao (2005) liken the series of educational stages to a pipeline. In this conception, difficulties or weakness developed in the earlier stages may carry forward to later stages and ultimately can decrease the likelihood of success during those later stages. Conversely, successes students experience or strengths they develop during the middle-grade years may increase the likelihood of achieving positive outcomes during later adolescence or adulthood. The charge for schools and school districts is to develop and support effective schools that help young adolescent students navigate an important developmental period while simultaneously addressing prior academic deficits, sustaining

earlier learning gains, and preparing students for the next stage of the educational process. These are not tasks which are easily achieved, but they are ones that can have significant implications for the overall outcomes of school improvement efforts and for the later development and progress of students.

Middle-grade Education Reform and Grade Configuration

Decades of school reform initiatives have targeted multiple aspects of school organization and operation. One middle grade reform strategy has been shifting the grade configurations of schools attended by middle-grade students (Clark & Clark, 1993; Cuban, 1992; Gruhn & Douglass, 1954; Juvonen, Le, Kaganoff, Augustine, & Constant, 2004). School reform initiatives, including the shifting of grade configurations are grounded in the assumption or belief that schools vary in their level of effectiveness in educating students and that organizational changes, both internal and external, can improve a school's efficacy in facilitating high levels of student achievement. School improvement initiatives represent attempts to improve the effectiveness of schools by changing school organizational structures and/or instructional practices. The primary goal of school effects research is to explore how changes made to the context and climate of a school, beyond the influence of student and family characteristics, affect student outcomes (Ma, Ma, & Bradley, 2008).

Well before the implementation of the No Child Left Behind legislation (NCLB), educators such as Ronald Edmonds (1979) advocated that *effective schools* could have a positive effect on student learning and achievement. The effective schools movement was, in some ways, a response to the earlier work of Coleman (1966), which emphasized the importance of student and family background on student academic performance and

3

growth and downplayed the independent role of schools on student outcomes. Although other researchers have disputed some of the findings and claims of student improvement presented in the work of Edmonds and his colleagues (Boyd & Shouse, 1997; Stedman, 1987), relative consensus exists that schools can play critical roles in facilitating or impeding student growth and progress (Allensworth & Easton, 2007; Bryk & Thum, 1989; Fine, 1991; Lee & Burkham, 2003; Ma, Ma, & Bradley, 2008; Rumberger, 2004; Rumberger & Thomas, 2000; Scribner, Scribner & Reyes, 1999; Zvoch, 2006). Strategies to improve school effectiveness and the related research work are central too much of the activity directed at the nation's public schools.

A relatively consistent pattern of the shifting of school grade configurations has characterized middle-grade reform strategies for more than a century. During the late 19th and early 20th centuries most middle-grade students attended schools which served students in kindergarten or first grade through eighth grades (K-8). However, some stakeholders viewed this school configuration as failing to adequately serve middle-grade students (Gruhn & Douglass, 1956). In response to perceived inadequacies of the K-8 model, school districts established junior high schools (seventh through eighth or ninth grades) during the early/middle 20th century. During the late 20th century, some education leaders and stakeholders expressed concerns about the ways in which some junior high schools failed to prepare students for high school, and school districts nationwide began to shift to the middle school model (sixth through eighth grades) (Cuban, 1992; Clark & Clark, 1993; Gruhn & Douglass, 1956; Juvonen et al, 2004). Continued dissatisfaction with the lack of progress of some middle-grade students has led some school districts to

return to the K-8 grade span to improve student outcomes (Balfanz, Curran, & Neild, 2002; Byrnes & Ruby, 2007; Lee, 2004; Weiss & Kipnes, 2006).

In a recent report on the outcomes of middle-grade students attending New York City K-8 and middle schools, Rockoff and Lockwood (2010) posed the following question: "Could something as simple as changing the grade configuration of schools improve academic outcomes?" (p. 1). The possibility that schools and school districts can potentially help facilitate higher levels of student achievement by altering grade configurations is alluring. Multiple school improvement initiatives have revealed how difficult it is to initiate, and perhaps most importantly, maintain effective school improvement strategies. Compared with other more complicated reforms that focus more directly on the processes of teaching and learning, changing the grade organization or configuration of district schools is a relatively simple structural fix.

Rockoff and Lockwood (2010) explored the extent to which the performance of students enrolled in New York City public middle schools differed from that of similar students enrolled in the district's K-8 schools. The authors concluded that middle schools had a distinct, negative impact on students. They found that compared with students enrolled in K-8 schools, students who attended middle schools suffered significantly larger declines in academic performance and rates of school attendance and experienced more behavioral problems. To boost student performance, the authors concluded that perhaps New York and other similar districts should consider shifting away from educating students in traditional middle schools in favor of educating them in combined elementary and middle schools.

Prior research on middle-grade reform efforts (Felner et al., 1997; Mergendollar, 1993) has indicated that structural changes such as reorganizing student schedules, changing grade configurations, or implementing vertical or horizontal team planning periods happen more quickly and are more easily implemented than changes that touch the critical areas of teaching and learning. Findings from this body of research indicate that sustainable changes in student learning are more likely to occur when instructional changes are implemented in conjunction with structural changes (Felner et al., 1997).

While Rockoff and Lockwood (2010) identified benefits of K-8 schools compared with middle schools, critics of the push for K-8 schools contend that the perceived positive effect of K-8 schools has been exaggerated. Research that has applied both student and school-level statistical controls has found that K-8 and 6-8 schools which serve a similar student population tend to produce similar student outcomes (Balfanz et al., 2002; Byrnes & Ruby, 2007). Weiss and Kipnes (2006) identified no consistent or statistically significant negative effect of middle schools on student outcomes. The researchers concluded that "the middle school environment is no more detrimental to students' performance than that of the K-8" (265-266). Balfanz, et al. (2002) identified a positive effect of high poverty K-8 schools on student achievement. They cautioned, however, that the improvements in student performance in K-8 schools would not be large enough to meet or exceed state performance standards; the benefits of K-8 schools were not significant enough to improve student achievement to the levels required by state accountability systems.

Purpose of Study

The extent to which school grade configuration is significantly related to school effectiveness is not clear. Rockoff and Lockwood (2010) concluded that grade configuration may, indeed, be related to school effects while others (Byrnes & Ruby, 2007; Weiss & Kipnes, 2006) found limited, if any, support for such a conclusion. The primary goal of this dissertation is to add to the existing research base on the role of grade configuration in school effectiveness. This research effort is based on analyses of student characteristics, school characteristics, and student outcomes for two cohorts of students enrolled in the Baltimore City Public School System (BCPSS). I selected two cohorts of students because of the increased opportunity to identify patterns among variables and test relationships. Student performance on assessments may vary across years and examining a single year of data may provide an inaccurate view of how the data may look over time. Two years of data still provides a narrow view of data but does provide an initial look at what trends in data may be over time. Outcomes of interest include performance on state eighth-grade reading and mathematics assessments and ninth-grade enrollment in a selective high school.

Since the early 1990's the BCPSS has implemented a process that has resulted in a decrease in the number of traditional middle schools and an increase in the number of K-8 schools (Yakimowski & Connolly, 2001). The number of schools fully implementing or phasing in the K-8 model increased from 21 in 2001 to 70 in 2010. Moreover, the number of traditional middle schools declined from 25 to 14 over the same period of time. This reorganization process has resulted in an increase in the number of students

who avoid the elementary to middle school transition. What is not clear is whether the changes have contributed to improved outcomes for middle-grade students.

Prior research on school grade configuration has identified some K-8 school benefits including improved rates of attendance, higher levels of student performance, and better student behavior (Abella, 2005; Offenberg, 2001; Yakimowski & Connolly, 2001). The Yakimowski and Connolly study focused on Baltimore and may have been a key factor in encouraging district leaders to expand implementation of the K-8 grade span. Weiss and Kipnes (2006), however, cautioned that little of the prior research on the impact of grade configuration on student outcomes has employed direct comparisons between the different models of school configuration. This methodological weakness limits the extent to which one can compare the potential benefits of the two models and draw conclusions about which model may foster more positive student outcomes. However, despite these mixed or inconclusive findings, several large school districts have embraced the K-8 school configuration as a means of improving student performance in the middle grades (Bowie, 2007; Gootman, 2007; Hernandez, 2007; Jan, 2004; Viadero, 2008).

Although school grade configuration is the primary focus of the following analyses, I recognize that other school characteristics may affect student outcomes. To this end, this dissertation incorporates additional information on schools in the analytical models. Additional variables include information from students and teachers about the learning environment or school climate and school-level demographic characteristics of students who attend the schools included in the study. The educational environment schools provide may facilitate or impede positive student outcomes through their impact

on student interests, motivations, and behaviors (Eccles et al., 1991; Ferguson, 2002; Rathunde & Csikszetmihalyi, 2005; Roeser et al., 1998). Additionally, prior research has found that school characteristics including the student poverty rate and prior academic performance of students may be related to student outcomes (Betts, Zau, & Rice, 2003; Steiffel, Schwartz & Iatorola, 2000). Schools that serve large proportions of poor students or students with weak academic backgrounds tend to have lower levels of student achievement compared with schools that serve a more affluent student population (Betts, Zau, & Rice, 2003; Steiffel, Schwartz, & Iatorola, 2000).

The inclusion of these additional school-level covariates potentially strengthens the validity of findings about the relationship between school configuration and school effectiveness. If school configuration is significantly related to student performance when other school and student-level variables are included, the case for the unique impact of school configuration is strengthened. On the other hand, if school configuration is not significantly predictive of student outcomes and other school-level factors are, in fact, predictive of student performance, then the rationale that has guided the expansion of the K-8 model in school districts like Baltimore may be flawed. School leaders may be better served by exploring other ways of supporting student learning in addition to or as a replacement for changes in school configuration.

Research Questions

The following four sets of research questions guide this work:

1. What are the demographic and performance characteristics of students who attend Baltimore K-8 and 6-8 schools? How do these student characteristics differ by school configuration?

9

2. What are the organizational differences between K-8 and middle schools? How do they compare in terms of average teacher qualifications, school size, and student enrollment?

3. To what extent do middle-grade students who attend Baltimore K-8 and 6-8 schools differ in terms of self-reports of relationships with teachers, level of interest in classes, and access to an environment that is conducive to learning? To what extent do teachers in K-8 and 6-8 schools report different levels of engagement with students and the school overall?

4. To what extent do eighth-grade outcomes differ by school configuration? In which ways are differences in student outcomes related to school structural characteristics and student and teacher engagement?

Through the use of multilevel models, this research explores the extent to which student and school characteristics, including grade configuration, appear to affect estimates of student outcomes for two cohorts of eighth-grade students . Student outcomes include:

- Proficiency status on the eighth-grade Maryland School Assessment (MSA) in reading

- Proficiency status on the eighth-grade Maryland School Assessment (MSA) in mathematics

- Ninth-grade enrollment in selective high schools.

Theoretical Model

Figure 1 displays a simplified view of the relationships underlying this research study and highlights the pipeline aspect of the progression from elementary school, through high school, on to adulthood. This research study only includes the italicized portions of the model. As demonstrated in the figure, I hypothesize that student academic outcomes are the result of the interplay between family background characteristics, prior achievement, student experiences at school, and school structural characteristics including grade configuration. Schools are unable to affect student background characteristics. Schools are, however, responsible for addressing prior learning deficiencies and for providing educational environments that actively engage students in their learning and foster learning gains.

In this model, school characteristics and organizational practices may affect student experiences and outcomes at all educational levels. Grade configuration is one of the school characteristics this research explores to identify whether there is any connection with school effectiveness and student outcomes. If grade configuration is not distinctively related to school effectiveness, K-8 and 6-8 schools serving similar student populations will likely produce similar student outcomes.

Figure 1 – Hypothesized Relationship among Student and School Characteristics and Educational Progress and Outcomes
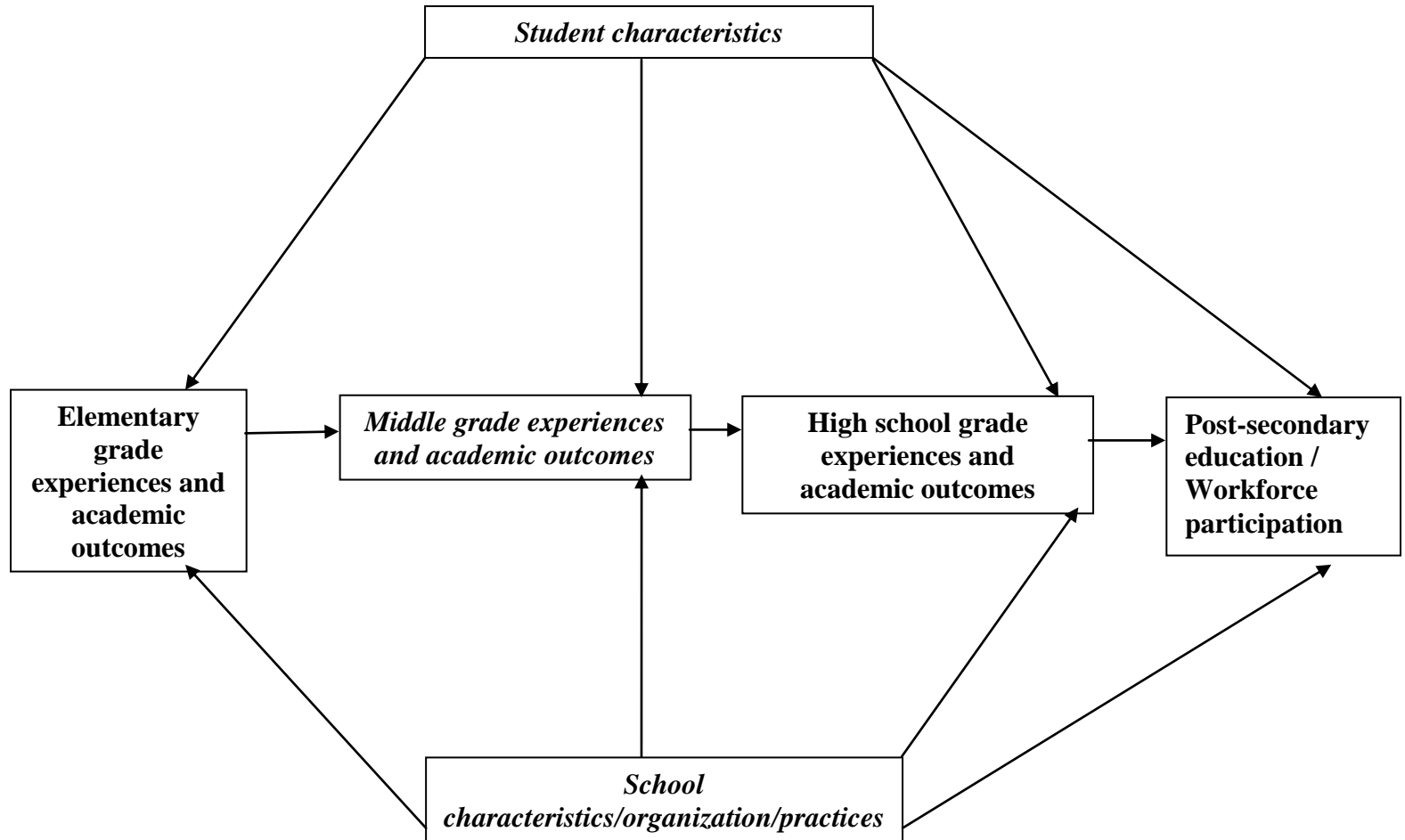
Significance of Study

Schools and school districts continue to implement multiple strategies, including changing the grade configurations of schools, to improve student academic outcomes at all educational levels. Improved understanding of whether changes in grade configuration can help facilitate improved student academic performance for a larger proportion of middle-grade students can help inform these efforts. Guided by a belief in the effectiveness of K-8 schools, districts such as Baltimore have moved toward widespread adoption of the K-8 model. The current research has the potential to provide evidence that either verifies or disproves the effectiveness of this approach to school improvement.

Although some available research advocates for an expansion of the K-8 school configuration, especially in school districts like New York City (Rockoff & Lockwood, 2010), the research base for widespread adoption of the K-8 model is mixed (Byrnes & Ruby, 2007; Coladarci & Hancock, 2002; Weiss & Kipnes, 2006). This study provides a limited, but potentially important, look at whether grade configuration is related to student outcomes and may provide evidence about the potential benefits of transition to the K-8 model.

Definition of Key Terms

The following definitions provide clarification of terms used for this dissertation.

- FARMS status – student identification as eligible for free or reduced-price meals as of the end of the school year.

- K-8 school – school that enrolled students in grades kindergarten or pre-kindergarten through eight.

- MSA (Maryland School Assessments) - annual reading and mathematics assessments administered to all students in third through eighth grades as part of the Maryland school accountability system.

- Middle school (6-8 school) – school that enrolled students in sixth through eighth grades.

- Selective high schools – high schools that require that students present a minimum performance level prior to admission.

- School climate – teacher and student reports of the health or functionality of the school environment.

Organization of Study

The dissertation consists of a total of six chapters. The current chapter provided background and the rationale for this research effort. The chapter concluded with a presentation of the research questions guiding this study and its potential significance for the field of education. Chapter 2 provides the foundation for this study through exploration of prior research on adolescence, middle-grade education, and school configuration. The section on middle-grade education includes a review of literature on the relationship between school climate and student outcomes. Chapter 3 provides contextual information on the site selected for this study, Baltimore City, Maryland. The chapter includes a discussion of the demographics of both the city and the school district and describes the relatively rapid and widespread growth of the K-8 model in the school district. Chapter 4 discusses the research design and the use of hierarchical generalized linear modeling (HGLM) to identify the impact of grade configuration on the odds of achieving proficiency state reading and mathematics assessments and the odds of enrolling in a selective high school in ninth grade. Chapter 5 presents descriptive and inferential analyses of K-8 and 6-8 schools and students and provides results and analysis

of the HLM models. Chapter 6 provides a discussion of findings, conclusions, and

suggestions for future research.

Chapter 2: Literature Review

The chapter aims to tie together the different branches of research on adolescent and middle-grade education. To ground this study, I reviewed existing research on (1) the origins and educational implications of the identification of adolescence as a distinct developmental stage; (2) the history of school grade configuration changes for middle-grade students; (3) the impact of school changes on student performance; and (4) comparisons of the performance of students enrolled in K-8 and 6-8 schools.

The first section uses a historical viewpoint to understand how past ideas and actions shape current views and practices. The section concludes with a discussion of some of the goals that educators have identified for middle-grade education. The second section discusses research on middle-grade transitions and the school practices and environmental characteristics identified as having the potential to ease the difficulties that some students experience when moving to new middle-grade schools. The third section explores the impact of school climate on middle-grade student performance. The final section of the chapter focuses on K-8 and 6-8 schools and examines the research comparing the academic performance of students enrolled in K-8 and 6-8 schools.

Historical Context of Adolescence and Principles of Adolescent Education

This section of the literature review will explore how adolescence became a distinct stage of human development and how this designation has affected school grade organization since the beginning of the 20th century. The identification of adolescence in this manner, in conjunction with large-scale economic and demographic changes,

facilitated a steep increase in secondary school enrollment and helped to shape ideas about the organization and characteristics of secondary education.

Finklestein (2002) reviewed the history of the development of the concept of adolescence in the United States and argued that during the early 20th century, the "architects of adolescence" (such as G. Stanley Hall) actively constructed and promoted the idea of adolescence as a distinct period of human development. The period of adolescence spans from ages 11 or 12 to 18. The biological changes of puberty drive the timing of adolescence; the onset of puberty is one of the key markers of the physical changes that youth undergo on the path toward adulthood. Prior to Hall's research, society did not commonly recognize adolescence as a distinct stage of human development. The early descriptions of the markers of adolescence included emotional swings, increased levels of both energy and exhaustion, heightened levels of stress, and an inability to self-govern emotions (Finklestein, 2002; Simmons & Blyth, 1987).

The characterization of adolescence as a distinct developmental stage occurred at the same time that the United States was undergoing significant social and economic change. As the economic structure of society changed from agrarian to industrial in the late 19th and early 20th centuries, children spent less time with their families and more time in the larger society. The number of students who weren't enrolled in school or employed in the labor force increased (Cuban, 1992). In addition to these economic and social changes, the demographic characteristics of northern cities changed as the number of immigrants and newly freed slaves increased (Finklestein, 2002). Community social and economic leaders feared that these changes might disrupt the social order (Bottoms, n. d.)., and education reformers suggested that schools should take a more prominent role

in helping children prepare for their adult lives (Department of the Interior Bureau of Education, 1918). Moreover, society began to view schools as critical institutions that would "become sites of socialization and community building as well as sites for intellectual nurture" for children (Finklestein, 2002; p. 7). As a result, at the end of the 19th century, secondary education was rapidly transformed from an institution that was available only to the children of social elites to a universally accessible institution for all students by the early decades of the 20th century (Anderson, 1988). Although access to educational opportunities rapidly expanded for much of the population, this access continued to be limited for African American and Native American children until the mid-20th century (Anderson, 1988; Finklestein, 2002).

School reformers and stakeholders also began to rethink how schools should be designed to serve students of all ages, including early adolescents. Gruhn and Douglass (1956) discussed the establishment and growth of the nation's junior high schools and commented how educators "believed that they were doing reasonably well in meeting the needs of elementary school children and older adolescents in upper high school grades; however, many of them seriously questioned the effectiveness of the program for early adolescents" (p. 26). Educators noted that many students lost interest in school by seventh grade and dropped out. Reformers linked this pattern of early school departure with the characteristics and practices of the schools. They argued that the schools were designed to serve young children rather than students who were approaching early adulthood (Cuban, 1992). A committee within the Department of the Interior wrote "a comprehensive reorganization of secondary education is imperative at this time" (Department of the Interior Bureau of Education, 1918, p.7).

Reform efforts during the early and mid-20th centuries sought to define specific school characteristics and practices that were critical for providing adolescents with a positive and productive educational experience. In 1918, the Commission on the Reorganization of Secondary Education issued the "Seven Cardinal Principles of Secondary Education" to outline practices and principles that would improve educational opportunities for adolescents (Department of the Interior Bureau of Education, 1918; Gruhn & Douglass, 1956). The seven principals were:

- Health
- Command of fundamental [academic] processes
- Worthy home membership
- Vocation
- Civic education
- Worthy use of leisure
- Ethical character.

The authors also identified a clear purpose for education in a democratic society:

> Education in a democracy, both within and without the school, should develop in each individual the knowledge, interests, ideals, habits, and powers whereby he will find his place and use that place to shape both himself and society toward ever nobler ends (p. 9).

These principles provided a framework for schools that covered multiple aspects of students' lives. Schools were charged with the responsibility to foster not only students' academic growth, but also their moral, social, and physical development.

The 1950's work of the California branch of the National Association of

Secondary School Principals represents another example of the attempts to identify

secondary education goals. The group developed and disseminated the "Ten Imperative

Needs of Junior High School Youth" (Gruhn & Douglass, 1956). The goals for junior

high schools included providing students with the opportunities to:

- Explore occupational interests and attain basic occupational proficiency

- Develop and maintain physical and mental health

- Participate as citizens of the community

- Have developmentally appropriate experiences and understanding

- Develop a sense of the material value of things

- Develop a scientific approach to the solution of problems

- Develop a sense of appreciation of the arts and artistic expression

- Experience a variety of socially acceptable and personally satisfying and leisure experiences

- Develop respect for the rights of others and ethical insights

- Have experiences to observe, listen, read, think, speak, and write with purpose and appreciation (p. 25).

These principles also reflected the different types of development or growth that

educators deemed necessary for adolescents (Altenbaugh, 2003; Kridel & Bullog, 2007).

In his historical study of the lasting effects of junior high school reform movement,

Cuban (1992) observed that these multiple goals and the "peculiar functions" of junior

high schools made it difficult for the schools to be fully successful.

Contemporary theories of adolescent education continue to reflect the principles

established in the early and middle 20th century. For example, the influential *Turning*

Points report of the Carnegie Council on Adolescent Development (1989) provided an

updated model for middle-grade education. The final report recommended eight practices

for middle-grade schools, including:

- Create small learning communities that allow for development of both intellectual development and personal growth

- Teach a core academic program that produces literate and critically thinking student

- Ensure the success of all students through the elimination of tracking

- Empower teachers and administrators to make appropriate educational decisions for students

- Staff middle-grade schools with teachers who are expert at teaching young adolescents

- Improve academic performance through fostering the health and fitness of young adolescents

- Reengage families in the education of young adolescents by giving them a meaningful role in governance

- Connect schools with communities so that the responsibility for youth outcomes is shared by more than just schools (p. 9)

Similarly, in 2009 the National Middle School Association (NMSA) released its

most current statement on the educational goals for middle school students. In *This We*

Believe: Keys to Educating Young Adolescents (2009), NMSA identified the following

goals for middle-grade students:

- Become actively aware of the larger world, asking significant and relevant questions about that world and wrestling with big ideas and questions for which there may not be one right answer.

- Be able to think rationally and critically and express thoughts clearly.

- Read deeply to independently gather, assess, and interpret information from a variety of sources and read avidly for enjoyment and lifelong learning.

- Use digital tools to explore, communicate, and collaborate with the world and learn from the rich and varied resources available. Connect schools with communities so that the responsibility for youth outcomes is shared by more than just schools.

- Be a good steward of the earth and its resources and a wise and intelligent consumer of the wide array of goods and services available.

- Understand and use the major concepts, skills, and tools of inquiry in the areas of health and physical education, language arts, world languages, mathematics, natural and physical sciences, and the social sciences

- Explore music, art, and careers, and recognize their importance to personal growth and learning.

- Develop his or her strengths, particular skills, talents, or interests and have an emerging understanding of his or her potential contributions to society and to personal fulfillment.

- Recognize, articulate, and make responsible, ethical decisions concerning his or her health and wellness needs.

- Respect and value the diverse ways people look, speak, think, and act within the immediate community and around the world.

- Develop the interpersonal and social skills needed to learn, work, and play with others harmoniously and confidently.

- Assume responsibility for his or her actions and be cognizant of and ready to accept obligations for the social welfare of others.

- Understand local, national, and global civic responsibilities and demonstrate active citizenship through participation in endeavors that serve and benefit those larger communities.

The common threads of the academic, moral, and social development of youth run through each of these statements of the principles and goals for the education of adolescent students. Although there have been significant social, economic, and political

changes since the late 19th century, these core principles have maintained a remarkable level of stability. Finklestein's (2002) chapter, "Is Adolescence Here to Stay?" concluded that the early 20th century concept of adolescence has "become embedded in the deep structures of society" (p. 28) and will likely continue to influence society's view of adolescence and to define how the educational community shapes and structures the learning opportunities for students. Ideally, these principles would guide the development and operation of successful schools for middle-grade students. Although many of the core principles of adolescent education have been stable over time, this stability has been frequently accompanied by a persistent dissatisfaction with the ability of some schools to achieve the goals that the principles describe (Bottoms, n. d., Cuban 1992; Clark & Clark, 1994; Gruhn & Douglass, 1956).

In summary, since the early 20th century, the advancement of educational opportunities and outcomes for middle-grade students has been a recurring aspect of the school improvement cycle. The recognition of developmental stages, including adolescence, and the broader society's expectation that schools serve as formal institutions of socialization and workforce preparation created many different and ambitious goals for schools. Over time, these demands have inspired multiple waves of school reform and improvement efforts. The following section explores how the change in school grade configuration has been employed as one means of improving the academic engagement and performance of middle-grade students.

The Middle Grades and School Configuration

This section of the literature review builds on the prior section through an exploration of how the change in grade configuration has been a component of middle-grade education plans. This review reveals how academic, social, economic, and demographic pressures have resulted in multiple shifts in the configuration of grade levels in secondary schools and how schools continue to implement these changes to the present day.

Until the early 20th century, middle-grade students were educated in the same schools as elementary students. Secondary education began with high school in the ninth grade. Gruhn and Douglass (1956) noted that this 8/4 split became the predominant organizational structure of schools by the early decades of the 19th century. The authors noted that there is little historical evidence to explain why most schools were organized in this manner. By the early 20th century, the 8/4 structure was the predominant organizational structure, despite the fact that critics at all educational levels identified weaknesses in the model (Clark & Clark, 1993; Cuban, 1992; Gruhn & Douglass, 1956; Manning, 2000). The high dropout rates after the seventh grade represented one of the major shortcomings of the 8/4 organization (Cuban, 1992).

Critics attributed these dropout rates to educational strategies that were predominantly focused on the developmental stages of younger students and therefore, incompatible with the development of adolescents. Education leaders argued that adolescent education needed to be developmentally appropriate to prepare students for adult employment or the transition to post-secondary education and training (Clark& Clark, 1993; Gruhn & Douglass, 1956). A report of the National Education Association

(1899) identified the seventh grade, rather than ninth grade, as a more natural transition point in the lives of youth and, proposed a 6-6 model of educational organization. The report emphasized the necessity for high schools to adequately prepare students for college. The report authors noted, "There must be the closest affiliation between the secondary schools and the colleges. This can be brought about, only by the adoption of a plan that shall be consistent with what the secondary schools can do, and what the colleges must have" (NEA, 1899, p. 11).

In response to the perceived deficiencies of the 8/4 model and a growing acceptance of the benefits of the schools that had adapted their organization and curriculum to accommodate the developmental stages of adolescents, many school districts began to adopt the model of a junior high school during the early decades of the 20th century (Cuban, 1992; Gruhn & Douglass, 1956; Juvonen et al., 2004; Manning, 2000). Education reformers viewed junior high schools as organizations that could better capture and maintain the interests of early adolescents and keep them enrolled in school (Gruhn & Douglass, 1956). Critics of the 8/4 model labeled the withdrawal of early adolescents from the nation's schools a "waste" (Cuban, 1992). Schools could limit such waste by ensuring that school staff took into account and addressed the developmental changes of early adolescents including the onset of puberty, the development of new social relationships, and the maturing of individual artistic and athletic skills and interests (Gruhn & Douglass, 1956). Gruhn and Douglass (1956) noted, "It is essential that the program of junior high school education should recognize these various aspects of child growth and development" (p. 27).

Brough (1995) linked the educational community's emphasis on responding to the developmental stage and unique interests of students to the growth of the field of psychology and the increased recognition of individual differences that may shape academic interest and motivation. The implicit assumption of this framework is that the schools that take these issues into consideration when planning instructional organization and strategies will produce students who are better prepared for high school, college, and adult employment. Critics of the 8/4 system argued that the elementary grades provided an education that was too immature for adolescents and that the high schools had standards that were too rigid. In high schools, the demands of particular academic subjects rather than the interests and abilities of individual students tended to drive instruction. Educators envisioned junior high schools as a means of addressing both of these problems. Junior high schools were established on core principles that (1) emphasized all aspects of growth, especially social and emotional growth; (2) recognized each child as an individual experiencing maturation at different rates; (3) provided a generalized rather than specialized education which allowed students opportunities to explore many interests; (4) provided instruction which improved students' basic skills; and (5) ensured that the school served as a community (Brough, 1995). Fueled by a desire for significant educational improvements, school districts increased the number of junior high schools from 55 in 1920, to nearly 2,000 by 1930, and more than 3,000 by the mid-1950's (Gruhn & Douglass, 1956).

Supporters of middle schools had high expectations for the junior high school to serve as a means of reorganizing educational opportunities for and improving the academic outcomes of early adolescents. Cuban (1992) argued that the theory behind

junior high schools was one that could have resulted in a fundamental change in the nation's educational organization and practices. Cuban differentiates between fundamental and incremental changes. The basis of fundamental reform efforts is the recognition that the foundational structures of institutions are flawed and require a complete transformation. Although fundamental reforms and incremental reforms are based on the recognition of flaws in the current systems of operation, Cuban shows how incremental reforms focus on altering rather than replacing current structures. He argues that although the development of junior high schools required fundamental changes, in practice, the efforts produced only incremental changes and ultimately resulted in the continued dissatisfaction with the educational opportunities and progress of early adolescent students. Rather than serving as a distinct experience for middle-grade students and serving as a bridge between elementary and high school, junior high schools became early high schools and were characterized by departmentalization, subject centered-curriculum, poorly trained teachers, and limited opportunities for student exploration of interests (Cuban, 1992, p. 238; Brough, 1995). George et al. (1992) contended that including ninth-grade students in the same building increased the pressure to make junior high schools become early versions of traditional high schools. They commented how high schools continued to drive many of the organizational and instructional practices for ninth-grade students. The junior high schools became "hybrid institutions" and had an "identity crisis" (p. 5). Overall, the theory of junior high schools failed to align with the everyday practices of many schools (George et al., 1992).

Just as dissatisfaction with the current schools for middle-grade students and social changes drove the initial movement away from the 8/4 school structure, new

dissatisfactions and social changes caused a shift away from junior high schools to a different middle-grade school model. Brough (1995) noted that rapid advances in technology necessitated increased knowledge and the skills to innovate. Additionally, the Civil Rights movement and desegregation pressures forced schools to adopt significant changes in school organization as they opened new middle schools to replace the closed, segregated junior high schools (George, 1998). Moreover, the decline in the number of secondary students and the increase in the number of elementary students encouraged schools to move sixth-grade students out of elementary schools to make room for kindergarten students (Brough, 1995).

The changing perceptions in the timing of adolescence also increased the demand for a reorganization of middle-grade schools. Education reformers noted that the onset of puberty was occurring at an earlier age than at the turn of the century. They argued that developmentally, a modern eighth-grade student was more similar developmentally, to a ninth-grade student at the turn of the century (Brough, 1995). Therefore, if puberty meant that students needed different educational settings, the earlier onset of puberty should lead to earlier access to these new educational settings. Additionally, educators noted that high schools would be a better setting for ninth-grade students (George, 1992). The middle school model of the 1960's emerged to address the shortcomings of the junior high model (Clark & Clark, 1993; Cuban, 1992; Midgely, 2002).

Reformers envisioned middle schools as environments that were student-centered in contrast to the subject-centered nature of junior high schools (Clark & Clark, 1993). Alexander (1995) described the middle school concept as encouraging the development of schools to (1) focus on ensuring the articulation of education for adolescents as the

move from primary to secondary education, (2) prepare students for the transition to adolescence, (3) continue to provide a solid general education and (4) provide an opportunity for the exploration of interests (p. 24). These functions or goals are nearly identical to those previously identified for junior high schools. George et al. (1992) highlighted these similarities and noted that what really matters is planning and following through in school design and operation. This argument aligns with Cuban's (1992) discussion of fundamental and incremental reforms. George et al. (1992) linked the full implementation of middle school concepts with fundamental, rather than incremental educational changes.

Despite the multiple plans for reform, the dissatisfaction with middle grades education continued. Yecke (2006) commented that the middle school model was plagued by its extreme emphasis on the social, emotional development of young adolescents that resulted in "anti-intellectualism" (p. 20). The author identified the limited focus on academic achievement as a fatal weakness of the middle school and a cause of the low levels of academic progress for middle-grade students. Critics of the middle school model cited low levels of middle-grade student achievement on national assessments (such as the National Assessment of Educational Progress) and international assessments as evidence of the failures of the middle school model (Bottoms, n.d., SREB, 1998). Anfara and Lipka (2003) reviewed research on middle school effectiveness for improving student performance. They noted that the overall research base was weak and inconsistent. A key area of concern was the extent to which schools adopted and implemented middle grade practices. The lack of a proven track record of success led

some districts to advocate for the development of another grade configuration for middle-grade students.

Recently, due to the dissatisfaction with the outcomes of middle schools, a number of urban school districts have begun to re-adopt the K-8 model as the primary organizational structure for middle-grade student education. Many school districts, including Boston, MA; Washington, DC; Cleveland, OH; Prince Georges County, MD; New York, NY; and Baltimore, MD have begun either partial or full implementation of the K-8 model (Bowie, 2007; Gootman, 2007; Hernandez, 2007; Jan, 2004; Viadero, 2008). The Cleveland school district implemented a full K-8 model and eliminated all traditional middle schools (Hernandez, 2007). However, few other school districts are implementing the K-8 model as broadly as Cleveland. The Chicago Public School district never widely adopted junior high or middle schools and continues to enroll middle grade students in K-8 schools (Rockoff & Lockwood, 2010).

District leaders often highlight anecdotal evidence of the benefits of such conversions and cite the common assumption that the K-8 configuration provides more benefits for students than the traditional middle school configuration. For example, a former chief academic officer in Baltimore commented that 54 percent of sixth-grade students in K-8 schools achieved state standards on the Maryland School Assessment (MSA) compared with 36 percent of sixth-grade students who attended traditional middle schools (Bowie, 2007). Similarly, a former superintendent for the Prince Georges County Schools noted that implementation of the K-8 model might help to limit the academic and behavioral problems experienced by some middle school students (Hernandez, 2007).

Such thinking represents a direct contradiction to the thinking that resulted in the first shift away from K-8 schools.

Although advocates of the K-8 model focus on improved student outcomes, Juvonen et al. (2004) noted that the regrouping of middle grades students for instruction has primarily been driven by practical issues such as overcrowding or declining enrollments, rather than by specific educational requirements of adolescent students. The acceleration of K-8 conversions in Baltimore occurred at the same time that the Maryland State Department of Education (MSDE) required the school district to reduce the amount of space occupied by schools by 15 percent in response to multiple years of declining enrollment (Baltimore City Schools, 2006). School leaders, however, stressed that school mergers and closures that occurred during implementation of the facilities space reduction plan were driven by comprehensive school reform efforts rather than by the requirement to reduce the amount of square footage of the district's school buildings (Baltimore City Schools, 2007). A former superintendent commented that the change to K-8 schools was accompanied by changes in curriculum, professional development for teachers of all middle-grade students, the hiring of reading and math coaches for schools, changes in school personnel, and the addition of social workers to school staffs (Baltimore Sun, 2007).

In summary, this review of literature reveals that, at least for some school districts, the return to the K-8 schools represents a return to past practices. Examination of the history surrounding the origin of adolescence as a distinct developmental period and the ways in which this idea shaped and was shaped by larger social, political, and economic forces provides interesting insights into the complexity of the educational

system. Despite the complexities and difficulties associated with most educational reform efforts, schools and school districts continue to work to improve educational opportunities and outcomes for students of all grade levels. The next section of this literature explores the ways in which grade configuration changes continue to play a role in middle grade reform efforts.

Current Perspectives on the Advantages and Disadvantages of the K-8 and 6-8 School Configurations

This section of the chapter delves into the current research on the relative advantages and disadvantages of the K-8 and 6-8 school grade configurations. The first section of this chapter reviews research on one of the purported benefits of K-8 school: the elimination of the need to change schools between the elementary and middle grades. The review explores prior findings that have shown how changing schools may affect student engagement, motivation, and academic performance. The second section explores the research on school configuration that compares the academic performance of students who attend K-8 and 6-8 schools.

Researchers have identified a general lack of substantive research on the middle grades (Coldarci & Hancock, 2002; Mac Iver & Epstein, 1993; Pardini, 2002). Since the 1980's, the amount and quality of middle grade research has improved (Mac Iver & Epstein, 1993). Mac Iver and Epstein (1993) conducted a review of middle-grade research and identified the on-going battle over school grade configuration as the "debate that has refused to die" (p. 521). They cited a prior research review in which the author declared that the review revealed that grade span has little impact on instructional practices and no further work on the topic of grade span configuration was necessary

(Calhoun, 1983). The revival of the K-8 school in some school districts indicates that this message has not been fully embraced by middle grade educators. Epstein (1990) argued that the battle over middle-grade configuration continues to rage because some students face difficulties when making the transition to middle or junior high schools, and parents and school administrators attempt to find ways to ease or eliminate that transitional stress.

The Impact of Grade Transitions on Student Achievement

A rather substantial body of research explores the impact of changing schools on student performance. A *Google Scholar Search* of the term "school grade transition" yielded more than 100,000 hits. A review of titles for the first 100 of these citations showed that almost 40 of these titles addressed the elementary to middle school or elementary to junior high school transition. The next most frequent school transition, with approximately 20 citations, was from middle school to high school. Approximately 10 citations referenced the transition from high school to college and an equal number of citations explored multiple transitions from the early primary grades through high school. The remainder of the citations explored the transition to elementary school or referenced research that was unrelated to this topic. Although this review was not exhaustive of all available research, it does highlight the relative frequency with which prior research has explored the middle grade transition and it may serve as an indicator for the importance of this transition for students' overall educational performance and progress.

Since the beginning of the 20th century, education reformers have linked these school transitions to potential declines in student performance. Early education reformers described the change from elementary school to high school as a "shock" for students (NEA, 1899) and identified the abrupt change from having a single teacher during the

elementary grades to having multiple teachers in high school as one of the reasons many students failed to complete high school. More recently, some research has highlighted student adjustment to unfamiliar environments as a possible reason for the decline in academic performance that some students experience upon entry to their new middle-grade schools (Eccles et al., 1993; George, 2005).

Research links changing schools during the middle and/or high school to negative outcomes, such as dropping out of high school. Rumberger and Larson (1998) conducted a logistic regression and HLM analyses of the National Educational Longitudinal Study (NELS) data for 13,000 students. They found that students who changed schools between eighth and twelfth-grades were 50 percent more likely to drop out of high school than students who did not change schools. They also identified a cumulative risk associated with school changes; more frequent school changes resulted in greater increases in the likelihood of dropping out of middle school (Rumberger & Larson, 1998). Rumberger (1995) also analyzed the NELS data set to study the phenomenon of middle school dropouts and found a similar relationship between changing schools and student dropout rates. HLM analyses of student demographic, academic, and survey data and school-level data revealed that students who changed schools during the middle grades were 30 percent more likely to drop out of school during their middle-grade tenure. Although student background variables such as race, ethnicity and the socioeconomic status of the student's family were most highly predictive of dropping out, these analyses also identified the unique effect of school changes on dropout rates.

The analyses of school district data have also linked school transitions with an increase in the likelihood of dropping out for some students. Roderick (1993) conducted a

34

longitudinal analysis of school transcript data of a cohort of approximately 800 students from Fall River, MA. The purpose of the study was to identify the relationship between middle grade and high school academic performance patterns and the timing of high school dropout or graduation. The analytic methods included logistic regression and event history analyses. The students in the school district transferred to middle school during either the sixth or seventh grades. Roderick created an interaction term for students who transferred to middle school during the sixth grade. She did not create a similar term for students who moved to middle school in the seventh grade. Data analyses revealed that during middle and high school transitions, the academic performance of future dropouts declined more significantly than the performance of future graduates. Roderick found that student grades declined by eight percent when students moved to middle school at sixth grade and by 18 percent when students moved to high school in ninth grade. Students who did not recover from these academic declines during the latter years of middle and high school were significantly more likely to drop out of school than were students who fared better during these transition years.

Alspaugh (1998) analyzed school district administrative data to identify patterns in the achievement of students who move to middle school and high school. This study included direct comparisons of the outcomes of students who remained in K-8 schools for sixth grade and those who moved to middle schools in sixth grade. Forty-eight rural Missouri school districts served as the focus for this analysis. Sixteen of the districts had a K-8 and 9-12 structure in which all students from the K-8 school moved to the same high school; half of the remaining districts had one elementary school, one middle school, and one high school. The final group of districts had two or three elementary

schools that fed into a single middle school and later into a single high school. Alspaugh

conducted all data analyses at the school rather than the individual level and compared

mean student performance on the fifth and sixth-grade state assessments; analytic

methods included two-way ANOVA's. The analyses revealed that students who attended

schools in the group of districts where multiple elementary schools fed into a single

middle school suffered the largest declines in mean performance on state assessments.

The performance of students in the first group of districts increased by an average of 7.4

scale score points, whereas the performance of students in the district where all students

fed into a single middle school declined by 5 scale score points. Students in the final set

of districts showed performance that declined by an average of 7.1 scale score points.

Students experienced similar performance declines when they transitioned to high school.

Simmons and Blyth (1987) also compared the performance of middle-grade

students enrolled in K-8 and 7-9 schools. The researchers conducted a multifaceted,

longitudinal study of the impact of adolescence on different measures of school

performance. In addition to examining student academic performance as measured by

GPA, they also investigated areas such as participation in extracurricular activities and

reports of self-esteem. The study used longitudinal data from students enrolled in 18

Milwaukee public schools. One component of the analyses compared the performance of

students enrolled in K-8 schools with that of students who moved to junior high schools

in the seventh grade and provided an interesting insight into the racial composition of the

schools included in the study. The six K-8 and comparison schools predominantly

enrolled Caucasian students. The remaining four schools were predominantly African

American K-6 schools. All K-8 and 7-9 comparisons included only Caucasian students to

control for race. All sixth-grade students enrolled in each of the sample schools were invited to participate in the study.

The analyses revealed that some students appeared to suffer negative effects after transferring to junior high schools. The researchers found that as student attitudes toward school became more negative, the GPA of both boys and girls declined among the group of students who moved to junior high schools in seventh grade. The study's major finding was that the experience of adolescence was specific to the individual. Many, but not all, students experienced academic challenges when entering junior high schools. The researchers summarized with the statement, "What seems to be true is that adolescent changes are difficult for some children under some circumstances" (p. 346).

Gutman and Midgely (2000) identified similar findings for African American students enrolled in a Michigan school district. The researchers studied the elementary to middle school transition of 62 low-socioeconomic status African American students. Data sources included parent interviews, student surveys, and school records; hierarchical linear regression was the primary analytic method. The goal of the research was to identify family, school, and psychological factors that appeared to protect students from the difficulties associated with the transition to middle school. Findings from the research paralleled those of other studies. The researchers identified a significant average decline in GPA between the fifth and sixth grades. Students who perceived that they were able to tackle their schoolwork had higher GPAs than students who perceived that they were less capable. Students who had high levels of both parent involvement and perceived teacher support had higher GPAs than students who had only one or none of these factors. The researchers concluded that school staff should make efforts to encourage parental

involvement, and schools and districts should provide training to help teachers support student engagement. The size of the study population limits the generalization of findings. However, the study results are generally consistent with prior research.

Other researchers have identified potential reasons that school transitions may lead to a decrease in student academic performance. Roderick (1993) suggested that academic declines were related to the difficulty of developing attachments to teachers and students in new schools. She concludes that difficulty developing these attachments may result in an elevated dropout risk for some students, particularly students who had lower levels of academic attainment during the elementary or middle grades. Students who had a history of poor academic performance exhibited higher dropout rates in high school. Anderson et al. (2000) noted that students with a history of poor grades were most likely inadequately prepared for the demands of the next educational stage; a condition that increased the likelihood of poor academic performance in the new setting.

Anderson et al. (2000) reviewed the body of research on school transitions and identified both the school and student-level characteristics that may contribute to difficulties during the elementary to middle grades transition. The most influential school-level characteristics included: (1) increase in both the physical size of the school and the number of students; (2) academic departmentalization and tracking; (3) poorer quality of relationships with teachers; (4) increased focus on comparing the performance of students and competition among students; and (5) a more socially and economically diverse student population (p. 327). They also noted that the transitioned students had elevated fears related to getting lost in the school, being bullied by older students, being less safe, and receiving lower grades (p. 329).

Barber and Olsen (2004) identified similar reasons for the decline in student performance of some students during the transition from elementary to middle school. Using the Ogden, Utah school district as the site for this analysis, the researchers analyzed four years of survey data collected from students enrolled in the fifth and eighth grades and used repeated ANOVA analyses to analyze changes in student reports of school environment, academic performance, and additional measures, including participation in extracurricular activities, psychological functioning, feelings of competence, and evidence of disruptive behaviors (p. 11). The researchers identified declines in student performance for all grade transitions except the sixth-grade transition. This finding contradicted findings from other studies that identified a decline in student functioning when students moved to middle schools in the sixth grade. They attributed this anomalous finding to the district practice of creating small "pods" for sixth-grade students within middle schools and theorized that these pods may have protected students from some of the negative effects of impersonality identified by other research.

Eccles and Midgely (1989) proposed a "stage-environment fit" model as a remedy for the motivational and behavioral changes associated with the move of students to middle school. This theory highlights the importance of matching student desires and developmental abilities with the learning opportunities available in schools and classrooms. When mismatched, student motivation and performance are likely to decrease. The authors specifically highlighted the adolescent need for independence and creativity as two key factors that influence student motivation.

Eccles et al. (1993) built on this model to examine changes in student motivation when students moved from elementary to middle schools (sixth grade to seventh grade).

The researchers focused on two aspects of motivation: (1) whether students thought they could succeed in accomplishing a task and (2) whether they wanted to succeed in accomplishing the task. The researchers used data gathered as part of the Michigan Adolescence Study, a two-year study of the impact of changes in school and classroom environments on student motivation, beliefs, and behaviors and drew the study's population of teachers and students from 12 Michigan school districts. Data sources included teacher and student surveys and classroom observations of both sixth and seventh-grade mathematics teachers. Key measures included teacher perceptions of their effectiveness as a teacher (teacher efficacy); student beliefs about their ability to be successful in class (student efficacy); teacher beliefs about the need to control students in class; and student and observer assessments of student/teacher relationships. ANOVAs and t-tests were the primary analytic method.

Study findings revealed a relationship between teacher efficacy and student outcomes. On average, students who had low-efficacy teachers experienced a decline in motivation in seventh grade. When students rated teachers as providing low levels of support in sixth grade but then had teachers who they perceived to provide higher levels of support in seventh grade, those students reported increases in their motivation. The reverse was also true; students who moved from a high support to a low support teacher between sixth and seventh grades reported decreased levels of motivation. Low-achieving students were particularly sensitive to low teacher efficacy and poor relationships with teachers and subsequently experienced dramatic declines in motivation and the perception of their abilities. Although they conceded that more research was necessary,

the authors concluded that schools could take steps to help students make successful transitions to middle school.

Previous research on how grade transitions may influence student academic performance and engagement provides evidence to explain how school changes are related to declines in academic performance and motivation for some students. The next section of this literature review delves into the role that the school environment and school climate plays in shaping student academic performance.

The Relationship between School Climate and Student Outcomes

Research indicates that schools serving middle-grade students, and most likely all primary and secondary schools, must strike a balance between creating challenging academic instruction and establishing social environments that are able to foster healthy and positive connections between and among peers and teachers (Davies, 1995; Ferguson, 2002; Juvonen, 2008; Midgely, 2001; Simmons & Blyth, 1987). School environments that balance academic and social environments may be better equipped to help students manage the emotional and physical changes of life while still remaining focused on making academic progress.

Some of the criticism directed towards middle schools centers around the observation that the environments of some middle schools do not adequately support or align with the developmental changes or stages of adolescence. As noted in the previous section, Eccles et al. (1993) theorized that the transition to a traditional middle school setting can be harmful to adolescents because they are expected to manage simultaneous biological, social, and academic changes. They argued that the traditional middle school setting is often mismatched with the developmental stage of adolescents. Such

41

mismatches may encourage student disengagement from school and may limit student achievement and motivation.

Eccles et al. (1991) identified the environment or climate of a school as factors that affect student progress and outcomes. Schools may be able to improve student progress by making changes that positively impact the school climate (Creemers & Reezgit, 2005). School climate research has explored multiple aspects of the relationship between school characteristics and student engagement or academic performance. Hoy and Hannum (1997) applied a health model in their analyses of school climate. They defined climate as "…the relatively stable property of the school environment that is experienced by participants, affects their behavior, and is on their collective perceptions of behavior in schools" (p. 291). The authors hypothesized that school climate and student achievement are mutually dependent.

Hoy and Hanum (1997) tested their hypothesis regarding the relationship between school climate and student achievement on a sample of 86 New Jersey middle schools from 15 of the 21 state counties. The researchers administered the 45-item Organizational Health Inventory for middle schools to teachers in the middle school sample to derive school climate measures. Six scales from the survey measured key aspects of school climate, including academic emphasis, teacher affiliation, collegial leadership, resource support, principal influence, and institutional integrity. The researchers also developed an overall summary measure of school health. They extracted student achievement data from New Jersey's Eighth-Grade Early Warning Test, an assessment that is administered to all and measures student performance in reading, mathematics, and writing. The researchers also included a measure of the schools' socioeconomic status (SES) in their analyses.

Correlation and regression analyses of the Hoy and Hanum (1997) data revealed multiple statistically significant correlations and regression coefficients. Academic emphasis had a significant effect on student performance in mathematics and reading, while institutional integrity and teacher affiliation had significant effects on student reading, writing, and mathematics performance. The researchers also found that SES was related to student performance; lower levels of SES correlated to lower levels of student performance.

Although Hoy and Hanum (1997) identified the ways that aspects of the school environment may have an impact on student performance, the study relied solely on the use of aggregated school data because climate is a school-level concept. Additionally, the analyses did not include students' perceptions of their school to those reported by teachers. These analyses, however, do not allow for an understanding of how such school measures may impact the performance of individual students. Multilevel modeling allows for simultaneous estimation of the relationship between school-level and student-level variables and outcomes.

Other researchers have examined the effect of school environment measures on student performance. Roeser et al. (1998) proposed a conceptual model of school ecology and theorized that the school is a "context that plays an important role in children's social and emotional development" (p. 322). Their model looked at the ways student perceptions of (1) support of competence, (2) support of autonomy, and (3) quality of relationships related to student motivation and performance. This work focused on the motivational, educational, and mental health aspects of adolescent development through

43

analyses of a sample of approximately 1,000 students who were part of the Maryland Adolescent Growth in Context longitudinal study.

Data sources for the study included in-person interviews and surveys completed by both the students and their primary caregivers. The researchers extracted data from school records to measure student performance and collected data from students at the beginning of the seventh grade and at the conclusion of the eighth grade. The researchers developed scales from the surveys to measure such constructs as academic motivation, emotional functioning, student reports of school support for academic competence and support of autonomy, and relationships with teachers. Key findings of the study included a reciprocal relationship between academic performance and emotional status over time and significant relationships between student perceptions of the school environment and changes in their academic performance and emotional status (p. 335).

Additional research has explored the relationship between student reports of engagement and motivation in school with school-level performance. Rathunde and Csikszentmihalyi (2005) compared data from students attending Montessori and traditional public schools. The study employed a unique method of examining the impact of the school environment on student perceptions and engagement. Through the implementation of the experience sampling method (ESM), the researchers collected data from approximately 300 students over a one-week period. ESM provided students with watches that were programmed to alert students at different periods. When the watches sounded, students completed the ESM questionnaire about their location, activities, engagement in the activity, and feelings.

Five Montessori schools were purposively included in the study because of the researchers' assessment of the quality of implementation of the Montessori model. The Montessori model included the following characteristics: an explicit focus on intrinsic motivation, extended periods of unstructured school time, lack of mandatory, comparative testing, student role in decision-making, and focus on small group as opposed to whole class work. The traditional middle schools were matched with the Montessori school based on comparable demographics and SES characteristics. Students who attended the traditional middle schools participated in the ESM data collection approximately nine years prior to the data collection for the Montessori students. The traditional middle schools differed from the Montessori schools in terms of instructional practices and school organization and were in the early stages of implementing a middle school reform plan.

The ESM data collection strategy captures 'real-time' information about students at different times of the day and may provide a more nuanced or contextual perspective of student engagement and motivation in a variety of settings. A key concept of the ESM model is that of optimal experience theory, which examines connections between a person's subjective experiences and the development of one's abilities. An integral part of this theory states that elements of the environment affect students' "flow". The authors define flow as an:

> Intrinsically motivated, task-focused state characterized by full concentration, a change in the awareness of time (e.g., time passing quickly), feelings of clarity and control, a merging of action and awareness, and a lack of self-consciousness… The experience is triggered by a good fit between a person's skills in an activity and the challenges afforded by the environment (p. 346).

According to this model, environmental alignment with student skills and interests may positively influence students' level of involvement and engagement in activities. Schools that do not align with student interests and abilities were less likely to allow students to experience the 'flow' and may ultimately inhibit sustained interest and the development of skills. The researchers theorized that deep engagement in activities promoted student learning and development. Schools that provide such learning environments may be able to help students avoid the decline in academic motivation and achievement that is often associated with the transition to middle school. The researchers found higher levels of student engagement, motivation, and positive affect among the Montessori students and attributed these differences to characteristics in the school environment.

Brand et al., (2008) examined the role of school climate on student engagement and performance through their analyses of teacher ratings of school climate and student academic measures. Data from the study came from the long-term Project on High Performance Learning Communities and included data from more than 3,000 schools. Surveys of school staff and students were the primary method of data collection. The researchers theorized that the school ecology has an important effect on student achievement and therefore should be targeted as part of school reform efforts. The researchers used surveys to develop both teacher and student measures of characteristics of the school environment. Using multilevel modeling and factor analyses of data, the researchers found that teacher and student measures of school climate were related, yet qualitatively distinct; one could not be substituted for the other. Additionally, in schools with positive teacher ratings of peer relationships, the researchers identified increased levels of student performance (as measured by test scores), lower levels of classroom

disruption of learning, and higher levels of school safety. Student performance was significantly related to an achievement orientation (the extent to which students are motivated and care about what they do).

This section of the literature has reviewed the extent to which grade transitions can have a negative effect on student academic progress and performance. A benefit of K-8 schools may be that students avoid making the elementary to middle grade transition; therefore, they also avoid the disruptions associated with school changes. Additionally, the review explored research on the ways that school characteristics and practices can mitigate some of these negative effects by providing classroom and building settings that align with the developmental characteristics of students. Research indicates that modifications to the school environment may have positive effects on student experiences and outcomes (Brand et. al, 2008; Rathunde & Csikszentmihalyi, 2005; Roeser et al., 2000). Although student socio-economic and demographic characteristics continue to play a predominant role in student performance and outcomes, school environments may facilitate or impede positive student outcomes by aligning with student developmental characteristics and academic interests. If middle schools are able to provide such environments, students may avoid some of the negative outcomes associated with school transitions. The next section of this literature review returns to an explicit discussion of K-8 and 6-8 schools and explores evidence surrounding the differences in the performance of students enrolled in the two school types.

Comparing Student Outcomes in K-8 and Traditional Middle Schools

This section of the chapter reviews some of the research that has fueled the current debates surrounding middle-grade school configuration. Prior research on the impact of K-8 and 6-8 organizational structures on student outcomes included research reviews and meta-analyses, analyses of survey and interview data, and direct comparisons of student achievement data. Most of the prior research compared the performance of sixth or enrolled in K-8 or 6-8 schools, and the majority of studies reviewed for this analysis (11 out of 16) identified higher levels of achievement for students enrolled in K-8 schools. A few studies found inconsistent or no statistical differences in the performance of students enrolled in the two school types.

Only a few of the studies included in this review used analytic methods that accounted for both student and school-level characteristics; the data analyses for most studies tended to focus on the comparison of school means through the use of ANOVAs or t-tests. It is possible that the use of such analyses may overstate the importance of school configuration for student academic outcomes because the analyses do not separately account for the impact of student-level variables. Three of the five studies that failed to identify any advantage or consistent advantages for K-8 schools used multilevel modeling techniques and thus controlled for both student and school characteristics. While no statistical analysis can include all relevant variables, the inclusion of both student and school-level variables may enhance the strength of analytic models and therefore, may increase the likelihood of identifying robust relationships among variables. Although some of the studies controlled for school characteristics, such as socioeconomic status (SES) and school size, no study included measures of the school

environment or climate as predictors of student performance. As discussed in the previous section, prior research has identified elements of the school environment that may potentially facilitate or impede student progress. The inclusion of these variables in the data may also help to identify possible reasons for differences in student performance. The first part of this section discusses the 11 studies that have identified a performance advantage for K-8 schools and the second part of the review investigates five studies that find no or inconsistent differences between the performances of students enrolled in K-8 and 6-8 schools.

K-8 School Advantage

Moore (1984) conducted one of the first studies to directly compare student performance in both K-8 and 6-8 school organizational structures. He compared the academic performance, attendance patterns, and attitudes of seventh and eighth-grade students enrolled in nine K-8 and junior high schools in New York City. Data analyses revealed higher mean scores on all measures for K-8 students. On average, K-8 students had higher levels of reading achievement, better attitudes toward school, and higher attendance rates.

A more recent study of New York K-8 and middle schools also identified a similar performance advantage for students enrolled in K-8 schools (Rockoff and Lockwood, 2010). The research analyzed data on multiple cohorts of students to identify patterns in student achievement before and after the move to middle schools. The researchers identified a decrease of 0.15 standard deviations in reading and mathematics performance among students who moved to middle schools. Additionally, they noted a decline in attendance rates for students enrolled in middle schools. The researchers

revealed that these issues were evident when students first moved to middle schools and persisted through the eighth grade. The researchers also found that students who entered middle schools with lower levels of achievement were more likely to experience significant declines in reading and mathematics in comparison to students who entered with above-average performance.

Rockoff and Lockwood (2010) attempted to identify potential reasons for the decline in performance among middle school students. They conducted a separate analysis of additional school-level variables that may impact student outcomes. These variables included average per-pupil funding, parent and student school satisfaction measures, class size, school size, diversity of the student population, and the extent to which students attended school with a different set of peers for the middle grades (peer stability). These variables were not, however, included in the regression analyses. All inferential analyses were based solely on student-level data. They noted that middle schools were more likely to serve a more diverse population of students, had higher grade cohort sizes, and were less likely to have a stable cohort of peers, school characteristics that may have a negative impact on student academic performance and engagement. Although the researchers concluded that the complexity of factors involved did not allow for the identification of one theory for the decline in achievement of middle school students, they suggested that, at least for cities like New York, K-8 schools may provide a better setting for middle-grade students.

Focusing specifically on the performance of eighth-grade students, Offenberg (2001) analyzed school-level data of K-8 and 6-8 Philadelphia public schools. Although he had access to individual level data, he opted to analyze only school level data because

he wanted to focus on schools as social institutions. He commented that school level analyses helped avoid the issues related with using non-independent student-level data (students are affected by the characteristics and practices of the school) (p. 25). Outcome measures were mean achievement on standardized assessments, enrollment in a specialized or selective high school in ninth grade, school-level academic performance gains, and ninth-grade achievement (GPA, attendance, credit accrual, and performance on standardized assessments). Linear regression was the primary method used for the data analyses. The analytic models incorporated school measures, including enrollment size and eligibility for lunch subsidies. Offenberg noted that critics of K-8 schools argued that student performance in K-8 was higher because the schools served a more affluent student population; therefore, he attempted to control for this by including the school poverty rate in the analytic models.

Data analyses revealed consistent benefits for students enrolled in K-8 schools. After controlling for the poverty measure, K-8 schools outscored 6-8 schools between 3.5 and 8.5 NCE's. Additionally, K-8 schools exhibited larger performance gains than 6-8 schools and students from K-8 schools were 11 percent more likely to enroll in selective high schools than were students from 6-8 schools. The study identified an interaction effect between the number of students in the grade and overall student performance. As the size of the eighth grade increased, the performance difference between the school types decreased. The author concluded that "as a group, K-to-8 schools are more effective than middle grades schools serving similar communities" (p. 28) and attributed the success of K-8 schools to the longer period of time students attended the same school, better teacher and student relationships, and more supportive school environments (p.

29). The author did not discuss the specific educational practices that schools implemented to provide these more supportive educational settings and the analytic techniques (analysis of variance of aggregated school-level data) did not allow for a partitioning of the variance between school and student-level characteristics.

Yakimowski and Connolly (2001) identified similar benefits for K-8 students in Baltimore. This study compared the performance of students who were enrolled in a single K-8 school or were enrolled in one K-5 school and one 6-8 school. The researchers analyzed the data of approximately 2,400 K-5/6-8 students (group A) and 400 K-8 students (group B). Data sources included administrative data of student performance on state and standardized assessments, attendance rates, and enrollment patterns. The researchers supplemented the quantitative analyses with analyses of parent and principal survey data about the school characteristics.

Examination of the descriptive data reveals significant demographic differences in between K-5/6-8 students. More than 80 percent of the K-5/6-8 students were African American in comparison with 54 percent of the K-8 students. Additionally, 78 percent of the K-5/6-8 students were eligible for free-or reduced price meals compared with 47 percent of K-8 students. K-5/6-8 students also had lower levels of baseline performance on the standardized assessment. The researchers attempted to control for these differences by using analytic techniques, such as ANCOVA and ordinary least squares (OLS) regression. After controlling for demographic and prior performance characteristics, the researchers found that students in K-8 schools, on average, scored approximately nine scale score points higher than students who attended different elementary and middle schools. K-8 students were more likely to enroll in the district's selective high schools

and were more likely to remain enrolled in district schools for sixth grade. Parents and principals also reported higher levels of satisfaction with K-8 schools.

Whiry, Coldarci, and Meadow (1992) also identified student performance benefits for K-8 schools. The researchers analyzed aggregated student-level data for 163 Maine schools. The goal of the analyses was to identify performance differences for eighth-grade students enrolled in elementary schools (K-8, K-9, 3-8), middle schools (4-8, 5-8, 6-8), junior high schools (7-8, 7-9) and junior/senior high schools (6-12, 7-12, 8-12). Variables for the study included socioeconomic status (district college attainment rates), instructional expenditures, school size, teacher/student ratio, teacher educational attainment, and teacher tenure. The outcome measure was the mean student performance on a state assessment. Analyses consisted of four multiple regression equations; each equation had a varied reference category while the remaining variables in each equation were consistent.

Analyses revealed that grade span was a significant predictor of student achievement in reading and, to a lesser extent, in mathematics. The reading performance of eighth-grade students enrolled in K-8 schools exceeded the performance of students enrolled in all other school types. The mathematics performance of students enrolled in elementary schools was significantly higher than the performance of students enrolled in junior high schools. The researchers found no other significant differences in mathematics performance by middle school configuration. Other significant predictors of student achievement included district college enrollment rates and teacher tenure.

Abella (2005) studied the performance of sixth through eighth-grade students attending K-8 and traditional middle schools in Miami. The study population included

approximately 4,000 students enrolled in middle schools and 360 students enrolled in K-8 schools. Abella found that students in K-8 centers tended to achieve higher levels in reading than students enrolled in traditional middle schools, particularly with students in sixth and seventh grades. By the eighth and ninth grades, the reading performance of students in both school types was similar. In mathematics, K-8 students experienced a sustained higher level of increase in performance compared with the performance of students enrolled in 6-8 middle schools. Upon the transition to high school, Abella found that students from K-8 schools experienced less of a decline in attendance rates than students who attended traditional middle schools.

Franklin and Glascock (1998) examined data from rural schools in Louisiana to identify achievement and behavior (attendance and suspension) differences for students enrolled in 6, 7, 10, and 11 grades based on school configuration. School configurations included elementary (K-6/7), middle/junior high (6/7-8/9), secondary (7/8/9-12), and unit (K-12). The researchers analyzed the data using ANOVAs and identified higher levels of achievement for students enrolled in sixth and seventh grades in elementary schools. Sixth and seventh-grade students enrolled in elementary and unit schools had better performance than students enrolled in secondary or middle/junior high schools. However, they found no differences in student performance by 11th grade. The researchers concluded that grade configuration is important because "it establishes the basic context for the learning environment" (p. 151). They emphasized the importance of the continuity of experience and the potential negative effects that the fragmentation of age-graded schools may have for students.

Poncelet (2004) analyzed data for the Cleveland Public School District. In 1999, the district began a full-scale adoption of the K-8 model as it added the middle grades to existing elementary (K-5) schools and closed middle schools. The research study was conducted in two stages. The first stage consisted of a case study of two elementary schools that were restructured into K-8 schools. The second stage was an impact study that included analyses of district-wide data of sixth-grade students enrolled in K-8 or 6-8 schools. Case study analyses identified the changes that the former elementary schools made to accommodate older students and identified strengths of the schools, including positive relationships between teachers and students, opportunities for students to serve as leaders, and a focus on creating student-centered learning environments. The researcher did not conduct a comparable case study analysis of middle schools. ANCOVAs of data from the impact study revealed higher levels of performance for sixth-grade students enrolled in K-8 schools. K-8 students had scores on the reading assessment that were approximately seven scale score points higher (effect size of 0.29) and mathematics scores that were approximately nine scale score points higher than those of 6-8 students (effect size 0.38). The researcher suggests that removal of the sixth-grade school transition and the more positive environment of K-8 schools may have helped to foster higher levels of student achievement.

Recently, a number of dissertations have explored the impact of grade configuration on student performance and behavior. Most of these studies have found higher levels of performance among middle-grade students enrolled in K-8 schools. Cooksley (2010) compared the mean reading and mathematics scale scores for students enrolled in Iowa K-8 and 6-8 schools and identified consistently higher levels of

performance for students enrolled in K-8 schools. Similarly, Shaefer (2010) conducted ANOVA and ANCOVA analyses of student performance data of sixth-grade students enrolled in a random sample of 300 Florida K-6, K-8, and 6-8. This research also identified higher scale scores for students enrolled in PK-6 schools; the lowest level of performance came from students enrolled in 6-8 schools. Keegan (2010) compared the student performance on state assessments, attendance rates, suspensions, and expulsions for students enrolled in New Jersey K-8 and 6-8 schools. The research included both ANOVAs and linear regression analyses that controlled for school and class size, and student poverty. The analyses identify performance advantages for students enrolled in K-8 schools in all areas except for expulsions from school.

No or Inconsistent K-8 Advantage

Five of the studies included in this part of the review found no or inconsistent evidence of a K-8 school advantage. Nobles' (2008) dissertation analyzed the end-of-grade assessment data for North Carolina students and compared the mean scores of K-8 and 6-8 students enrolled in 18 districts. The analyses included comparisons of overall means and comparisons of means of student race and gender subgroups. Data analyses revealed significant differences in mean scores of White students, with K-8 White students outperforming 6-8 White students. The analyses identified no other significant differences in student performance.

Ellis, Gaudet, and Hoover (2005) identified a lack of performance advantage for seventh and eighth-grade students enrolled in K-8 schools. Using hierarchical linear modeling (HLM), researchers analyzed one year of state reading and mathematics assessment data of students in the fourth, seventh, and eighth grades. School-level

variables included school size and configuration status; student-level variables incorporated free or reduced-price lunch status, special education status, limited English proficient status, gender and race. All student-level variables were significantly negatively related to student performance on reading and mathematics assessments. Neither of the two school-level variables was related to student achievement.

Watson (2009) conducted a factorial ANOVA on the performance of students enrolled in 271 Montana K-8, 7-8, and 6-8 schools. He also analyzed survey data about student participation in risky behaviors (24 schools) and conducted qualitative data collection in eight schools. The researcher created groupings of schools based on SES status and school size for the ANOVA analyses of student performance on state reading and mathematics assessments. Quantitative analyses identified no consistent performance difference for students in reading and mathematics performance based on school configuration or size. However, schools with higher SES levels posted higher mean scores. Survey analysis did not reveal consistent differences in student reports of participation in risky behaviors. Qualitative interviews with staff in K-8 and 6-8 exposed a lack of consistent reports of the advantages or disadvantages in each school type.

The analyses of students enrolled in Philadelphia K-8 and 6-8 schools provides the most statistically rigorous work on the relationship between school grade configuration and student outcomes. Weiss and Kipnes (2006) and Byrnes and Ruby (2007) analyzed student academic and non-academic outcome data. As noted earlier in this review, Offenberg's (2001) analyses of prior Philadelphia data identified a consistently positive effect of school grade configuration on student performance. The more recent analyses of student performance data identified no such K-8 advantage.

Weiss and Kipnes (2006) analyzed both academic data from district files and self-reported survey data collected as part of a longitudinal data collection initiative. Student outcomes included GPA, whether the student received any F's as final grades, attendance rates, and suspension rates. Non-academic outcomes included measures such as, self-esteem, feelings of safety, liking school, and feeling threatened at school. School-level variables included the number of and the percentage of African American students. Individual-level variables included student race, gender, whether the student had been retained in a grade, parent's education level, and participation in public assistance programs.[1] On six of eight outcomes, data analyses failed to show any negative effects of middle school enrollment. Middle school attendance was significantly related to lower reported levels of self-esteem and more frequent reports of being threatened at school. The researchers found no difference on comparable academic measures between students enrolled in K-8 and 6-8 schools. The researchers concluded that middle schools were "no more detrimental to students' performance" than were K-8 schools (p. 264).

Byrnes and Ruby (2007) also failed to identify a relationship between school configuration and student academic outcomes. The study included five cohorts of Philadelphia students (n=40,883). The researchers conducted a three-level analysis with students comprising level one, cohorts comprising level two, and schools comprising level three. Both students and cohorts were nested within schools. The outcome was eighth-grade student performance on a state assessment (NCE and scale scores). Student-level variables included prior achievement (fifth grade) on the state assessment, race/ethnicity, special education status and English language learner status, and whether the student changed schools between the fifth and eighth grades. Cohort-level measures

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[1] The researchers extracted these measures from a survey of parents.

included time (based on school year), the percent of students eligible for free or reduced-price lunch, the percent of Hispanic or African American students, teacher absence rates, the percent of certified teachers, and average years of teacher experience. School-level measures included grade size, the proportion of students who changed schools during the school year, and geographic region. School configuration status was captured within three dummy variables: (1) middle schools, (2) old K-8 schools, and (3) new K-8 schools (formed within the previous five years).

The researchers identified no differences in school performance after all variables were included in the models. Early stages of the analyses that included fewer or no control variables identified a significant advantage of K-8 schools, particularly the old K-8 schools. The inclusion of additional variables eliminated this advantage. The researchers noted that the newer K-8 schools more closely resembled middle schools in terms of both student performance and demographics. Old K-8 schools tended to serve a more affluent population and had the highest level of student achievement (prior to the inclusion of control variables).

Summary

This chapter has reviewed research on a number of topics related to middle-grade education. The chapter began with an exploration of some of the historical forces that led to the identification of adolescence as a unique developmental stage in need of specialized educational settings. The second section delved into the discussion surrounding how school grade configurations may affect the ability to provide appropriate education settings for adolescents. Over time, education leaders have linked

the changing of school grade configurations with the prospect of improved student performance. However, despite the relative consistency of foundational principles for middle-grade education, research reveals a persistent dissatisfaction with the performance of middle-grade students. The third section explored research on the impact of school transitions on student performance and the characteristics and practices of schools that inhibit student academic and social growth. The research revealed that school transitions may be difficult for some students, particularly those students with a history of poor academic performance. The final section explored comparative research on the performance of students enrolled in K-8 and 6-8 schools. The majority of this comparative research identified performance advantages for students enrolled in K-8 schools; however, the two most statistically rigorous studies identified no such advantages. Although prior research on the school climate or school characteristics has highlighted the ways in which middle schools may be detrimental to student performance, I identified no research that included any measures as predictors in analytic models.

The goal of this study is to continue the exploration of the unique role that school grade configuration might play in student academic outcomes. To date, much of the research on the impact of school grade configuration has resulted in inconsistent and contradictory findings. This effort will not settle the seemingly unending debate on grade configurations, but it seeks to contribute to the development of a consistent body of evidence on the relative impact of school configuration on student academic performance. The next chapter provides a discussion of the setting for this research study.

Chapter 3: Why Baltimore?

Introduction

The previous two chapters provided the framework and empirical support for this investigation of the relationship between school configuration and three eighth-grade outcomes: (1) reading proficiency, (2) mathematics proficiency, and (2) enrollment in a selective high school in ninth grade. Each of these outcomes may serve as an early indicator of success during high school. Students who complete the middle grades with higher levels of reading and mathematics achievement may be better positioned for successful completion of high school. This chapter describes some of the demographic characteristics of Baltimore City and its public school system and highlights the increase in the number of K-8 schools, the decline in the number of middle schools, and some of the organizational characteristics of each type of school. Both the demographic characteristics of the school district and the relatively rapid and widespread expansion of K-8 schools make Baltimore an appropriate location to make the direct comparisons of the outcomes of students who attend both types of schools (Weiss & Kipnes, 2006).

Characteristics of Baltimore City and the Baltimore City Public School System

Baltimore faces many of the problems that commonly affect urban areas; these problems including decreases in the size of the population, elevated levels of poverty and crime, and lower levels of educational attainment among a significant portion of the adult population. The 2006 estimate of the city's population, 631,366, was approximately 100,000 less than the 1990 census count and 20,000 less than the 2000 census (U.S. Census Department, 2006). Approximately 20% of individuals and 16% of Baltimore

families lived below the federal poverty level in 2006. These rates are significantly higher than comparable rates for Maryland (8% of individuals and 5% of households) and for the nation as a whole (13% of individuals and 10% of families) (U.S Census Department, 2006).[2] Approximately one-quarter of Baltimore residents 25 years old or older compared with 16% of the United States as a whole and 13% of Maryland residents lack a high school degree (U.S Census Department, 2006). Approximately two thirds of Baltimore residents are African American compared with 12% of the U.S. population and 30% of the Maryland population. Such characteristics help to define educational and economic challenges faced by the citizens of Baltimore and its school system.

The Baltimore City Public School System, the fourth largest and only urban school system in Maryland, reflects the demographic characteristics of the city as a whole. The level of poverty (as measured by student eligibility for free or reduced-price meals) and racial isolation are, however, magnified within the public school system. In 2009-10 the BCPSS enrolled approximately 83,000 students in grades pre-kindergarten through 12, a substantial decrease from the 1996-97 school year enrollment of 109,000 students in 1997 (mdreportcard.org). As enrollment has declined, the proportion of African American students has increased slightly from approximately 85% in 1997 to 88% in 2010 (mdreportcad.org). The overall proportion of students eligible for free or reduced-price meals increased from approximately 66% in 2000 to 81% in 2010 (mdreportcard.org).[3]

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[2] The poverty level of the American Community Survey is 125% of the poverty threshold. The base year for the calculation is 1982. Poverty status reflects the inflation factor, income of related individuals, and the number of children. In 2006, the threshold for a family of 3 with a child under 18 was $20,011 (U.S. Census, 2006).

[3] Information prior to the 1999-2000 school year is not available on the MSDE website. Typically, the proportion of students eligible for free or reduced-priced meals is significantly higher among elementary

Baltimore students, on average, have among the lowest levels of academic achievement in Maryland. Student performance as measured by performance on state assessments has improved recently. However, achievement levels are, on average, well below federal accountability targets. Maryland State Department of Education (MSDE) Baltimore has regularly identified a large number of Baltimore schools for improvement under the No Child Left Behind legislation (NCLB). In 2009-10, 117 of 188 BCPSS schools were identified for improvement under NCLB.[4] Moreover, BCPSS students, on average, have among the lowest average rates of attendance, the lowest graduation rates, the highest dropout rates, and the highest student mobility rates in the state (mdreportcard.org). Given these characteristics, the BCPSS faces many deeply entrenched barriers to increasing the level of academic achievement of its students.

Secondary Education in Baltimore

Student performance during the middle grade years may have a great influence on shaping which district high school a student attends and ultimately the likelihood that a student will successfully complete high school and have access to post-secondary education or training. The BCPSS offers high school choice to all (Baltimore City Public Schools, 2008). The district offers a mix of open enrollment and schools of choice including charter schools, schools which require students to meet entrance requirements, and comprehensive or neighborhood high schools which students may select or to which

and middle-grade students. Until recently, approximately 80% of elementary and middle students received meal assistance compared with approximately half of high school students. Over the past few school years the district has increased attempts to encourage students to submit the required forms and has increased the direct certification of students based on participation in federal welfare programs. These strategies have likely resulted in increases in the district's FARMS rate.

[4] Includes only schools which enrolled students in grades which are included in NCLB accountability systems.

students who do not participate in the choice process may be assigned. Students who attend schools with enrollment requirements tend to have better high school outcomes than students who attend other high schools, especially the comprehensive or neighborhood high schools. Historically, BCPSS high schools with enrollment requirements have offered students the greatest opportunity for academic success and progress. Enrollment in selective high schools is based on academic performance during the sixth and seventh grades and performance on the Terra Nova reading and mathematics assessment administered during the fall of the eighth-grade year.[5] On average, approximately one-third of BCPS high school students were enrolled in selective high schools between the 2007-08 and 2009-10 school years (mdreportcard.org).

The differences in student outcomes are evident when examining graduation and dropout rates for the different types of high schools. Although, on average, BCPSS students have had comparatively high dropout and low graduation rates, the rates of individual schools within the system may vary significantly. For example, the graduation rate at one of the selective high schools in the district for 2009-10 was 96%; the dropout rate was 0.5%.[6] Similarly, the graduation rate for one of the district's career/technical education high schools was 90%; the dropout was 3%. At the other end of the spectrum, a neighborhood comprehensive high school had a graduation rate of 56% and a dropout

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[5] In 2009, BCPS discontinued use of the Terra Nova as part of school admissions and substituted the seventh-grade Maryland School Assessment (MSA) performance in reading and mathematics to determine eligibility for enrollment in selective high schools.

[6] Maryland calculates graduation by use of a "leaver rate." The graduation rate is "the percentage of students who received a Maryland high school diploma during the reported school year. The *leaver rate* is an estimated cohort rate. It is calculated by dividing the number of high school graduates by the sum of the dropouts for grades 9 through 12, respectively, in consecutive years, plus the number of high school graduates. The measure is drawn from four years of enrollment and withdrawal data. The performance standard for graduation rate for AYP is 90%" (Mdreportcard.org). The dropout rate is an annual measure of high school students who withdraw from school and for whom there is no record of transfer to a new school. Although the two measures are related, they do not add up to 100%.

rate of 6%. A district alternative school serves as an extreme example of the graduation and dropout rate disparities within the BCPSS. In 2009-10, the school had a graduation rate of 32% and a dropout rate of 23%. Students who attend this school have not been successful in other BCPSS high schools, tend to be over-age for their grade, and are among the most vulnerable and challenged BCPSS students.

Growth of the K-8 School Configuration and School Characteristics

Baltimore formally adopted an expansion of the K-8 model during the early 1990's (Yakimowski & Connolly, 2001). Advocates for increasing the number of K-8 schools argued that K-8 schools would provide a more nurturing environment for early adolescents and would improve student achievement (Hall, 2004). This study focuses on a comparison between the K-8 and 6-8 models primarily for practical purposes; these are the two main organizational structures of BCPSS schools serving middle grades students. Although the K-8 and 6-8 models are the predominant middle-grade school configurations, other grade configurations including 7-9 and 6-12 exist within the district. The number of schools serving students in sixth through twelfth grades has expanded during recent school years. The number of middle/high schools increased from 3 in 2007-08 to 13 in 2009-10 (mdreportcard.org). "Transformation" high schools serve students in both the middle and high school grades and eliminate the middle to high school transition for students who remain enrolled in the school. School leaders theorized that these schools would provide improved educational opportunities for vulnerable middle-grade students by eliminating the need to change schools in ninth grade (Baltimore City Schools, 2008).

As of the 2008-09 school year, the majority of BCPSS middle-grade students were enrolled in K-8 schools. Although the school district embraced the K-8 model several years before (Yakimowski & Connolly, 2001), student enrollment in K-8 schools experienced its largest increase after the 2006-07 school year. As discussed above, the BCPSS has experienced a steady decline in student enrollment over the past several years. Total enrollment declined from 98,226 in 2001 to 82,866 in 2010 (mdreportcard.org). The 2008-09 school year was the first in which the district experienced an enrollment increase in more than 10 years; enrollment increased from 81,284 in 2007-08 to 82,266 in 2008-09. Overall middle grades enrollment has also declined over time; enrollment declined from 22,597 in 2001 to 16,544 in 2010 (mdreportcard.org). Student enrollment in K-8 schools has, however, significantly increased during this period of time. The number of K-8 schools more than tripled (increased from 21 in 2001 to 70 in 2010) and, as shown in Figure 3.1, middle-grade student enrollment doubled (4,855 to 9,854). Rather than open new buildings, the school district tended to either add middle grades to existing elementary schools or merge existing elementary and middle grades schools.

An examination of descriptive data on student characteristics in K-8 and middle schools reveals that both types of schools serve large proportions of African American students and students who are eligible for free or reduced-price meals. Historically, compared with middle schools, K-8 schools enrolled somewhat fewer students who were eligible for meal subsidies (Figure 3.2). However, as enrollment in K-8 schools has increased, the proportion of students eligible for this assistance has more closely mirrored

that of middle schools. The proportion of African American students has followed a similar pattern (Figure 3.3).

Although descriptive data tend to indicate that K-8 schools serve student populations similar to those of middle schools, further analyses of descriptive data reveal a higher level of variation in student characteristics among K-8 schools compared with middle schools. Standard deviations for free meal eligibility, African American student enrollment, and White student enrollment are consistently almost twice as large for K-8 schools as they are for middle schools (See Appendix). While, on average, middle schools tend to serve a homogenous student population, K-8 schools appear to serve a more heterogeneous student population.

Figure 2
Proportion of Students Enrolled in K-8 and Middle Schools
2000-01 through 2008-09
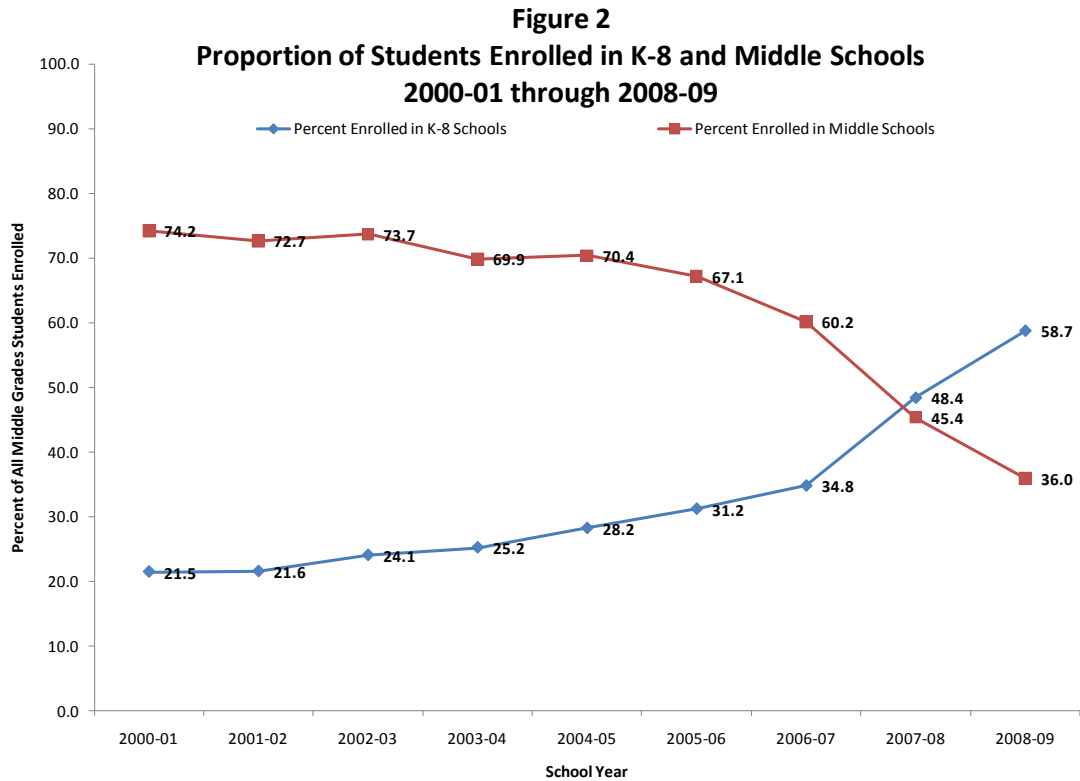
Figure 3
Median Percent of Students Eligible for Free or Reduced-Price Meals
2000-01 through 2008-09
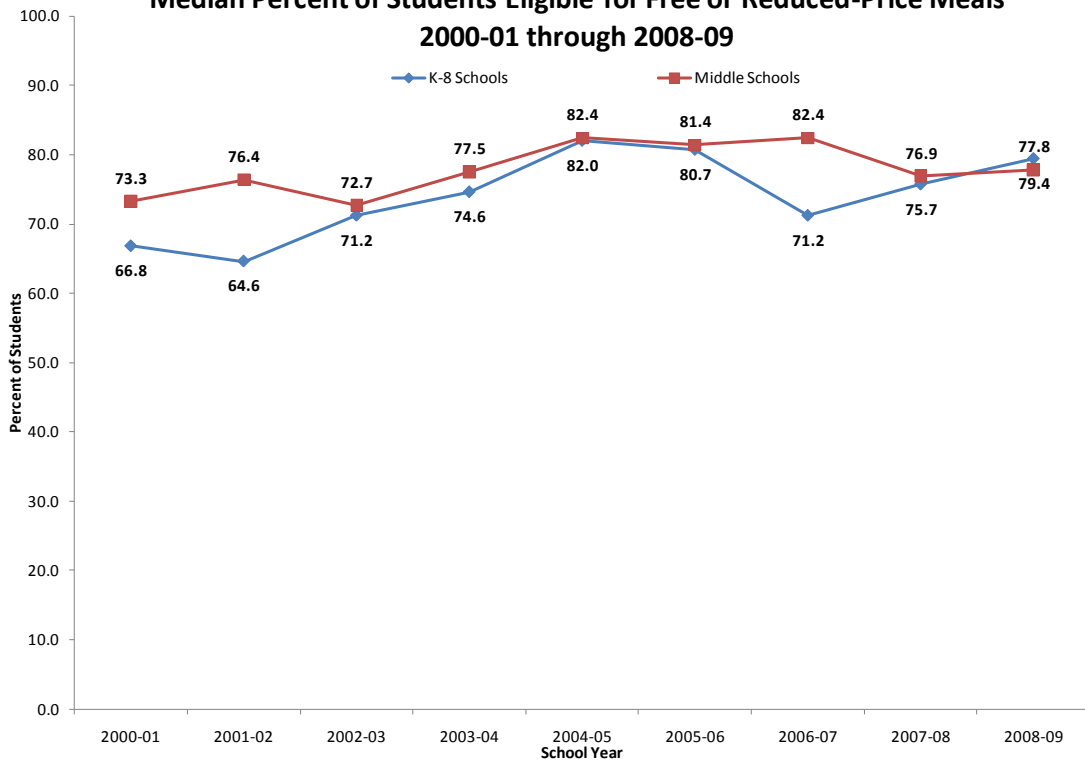
Figure 4
Median Percent African-American Enrollment
2000-01 through 2008-09
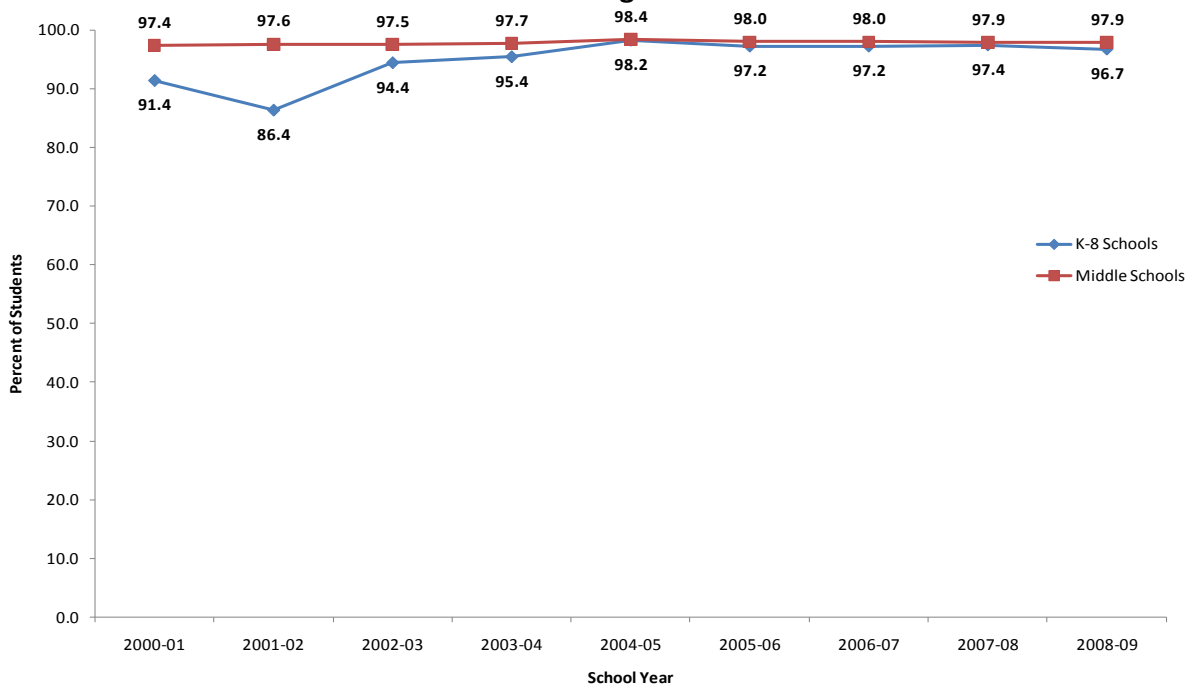
Organizational Characteristics of K-8 and 6-8 Schools

To gather information on organizational characteristics of K-8 and 6-8 schools I reviewed school profiles available on the BCPSS Internet website and school Internet sites (10 K-8 and 8 middle schools). The data gathered from these two sources included a mix of information that schools self-report and data that the central office maintains and reports for all schools. At the time of the study, the BCPSS did not systematically collect and report information on how schools organize staff and other resources to support teaching and learning activities. The lack of such information precluded inclusion of such school-specific data in any quantitative analyses. Such information might have shed light on student experiences in school and may have provided contextual information that might have helped to explain differences in student outcomes. Although these data were not available for all schools, I did gather such information for a subset of K-8 and 6-8 schools.

Review of data from selected school profiles and school Internet sites revealed key organizational similarities among Baltimore's K-8 and 6-8 schools. Both the selected K-8 and 6-8 schools departmentalize instruction, but K-8 schools appear to have made additional efforts to provide a differentiated experience for older students. A review of the Internet sites for 10 K-8 schools revealed that all schools departmentalized academics in the middle grades. Schools tended to group middle grade teachers by the subject taught rather than the grade level of students. One K-8 school described itself as having separate elementary and middle schools; both of the schools had different start times and student handbooks. At least one K-8 school housed the middle-grade students in modular units that were separate from the main building. Most of the schools reviewed had a mandatory

uniform policy; many of these provided different uniforms for elementary and middle-grade students. Although this review of data did not include all K-8 schools, such policies and procedures may be an indication of attempts by K-8 schools to provide experiences that were more similar to those of students who attended traditional middle schools.

The review of K-8 and 6-8 school profiles also revealed that middle schools were more likely than K-8 schools to report that they provided access to services such as college and career counseling. Six of eight middle schools compared with one of six K-8 schools reported providing such services. The one K-8 school that did report providing such services previously was a middle school that merged with an elementary school at the start of the 2006-07 school year. Staff at K-8 schools may have opted not to provide such information for the profile, which may account for the lack of information on middle grade specific programming. It is also possible that K-8 schools are less likely to provide these services than traditional middle schools. Future research might explore the types of programs and activities to which students have access in both types of schools.

Although complete data on how individual schools organize teaching and learning for middle-grade students were not available, the review of profile and school Internet website data indicated that staff at K-8 schools may have made efforts to provide students with an educational experience that is more similar to the experience of traditional middle schools through practices such as academic departmentalization and separate spaces for middle-grade students. Such practices may decrease the likelihood that students attending K-8 and 6-8 schools will have qualitatively different experiences in school. K-8 schools may also provide less programming that is specifically designed for young adolescents.

Summary

The BCPSS serves as the site for this dissertation study of student outcomes in K-8 and 6-8 schools. The student and school-level data from Baltimore allow for direct comparisons between the two types of schools. Some prior research has identified the lack of such comparisons as a weakness of some existing research (Weiss & Kipnes, 2006). The assumption that the K-8 schools fostered higher levels of student performance (Hall, 2004) as wells as enrollment shifts and economic considerations provided the impetus for the growth of K-8 schools in Baltimore. As the number of K-8 schools and the number of students enrolled in K-8 schools have grown over the past several years, characteristics of the student populations of the K-8 schools have grown more similar to those of middle schools. A review of data on organizational practices of selected K-8 and 6-8 schools revealed similarities between how staff in each configuration approached teaching and learning. Both types of schools appear to departmentalize instruction; the selected K-8 schools attempt to provide differentiated experiences for elementary and middle-grade students.

The widespread adoption of the K-8 model in Baltimore and the opportunity to compare student outcomes for students enrolled in both K-8 and 6-8 schools make the district an interesting place to explore the relationship between grade configuration and student outcomes. The next chapter provides the analytic framework for the study's quantitative data and describes the methodological grounding of data analyses.

Chapter 4: Research Methods

Introduction

Findings from prior research on the extent to which grade configuration may exert a unique influence on student outcomes are mixed. The primary goal of this research project is to continue examination of this relationship for students enrolled in the Baltimore Public Schools. This dissertation specifically focuses on understanding (1) whether the characteristics of students who attend Baltimore's K-8 and 6-8 schools differ; (2) whether the overall characteristics of the two types of schools differ; and (3) the extent to which eighth-grade students who attend the two types of schools differ in performance on state reading and mathematics assessments and enrollment in selective high schools for ninth grade.

The first section of this chapter identifies the student cohorts and the number of students enrolled in each cohort. The second section discusses analytic strategies which include Pearson's chi-square and t-test statistics and multilevel modeling. The section also describes the student-level and school-level data used in the analyses. The final section explains the specific procedures used in data analyses and specifies the models used to explore student outcomes.

Student Cohort Identification

This research study analyzes school enrollment and academic performance patterns for two cohorts of BCPSS students who (1) completed fifth grade in 2004-05 or 2005-06 school years, and (2) entered sixth grade during the 2005-06 or 2006-07 school years. On-track students who were still enrolled in district schools should have completed

eighth grade at the end of the 2007-08 or 2008-09 school years. I assigned students to the K-8 or middle school configuration groups based on the last school attended during eighth grade and excluded students who were missing any of the key data points, particularly fifth grade or eighth-grade reading or mathematics MSA scores, from inclusion in the initial or final study populations.

Table 1 provides descriptive information for both student cohorts as of the end of fifth and eighth grades. The total number of students included in the original study population (based on fifth grade completion) was 12,572 (6,584 in cohort 1 and 5,988 in cohort 2). The size of the two cohorts demonstrates the decline in system enrollment. Cohort 2 is approximately 600 students smaller than cohort 1. Table 1 also displays the rate and reasons for attrition by student cohort and overall. The overall size of the student population declined 38.6% between the fifth and eighth grades to 7,722. The largest contributor to cohort attrition was student withdrawal from BCPSS prior to the final year of the study. Attrition was larger for cohort 1 compared with cohort 2. The primary reason for the difference in the size of the final study population by cohort was the lack of climate survey data for students attending two middle schools in 2007-08 and enrollment in schools that only served students in behavioral programs (12% of cohort 1 attrition). The final study population includes only those students who:

- Were enrolled in the eighth grade in a BCPSS K-8 or 6-8 school in 2007-08 (cohort1) or 2008-09 (cohort 2)
- Had eighth-grade reading and mathematics MSA scores
- Attended a school in which students and teachers completed the school district's climate survey in 2007-08 (cohort 1) or 2008-09 (cohort 2).

Table 1 - Cohort 1 and 2 Size and Attrition

Number of Students	Overall	Cohort 1	Cohort 2
Total Number of Students at Grade 5	12,572	6,584	5,988
Left District Prior to Final Year of Study	2,058	1,085	973
Not Enrolled in Eighth Grade	1,395	729	666
Missing Eighth-Grade MSA or Not Enrolled in Regular K-8 or 6-8 School	1,052	658	394
Missing Eighth-Grade School-level Climate Data	345	345	0
Total Study Attrition	4,850 (38.6%)	2,817 (42.7%)	2,033 (34.0%)
Final Study Population	**7,722**	**3,767**	**3,955**

Students who were not included in the final study population differed from those who remained in the study. Analyses of fifth-grade performance and demographic data revealed that excluded students had lower fifth-grade reading and mathematics proficiency rates, were more likely to be over-age, and were more likely to be male.

Analytic Approach

I employed multiple strategies for analyzing the student-level and school-level data. Research questions 1 through 3 are both descriptive and inferential in nature and are answered using Pearson's chi-square tests for categorical variables such as proficiency status and t-tests for interval or continuous variables such as the climate survey scales.

Multilevel modeling, specifically hierarchical generalized linear modeling (HGLM), is the primary analytic technique for analyzing differences in student outcomes on reading and mathematics assessments and ninth-grade enrollment in a selective high school (question 4).

Multilevel analysis is grounded in the understanding that individuals and organizations are nested within larger social and organizational structures and that this nesting may have a significant impact on individual or organizational experiences or outcomes (Ma, Ma, & Bradley, 2008; Kreft & De Leeuw, 1998; Bickel, 2007; Raudenbush & Bryk, 2002). Students are nested within classrooms, and classrooms are nested within schools. The phenomenon of nesting is not inconsequential if one wants to develop a more accurate or nuanced picture of the multiple factors that may interact to shape student or school experiences. Moreover, examination of educational outcomes of a student or classroom that fails to take account of the potential influence of the larger structures in which that child or classroom is located potentially ignores important contextual factors that may shape the outcomes of interest.

Traditional linear or logistic regression and analysis of variance analyses are unable to account for the interdependent relationships that may exist between and among these different levels of measurement (Kreft & De Leeux, 1998; Luke, 2004; Raudenbush & Bryk, 2002). Such analytic methods examine key outcomes like student achievement independently of the context in which the student learns. Although some studies attempt to account for the impact of the larger structure on outcomes by aggregating individual-level data to include in their analyses, these results are prone to estimation errors and bias (Ross, 2006). Pedhazur (1997) notes that attempts to make cross-level inferences with

traditional descriptive or inferential techniques are most often "fallacious and grossly misleading" (p. 677) because they assume that group-level characteristics or relationships operate similarly on the individual level.

Multilevel modeling overcomes many of these analytic limitations and allows for the estimation of the simultaneous impact of multiple variables at different levels of analysis by statistically linking lower and higher levels of aggregated data (Kreft & De Leeux, 1998; Luke, 2004; Pedhazur, 1997; Raudenbush & Bryk, 2002). Use of multilevel modeling in education research is increasing (McCoach, 2009), and the technique has previously been used to examine the relationship between school configuration and student outcomes (Byrnes & Ruby, 2007; Weiss & Kipnes, 2006). Use of hierarchical modeling in this research effort allows for examination of the unique effect of grade configuration on student outcomes while controlling for other student and school-level characteristics. The current analyses employ a two-level model with students at level one and schools at level two.

There are two general types of multilevel modeling, hierarchical linear modeling (HLM) and hierarchical generalized linear modeling (HGLM) (Raudenbush & Bryk, 2002). The nature of the dependent variable determines which type of multilevel modeling is most appropriate. Normally distributed, continuous data may be analyzed with HLM. Key assumptions for HLM include (1) outcomes at each level have a linear relationship with predictor variables and (2) random effects at each level of analyses are normally distributed (Raudenbush & Bryk, 2002). Outcomes for this study are, however, binary, and data that are not normally distributed or are categorical, ordinal, count, or binary cannot be accurately analyzed using linear methods. Such data require the use of

nonlinear methods that perform transformations of the dependent variable and are based on different assumptions about sampling distributions.

HGLM is the appropriate statistical technique for binary, count, ordinal, and nominal data and consists of three components including a sampling model, a link function, and a structural model (Bryk & Raudenbush, 2002). In the case of a binary dependent variable, the appropriate link function (transformation of Y) is the logit link assuming the Bernoulli sampling distribution. The link function transforms the data into the appropriate format for analyses. In the case of binary outcomes, this transformation allows for the prediction of the log odds of an occurrence (φ_{ij}) where (η_{ij}) represents the log of the odds of success. The full equation for the logit link function is

$$\eta_{ij=log\left(\frac{\phi_{ij}}{1-\phi_{ij}}\right)}.$$

If the likelihood of an occurrence is 0.5, the log odds (logit) are 0. When the probability of an occurrence is less than 0.5, the odds are less than 1 and the log odds are negative. When the probability of success is greater than 0.5, the odds are greater than 1 and the log odds are positive. To facilitate understanding of the relationship between independent variables and predicted outcomes, the log odds can be converted into probabilities or odds ratios by exponentiating the log odds ($1 / 1+ \exp\{\eta_{ij}\}$) (Bryk & Raudenbush, 2002). Odds ratios which are greater than 1 indicate an increased likelihood of achieving an outcome, and odds ratios which are less than 1 indicate a decreased likelihood of achieving an outcome. This study presents estimates of student outcomes using both regression coefficients and odds ratios. Logistic regression also allows for modeling the probabilities associated with the odds of an event occurring. The probability of an event occurring based on a data model is: Prob(event)$=e^{L}_{i}/1+e^{L}_{i}$

In this equation, L represents the linear combination of the log odds of the independent variables used to predict event occurrence included in the model. One can use this equation to predict the likelihood that an event will vary according to the values of independent variables included in the model (Pampel, 2000).

The level-1 and level-2 structural models are represented in equations 1 and 2 (Raudenbush & Bryk, 2002).

$$(1)\ \eta_{ij} = \beta_{0j} + \beta_{ij}X_{1ij} + \beta_{2ij} + \beta_{2j}X_{2ij} + \ldots \beta_{pj}X_{pij}\ \text{(level-1)}$$

$$(2)\ \beta_{0j} = \gamma_{qs} + \Sigma\gamma_{qs} + W_{sj} + u_{qj}\ \text{(level-2)}$$

η_{ij} represents the transformed predicted values in the equation. The combined model is represented as:

$$(3)\ \log[p_{ij}/1\text{-}p_{ij}] = \beta_{0j} + \beta_{ij}X_{ij+}u_{j}$$

In this equation $\log[p_{ij}/1\text{-}p_{ij}]$ represents the log odds of a student being classified as a '1' (proficient in reading or mathematics or accepted into a selective high school).

Multilevel modeling requires that researchers make key decisions about how data will be handled for analyses. One of these decisions revolves around the centering of data. Bickel (2007) suggests that purposeful centering of all independent variables should always be used in multilevel analyses. Centering decisions reflect both the goals of the researcher and whether outcomes appear to vary by group. If there is no significant variability across groups, then grand-mean centering may be the preferred method (Raudenbush & Bryk, 2002). Centering data in multilevel analyses transforms the data by subtracting a constant from the group or grand mean. This procedure changes the interpretation of the intercept, and determines the types of comparisons or interpretations that can be drawn from the data (Kreft & De Leeuw, 1998). Grand-mean centering

subtracts the overall grand mean for the level one population (the same constant is used for all groups) from a group's value. Grand-mean centering adjusts the means for each group similar to analyses of covariance (Raudenbush & Bryk, 2002). In group-mean centering, the mean for the group (values are dependent on the particular group) is subtracted from a group's value. Group-mean centering produces unadjusted means for groups. I employed grand mean-centering for all level-1 independent variables in each data model.[7]

Another important decision in multilevel modeling concerns whether coefficients will be fixed or random. Fixed coefficients do not vary across groups while random coefficients are allowed to vary across groups (Bickel, 2007). Random parameters include both the fixed effect (mean effect across groups) and the random effect (unexplained variance of the group around the mean effect) (Bickel, 2007). The inclusion of random effects increases complexity in the model's error term and typically requires large data sets (Bickel, 2007). The current study modeled only the intercepts for each model. The intercepts varied while other predictors were fixed.

HGLM output includes estimates of both fixed and random effects for each model. There is a single set of estimates of random effects. However, there are four estimates of fixed effects. The focus of the research question determines which set of estimates I should use. The *unit-specific* fixed effect estimates are most appropriate when the research question is primarily focused on estimating the impact of change in a level-1 variable on predicted probabilities while controlling for level-2 grouping (Raudenbush &

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[7] This decision may have resulted in an under-estimation of school-level effects since it assumes that the relationship between dependent and independent variables is constant across schools (the focus is on the average). As discussed in Chapter 5, there is significant variance between schools which may not have been appropriately reflected in the selected data modeling strategy.

Bryk, 2002). These estimates are similar to those produced in standard HLM for continuous variables. In contrast, the *population-average* model allows the level-2 predictor to vary and allows for estimates of probabilities for students with the same level-1 characteristics but differ by one unit at the group level. Both the unit-specific and population-average models also provide fixed effect estimates with robust standard errors. Robust standard errors are less likely to be affected by violations of model assumptions about the distribution of variables and variances and covariances (Raudenbush & Bryk, 2002). Since the focus of the current research was to examine how predicted probabilities varied by school type, I used population-average estimates for all models.

Data Sources

I extracted all of the student-level data for this study from administrative files provided by Division of Research, Evaluation, Assessment, and Accountability (DREAA) from BCPSS. I downloaded most school-level data from the MSDE Internet website which provides statewide data of school-level demographics, enrollment, and performance on state assessments. DREAA also provided school-level data from the annual climate survey.

Student-level Data

Student-level data comprised level-1 of the analytic files. The selected variables are aligned with and reflect characteristics identified in previous research. All schools in Baltimore enter data into a common student information system. The district's technology department monitors all data entered by school staff. In addition the

technology department must submit the enrollment and attendance files to MSDE for final review and approval. Few student records have missing data in this file, and most students will have a terminal record signaling their exit from the district.

Independent Variables

School enrollment, attendance, and demographics

DREAA staff extracted student enrollment data from the final student-level files submitted to MSDE during the summer following the completion of each school year. The enrollment and attendance file includes individual records for each school in which a child was enrolled during the school year. If a child transfers to a different school during the school year, the information system creates a new record documenting that transaction. I used enrollment and attendance file data for the 2004-05 through 2008-09 school years for the targeted group of students.[8] Each record from the enrollment and attendance file included the following information:

Cohort - Students who entered sixth grade during the 2005-06 school year comprised cohort 1, and students who entered sixth grade during the 2006-07 school year comprised cohort 2.

Student entry and leave codes and dates – Each student entry in the enrollment and attendance file includes the date a student entered and, if applicable, exited a particular school. In addition, the codes for each record document the type of entry and exit. Students who are actively enrolled at the end of the school year have no exit codes.

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[8] Student-level analyses will include only the cohort of discussed above. All records of other BCPSS students were deleted from analytical files.

Grade – Each student record includes the current grade of the student. Although most students are enrolled in the same grade during the school year, some students may have different grades during the same school year due to data entry errors or mid-year promotions. All analyses for this study relied on the grade of the terminal record which was likely to be the most accurate.

Gender – Student gender is designated by 'M' and 'F' in the 'A' file. I transformed these data into numeric value ('1' for males and '0' for females) to facilitate data analyses and interpretation.

Race/ethnicity – The school district currently captures race/ethnicity data in five categories (Asian/Pacific Islander, American Indian, African American, White, and Hispanic). I dummy-coded this variable for all races, thus creating five variables to facilitate data analyses and interpretation.

Over-age status – The data extract included a flag for whether students were at least one-year over-age for grade based on their age and grade as of September 1st of the school year for the fifth and eighth grades.

Years enrolled in the same school – I linked student records across school years and calculated the number of consecutive years a student was enrolled in the same school since grade five. I assigned students to schools based on data extracted from the final record in the enrollment and attendance files. The maximum number of years a student could be enrolled in a school was four and the minimum was one. Analyses did not prorate enrollment if a student changed schools during the same school year.

Student Outcome Measures

<u>Performance on state assessments of reading and mathematics</u>

I measured student academic performance by proficiency status performance on state reading and mathematics assessments. Proficiency status for fifth grade provided baseline control data, and proficiency status in eighth grade provided the outcome measure. The MSAs measure student performance in reading and mathematics and measures student performance as basic, proficient, or advanced. Students who are at or above grade level should score at the proficient or advanced levels. The state determines proficiency levels for each subject according to scale scores. Students must achieve a scale score which is at or above the proficiency cut score to score proficient or advanced on the assessments. Student performance on the MSAs may thus be described in terms of either scale scores or proficiency levels. I selected proficiency level as the outcome measure because it is the more meaningful measure in the current school accountability system. Under NCLB, state education agencies (SEAs) determine school improvement status by the proportion of students performing at or above the proficient level in reading and mathematics. I coded students scoring at the proficient or advanced levels in reading and/or mathematics as '1' and students scoring at the basic level as '0' for both the fifth and eighth-grade data.

<u>Enrollment in a selective high school in grade nine</u>

To measure whether members of each cohort enrolled in a selective high school in grade nine, I also requested access to student-level enrollment files for the 2008-09 (cohort 1) and 2009-10 (cohort 2). I extracted the variable which recorded the school in which a student was enrolled in the following school year. Students who were enrolled in

a selective high school were coded as '1', and students who were enrolled in another school type were coded as '0'.[9] I excluded students who were no longer enrolled in the BCPS for ninth grade or who remained in grade eight from these analyses.

School-level Data

School-level data from the 2004-05 through 2008-09 school years comprised level-2 of the analyses. School-level variables for each school year included the following variables.

Grade configuration

K-8 or traditional middle school status – Each middle-grade school serving middle-grade students was coded as '1' for K-8 or '0' for traditional middle school for each of the years of the study.

School size and characteristics

Size – The total enrollment and number of middle grades students enrolled in the school based on official September 30 enrollment counts.

Number of years serving eighth-grade students since the 2001-02 school year. Using data downloads from MSDE or enrollment data provided by the BCPSS, I calculated the number of years schools had served eighth-grade students (full implementation of the middle grades model).[10]

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[9] I classified students who attended Baltimore Polytechnic High School, City College High School, Western High School, Paul Laurence Dunbar High School, Merganthaler High School, Carver High School, or Edmondson High School as attending a selective high school.

[10] Due to the lack of a statistical non-significance, I did not include this variable in any of models.

Proportion of teachers with standard or professional certification. Maryland

provides three levels of teacher certification, standard I, standard II, and advanced

professional.[11] Teachers without full certification may have a resident teacher certificate

(teachers enrolled in special district-sponsored program) or a conditional certification

(awarded at the request of the local superintendent for teachers who do not meet

certification requirements).

Proportion of students eligible for free or reduced-price meals (FARMS).[12] This

measure provided limited information on the economic status of students as linked to

their participation in the free or reduced meals program. As with other similar variables, I

dummy coded the variable.

Proportion of over-age students.[13] As with the student-level measure, this is a

metric which captures the extent to which enrolled students may have not experienced

on-time grade promotion.

School climate measures - The BCPSS has administered an annual climate survey

to students in grades 3-12, parents, and staff since the 2005-06 school year (Appendix).

The climate survey, developed in consultation with staff from Johns Hopkins University

Bloomberg School of Public Health and other district and community stakeholders

covers, a variety of topics including safety, the learning environment, teacher

expectations, and parental involvement. Students in grades 3-5 complete one survey, and

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[11] The standard professional certificate I is provided to all teachers who meet basic certification requirements. The standard professional certificate II requires 3 years of experience, 6 hours of acceptable credits, and the development of a plan to attain advanced certification. The advanced professional certificate requires 3 years of experience 6 hours of acceptable credit, a master's degree or 36 hours beyond the bachelor's degree, or national board certification with 12 hours of graduate credit earned beyond the bachelor's degree (mdreportcard.org).

[12] I created a decile measure for this variable which was included in the models (=% FARMS/10).

[13] I created a decile measure for this variable which was included in the models (=% Over-age/10).

students in grades 6-12 complete a similar survey. Parents and school staff also complete a survey. During the survey administration process, staff from the research and accountability office sends the appropriate number of surveys to schools, and school administrative staff is responsible for administering the surveys and returning them to the central office for analyses and reporting.

Using data from the student and staff climate surveys, I constructed four scales that measured different aspects of the school environment. Student survey responses comprised three of the scales, and staff responses comprised the fourth scale. The three student measures included (1) student perceptions of the learning environment, (2) relationships between students and teachers, and (3) engagement in the learning process. The teacher measure assessed teacher engagement and connection with the school. Because of the high level of correlation between the student climate measures (all correlation coefficients were above 0.8), I also created a summary student scale from the four student sub-scales for use in the final models. I used this summary scale rather than the individual scales in data modeling.

All survey items were measured on four-point Likert scales. Response options ranged from "strongly disagree" to "strongly agree" or "not a problem" to "serious problem." To maintain logical consistency, I reverse coded survey items where applicable and assessed reliability of the scales using the scale reliability function of SPSS 15®. Cronbach's alphas for all of the scales were acceptable and ranged between 0.71 and 0.89 (DeVellis, 1991). Tables 2 and 3 present scale descriptive statistics and the reliability measures for each student cohort.

Table 2 - Cohort 1 Descriptive Statistics and Reliability Analyses of School Climate Measures

Number of Valid Responses (Middle and K-8 Schools Only)	Survey Items	Crohnbach's Alpha	Mean	Standard Deviation
	Student Engagement			
8,341	• I learn a lot at my school. • My classes are interesting • I like my school. • It is important for students to come to class prepared. • It is important to come to school every day. • It is important to try hard in school. • It is important to finish high school.	0.8	22.2	3.8
	Student and Teacher Relationships			
8,605	• Most of the teachers at school know me by name. • Students get along well with teachers. • Teachers care about their students. • I know how teachers expect me to perform in class • Teachers encourage me to work hard in my classes. • I like my teachers.	0.8	17.4	3.5
	Student Perceptions of the Learning Environment			
8,995	• I feel safe at this school. • My school has clear rules about student behavior, • Teachers are well-organized and prepared. • Teachers can handle students who disrupt class. • Teachers believe all students can do well if they try.	0.7	14.0	3.1
	Student Climate Summary Measure			
7,131	Includes all items from the other student climate measures	0.9	47.5	8.3

Number of Valid Responses (Middle and K-8 Schools Only)	Survey Items	Crohnbach's Alpha	Mean	Standard Deviation
	Teacher Engagement			
2,395	• Teachers feel responsible for the students' academic success. • Teachers feel responsible for their students' social and emotional development. • Teachers at this school set high standards for their teaching. • I enjoy working at this school. • There is a great deal of cooperative effort among staff members. • I would choose to stay at this school even if given the option of transferring	0.8	18.9	3.2

Table 3 - Cohort 2 Descriptive Statistics and Reliability Analyses of School Climate Measures

Number of Valid Responses (Elementary and K-8 Schools Only)	Survey Items	Alpha	Mean	Standard Deviation
Student Engagement				
9,648	• I learn a lot at my school. • My classes are interesting • I like my school. • It is important for students to come to class prepared. • It is important to come to school every day. • It is important to try hard in school. • It is important to finish high school.	0.8	22.2	3.5
Student and Teacher Relationships				
10,137	• Students get along well with teachers. • Teachers care about their students. • I know how teachers expect me to perform in class • I like my teachers.	0.7	11.1	2.6
Student Perceptions of the Learning Environment				
9,967	• I feel safe at this school. • My school has clear rules about student behavior, • Teachers are well-organized and prepared. • Teachers can handle students who disrupt class. • Teachers believe all students can do well if they try.	0.7	14.1	3.1
Overall Student Climate				
8,408	Includes all items from the other student climate measures	0.9	47.5	7.9

Number of Valid Responses (Elementary and K-8 Schools Only)	Survey Items	Alpha	Mean	Standard Deviation
	Teacher Engagement			
2,709	• Teachers feel responsible for the students' academic success. • Teachers feel responsible for their students' social and emotional development. • Teachers at this school set high standards for their teaching. • I enjoy working at this school. • There is a great deal of cooperative effort among staff members. • I would choose to stay at this school even if given the option of transferring	0.8	19.7	3.1

I only included schools that had both student and teacher surveys for the school year. Differences in survey response rates across schools likely limit the validity of survey responses for some schools (BCPS, 2010). Schools with higher response rates likely have more valid results than schools with lower rates. I excluded one cohort 1 school from analysis because the school submitted one student survey. However, to maximize sample size, I included all other schools regardless of response rate. The mean student survey response rate for cohort 1 schools was 63%, and the median was 68%. Cohort 1 student survey response ranged from a low of 9% to a high of 85%. The cohort 2 average student response rate was 72%, and the median was 78%. Response rate ranged 7% and 91%. The average cohort 1 teacher survey response rate was 59%, and the median rate was 63%. Response rates ranged from a low of 20% to a high of 90%. The average cohort 2 response rate was 61%, and the median was 65%. Response rates ranged

between 9% and 100%. Readers should cautiously interpret findings related to school climate measures.

Analytic Procedures and Model Specification

Data analyses occurred in a series of steps beginning with descriptive analyses of data conducted in SPSS 15.0® (SPSS, 2006). Kreft and De Leeuw (1998) recommended such data exploration, tied to a specific theory of how the different variables will operate, to guide choices of variables to be included in the final models. Descriptive analyses included basic frequencies, means, and correlation matrices for the selected variables and provide a basic sense of the factors or characteristics related to middle grades performance. I standardized all continuous and interval level-2 variables to facilitate interpretation of multilevel model coefficients, checked for evidence of multicollinearity (Bickel, 2007), and used t-tests and chi-squares to determine the extent to which the characteristics of students attending K-8 and 6-8 schools differed.

The first phase of data analysis explores differences in the characteristics of K-8 and 6-8 schools and the students who attend them. Pearson's chi-square tests assess whether students and schools are different in key areas such as fifth and eighth-grade reading and mathematics proficiency rates, over-age status, and eligibility for free-or reduced price meals. Pearson's chi-square (χ^2) tests for significant differences in the frequencies of categorical data (Field, 2009). Specifically, the test explores whether two categorical variables are related by calculating the difference between observed and expected frequencies for cross-classified data (Field, 2009). The basic chi-square equation is presented below, and the statistic is the measure of deviance between the numbers of observed and expected frequencies for two variables.

$$(4) \ \chi^2 = \Sigma \left(\frac{observed_{ij} - expected_{ij}}{\text{expected}_{ij}} \right)$$

If the chi-square statistic exceeds the critical value, the difference between the two groups

is statistically significant.

In addition to the chi-square tests for differences in student and school

characteristics, t-test analyses explored whether K-8 and 6-8 schools and students

differed in terms of climate survey scale scores, school size, years enrolled , etc. The t-

test statistic is similar to the chi-square statistics in that it attempts to determine whether

there is a significant difference between two groups in a particular measure (Field, 2009).

However, whereas chi-square is used to explore such differences for categorical data, the

t-test is used to identify significant differences in the means of continuous or interval

level data. The current analyses used the *independent* t-test statistic since students were

members of two different school configuration groups. The equation for the independent

t-test statistic for different group sizes is as follows:

$$(5) \ t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\left(\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2} \right)}}$$

where $\overline{X}$ is the group mean, s_p^2 is the pooled variance, and n is the group size. If the test

statistic exceeds the critical value, the difference in the group means is statistically

significant.

HGLM analyses for each of the outcomes followed the same basic procedures. I

performed all outcome modeling with HLM 6.08 (Raudenbush, Bryk, & Congdon, 2009).

The first step of all model building examined student outcomes for the fully

unconditional model that did not include any student-level (X's) or school-level (W's)

predictors. This model served as a baseline comparative measure for estimation of explained and unexplained variances as explanatory variables are added (Kreft & De Leeuw, 1998). The basic equation for the unconditional level-1 and level-2 combined model is listed below.

$$(6) \; \eta_{ij} = \gamma_{00+} \mu_{01j}$$

A key goal and strength of multilevel modeling is the partitioning of variance between each level of analysis. The unconditional model provides the basis for determining the proportion of variance which occurs within and between groups. The intraclass correlation (ICC) provides a measure of the variance composition for fully unconditional models with continuous outcome data. Equation 7 denotes the calculation of the ICC.

$$(7) \qquad P \; (ICC) = \tau_{00/} \; \tau_{00} + \sigma^2$$

In the equation τ_{00} is the estimate of variance between groups and σ^2 is the estimate of variance within groups. Values for ρ range between 1 (group variance is largest) and 0 (variability is primarily a reflection of individual rather than group differences). Due to the way binary data are distributed (there is no within group variance measure), this ICC measure is not appropriate for logistic multilevel data. However, prior research has indicated that use of the logistic distribution which has a mean of 0 and a distribution of 3.29 may be substituted for the within group variance (σ^2) to compute an analogous ICC measure (O'Connell, Goldstein, Rogers, & Peng, 2008; Snijders and Bosker, 1999). This measure assumes that outcome *Y* is the dichotomization of an unknown continuous variable whose level one residual follows the logistic distribution (O'Connell, Goldstein, Rogers, & Peng, 2008, p. 220). Equation 8 denotes the calculation of the ICC for binary data:

$$(8) \quad P(ICC) = \tau_{00} / \tau_{00} + 3.29$$

As new variables are added, one can calculate adjusted ICCs which measures variance in the value of the intercept. The ICC thus allows a way of comparing the extent to which group-level variance differs across models.

The second step of the model-building process was the development of within-school models that examine the impact of student-level variables for each of the outcome measures (Maher, 2000). This model included only student-level predictors (the level-2 model had no predictors included).

The third step of the analytical process was to estimate the between schools (level-2) model. I developed each of the models to estimate the three selected student outcomes (reading proficiency, mathematics proficiency, and grade nine enrollment in a selective high school) in stages or steps. I added level-2 variables to the model in groups based on theory and prior research. Student-level variables remained constant throughout all models. Each subsequent analytical stage builds on the prior stage through the addition of new variables and includes all variables from prior models.[14] The final model, the fully conditional model, includes all level-1 and level-2 variables. Table 4 identifies the variables included in each of the models. Adding variables in steps allows for analyses of how the relationship between independent variables at each level and dependent variables changes upon the inclusion of new variables (Pedhazur, 1997). If an independent variable was significantly related to the outcome prior the inclusion of a new variable or set of variables, but loses significance after new variables are added, one can

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[14] I tested two interaction effect terms: (1) cohort and configuration and (2) configuration and number of years operated a full middle school model (enrolled students in eighth grade). Neither of the terms was statistically significant (e.g. provided additional explanatory information above the individual terms) and were subsequently dropped from the latter stages of model building.

assume that the new variable(s) provided contextual or explanatory information that was previously associated with the original variables (Pedhazur, 1997).

As discussed above, the first stage of analyses for each outcome included no level-1 or level-2 variables. The second stage included only the student-level (level-1) predictors. The third stage added school configuration as the sole level-2 predictor, and the fourth stage included the cohort variable. The fifth stage added student and teacher climate measures, and the final stage of analysis incorporated the remaining school-level contextual variables. To facilitate interpretation of the regression coefficients I performed z-score transformations for continuous and interval school-level variables. Z-score transformation provides a common distribution across variables measured on different scales in which the mean is zero and the standard deviation is one. Regression coefficients for z-scores represent the unit change in y as the result of a one standard deviation increase in the z-score for x (Field, 2009).

Building models in this way allows for comparisons of the extent to which the addition of new independent variables provides a better "fit" with data. The analytic models for this study are nested; later models include all of the same variables that were included in prior models. In logistic regression the adequacy of a model may be determined by both the statistical significance of independent variables in estimating changes in dependent variables and the extent to which these estimates fit or align with data (Trexler & Travis, 1993, p. 1631). The deviance statistic is a measure which assesses the extent to which a model a model fits the data. The size of the deviance statistic indicates the extent to which a data model provides a good fit with the data (goodness-of-fit); decreases in the size of the statistic indicate a better fit. The likelihood ratio test

determines whether changes in the size of the deviance statistic are statistically

significant. With nested models, one can use the likelihood ratio test to determine

whether the inclusion of additional independent variables significantly improves the

model's fit with the data (Pampel, 2000).

Table 4 - Analytic Models

Model	Level-1 Variables		Level-2 Variables	
1	• None		• None	
2	• Gender • Prior performance on state assessments • Over-age status • Years enrolled in school • FARMS status		• None	
3	• Gender • Prior performance on state assessments • Over-age status • Years enrolled in school • FARMS status		• Configuration	
4	• Gender • Prior performance on state assessments • Over-age status • Years enrolled in school • FARMS status		• Configuration • Cohort	
5	• Gender • Prior performance on state assessments • Over-age status • Years enrolled in school • FARMS status		• Configuration • Cohort • Student climate measure • Teacher engagement	
6	• Gender • Prior performance on state assessments • Over-age status • Years enrolled in school • FARMS status		• Configuration • Cohort • Student climate measure • Teacher engagement • % of teachers with standard or advanced certification • Middle grades enrollment • % of FARMS students • % of students over-age	

HGLM conducts single-parameter tests of model components. Hypothesis testing

for each model indicated whether the fixed effects and random effects were different

from 0. The basic null and alternative hypotheses for fixed effects (γ) were:

$$(9) \quad H_0: \gamma_{qs} = 0; \; H_1: \gamma_{qs} \neq 0 \; \text{(t-ratio)}$$

A statistically significant result for the fixed effects of regression coefficients indicates that independent variable is related to the estimates of the dependent variable. Similarly, the null and alternative hypotheses for random effects were:

$$(10) \quad H_0: \tau_{qq} = 0; \; H_1: \tau_{qq} > 0 \; \text{(Chi-square)}^{15}$$

The random effect measure provides information on whether there is significant variance in estimates of outcomes between groups. If there is no statistically significant random effect, multilevel modeling is not required because there is no variation in estimates of the dependent variable at the group level. I employed an alpha-level of .05 to determine whether to accept or reject the null hypothesis.

Equation 9 represents the level-1 equation for models 2 through 6 for the likelihood of achieving the proficient or advanced level on the eighth-grade reading MSA.

$$(11) \quad \eta_{ij} \; \text{(Likelihood of 8}^{\text{th}} \text{ grade reading proficiency)} = \beta_{0j} + \beta_{1j} \text{ Grade 5 reading}$$
$$\text{proficiency} + \beta_{2j} \text{ Years enrolled in school} + \beta_{3j} \text{ Over-age status} + \beta_{4j} \text{ Gender} + \beta_{5j}$$
$$\text{Free/reduced meal status}$$

The intercept represents the likelihood of eighth-grade reading proficiency in a school with the averages of each level-2 variable, controlling for other level-2 variables. Each of the independent variables (β_{qj}) represents the change in predicted odds of eighth-grade reading proficiency controlling for other factors.

Equation 10 represents the final level-2 equation of model 6 for eighth-grade reading proficiency. Equations for the other student outcomes followed the same format.

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[15] This is the same value used to calculate the ICC.

(12) η_{ij} (Likelihood of 8th grade reading proficiency in school j $[\beta_{0j}] = \gamma_{00j+}\ \gamma_{01j}$ School

configuration+ γ_{02j}% of teachers with standard/advanced certification $+ + \gamma_{03j}$ middle

grades enrollment $+ \gamma_{04j}$ student climate+ γ_{05j} teacher engagement$_+ \gamma_{06j}$% of students over-

age$_+ \gamma_{07j}$% of students eligible for free or reduced meals

$\beta_{1j=}\ \gamma_{10}$
  .
  .
  .
$B_{8j=}\ \gamma_{80}$

The level-2 equation represents the change in predicted probability of eighth-grade reading proficiency for the same student in the level-1 equation controlling for level-2 variables. For example, the coefficient γ_{05} represents the change in predicted probabilities of reading proficiency for students attending schools with average levels of teacher engagement while controlling for other level-2 variables.

Summary

In this chapter I have highlighted the variables and analytic methods to be used for this research study. The identified variables are readily available in BCPSS administrative records and should provide an indication of the performance level of students in eighth grade. The proposed study should provide additional information on the relationship between middle grade outcomes and school configuration. If there is no relationship, after controlling for key variables, students from BCPSS middle and K-8 schools should have similar middle grade outcomes. One of the strengths of the study will be use of analytical techniques which incorporate both student and school-level measures in analyses. The next chapter provides results of the descriptive and HGLM analyses.

Chapter 5: Results

Introduction

The goal of this chapter is to present results of both the descriptive and multilevel analyses of data for both student cohorts. Data analyses focus on uncovering evidence about the unique contribution that school grade configuration may have on eighth-grade reading proficiency, mathematics proficiency, and ninth-grade enrollment in a selective high school. Four groups of questions guided data analyses. The research questions that guided this study were:

1. What are the demographic and performance characteristics of students who attend Baltimore K-8 and 6-8 schools? How do these student characteristics differ by school configuration?

2. What are the organizational differences between K-8 and middle schools? How do they compare in terms of average teacher qualifications, school size, and student enrollment?

3. To what extent do middle-grade students who attend Baltimore K-8 and 6-8 schools differ in terms of self-reports of relationships with teachers, level of interest in classes, and access to an environment that is conducive to learning? To what extent do teachers in K-8 and 6-8 schools report different levels of engagement with students and the school overall?

4. To what extent do eighth-grade outcomes differ by school configuration? In which ways are differences in student outcomes related to school structural characteristics and student and teacher engagement?

The first three sets of research questions are primarily descriptive in nature and explore the characteristics of students and the K-8 or 6-8 schools they attended in eighth grade. The final question requires use of multilevel modeling. The data modeling incorporates the descriptive data of the first three questions to analyze and understand student outcomes. The chapter is divided into four sections that address each of the research questions and concludes with a summary of key findings.

Research Question 1: Student-level comparisons

Baseline Demographic and Academic Performance Comparisons by Cohort

Baseline demographic and performance characteristics were similar for students in both cohorts 1 and 2. Tables 5 and 6 provide descriptive information for each student cohorts (cohorts 1 and 2, respectively). The first column provides information for all fifth graders in the district, while the next two columns provide information about eighth graders enrolled in either K-8 or 6-8 schools. At baseline, fifth grade) approximately 50% of both cohorts were male. Approximately 89% of students in both cohorts were African American, and 84% were eligible for free or reduced-price meals. Slightly less than 30% of students in both cohorts were at least one-year over-age in fifth grade. Fifth-grade reading proficiency rates were similar for students in both cohorts.

Comparison of Fifth-Grade and Eighth-Grade Demographic and Academic Performance Characteristics by Eighth-Grade School Configuration

Tables 5 and 6 also provide information on eighth-grade demographic and academic performance characteristics. Descriptive analyses of the final eighth-grade study population by school configuration reveal significant differences for both cohorts

of students. Across both cohorts, compared with students enrolled in 6-8 schools, eighth-grade students enrolled in K-8 schools exhibited significant differences in both demographic characteristics and performance on state assessments. Students enrolled in 6-8 schools were significantly more likely to be African American, eligible for free or reduced-price meals, and to be over-age for grade. Students enrolled in 6-8 schools also had significantly lower fifth- and eighth-grade reading and mathematics proficiency rates. Fifty-five percent of cohort 1 6-8 students were proficient in reading in fifth grade compared with 67% of K-8 students. Similarly, 57% of 6-8 and 65% of K-8 eighth-grade cohort 2 students were proficient in reading as fifth graders. Similar performance gaps for both cohorts are also evident in mathematics. Forty-six percent of cohort 1 6-8 and 57% percent of K-8 students were proficient in mathematics as fifth-grade students. Cohort 2 K-8 students had a higher mathematics proficiency rate (58%) than 6-8 students (54%).

Proficiency rates for both cohorts of 6-8 students generally declined between fifth and eighth grades. Among cohort 1 6-8 students, the reading proficiency rate declined from 55% to 44%, and the mathematics proficiency rate declined from 46% to 22%. For cohort 2 students, the reading proficiency rate declined slightly from 57% to 54%, and the mathematics rate declined from 54% to 33%. Students enrolled in K-8 schools exhibited similar declines in reading. The cohort 1 reading proficiency rate declined by approximately 3 percentage points, and the mathematics proficiency rate declined by nearly 14 percentage points. Cohort 2 K-8 students had an increase in reading proficiency rates (65% to 70%), while the mathematics proficiency rate declined from 58% to 48%. Across both cohorts, eighth-grade K-8 students were significantly more likely than eighth-grade 6-8 students to enroll in a selective high school for ninth grade. Forty-three

percent of cohort 1 K-8 students and 28% of 6-8 students enrolled in a selective high school for ninth grade. Similarly, 49% of cohort 2 K-8 students and 31% of 6-8 students enrolled in a selective high school in ninth grade. Across both grade configurations, selective high school enrollment rates were significantly higher for cohort 2 students. As might be expected, compared with 6-8 students, K-8 students had a higher mean number of years enrolled in the same school during the sixth through eighth grades. On average, cohort 1 K-8 schools were enrolled for approximately three-quarters of a year longer than 6-8 students. Cohort 2 K-8 students were, on average, enrolled in the same school for approximately one-half year longer than 6-8 students.

Table 5 - Cohort 1 Student-level Descriptive Statistics

	5th Grade (all students)	Final 8th Grade Study Population	
		K-8	**6-8**
Number of Students	6,584	1,696	2,071
% Male	51.1	47.5	49.2
% African American	88.7	86.6	91.7***
% Free or reduced-price meals	84.2	71.3	83.5***
% Over-age	29.7	20.8	30.8***
5th grade % Proficient or Advanced in Reading	57.9	66.9	55.4***
5th grade % Proficient or Advanced Mathematics	48.7	56.9	46.0***
8th grade % Proficient or Advanced in Reading		63.3	43.9***
8th grade % Proficient or Advanced in Mathematics		42.2	22.4***
Mean # of Years Enrolled in Same School (s.d.)		3.2 (1.0)	2.5 (0.8)***
% Enrolled in Selective High School for Grade 9		43.2	27.5***

*p<.05, *** p<.001

Table 6 - Cohort 2 Student-level Descriptive Statistics

	5th Grade (all students)	Final 8th Grade Study Population	
		K-8	6-8
Number of Students	5,988	1,634	2,321
% Male	50.1	48.0	48.2
% African American	88.7	86.4	96.6[***]
% Free or reduced-price meals	83.4	79.9	86.3[***]
% Over-age	28.5	23.9	32.8[***]
5th grade % Proficient or Advanced in Reading	59.4	65.0	57.3[***]
5th grade % Proficient or Advanced Mathematics	54.0	57.8	53.9[***]
8th grade % Proficient or Advanced in Reading		69.7	53.5[***]
8th grade % Proficient or Advanced in Mathematics		48.4	33.1[***]
Mean # of Years Enrolled in Same School (s.d.)		3.1 (1.0)	2.6 (0.8)[***]
% Enrolled in Selective High School for Grade 9		48.8	30.5[***]

Note:. *p<.05, *** p<.001

Summary of Student-level Data

Descriptive data analyses reveal that 6-8 students do indeed have lower eighth-grade reading and mathematics proficiency rates. Additionally, 6-8 students are less likely than K-8 students to enroll in district selective high schools. However, analyses of fifth grade reading and mathematics data also indicate that 6-8 students were less likely to

be proficient in reading and mathematics prior to entering middle school. Middle school students were also more likely than K-8 students to be over-age and to be eligible for free or reduced-price meals. These additional data points provide crucial context for interpreting eighth-grade student outcomes. Eighth-grade K-8 students in both cohorts appear to benefit from both demographic and prior performance advantages.

Research Question 2: School-level Demographic and Structural Comparisons

School-level data analyses explored the extent to which K-8 and 6-8 schools differed in school size, the characteristics of the student population, teacher qualifications, and school climate. As noted in the previous chapter, school data serve as the second level of analysis. Tables 7 and 8 display data for the schools attended by cohort 1 and cohort 2 students, respectively. These tables compare average school size, average student characteristics, and average teacher licensures for schools that enroll students in K-8 and 7-8 grade configurations. Descriptive analyses of school-level data reveal few statistically significant differences between cohort 1 and cohort 2 K-8 and 6-8 schools. Compared with K-8 schools, middle schools enrolled significantly more middle-grade students but had lower overall student enrollments. Cohort 1 and 2 K-8 schools on average enrolled approximately 500 students, and 6-8 schools enrolled approximately 300 students. K-8 middle-grade student enrollment was approximately 200 for both cohorts. There was no statistical difference in the proportion of K-8 and 6-8 teachers who had full standard or advanced teacher certification.

On average 6-8 schools served a more academically at-risk student population. Middle schools attended by cohort 1 and cohort 2 students also enrolled more over-age

students, and students generally had lower reading and mathematics proficiency rates. Thirty-nine percent of middle-grade students enrolled in cohort 1 and 2 6-8 schools were over-age for grade. The over-age rate for cohort 1 K-8 schools was 10 percentage points lower than the 6-8 rate. Cohort 2 K-8 schools, on average, had over-age rates which were 18 percentage points lower than 6-8 schools. The school-level reading proficiency rate for cohort 1 K-8 schools was approximately 18 percentage points higher than for 6-8 schools. K-8 mathematics proficiency rates were approximately 19 percentage points higher than 6-8 rates. Cohort 2 K-8 schools had reading and mathematics proficiency rates that were approximately 13 percentage points higher than 6-8 rates.

Table 7 - Cohort 1 School-level Descriptive Statistics

Final Study Population				
	K-8 **n=35**		**6-8** **n=18**	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Average Total Enrollment	494.2	215.6	353.4[*]	209.1
Average Middle Grades Enrollment	195.4	144.5	353.4[***]	210.4
% Male	49.3	4.7	51.8	4.9
% African American	86.8	22.1	88.3	17.1
% Free or reduced-price meals	71.7	11.4	76.1	5.8
% Over-age	29.4	10.0	39.4[***]	7.0
% Proficient or Advanced in Reading (middle grades only in K-8 schools))	65.8	11.9	48.2[***]	14.8
% Proficient or Advanced in Mathematics (middle grades only in K-8 schools)	47.2	19.4	27.7[*]	21.6
# Years enrolled 8th grade since 1999-2000	6.6	2.8	7.9[*]	2.2
% Teachers with standard or advanced license	58.5	14.5	55.0	16.1

p<.05, *** p<.001.

Table 8 - Cohort 2 School-level Descriptive Statistics

Final Study Population				
	K-8 n=51		6-8 n=18	
	Mean	Standard Deviation	Mean	Standard Deviation
Average Total Enrollment	476.7	197.7	314.2[*]	170.9
Average Middle Grades Enrollment	167.1	118.8	314.2[*]	170.9
% Male	49.9	3.0	50.6	4.3
% African American	82.2	25.7	92.5	16.1
% Free or reduced-price meals	80.3	13.5	82.0	4.5
% Over-age	21.9	6.8	39.1[***]	16.6
% Proficient or Advanced in Reading (middle grades only in K-8 schools)	70.6	12.8	56.2[*]	15.9
% Proficient or Advanced in Mathematics (middle grades only in K-8 schools)	51.5	17.6	39.0[*]	22.0
# Years enrolled 8th grade since 1999-2000	5.3	3.8	8.3[*]	3.2
% Teachers with standard or advanced license	61.3	16.2	56.1	14.3

*p<.05, *** p<.001.

Summary

In some respects, the schools cohort 1 and 2 students attended were similar. There were no statistically significant differences in the percentage of students eligible for free or reduced-price meals, the percentage of African American students, or the percentage of fully-certified teachers. K-8 schools did, however, enroll a significantly lower percentage of over-age students, and average student reading and mathematics proficiency levels were significantly higher in K-8 schools. There were no significant

differences in the percentage of teachers who had standard or advanced certifications. The next section of this chapter explores the extent to which students and teachers in K-8 and 6-8 schools report differences in school climate.

Research Question 3: School-level Climate Comparisons

Data analyses also explored the extent to which K-8 and 6-8 schools differed in student and teacher assessments of the school climate. Tables 9 and 10 display the means and standard deviations for the teacher and student climate survey scales for the schools attended by cohort 1 and cohort 2 students, respectively. School environment characteristics may facilitate or impede student learning (Creemers & Reezgit, 2005; Eccles et al., 1993; Hoy & Hanum, 1997). Middle-grade students enrolled in K-8 schools reported slightly higher ratings on each of the climate measures. However, only the learning environment difference for cohort 1schools was statistically significant. The overall student climate measure includes each of the other three student climate scales. As with each of the individual scales, the summary score for students enrolled in K-8 schools was slightly larger in K-8 schools compared with 6-8 schools; the difference was, however, not statistically significant. Compared with teachers in K-8 schools, cohort 1 6-8 teachers reported slightly lower levels of engagement. There were no statistically significant differences in teacher or student ratings of the school environment for cohort 2 schools

Summary

Analyses of school-level climate data revealed few statistically significant differences in student and teacher ratings of climate data. Teachers and students in K-8

schools tended to provide slightly more positive ratings of school climate, but few of these differences were statistically significant. The overall student climate measure is a composite measure of the three other student measures. As with the other measures, there was not statistically significant difference among the K-8 and 6-8 schools attended by cohort 1 and cohort 2 students.

Table 9 - Cohort 1 School-level Climate Survey Descriptive Statistics

Final Study Population				
	K-8 n=35		6-8 n=18	
	Mean	Standard Deviation	Mean	Standard Deviation
Mean student engagement	22.3	1.1	21.8	1.1
Mean teacher/student relationships	17.5	1.2	17.2	1.2
Mean learning environment	14.1	1.2	13.4[*]	1.2
Overall student climate	47.6	3.0	46.3	3.0
Mean teacher engagement	25.2	1.4	23.7[*]	2.0

*p<.05, *** p<.001.

Table 10 - Cohort 2 School-level Climate Survey Descriptive Statistics

Final Study Population				
	K-8 n=51		6-8 n=18	
	Mean	Standard Deviation	Mean	Standard Deviation
Mean student engagement	22.2	1.1	22.0	1.1
Mean teacher/student relationships	11.2	0.9	10.9	0.8
Mean learning environment	14.1	1.2	13.7	1.1
Mean teacher engagement	19.7	1.4	19.6	1.5
Overall student climate	47.5	3.0	46.8	3.0

*p<.05, *** p<.001.

Research Question 4: Comparing Student Outcomes

Model Building

As described in chapter 4, I added student and school-level variables to the analytic models in steps. Data modeling is the same for all three outcomes. Below are the variables included in each model: [16]

- Model 1 – fully unconditional model that includes no student or school-level variables.

- Model 2 – within school model that includes only student-level variables.

- Model 3 – all student-level variables and school configuration

- Model 4 – all student-level variables and school configuration, cohort

- Model 5 – student-level variables and school configuration, cohort, student climate summary measure, teacher engagement

- Model 6 – fully conditional model that includes all student-level variables and all school-level variables (school configuration, cohort, student climate summary measure, teacher engagement, middle grades enrollment, teacher certification, percent of students over-age, and percent FARMS-eligible).

I describe data the data models for each outcome below.

Reading Proficiency

Table 11a displays the logs odds and the odds ratio for each stage of model building.[17] The first model did not include any student- or school-level predictors. This

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[16] Reference categories for each model are: gender (0=female; 1=male); over-age status (0=not over-age; 1=over-age); FARMs status (0= not FARMs eligible; 1=FARMS eligible). Since the level-1 variables have been grand-mean centered, the gender variable can be interpreted as the likelihood of a study outcome in a school with an average proportion of male students. Each outcome is coded as '0' for not achieving the outcome and '1' for achieving the outcome.

[17] To assess multicollinearity of the student-level data, I conducted an ordinary linear regression analysis (OLS) with collinearity diagnostics of a level-1 data for each outcome. All variance inflation factors (VIF)

model indicates that there is statistically significant variance in reading proficiency at the school-level (see Table 11b). Additionally, the intraclass correlation coefficient (ICC) indicates that approximately 14% of the variance in the estimate of eighth-grade reading proficiency was between schools; most of the variance in estimates of reading proficiency was within schools, at the student-level. The second step of model building included the addition of student-level variables. Each student-level variable was significantly related to the likelihood of reading proficiency. Male students, students who were eligible for free or reduced-price meals, and students who were over-age for grade had a lower odds of reading proficiency. The odds of over-age students being proficient in reading were more than 50% lower than for students who were not over-age. Fifth-grade reading proficiency had a large, significant effect on the odds of eighth-grade reading proficiency. The odds of eighth-grade reading proficiency for students who were proficient in reading as fifth-grade students were five times higher than for students who were not proficient in the fifth grade. The number of years students were enrolled in a school was also linked to an increase the likelihood of proficiency. An additional year of enrollment in the same school increased the odds of reading proficiency by approximately 16%.

The next step of analysis included the addition of school-level variables. The first variable was the school configuration variable. Controlling for student-level variables, school configuration was significantly related to the likelihood of reading proficiency. On average, controlling for student-level characteristics, students who were enrolled in K-8 schools were 70% more likely to be proficient in reading than students enrolled in 6-8 schools. Cohort was also significantly related to the likelihood of reading proficiency in

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were approximately 1 which indicates the possibility of collinearity but not at a level that would have a severe negative effect on the accuracy of the data models (Field, 2009).

model 4; the odds of cohort 2 students being proficient were more than 60% higher than similar cohort 1 students. The inclusion of the cohort variable in model 4 resulted in a slight decrease in the size of the school configuration regression coefficient. Interestingly, the addition of the cohort variable also resulted in a small increase in the coefficient associated with fifth grade reading proficiency.

The next stage of analyses added the school climate measures. After controlling for other variables included in the model, both the overall student measure and the teacher engagement measure were positively related to the likelihood of eighth-grade reading proficiency. Controlling for other variables, school configuration remained a significant contributor to student reading proficiency after the inclusion of climate variables; the odds that students enrolled in K-8 schools were proficient in reading more than 60% higher than students enrolled in 6-8 schools. However, the size of the regression coefficient declined again. The decrease in the size of the regression coefficient indicates that some of the effect previously attributed to school configuration can be attributed to the impact of the student climate and teacher engagement measures.

The final stage of analysis included the addition of school size, teacher qualifications, and school context variables (percent over-age and percent free and reduced-meal participation). The only additional variable that had a significant relationship with the likelihood of student reading proficiency was the percentage of students who were over-age for grade; a one standard deviation increase in the percentage of over-age students resulted in a 17% decrease in the likelihood of student reading proficiency. Data analyses indicate that the impact of over-age status may operate at both the student and school-level. The inclusion of the school context variables also reduced

the effect of the school configuration variable to statistical non-significance. It is possible

that being enrolled in a K-8 school may decrease the likelihood of being over-age for

grade, and including the over-age variable in the model accounts for some of the positive

effects of K-8 schools in the earlier models. In addition to the percent of over-age

students, the cohort and teacher engagement variables were the only school-level

variables that were significantly related to the estimates of the likelihood of eighth-grade

reading proficiency when all other variables are included in the model.

Model Comparison

  Each of the models improved fit with the data and explained more of the school-

level variance compared with previous models. Tables 11b and 11c provide information

on school-level variance and model fit. The level of between-school variance declined

from approximately 14% in the fully unconditional model to an adjusted value of

approximately 3% in the fully conditional model. The fully conditional model still had a

statistically significant level of variance at the school-level; an indication that other

unspecified school-level variables may be affecting estimates of eighth-grade reading

proficiency ($\tau=0.11$, $p<.001$). Each subsequent model improved model fit compared with

prior models. The largest reduction in the size of the deviance statistic occurred in model

2 with the addition of student-level variables. However, the addition of school-level

variables also provided significantly improved model fit for models 3 through 6.

Table 11a – Eighth-Grade Reading Proficiency – Fixed Effects

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio
Between School[1]												
Intercept	0.43	1.5**	0.49	1.6**	0.16	1.16	-0.09	0.92	-0.08	0.92	0.11	1.11
Cohort							0.48	1.62**	0.71	2.04**	0.70	2.02**
Configuration					0.53	1.70**	0.49	1.63**	0.36	1.43*	0.09	1.10
Teacher Engagement									0.24	1.27*	0.20	1.22*
Student Climate									0.19	1.21*	0.16	1.17
Middle Grades Enrollment											-0.03	0.97
Teacher Certification											0.06	1.07
% Over-age											-0.02	0.98*
% FARMS											-0.01	0.99
Within School												
Gender			-0.32	0.72**	-0.33	0.72**	-0.33	0.72**	-0.33	0.71**	-0.34	0.71**
FARMS			-0.14	0.87*	-0.15	0.86*	-0.16	0.85*	-0.17	0.84*	-0.14	0.87
Over-age			-0.75	0.47**	-0.77	0.46**	-0.78	0.46**	-0.79	0.45**	-0.78	0.46**
Prior Reading Proficiency			1.61	5.00**	1.65	5.21**	1.67	5.33**	1.69	5.41**	1.69	5.45**
Years Enrolled in School			0.15	1.16**	0.14	1.15**	0.14	1.15**	0.14	1.15**	0.14	1.15**

*p<.05, ** p<.001.

1- Cohort and configuration are dummy-coded variables. Percent over-age, and FARMS are recoded into deciles (percentage of students / 10). Teacher certification, middle grade enrollment, student climate, and teacher engagement are standardized measures with a mean of 0 and a standard deviation of 1. All level-1 variables are grand-mean centered.

Table 11b – Eighth-grade Reading Proficiency – Random Effects

Model Number	Variance Component
1	0.53
2	0.36
3	0.29
4	0.24
5	0.16
6	0.11

*p<.05, ** p<.001.

Table 11c – Eighth-Grade Reading Proficiency – Model Comparison

Model Number	Deviance Statistic	Intercept Variance
1	--	0.14
2	1467.1*	0.10
3	17.6*	0.08
4	18.7*	0.07
5	37.6*	0.05
6	21.3*	0.03

Predicted Probabilities

Figure 6 illustrates three sets of predicted probabilities of eighth-grade reading proficiency for students enrolled in K-8 and middle schools based on the fully conditional model (model 6). None of the differences between the two school types are statistically significant in the final model. The first series of numbers represents the probability of reading proficiency for students controlling for all student-level and school-level variables. The associated probability is 55% for a student enrolled in a K-8 school and 53% for a student enrolled in middle school. The second series controls for all student-level ad school-level variables except teacher engagement. The probability of being proficient in reading increases to 60% in a K-8 school and 58% in a middle school. The final series of numbers introduces the impact of the size of the over-age population while

controlling for other student-level and school-level variables. Predicted probabilities of
reading proficiency decline to 55% in K-8 schools and 52% in middle schools.

Figure 5
Predicted Probabilities of Eighth-grade MSA Reading Proficiency
Model 6
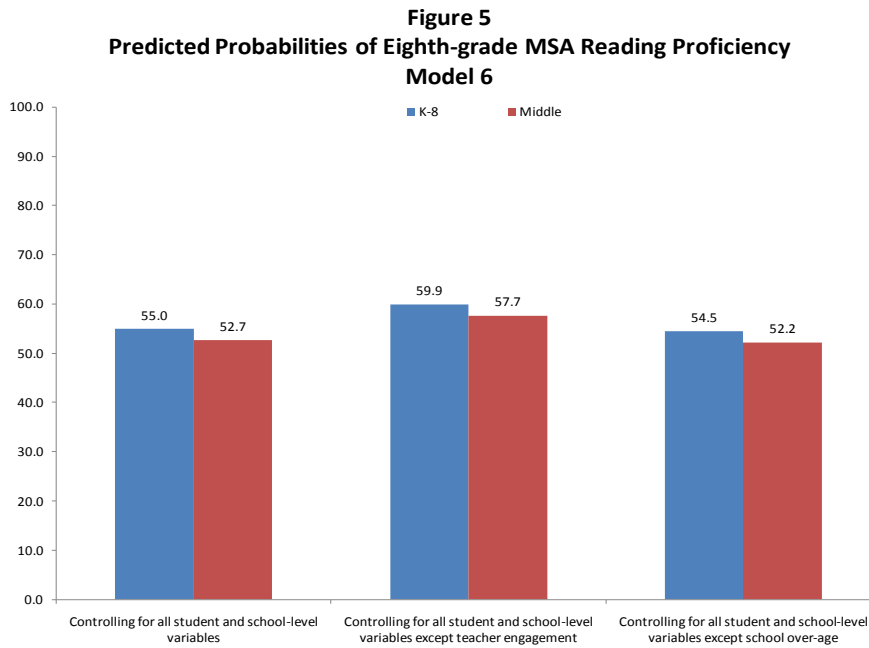
Mathematics Proficiency

Findings for the estimates of eighth-grade mathematics proficiency are similar to
those for reading proficiency. As with the analysis of reading proficiency, mathematics
proficiency model building began with the fully unconditional model that included no
student or school-level variables. The second stage of analysis added all of the student-
level variables. All student-level variables except gender were significantly related to
estimates of the likelihood of mathematics proficiency; there was no statistical difference
in the likelihood of mathematics proficiency for males and females. Students who were
proficient in mathematics as fifth-grade students were more than five times as likely to be
proficient in the eighth grade. The number of years students were enrolled in school was
also positively related to estimates of mathematics proficiency; an additional year of

enrollment in the same school was related to a 26% increase in the odds of mathematics proficiency. Except for increases in the size of the fifth-grade mathematics proficiency coefficient, the regression coefficients for the remaining student-level variables remained consistent throughout the remaining model stages.

The remaining stages of data analysis focused on the addition of school-level variables to the model. School configuration was the first variable included and, as with reading proficiency, was significantly related to the estimates of mathematics proficiency. In model 3, on average after controlling for student characteristics, students enrolled in K-8 schools were 69% more likely to be proficient in mathematics. However, unlike the reading proficiency model, cohort was not significantly related to estimates of mathematics proficiency in model 4. Cohort was significantly related to estimates of mathematics proficiency when the climate variables were added in model 5, suggesting either a suppression effect or possible interaction with these variables. On average, cohort 2 students were almost twice as likely to be proficient in mathematics after controlling for other student and school-level variables. The addition of climate variables reduced the impact of school grade configuration to statistical non-significance at the .05 level (p=.10) in model 5; this level of significance, however, does suggest some remaining effect of school configuration on mathematics proficiency. The student and teacher climate variables appear to account for some of the influence that school configuration had in the prior model. In contrast to model 5 for reading proficiency, the student climate measure was not significantly related to mathematics proficiency. The direction of the coefficient was positive, though. Teacher engagement, however, continued to be a

statistically significant predictor of mathematics proficiency after controlling for other student and school-level variables.

Model 6 includes all student and school-level variables. All student-level variables except gender continued to be significantly related to estimates of mathematics proficiency. Fifth-grade mathematics proficiency and the number of years enrolled in the same school continued to be positively related to the likelihood of mathematics proficiency, and eligibility for free or reduced-price meals and over-age status continued to be negatively related to the likelihood of proficiency. Being 1 year or more over-age was especially harmful to the likelihood of proficiency. Students who were 1 year or more over-age were 60% less likely to be proficient in mathematics when all variables were included model 6. At the school-level, teacher engagement, the percentage of over-age students, and cohort were significantly related to the likelihood of student mathematics proficiency. Controlling for all other variables, a one standard deviation increase in the teacher engagement measure was related to a 40% increase in the likelihood of eighth-grade mathematics proficiency, and a one-unit increase in the percent of over-age students was related to a 26% decrease in the odds of mathematics proficiency.

Model Comparison

As with eighth-grade reading proficiency, there was a significant level of variance in estimates of student outcomes at the school level (Table 11b). As represented in table 11c, in the fully unconditional model (model 1) approximately 24% of variance in the odds of eighth-grade mathematics proficiency was situated at the school level. The level of between-school variance decreased to approximately 19% in the fully conditional

119

model (model 6). The addition of variables in models 4 and 6 did not significantly improve data fit compared with the prior models. The most significant improvement in model fit occurred with the addition of the student-level variables in model 2.

Table 12a – Eighth-Grade Mathematics Proficiency

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio
Between School - Fixed Effects[1]												
Intercept	-0.39	0.67**	-0.53	0.59**	-0.90	0.41**	-1.08	0.34**	-1.10	0.33**	-0.94	0.39
Cohort							0.34	1.40	0.64	1.89*	0.81	2.26*
Configuration					0.52	1.69*	0.50	1.65*	0.30	1.35	-0.12	0.89
Teacher Engagement									0.38	1.46*	0.34	1.40*
Student Climate									0.24	1.27	0.28	1.33
Middle Grades Enrollment											-0.08	0.93
Teacher Certification											0.05	1.06
% Over-age											-0.27	0.76*
% FARMS											-0.11	0.89
Within School Fixed Effects												
Male			-0.08	0.92	-0.08	0.92	-0.08	0.92	-0.08	0.92	-0.08	0.92
FARMS			-0.21	0.81*	-0.21	0.81*	-0.22	0.80*	-0.22	0.80*	-0.21	0.81*
Over-age			-0.86	0.42	-0.88	0.42**	-0.88	0.41**	-0.92	0.40**	-0.91	0.40**
Prior Mathematics Proficiency			1.67	5.32**	1.71	5.56**	1.73	5.65**	1.79	6.00**	1.81	6.08**
Years Enrolled in School			0.23	1.26**	0.23	1.26**	0.23	1.26**	0.24	1.27**	0.24	1.27**

*p<.05, ** p<.001.

1 - Cohort and configuration are dummy-coded variables. Percent over-age, and FARMS are recoded into deciles (percentage of students / 10). Teacher certification, middle grade enrollment, student climate, and teacher engagement are standardized measures with a mean of 0 and a standard deviation of 1 . All level-1 variables are grand-mean centered.

Table 12b – Eighth-Grade Mathematics Proficiency – Random Effects

Model Number	Variance Component
1	1.01**
2	1.04**
3	0.97**
4	0.94**
5	0.69**
6	0.76**

*p<.05, ** p<.001.

Table 12c – Eighth-Grade Mathematics Proficiency – Model Comparison

Model Number	Deviance Statistic	Intercept Variance
1	--	0.24
2	1489.18**	0.24
3	6.50**	0.23
4	3.43	0.22
5	33.76**	0.17
6	6.14	0.19

Predicted Probabilities

Figure 7 illustrates three sets of predicted probabilities of eighth-grade

mathematics proficiency for students enrolled in K-8 and middle schools based on the

fully conditional model (model 6). None of the differences between the two school types

are statistically significant in the final model. The first set of numbers represents the

probability of reading proficiency for students controlling for all student-level and

school-level variables. The probability of mathematics proficiency is 28% in both K-8

and middle schools. The second series controls for all student-level ad school-level

variables except teacher engagement. The probability of being proficient in reading

increases to 35% for both K-8 and middle. The final set of numbers introduces the impact

of the size of the over-age population while controlling for other student-level and

school-level variables. Predicted probabilities of reading proficiency decline to

approximately 14% in both K-8 and middle schools.

Figure 6
Predicted Probabilities of Eighth-grade MSA Mathematics Proficiency
Model 6
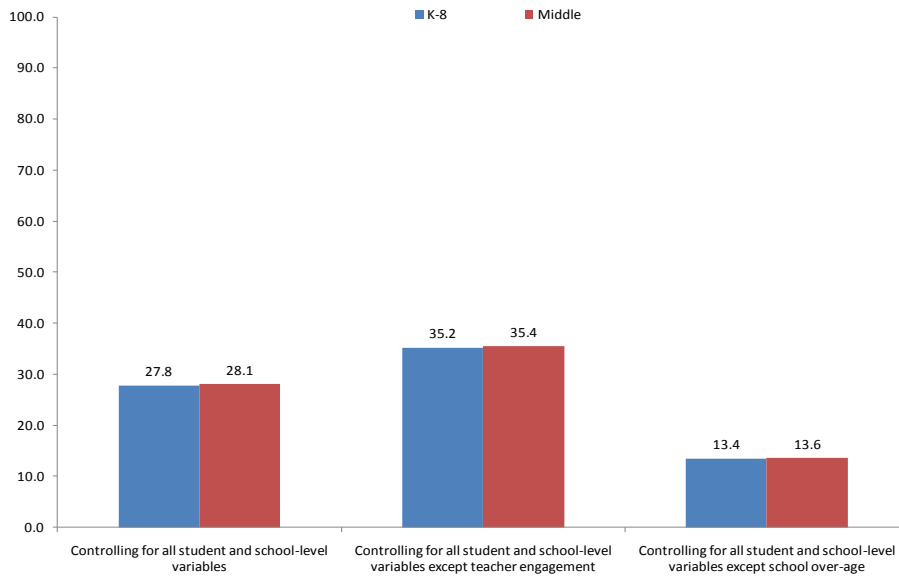
Enrollment in a Selective High School

The relationship between estimates of the likelihood of enrollment in a selective

high school and the school-level and student-level predictors was similar to that of the

relationship for reading and mathematics proficiency. Table 13a presents all regression

coefficients (log odds) and odds ratios for each model. At the student-level, most

variables were consistently related to estimates of the likelihood of enrollment in a

selective high school. Eligibility for free or reduced-price meals was significantly related

to enrollment in a selective high school only in model 2 and model 5. The relationship

approached significance in the other models, though. Prior reading proficiency and the

years enrolled in the same school were consistently related to the likelihood of selective

high school enrollment for all models. Fifth grade reading proficiency increased the likelihood of enrollment in a selective high school by 300%. Over-age students were only 37% as likely as non-over-age students to enroll in a selective high school.

School configuration, cohort, and the percent of over-age students were the only school-level variables that were related to the likelihood of enrollment in a selective high school. School configuration was related to estimates of mathematics proficiency in models 3 through 5. The impact of configuration was most significant in model 3 when it was the only school-level variable included; the odds that K-8 students would enroll in a selective high school were 49% higher than for students enrolled in 6-8 schools. The inclusion of additional variables reduced the independent effect that grade configuration had on selective high school enrollment. Student cohort was significantly related to the likelihood of enrollment in a selective high school in models 4 through 6. Controlling for other student and school-level variables, Cohort 2 students were more approximately 55% likely than cohort 1 students to enroll in selective high schools (model 6). At the school-level, the percent of over-age students was again negatively related to the likelihood of enrollment in a selective high school. A one standard deviation increase in the percent of students enrolled in a school decreased the likelihood of enrollment in a selective high school by 36%. Neither of the teacher or student school climate measures was significantly related to the likelihood of enrollment in a selective high school.

Model Comparison

Each of the ninth-grade enrollment models improved fit with the data and explained more of the school-level variance compared with previous models. Tables 13b and 13c provide information on school-level variance and model fit. The level of

between-school variance declined from approximately 18% in the fully unconditional model to approximately 8% in the fully conditional model. The fully conditional model still had a statistically significant level of variance at the school-level; an indication that other unspecified school-level variables may be affecting estimates of eighth-grade reading proficiency ($\tau=0.29$, p<.001). Each subsequent model improved model fit compared with prior models. The largest reduction in the size of the deviance statistic occurred in model 2 with the addition of student-level variables. However, the addition of school-level variables also provided significantly improved model fit for models 3 through 6.

Table 13a – Ninth-Grade Enrollment in a Selective High School

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio	Log Odds	Odds Ratio
Between School - Fixed Effects[1]												
Intercept	-0.44	0.64**	-0.59	0.55**	-0.87	0.42**	-1.01	0.37**	-1.16	0.31**	-0.77	0.46**
Cohort							0.28	1.32*	0.57	1.76*	0.44	1.55*
Configuration					0.40	1.49*	0.37	1.45*	0.33	1.39*	-0.12	0.88
Teacher Engagement									0.08	1.09	0.09	1.09
Student Climate									0.20	1.22	0.10	1.10
Middle Grades Enrollment											0.07	1.07
Teacher Certification											0.10	1.11
% Over-age											-0.45	0.64**
% FARMS											0.06	1.06
Within School - Fixed Effects												
Male			-0.22	0.81**	-0.22	0.80**	-0.22	0.80**	-0.23	0.79**	-0.23	0.80**
FARMS			-0.13	0.88**	-0.13	0.88	-0.13	0.87	-0.15	0.86*	-0.12	0.88
Over-age			-0.99	0.37**	-1.00	0.37**	-1.00	0.37**	-1.07	0.34**	-1.01	0.36**
Prior Reading Proficiency			1.11	3.03**	1.12	3.06**	1.13	3.09**	1.19	3.29**	1.14	3.12**
Years Enrolled in School			0.27	1.34**	0.26	1.30**	0.26	1.30**	0.28	1.32**	0.27	1.31**

*p<.05, ** p<.001.

1 – Cohort and configuration are dummy-coded variables. Percent over-age, and FARMS are recoded into deciles (percentage of students / 10). Teacher certification, middle grade enrollment, student climate, and teacher engagement are standardized measures with a mean of 0 and a standard deviation of 1. All level-1 variables are grand-mean centered.

Table 13b – Ninth-Grade Enrollment in a Selective High School – Random Effects

| Model Number	Variance Component
1	0.71**
2	0.50**
3	0.46**
4	0.44**
5	0.41**
6	0.29**

*p<.05, ** p<.001.

Table 13c – Ninth-Grade Enrollment in a Selective High School - Model Comparison

Model Number	Deviance Statistic	Intercept Variance
1	--	0.18
2	883.03**	0.13
3	8.12*	0.12
4	4.45*	0.12
5	8.18*	0.11
6	39.08**	0.08

Predicted Probabilities

Figure 8 illustrates three sets of predicted probabilities of eighth-grade reading proficiency for students enrolled in K-8 and middle schools based on the fully conditional model (model 6). The first series of numbers represents the probability of reading proficiency for students controlling for all student-level and school-level variables. None of the differences between the two school types are statistically significant in the final model. The associated probability is 29% for a student enrolled in a K-8 school and 32% for a student enrolled in middle school. The second series controls for all student-level and school-level variables except teacher engagement. The probability of being proficient in reading increases to 31% in a K-8 school and 34% in a middle school. The final series of numbers introduces the impact of the size of the over-age population while controlling

for other student-level and school-level variables. Predicted probabilities of reading

proficiency decline to 13% in K-8 schools and 14% in middle schools.

Figure 7
Predicted Probabilities of Ninth-grade Enrollment in a Selective High
School
Model 6
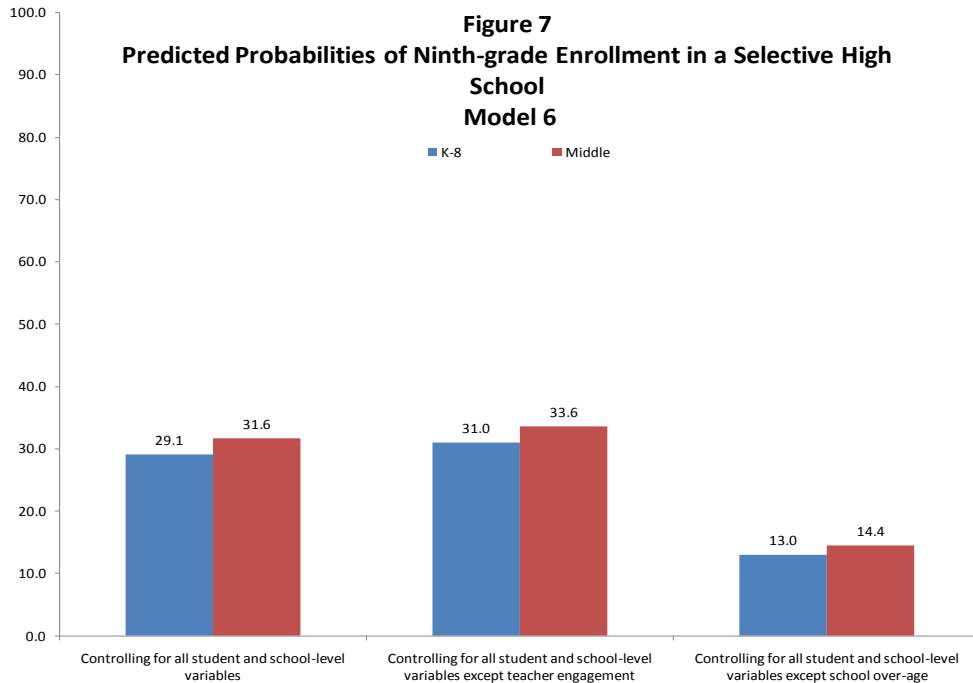
Summary

Findings were similar across all three outcomes. School configuration was

significantly related to each of the outcomes in the early models and was reduced to non-

significance in the final model. It is possible that school climate, as currently represented

by teacher engagement, may serve as mediating variable that affects the relationship

between school configuration and each of the three outcomes. At the school-level, only

cohort and the percent of over-age students were related to the likelihood of all three

study outcomes. Teacher engagement was significantly related to the odds of reading and

mathematics proficiency. Most student-level variables were consistently related to each

outcome. Over-age status significantly reduced the odds of each of study outcome and

prior reading or mathematics proficiency significantly increased the odds of each outcome. In general, the addition of variables in each of the subsequent models significantly improved model fit compared with the prior model. Moreover, the amount of unexplained school-level variance also generally declined with the addition of variables in later models.

Chapter 6: Summary and Interpretation of Findings

This chapter I summarize key findings from this study, identify ways in which the findings contribute to prior research, discuss some of the broad implications of these findings, and identify potential areas for future research. The chapter begins with a summary of the background of the study and concludes with the research questions. The second section of the chapter discusses the major findings. The next section elaborates on the limitations of the research, and the final section discusses implications of the findings and identifies areas for further research.

Summary of Study

The goal of this study was to assess whether school grade configuration was uniquely related to eighth-grade reading and mathematics proficiency and ninth-grade enrollment in a selective high school in the Baltimore City Public School System. Data analysis focused on two cohorts of students who were enrolled in K-8 or 6-8 schools for eighth grade during either the 2007-08 (cohort 1) or 2008-09 (cohort 2) school years. The basic theoretical framework for this work was that one can view the educational progress of a student as a pipeline that begins in pre-school, or even at home, and ultimately ends with college graduation and/or workforce participation. Earlier sections of the pipeline may set the stage for what comes later. Both student characteristics and school characteristics also may affect a student's progress and performance.

Although all phases of the education pipeline are likely important, this study focused on the middle grades because some researchers have identified these grades as key transitional grades or as potential turning points that may significantly affect a

student's later academic progress and performance (Carnegie Foundation, 1989; Graber & Brooks-Gunn, 1996; Hughes, 1998; Jessor, 1998; Laub & Sampson, 1993; Roeser, Eccles & Sameroff, 2000). Over the past century, one of the ways that education researchers and reformers have attempted to provide positive and effective schools for middle-grade students is by altering the grade configurations of schools. At the end of the 19th century most students attended K-8 schools. The early 20th century saw the development of 7-9 schools; the mid-to-late 20th century was marked by the development of middle schools, which typically enrolled students in grades 6-8. Recently some urban school districts have begun to return to the K-8 model (Clark & Clark, 1993; Cuban, 1992; Gruhn & Douglass, 1956; Juvonen et al., 2004).

Current research on the impact of such changes on student outcomes is mixed. Most studies I reviewed consistently identified better outcomes for students enrolled in K-8 schools (Abella, 2005; Cooksley , 2010; Franklin & Glascock , 1998; Keegan, 2010; Moore, 1984; Offenberg , 2001; Poncelet, 2004; ; Rockoff & Lockwood, 2010; Shaefer, 2010; Whiry, Coldarci, & Meadow, 1992; Yakimowski & Connolly, 2001). Other studies have identified an inconsistent or nonexistent advantage for students enrolled in K-8 schools (Byrnes & Ruby, 2006; Ellis, Gaudet, & Hoover; 2005; Nobles, 2008; Watson, 2009; Weiss & Kipnes, 2007).

The goal of this study was to add to this body of work by providing empirical evidence about the relative advantages for students of the K-8 or 6-8 school configurations. To isolate the potential relationship between school configuration and students outcomes I selected hierarchical generalized linear modeling (HGLM) because such analyses incorporate data on both students and the schools they attend. I used the

133

same student-level variables in all models except the fully unconditional model. The school-level variables were added in steps. This method allows for examination of the ways in which the relationship between dependent and independent variables may change when additional variables are included in the model. The research questions guiding this study were:

1. What are the demographic and performance characteristics of students who attend Baltimore K-8 and 6-8 schools? How do these student characteristics differ by school configuration?

2. What are the organizational differences between K-8 and middle schools? How do they compare in terms of average teacher qualifications, school size, and student enrollment?

3. To what extent do middle-grade students who attend Baltimore K-8 and 6-8 schools differ in terms of self-reports of relationships with teachers, level of interest in classes, and access to an environment that is conducive to learning? To what extent do teachers in K-8 and 6-8 schools report different levels of engagement with students and the school overall?

4. To what extent do eighth-grade outcomes differ by school configuration? In which ways are differences in student outcomes related to school structural characteristics and student and teacher engagement?

Findings

The main finding for this study was that although school configuration was significantly related to each of the outcomes in the early stages of analysis, the inclusion of all student-level and school-level variables in the fully conditional model (model 6) reduced the impact of school configuration to statistical non-significance. In the early models, students enrolled in K-8 schools were significantly more likely to be proficient in reading and mathematics and were more likely to enroll in a selective high school.

There are at least a couple potential explanations for this relationship pattern. First, the initial significance of the school configuration variable may have masked the impact of teacher engagement and other school context variables. School configuration may be completely unrelated to the study outcomes, while the impact of over-age status and teacher engagement are independently related to outcomes. Another, more likely, explanation is school configuration may have an indirect relationship to study outcomes. Prior research has identified a negative relationship between school changes and student outcomes (Eccles et al., 1993; George, 1995). The longer students remain enrolled in the same school, the more likely that staff and students will have time to develop relationships. These are key elements of the K-8 model. These relationships may enhance teacher engagement with students and schools and may also provide teachers more opportunities to know when students face academic struggles. This knowledge might allow staff to provide academic supports that reduce the likelihood that a student is retained in grade during both the elementary and middle grades.

The theoretical model I presented in chapter 1 implies a direct relationship between school configuration, other school characteristics, and student outcomes. In this

conception, I combined school configuration and characteristics into a single level of analysis and treated all aspects of schools similarly. However, study findings indicate that this simplified model may be enhanced by unpacking the different elements of school characteristics and developing an understanding of how the different aspects of schools may interact to produce student outcomes. For example, it is possible that the K-8 configuration may facilitate the development of intervening practices or conditions that may, in turn, facilitate or impede positive student outcomes. These practices or conditions may serve as mediating variables that might cause the occurrence of dependent variables (MacKinnon, Krull, & Lockwood, 2000). As I discuss during the sections on study limitations and areas for future research, the current study was unable to provide insights into how K-8 and 6-8 schools structure day-to-day school operations. Such information may help shed light on how school climate and practices may be related to student achievement. Franklin and Glascock (1998) concluded that school grade configuration may establish a context for learning. Data from this study provide additional evidence of such a relationship between school configuration and the context for learning.

Student-level

Although the main finding is of particular interest, the study also identified important findings about the impact of students' prior academic performance on future academic performance. As noted earlier, the education pipeline analogy theorizes that early outcomes shape later outcomes. The high level of significance that fifth-grade proficiency had for all three study outcomes illustrates the relationship between early and late outcomes. Students who were proficient in reading or mathematics as fifth-grade students were significantly more likely to be proficient in eighth grade. Additionally,

136

students who were proficient in reading in fifth grade were significantly more likely to be accepted by and enroll in a selective high school in ninth grade. These findings are not surprising, but they do emphasize how important student experiences and outcomes prior to beginning the middle grades may be. Descriptive analyses of the data revealed significantly higher reading and mathematics proficiency levels for students enrolled in K-8 schools. The inclusion of the fifth grade data reveals that, for some students, these performance advantages were evident before the middle grades. If these prior performance data were excluded from analyses, school configuration may have remained a significant predictor of eighth-grade outcomes for all of the analytic models.

It is also possible that the impact of K-8 schools may become evident even prior to entering the middle grades. If K-8 schools do, indeed, establish a different context for learning, the lower fifth-grade reading and mathematics proficiency rates and lower fifth-grade over-age rates for eighth-grade K-8 students may be evidence that K-8 schools may have positively affect student learning patterns during the elementary grades. Future research may want to control for whether a student was enrolled in the same school in both fifth and eighth grades to further tease the potential impact of K-8 schools.

The impact of over-age status also provides additional evidence for the effect of prior performance on student outcomes. Students who were over-age for grade were significantly less likely to achieve any of the study outcomes. The reason for a student's over-age status was not available; however, if the status was due to poor performance in prior grades, then the effects of these early academic troubles extended until at least the first year of high school. Although the significance of the relationship between gender and student outcomes was not consistent across all models, the evidence suggests that

137

males in these two cohorts of students perform at a lower level than females. Additional research may also attempt to disentangle the role of gender and school practices on student performance. Future research may explore whether male K-8 students are less likely to become over-age than male students enrolled in other school grade configurations.

The number of years a student was enrolled in a school also had a significant relationship with all three student outcomes. The literature on school transitions noted that some students suffer declines in student performance after transferring to middle schools (Alspaugh, 1998; Barber & Olson, 2004; Gutman & Midgely, 2000; Simmons & Blyth, 1987; Roderick, 1993). This study did not specifically analyze changes in school performance before and after students entered middle school. However, the finding that longer tenure in a school is positively related to student outcomes provides indirect evidence that changing schools may lower student performance levels.

School-level

A few of the school-level variables were significantly related to student outcomes. Controlling for all other variables, cohort 2 students were significantly more likely than cohort 1 student to achieve each of the study outcomes. This finding may be evidence of general district-level improvements in student performance on state assessments. Review of data provided by MSDE highlights steady improvements in student MSA achievement over the past several school years. Byrnes and Ruby (2007) also identified a cohort effect in their three-level multilevel model. These cohort effects may reflect overall student performance trends within school districts overall and should be included in longitudinal modeling.

The teacher engagement variable was significantly related to the likelihood of reading and mathematics proficiency. As discussed in the next section, findings related to school climate should be interpreted cautiously; nonetheless, the consistent positive relationship with proficiency warrants further consideration. My review of school climate literature found that elements of the school environment can facilitate or impede positive student outcomes (Hoy & Hanum, 1997; Roeser et al., 1998; Brand et al, 2008). Brand et al. (2008) examined the relationship between student and teacher ratings of the school climate and noted that although the variables were related, they were qualitatively distinct. This study also found evidence of this pattern. Somewhat surprisingly, the student climate measure was not significantly predictive of student outcomes in the fully conditional models. The direction of the coefficient was, however, in the expected positive direction. The current analysis does not provide information on why or how teacher engagement works to support student learning. It may be that teachers who are more closely tied to their schools and students teach differently. Another possibility is that these relationships may encourage more effort and ultimately achievement from students. Additional research may help to unpack how teacher engagement facilitates or impedes student achievement at all grade levels and across school configurations

Another significant finding of this work was the consistently negative relationship between the percentage of over-age students in a school and the likelihood of achieving each of the study outcomes. Not only were over-age students less likely to achieve the selected outcomes, students who attended schools that enrolled more over-age students were less likely to achieve the study outcomes. Over-age status appears to affect student achievement at both the individual and school levels. Schools and school districts might

want to consider ways to support both over-age students and the schools that enroll large numbers of over-age students. The relative size of the over-age population potentially may have a negative effect on several aspects of the school environment. Staff may struggle to address the sometimes deeply-rooted learning difficulties that students have. This struggle may subsequently affect teacher engagement in the school and, indirectly, student learning. Moreover, students who have experienced prior academic difficulties may be less engaged in school, and large numbers of these students may negatively affect the academic engagement of both over-age and non-over-age students.

Study Limitations

This study provided descriptive and inferential data about the potential role that school configuration may have played in affecting the outcomes for two cohorts of Baltimore students. It is not appropriate in generalize findings to Baltimore in general or to K-8 and 6-8 schools overall. Although this study may have provided evidence about the relationship between school configuration and other student-level and school-level characteristics and student outcomes, the lack of more comprehensive data for both students and schools may also limit the generalizability of the findings. Sources of missing data at the student-level include cohort attrition and the lack of substantive information about student lives outside of school. At the school-level, the representativeness of school climate as measured by student and teacher response rates varied significantly and was particularly low in some schools. The evaluation also failed to capture any information about how K-8 and 6-8 organize and implement day-to-day school operations. Finally, I made certain methodological decisions when developing the analytical models that may have resulted in a narrower range of findings.

Student-level Data Limitations

One of the most significant limitations to study findings is related to missing data. First, as noted in chapter 4, the final eighth-grade study population was approximately 40% smaller than the initial fifth-grade population. There were several reasons for attrition including withdrawal from the school district, enrollment in another school grade configuration, and irregular grade progression. Across all sources of attrition, students who were not included in the final study population were more likely to be male, over-age, and were less likely to be proficient in reading and/or mathematics in fifth grade. If these students were included in the data models, it is possible that study outcomes may have differed from what I report here. Although there is little that researchers can do to limit attrition patterns like this when analyzing secondary data, we must be aware of the ways in which attrition can potentially skew study findings.

This study also focused on a limited number of student-level explanatory variables when examining middle grade outcomes. For example, a large body of research has emphasized the importance of family background and support on student academic progress and success (Barro & Kolstad, 1987; Rumberger, 1995; Temple et al., 2000; Wimberly, 2000). Variables that were excluded from these analyses may have played critical roles in shaping the selected outcomes. However, because this research study relied on analyses of existing administrative data maintained by the BCPSS, no such additional explanatory data were available for inclusion in analyses. The BCPSS does not systematically collect or maintain data on family organization, parental education, or family income. Although inclusion of such data would likely provide critical contextual information that may have helped to explain or identify missing sources of variation in

the current models, this study still had the potential to identify the relationship between factors which schools can manipulate and student outcomes.

School-level Data Limitations

Climate survey response rates may have significantly limited the reliability of the summary student measure and the teacher engagements measures which were used in models 5 and 6. As noted in chapter 4, climate survey response rates varied widely across schools. Basing a school-level measure on the responses of a few participants may have resulted in the development of measures which do not accurately reflect the viewpoints of the larger school body. I also excluded a few schools due to the lack of climate data; the inclusion of these schools may have affected the study's overall outcomes.

At the school-level, perhaps the most significant limitation is that I did not include information on specific school instructional strategies, organizational practices, or reform efforts in the current analyses. Although the Baltimore school district has implemented general reform efforts including professional development for teachers, additional social workers for schools, and curricula that are better aligned with state goals and learning standards (Baltimore Sun, 2007), I did not have access to systematically collected data across schools and did not include any of these measures in the analyses. These data might have provided additional explanations for student outcomes and might have yielded better insight into why student academic performance outcomes differ across schools. Analyses that include such information would require more in-depth school-level data collection using research methods such as case studies.

Analytic Limitations

In addition to limitations related to data availability, this study also has some analytic limitations. As noted in chapter 4, when analyzing data using multilevel modeling, researchers must make decisions about such issues as centering and whether factors should be fixed or allowed to vary. I opted to grand-mean center most level-one variables. This decision may have resulted in an underestimation of the variation across schools. Additionally, I only allowed the intercepts to vary and assumed that the effect of the independent variables were the same across groups (fixed slopes). Allowing a random component for slopes may have revealed variation in the relationship between independent and dependent variables across groups.

Implications

The results of this study may have multiple implications for how schools and school districts organize and reorganize schools to improve student achievement and meet the demands of local, state, and federal accountability systems. First, evidence that changing school configurations will lead to improved student outcomes is inconsistent and, in many cases, weak. The findings of this study identify no direct relationship between school configuration and student outcomes once additional student-level and school-level variables are included in the models. Other school-level and student-level factors were consistently related to student outcomes. However, study findings suggest that school configuration potentially facilitates the development of other characteristics or practices which may positively affect student academic performance.

At the student-level, this study highlights the importance of identifying and addressing student learning difficulties as early as possible. Data analyses reveal that

fifth-grade performance had a significant impact on eighth-grade performance. Schools may be able to improve middle grade performance by making improvements during the elementary grades and sustaining this performance during the middle grades. Schools that serve middle -grade students may also want to pay close attention to the academic difficulties that students carry over from elementary school and devise plans to address these learning gaps as quickly and thoroughly as possible. Students who are over-age or who have poor academic histories should be prime targets for academic interventions and supports.

The study also has possible implications for school-level organization and characteristics. The potential contextual effects that the proportion of over-age students in a school may have on student achievement may warrant attention from school and district leaders. Leaders may want to consider the desirability of assigning large numbers of over-age students to the same schools and developing and testing strategies to support schools that enroll a disproportionate number of over-age students.

Finally, although teacher engagement may be somewhat of an amorphous idea, data from this study suggest that it may be an important factor in facilitating higher levels of student achievement. Schools and school districts may want to actively explore ways to strengthen teachers' ties to their students and schools. Leaders may want to focus on the ways that teachers are hired, trained, and supported throughout their careers.

Recommendations for Further Research

Although this study provides some limited evidence that school configuration does not have a significant relationship with student outcomes, additional research is necessary. To date, most research on the impact of school configuration on student

outcomes has been limited to single school districts or states. I identified no nationally representative studies that explored the relationship between school configuration and student academic outcomes.[18] Such expanded analyses might produce data that are more generalizable and more relevant to school districts nationwide. Additionally, future research may want to include comparisons of the outcomes of middle-grade students enrolled in other types of schools. For example, Baltimore has increased the number of 6-12 schools. Future research may want to include these schools in comparisons with K-8 and 6-8 schools to determine the extent to which grade configuration may be related to student outcomes. The inclusion of an additional grade configuration may provide additional evidence about whether grade configuration appears to affect the learning environment.

As noted earlier, a limitation of this study is that it does not include any data on the actual teaching and learning practices in schools. The climate survey measures provide a narrow view on some basic school characteristics. However, the use of in-depth teacher and student surveys, interviews, or observations that describe instructional strategies and organizational practices might provide for better understanding of the ways that schools in the different grade configurations operate. Data collection topics could include the ways in which schools prepare for and support students who are at the highest risk of poor outcomes during the middle grades.

Research efforts that include analyses of high school data of students who were enrolled in K-8 and 6-8 schools may also prove helpful. Abella (2005) found that some of

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[18] Bedard and Do (2005) do examine differences in high school dropout rates for 6-8 and 7-9 schools. Using data extracted from the *Common Core of Data*, they found that school districts that had adopted the middle school model had higher high school dropout rates than school districts that maintained the 7-9 (junior high) model.

the benefits that students from K-8 schools enjoyed were no longer apparent in ninth grade. Future analyses may study the outcomes and experiences of students as they progress further down the education pipeline.

Conclusion

The results of this study indicate that school characteristics may play a role in facilitating student academic outcomes. Grade configuration may be a school feature which may affect other school characteristics or practices and may have an indirect effect on student outcomes. Study findings suggest that school configuration may facilitate or impede the development of other school characteristics or conditions which may, in turn, shape student outcomes. Although some prior research has identified a benefit for K-8 schools, and analyses of descriptive data from Baltimore do identify clear performance advantages for students enrolled in K-8 schools, these performance advantages may be rooted in student elementary school performance and other characteristics of middle-grade schools. Rather than continue to open, close, or expand schools to continue the cycle of school grade configuration changes for middle-grade students, school and district leaders may want to focus their efforts and resources in other areas. School leaders may better serve their student populations by focusing on providing supports to students that will help students improve their performance throughout their educational careers. School and district leaders may want to increase focus on providing supports to schools that enroll at-risk students. Schools that serve large numbers of at-risk students will likely need more or different supports than schools that serve a more advantaged population.

School and district leaders may also want to explore ways to develop and maintain

teacher engagement with their students and schools.

Appendices

Table A1
Districtwide K-8 and 6-8 School Characteristics
2000 – 01

	K-8	6-8
Number Schools	21	24
Middle Grades Enrollment		
Total	4,855	16,775
% of all Enrollment	21.5	74.2
Mean	231.2	699.0
Median	191	677.5
Minimum	26	97
Maximum	988	1273
Standard Deviation	211.1	283.4
Eligibility for Free or Reduced-Price Meals		
Mean	62.4	71.0
Median	66.8	73.3
Minimum	23.5	37.8
Maximum	88.1	80.3
Standard Deviation	18.1	8.6
African American Student Enrollment		
Mean	74.8	89.5
Median	91.4	97.4
Minimum	6.1	48.6
Maximum	99.7	100.0
Standard Deviation	31.2	16.0
White Student Enrollment		
Mean	23.8	9.0
Median	8.6	1.8
Minimum	0.0	.0
Maximum	90.7	42.2
Standard Deviation	30.5	13.9

Table A2
Districtwide K-8 and 6-8 School Characteristics
2001 – 02

	K-8	Middle
Number Schools	21	24
Middle Grades Enrollment		
Total	4721	15908
% of all Enrollment	21.6	72.7
Mean	225.0	662.8
Median	198.0	639.0
Minimum	32.0	94.0
Maximum	895.0	1192.0
Standard Deviation	194.2	263.1
Eligibility for Free or Reduced-Price Meals		
Mean	63.4	75.6
Median	64.6	76.4
Minimum	29.8	55.1
Maximum	87.9	87.0
Standard Deviation	18.7	6.8
African American Student Enrollment		
Mean	74.4	89.4
Median	86.4	97.6
Minimum	7.0	44.5
Maximum	100.0	99.8
Standard Deviation	29.8	16.1
White Student Enrollment		
Mean	23.8	75.6
Median	13.6	76.4
Minimum	0.0	55.1
Maximum	89.1	87.0
Standard Deviation	28.8	6.8

Table A3
Districtwide K-8 and 6-8 School Characteristics
2002 – 03

	K-8	Middle
Number Schools	26	26
Middle Grades Enrollment		
Total	5392	16506
% of all Enrollment	24.1	73.7
Mean	207.4	634.8
Median	177.5	666.5
Minimum	27.0	48.0
Maximum	938.0	1150.0
Standard Deviation	188.4	320.3
Eligibility for Free or Reduced-Price Meals		
Mean	67.8	72.6
Median	71.2	72.7
Minimum	33.9	57.2
Maximum	92.9	92.9
Standard Deviation	18.4	7.0
African American Student Enrollment		
Mean	80.0	88.7
Median	94.4	97.5
Minimum	8.3	47.2
Maximum	100.0	100.0
Standard Deviation	27.3	17.0
White Student Enrollment		
Mean	18.2	9.0
Median	2.8	1.9
Minimum	0.0	0.0
Maximum	86.0	49.6
Standard Deviation	25.9	14.3

	K-8	**Middle**
Number Schools	28	25
Middle Grades Enrollment		
Total	5,614	15,547
% of all Enrollment	25.2	69.9
Mean	200.5	621.9
Median	169	660
Minimum	26.0	23.0
Maximum	890.0	1196.0
Standard Deviation	172.6	334.6
Eligibility for Free or Reduced-Price Meals		
Mean	69.8	76.8
Median	74.6	77.5
Minimum	36.3	64.6
Maximum	90.2	89.5
Standard Deviation	16.9	7.4
African American Student Enrollment		
Mean	81.2	89.4
Median	95.4	97.7
Minimum	8.4	47.0
Maximum	100.0	100.0
Standard Deviation	30.0	16.2
White Student Enrollment		
Mean	16.6	8.1
Median	2.6	1.6
Minimum	0.0	0.0
Maximum	83.9	44.6
Standard Deviation	24.1	12.9

	K-8	Middle
Number Schools	32	25
Middle Grades Enrollment		
Total	6,209	15,485
% of all Enrollment	28.2	70.4
Mean	194.0	619.4
Median	156.5	651.0
Minimum	31	87
Maximum	900	1133
Standard Deviation	164.5	308.9
Eligibility for Free or Reduced-Price Meals		
Mean	77.4	82.6
Median	82.0	82.4
Minimum	36.5	70.5
Maximum	94.8	91.7
Standard Deviation	16.5	4.9
African American Student Enrollment		
Mean	84.6	89.4
Median	98.2	98.4
Minimum	7.9	47.0
Maximum	100.0	99.9
Standard Deviation	23.9	16.6
White Student Enrollment		
Mean	13.4	8.0
Median	1.3	1.2
Minimum	0.0	0.0
Maximum	85.1	44.5
Standard Deviation	22.4	13.4

	K-8	**Middle**
Number Schools	33	24
Middle Grades Enrollment		
Total	6,453	13,888
% of all Enrollment	31.2	67.1
Mean	195.6	579.7
Median	154.0	548.5
Minimum	31.0	64
Maximum	816.0	1245
Standard Deviation	150.0	282.1
Eligibility for Free or Reduced-Price Meals		
Mean	76.2	81.7
Median	80.7	81.4
Minimum	33.9	65.0
Maximum	95.2	91.0
Standard Deviation	16.7	6.0
African American Student Enrollment		
Mean	84.5	91.1
Median	97.2	98.0
Minimum	9.2	46.4
Maximum	100.0	100.0
Standard Deviation	23.6	14.3
White Student Enrollment		
Mean	13.9	6.1
Median	1.4	1.3
Minimum	0.0	0.0
Maximum	79.3	36.8
Standard Deviation	20.0	10.7

Table A7
Districtwide K-8 and 6-8 School Characteristics
2006 – 07

	K-8	Middle
Number Schools	35	26
Middle Grades Enrollment		
Total	6,599	11,412
% of all Enrollment	34.8	60.2
Mean	188.5	438.9
Median	154.0	462.0
Minimum	26.0	77.0
Maximum	722	930.0
Standard Deviation	140.2	245.5
Eligibility for Free or Reduced-Price Meals		
Mean	67.5	80.0
Median	71.2	82.4
Minimum	30.0	49.5
Maximum	83.5	90.8
Standard Deviation	13.5	9.2
African American Student Enrollment		
Mean	84.5	91.1
Median	97.2	98.0
Minimum	9.2	46.4
Maximum	100.0	100.0
Standard Deviation	23.6	14.3
White Student Enrollment		
Mean	12.1	6.1
Median	1.6	1.3
Minimum	0.0	0.0
Maximum	79.3	36.8
Standard Deviation	20.0	10.7

Table A8
Districtwide K-8 and 6-8 School Characteristics
2007 – 08

	K-8	Middle
Number Schools	53	23
Middle Grades Enrollment		
Total	8,549	8,020
% of all Enrollment	48.4	45.4
Mean	161.3	348.7
Median	132.0	306.00
Minimum	28	49
Maximum	682	678
Standard Deviation	130.0	218.8
Eligibility for Free or Reduced-Price Meals		
Mean	71.7	71.7
Median	75.7	73.9
Minimum	24.3	33.4
Maximum	93.5	81.1
Standard Deviation	14.4	7.8
African American Student Enrollment		
Mean	82.5	89.9
Median	97.4	97.9
Minimum	9.9	39.6
Maximum	100.0	99.6
Standard Deviation	24.9	15.9
White Student Enrollment		
Mean	12.2	7.2
Median	1.7	1.4
Minimum	0.0	0.1
Maximum	82.3	39.2
Standard Deviation	20.3	11.8

Table A9
Districtwide K-8 and 6-8 School Characteristics
2008 – 09

	K-8	Middle
Number Schools	66	24
Middle Grades Enrollment		
Total	9,894	6,059
% of all Enrollment	58.7	36.0
Mean	150.0	252.5
Median	122.5	215.5
Minimum	31.0	50.0
Maximum	675.0	561.0
Standard Deviation	111.3	178.8
Eligibility for Free or Reduced-Price Meals		
Mean	76.6	77.6
Median	79.4	77.8
Minimum	68.3	63.1
Maximum	95.7	86.9
Standard Deviation	13.4	5.4
African American Student Enrollment		
Mean	81.1	92.9
Median	96.7	97.9
Minimum	9.4	35.6
Maximum	100.0	99.7
Standard Deviation	25.8	13.5
White Student Enrollment		
Mean	12.3	4.5
Median	1.6	1.6
Minimum	0.0	0.0
Maximum	84.8	37.3
Standard Deviation	19.5	8.1

BCPSS SCHOOL CLIMATE SURVEY – STUDENTS (GRADES 6-12)

About This Survey

The purpose of this survey is to learn more about what students think and feel about their school. Your answers will be used to help us improve the Baltimore schools. All the information you share with us will be private and confidential. We will not tell your teachers, parents, friends, or anyone else about the things you report in the survey. This is not a test, so there are no "right" or "wrong" answers. Information from these surveys will be used in reports about conditions in Baltimore's schools.

Instructions

Please read each statement and clearly mark one response. Please use a pencil.

Indicate your school code.

| ① ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ |
| ① ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ |
| ① ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ |

- Please use a #2 pencil ONLY.
- Fill in ovals completely.
  For example:

  Incorrect ⊘ ⊗ ⊖ ⊙
  Correct ●

To what extent is each of the following a problem at your school?
Mark one response in each row.

	Not a Problem	Minor Problem	Moderate Problem	Serious Problem
1. Outsiders can get into the school	①	②	③	④
2. Fighting among students	①	②	③	④
3. Vandalism of school property	①	②	③	④
4. Physical or verbal abuse of teachers	①	②	③	④
5. Student possession of weapons like knives and guns	①	②	③	④
6. Students pick on other students at school	①	②	③	④
7. Student drug/alcohol abuse	①	②	③	④
8. Fires are set at the school	①	②	③	④

How much do you agree or disagree with the following statements about your school? *Mark one response in each row.*

	Strongly Disagree	Disagree	Agree	Strongly Agree
9. I feel safe at this school	①	②	③	④
10. I feel safe going to and from school	①	②	③	④
11. Disruptions by other students get in the way of my learning	①	②	③	④
12. Teachers can handle students who disrupt class	①	②	③	④
13. My school has clear rules about student behavior	①	②	③	④
14. Misbehaving students get away with it	①	②	③	④
15. Students are rewarded for positive behavior	①	②	③	④
16. Most of the teachers at school know me by name	①	②	③	④
17. Most of the students at school know me by name	①	②	③	④
18. Students get along well with each other	①	②	③	④
19. Students get along well with teachers	①	②	③	④
20. Teachers care about their students	①	②	③	④
21. I know how my teachers expect me to perform in class	①	②	③	④
22. Teachers encourage me to work hard in my classes	①	②	③	④
23. Teachers believe all students can do well in school if they try	①	②	③	④
24. Teachers are well organized and prepared	①	②	③	④

How much do you agree or disagree with the following statements about your school? *Mark one response in each row.*

	Strongly Disagree	Disagree	Agree	Strongly Agree
25. It is important to come to school every day	①	②	③	④
26. It is important to come to class prepared	①	②	③	⑤
27. It is important to try hard in school	①	②	③	④
28. It is important to finish high school	①	②	③	④
29. The school building is clean	①	②	③	④
30. The temperature in my school is comfortable all year round	①	②	③	④
31. The bathrooms in my school are clean	①	②	③	④
32. The are a lot of broken windows, doors, or desks at my school	①	②	③	④
33. Students have enough school supplies	①	②	③	④
34. There is someone at school who can give me extra academic help when I need it	①	②	③	④
35. There is someone at school who I can talk to about personal problems	①	②	③	④
36. My school has programs to deal with violence and conflicts between students	①	②	③	⑤
37. My parent or guardian feels welcome at school	①	②	③	④
38. My teacher talks to my parent or guardian	①	②	③	④
39. When I do something good at school, my parent or guardian hears about it	①	②	③	④
40. When I do something bad at school, my parent or guardian hears about it	①	②	③	④
41. The school tries to involve parents	①	②	③	④
42. I learn a lot at my school	①	②	③	④
43. I like my school	①	②	③	④
44. I like my teachers	①	②	③	④
45. I would rather keep going to this school than transfer to another school	①	②	③	④
46. My classes are interesting	①	②	③	④

47. **What grade are you in this year?** *Mark one response.*

6   7   8   9   10   11   12
○   ○   ○   ○   ○   ○   ○

48. **What is your sex?** *Mark one response.*

① Male   ② Female

BCPS SCHOOL CLIMATE SURVEY
STAFF

6206773

About This Survey

Baltimore City Public Schools is conducting a survey to learn more about school conditions. Information from this survey will be reported in statistical summaries and used to help improve the quality of Baltimore's schools. This study is focused on overall school conditions, not individual staff members. That is why there will be no individual staff identifiers attached to the surveys and there is no way to link these surveys to individual staff or students. Therefore, your responses will be kept confidential and your identity will never be revealed to the school, the district, or members of the public.

Instructions

Please read each statement and clearly mark one response.
Please use a pencil.

• Please use a #2 pencil ONLY.
• Fill in ovals completely.

For example: Incorrect ⊘ ⊗ ⊖ ⊙
                    Correct ⬤

Indicate your school number.

11895 / 11694

How much do you agree or disagree with the following statements about your school? *Mark one response in each row.*

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. This school does a good job educating students	①	②	③	④
2. I enjoy working at this school	①	②	③	④
3. Staff members are recognized for good work	①	②	③	④
4. There is a great deal of cooperative effort among staff members	①	②	③	④
5. I would choose to continue to work at this school even if given the option of transferring	①	②	③	④
6. The classes I teach are interesting to me	①	②	③	④
7. Opportunities for learning in and through the arts are part of our school environment	①	②	③	④
8. Creative thinking is shared among staff and students	①	②	③	④
9. The school is enlivened through artistic and cultural enrichment	①	②	③	④
10. I feel safe at this school	①	②	③	④
11. Students feel safe at this school	①	②	③	④
12. Students feel safe going to and from school	①	②	③	④
13. This school has clearly defined rules and expectations for students' behavior	①	②	③	④
14. Student drug/alcohol abuse is not a problem at this school	①	②	③	④
15. Student possession of weapons like knives and guns is not a problem at this school	①	②	③	④
16. Students setting fires is not a problem at this school	①	②	③	④
17. Student vandalism of school property is not a problem at this school	①	②	③	④
18. Outsiders getting into this school is not a problem	①	②	③	④
19. Students are rewarded for positive behavior	①	②	③	④
20. Students get along well with each other	①	②	③	④
21. Fighting among students is not a problem at this school	①	②	③	④
22. Students picking on other students is not a problem at this school	①	②	③	④
23. Gangs are not a problem at this school	①	②	③	④
24. Students get along well with teachers	①	②	③	④
25. Physical or verbal abuse of teachers is not a problem at this school	①	②	③	④
26. Easy access to drinkable water is not a problem at this school	①	②	③	④
27. Disruptions in the classroom get in the way of student learning	①	②	③	④
28. The school rules are strictly enforced	①	②	③	④
29. The school provides an orderly atmosphere for learning	①	②	③	④
30. Misbehaving students get away with it	①	②	③	④
31. I know most of the students at this school by name	①	②	③	④

How much do you agree or disagree with the following statements about your school? *Mark one response in each row.*

	Strongly Disagree	Disagree	Agree	Strongly Agree
32. Students talk to the teachers when they need help	①	②	③	④
33. Teachers care about their students	①	②	③	④
34. The school sets high standards for academic performance	①	②	③	④
35. Teachers make expectations for meeting instructional goals clear to students	①	②	③	④
36. Teachers provide extra academic help to students who need it	①	②	③	④
37. Teachers encourage students to take challenging classes	①	②	③	④
38. Teachers believe all students can do well in school if they try	①	②	③	④
39. Teachers are well organized and prepared	①	②	③	④
40. Teachers feel responsible for their students' academic success	①	②	③	④
41. Teachers feel responsible for their students' social and emotional development	①	②	③	④
42. It is important for students to attend school every day	①	②	③	④
43. Teachers at this school set high standards for their teaching	①	②	③	④
44. It is important for students to finish high school	①	②	③	④
45. The school building is clean and well maintained	①	②	③	④
46. The temperature in this school is comfortable all year round	①	②	③	④
47. There are a lot of broken windows, doors, or desks at this school	①	②	③	④
48. The school has an effective Student Support Team	①	②	③	④
49. Collaborative planning time is a useful tool in improving instructional practices	①	②	③	④
50. The school offers sufficient in service training for staff regarding instructional practices	①	②	③	④
51. The school offers sufficient in service training for staff regarding classroom behavior management practices	①	②	③	④
52. Students have enough school supplies	①	②	③	④
53. My ability to do my job is limited by inadequate supplies or materials	①	②	③	④
54. The school has clear procedures for getting help for students with suspected learning problems	①	②	③	④
55. The school has clear procedures for getting help for students with suspected emotional problems	①	②	③	④
56. The school has programs to support students' emotional and social development	①	②	③	④
57. This school has programs that address conflict and violence among students	①	②	③	④
58. The school administration promptly responds to my concerns	①	②	③	④
59. The school administration coordinates and supports school programs that enable the school to operate efficiently and smoothly	①	②	③	④
60. School administration supports the staff in performing their duties	①	②	③	④
61. Staff members know what is expected of them	①	②	③	④
62. The school administration knows what kind of school it wants and has communicated it to staff	①	②	③	④
63. The school administration works collaboratively with staff to solve problems	①	②	③	④
64. Parents or guardians are welcome at this school	①	②	③	④
65. I have enough opportunity to talk with parents or guardians about students' progress or problems	①	②	③	④
66. When a student does something good at school, the parents are informed	①	②	③	④
67. When a student does something bad at school, the parents are informed	①	②	③	④
68. The school has effective ways of involving parents in the management of student behavior	①	②	③	④
69. The school tries to involve parents	①	②	③	④
70. Staff have enough opportunity to provide input into the school's programmatic decisions	①	②	③	④
71. Staff have enough opportunity to provide input into the school's budgetary decisions	①	②	③	④
72. My students have the opportunity to visit the library and take home books	①	②	③	④

73. What is your primary position at the school? *Mark one response.*

① General Educator   ② Other (Special Educator, Support Staff, Administrator, etc.)

74. What grade(s) do you teach this year? *Mark all that apply.*

Not Applicable	Pre-K	K	1	2	3	4	5	6	7	8	9	10	11	12
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

160

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