I HAVE A DREAM: RURAL ADOLESCENTS' EDUCATIONAL PLANS AND MATHEMATICS ACHIEVEMENT

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ABSTRACT

VICTORIA A. SCHAEFER: I Have a Dream:
Rural Adolescents' Educational Plans and Mathematics Achievement
(Under the direction of Judith L. Meece)

This study used a social cognitive theoretical framework to examine the relations of selected 10^{th} grade school contextual influences, parent socioeconomic status, and personal beliefs to rural adolescents' 12^{th} grade educational plans and mathematics achievement. Participants were 2,095 rural high school students from the 2002 Educational Longitudinal Study. This study found that rural youth who had more positive views of the relational context of their school, were enrolled in college-preparatory high school programs, and were of higher socioeconomic status had higher mathematics self-efficacy beliefs, higher educational expectations for their future, and higher mathematics achievement. Consistent with social cognitive theory, the study found that mathematics self-efficacy beliefs partially mediated the relation of high school program enrollment and socioeconomic status to educational expectations and mathematics achievement. Mathematics self-efficacy beliefs also partially mediated the relation of the relational context of schools to educational expectations, and fully mediated the association between the relational context of the school and mathematics achievement. In addition, students who expressed more interest in moving away from the area and less importance on living near family had higher educational expectations. Mathematics teacher beliefs about student success and the academic press within schools did not have a significant effect on mathematics self-efficacy beliefs, educational expectations, or mathematics achievement. The findings provide support for the

importance of socioeconomic status and certain school contextual influences for rural youth's academic and career trajectories.

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CHAPTER I

INTRODUCTION

In this time of widespread national accountability and state standards, research indicates that rural youth lag behind their nonrural peers in standardized achievement, high school completion, and college attendance (Brookings Institution, 2003; Provasnik et al., 2007). Rural youth make up a sizable percentage of America's school-age population; some estimates range as high as almost one-third of all the nation's 50 million students (National Research Center for Rural Education Support, 2006; Provasnik et al., 2007; U.S. Department of Education, 2006a). In trying to explain academic differences between rural and nonrural youth, most studies of rural youth have focused on family influences. Few studies have focused on the role of schooling experiences in the academic attainment and achievement of these youth.

This study examines the educational plans and achievement of rural youth in the Educational Longitudinal Study: 2002 (ELS: 2002). The total sample included 752 schools, including 130 schools located in rural communities. The study began when students entered the 10th grade, and a follow-up study was conducted in 2004 when a majority of the students were seniors in high school. Though there is no standard definition of rural, the rural sample that made up the ELS: 2002 study attended high schools located "in a rural area, either inside or outside a metropolitan statistical area" (U.S. Department of Education, 2004a, p. 40). The schools differed in configurations, sizes, and socioeconomic status.

The study is guided by two developmental frameworks. Bandura's social cognitive theory is used to test the influence of schooling experiences and socioeconomic status on the educational plans and achievement of rural youth. In this theory, self-beliefs of competency, or self-efficacy beliefs, play a central role in predicting educational outcomes (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001). The study also draws on research by Eccles and Roeser (2003) to identify key aspects of the school environment that can influence students' competency-related beliefs and educational outcomes. Recent research on school effects has documented the influence of students' school-related experiences on academic achievement, occupational choice, and adult life (e.g., Eccles, 2004; Eccles & Roeser, 2003; Smith-Maddox & Wheelock, 1995).

Equally important, the present study focuses on the educational outcomes of rural youth as they transition to work, postsecondary education, and early adulthood. During adolescence, cognitive growth enables, for the first time, serious thinking about potential plans for high school completion, college attendance, and occupation (Eccles, 2004; Nurmi, 1991, 2004); thus, influences on youth during this time may hold particular importance, as decisions made during the high school years may set lifelong trajectories. By understanding more about influences on rural youth's educational plans and their achievement, researchers, practitioners, parents, and policymakers will be better positioned to improve the educational attainment of rural youth.

This introductory chapter provides important information about the precarious nature of rural youth's educational outcomes and the situation of rural schools and communities amidst heightened national interest in student achievement. It provides a brief explanation as to the importance of studying youth's plans for the future and their achievement during adolescence. The theoretical foundation and guiding frameworks for this study are also introduced. This chapter closes with a brief overview of the study's purpose and the constructs examined.

National Trends
Regarding Educational Achievement and Attainment

It is important to situate this study within some significant, but troubling, national trends that raise questions about the role school experiences may play in shaping educational attainment-related outcomes. National leaders' concerns over less than desired student achievement in preparation for the workforce led to unparalleled federal education reform manifested in *No Child Left Behind* of 2001. American students are routinely outperformed by students from other industrialized nations on standardized tests, especially in areas of science and math (National Governors Association & Achieve, Inc, 2005; U.S. Department of Education, 2005b). Further, the U.S. four-year high school graduation rate is among the lowest of the industrialized nations, ranking 16th of 20 countries (National Governors Association & Achieve, Inc., 2005).

National reports also indicate that there is considerable variability in educational attainment and achievement depending on ethnicity, race, socioeconomic status, and geographic location. Of interest to the present study are trends for rural youth who make up approximately 20-30% of the nation's 50 million students (National Research Center for Rural Education Support, 2006; Provasnik et al., 2007; U.S. Department of Education, 2006a). According to recent national reports based on U.S. Department of Education data, rural high school students do not perform as well on the National Assessment of Educational Progress (NAEP) tests as their suburban peers; rural college-going rates are lower than the national average (Brookings Institution, 2003; Provasnik et al., 2007); and rural dropout rates are higher than suburban dropout rates (11% vs. 9%, respectively) (Provasnik et al., 2007).

Rural youth face challenges that affect their educational achievement and attainment. One challenge is the effects of rural poverty. Approximately 20% of youth in nonmetropolitan areas live in poverty; this rate is higher than the poverty rate for metropolitan youth (15%), as well as higher than the national average poverty rate of nearly 13% (O'Hare & Johnson, 2004; U.S. Census Bureau, 2006; U.S. Department of Agriculture, 2004). When comparing urban, rural, and suburban children and youth living in low-income families,[1] the rates for urban and rural children and youth are similar, at 48% and 47% respectively, and are above the suburban rate of 31% (National Center for Children in Poverty, 2008). Poverty rates are particularly high in the South and Southwest, where 80% of the nation's 340 rural persistently poor counties are located (Rural Poverty Research Center, n.d.).[2] Also, a larger percentage of students in the South and Midwest attend rural schools (28% and 25%, respectively), when compared to students in the West and Northeast (13% and 16%, respectively) (Provasnik et al., 2007, p. iii). Poverty and low-income status are well established as being associated with lower academic achievement in test scores, grade retention, and course failures (Corcoran, 1995; Haveman & Wolfe, 1995; McLoyd, 1998; Sirin, 2005). Additionally, minority youth in rural areas are more likely to attend public schools with higher concentrations of poor students. Specifically, more Black and Native American students in rural areas than White or Asian students in rural areas attend public

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[1] Families are defined as low-income if they have incomes below twice the federal poverty limit, yet above the poverty limit (National Center for Children in Poverty, 2008).The federal poverty limit for a family of 4 in 2007 was $20,650.

[2] Persistently poor counties are defined by the U.S. government as those with poverty rates of 20% or higher since 1970 (Rural Poverty Research Center, n.d.). Of the 386 persistently poor counties, 340 are rural.

schools that are moderate-to-high poverty. Moreover, in remote rural areas, more Black and Native American youth attend moderate-to-high poverty schools (87% and 79% respectively) than do youth from the same racial and ethnic groups in America's large cities (Provasnik et al., 2007). Also, higher percentages of rural high school dropouts are from poor or near-poor families than their counterparts in towns, suburban areas, or cities (Provasnik et al., 2007).[3]

Other challenges for rural youth may involve the quality of their educational experiences. Rural youth may not have the same access to highly qualified teachers as more urban youth. Federal reports suggest that rural and rural remote schools are among the hardest to staff, especially in the area of mathematics (Peske & Haycock, 2006; Provasnik et al., 2007; U.S. Department of Education, 2005a). The distance from urban areas, potential social isolation, and lower salaries pose barriers for rural schools' efforts at attracting and retaining highly qualified teachers (Gandara, Gutierrez, & O'Hara, 2001; Monk, 2007). Due to lack of resources, including highly qualified teachers, rural schools have difficulty providing programs to assist struggling learners, English language learners, or students with other special learning needs. Rural youth are also less likely to attend schools that offer Advanced Placement (AP) courses and International Baccalaureate (IB) programs (Provasnik et al., 2007)[4].

In addition, rural communities are undergoing significant economic and social changes. Global economic shifts and technological advances have led to job losses in industries such as agriculture, manufacturing, and textiles that had been mainstays of rural

[3] Reports indicate that while the percentage of dropouts (between the ages of 16-24) who lived at or below 185 % of the poverty threshold in rural areas was 40.3, it was 32% for towns, 33.3% for suburban areas, and 34.7% for cities (Provasnik et al., 2007).

[4] Only 69% of rural high school students attended schools offering AP courses compared to 96% of suburban youth, 93 % of youth in cities, and 83% of youth in towns. Only 1% of rural high school students attended schools that offered IB programs, compared to 7% in suburban schools and 8% in city schools (Provasnik et al., 2007).

economies (Gibbs, Kusmin, & Cromartie, 2005). Simultaneous with these economic changes, some rural communities are experiencing social and cultural transformations as well. Immigrant groups are increasingly settling in America's rural areas (Donato, Tolbert II, Nucci, & Kawano, 2007; Kasarda & Johnson, 2006) and their children, who may speak languages other than English attend rural schools. Thus, some rural communities reflect higher percentages of immigrants, the elderly, and the poor (Cotter, 2002; Donato et al., 2007; Kasarda & Johnson, 2006; Lichter, Johnston, & McLaughlin, 1994). As many rural areas struggle with these new challenges, many of their youth face the prospect that they will need to leave their communities to pursue economic opportunities elsewhere.

Although policymakers at the national level have called for and implemented sweeping education reforms, rural education leaders have indicated that the policies may not accurately reflect the circumstances of rural youth, families, communities, and schools (Arnold, Biscoe, Farmer, Robertson, & Shapley, 2007). For example, a recent Brookings Institution Report called rural schools "America's forgotten educational institutions" (Brookings Institution, 2003, p. 10). The disconcerting facts about outcomes associated with rural youth and rural schools presented here raise many questions, but those of specific interest to this study concern the impact of school experiences, socioeconomic status, and residential preference on adolescents' academic development and transition to adulthood. The data present a reasonable case for examining the future educational plans and academic achievement of youth attending rural schools and the relation of certain school and socioeconomic influences on their plans and achievement.

Rural Youth's Educational Plans and Achievement During Adolescence

During adolescence, young people acquire the cognitive abilities to think seriously about work and schooling (Eccles, 2004; Nurmi, 1991, 2004). They begin to develop aspirations for their future. In this study, aspirations are viewed as a significant psychological construct that pertains to the ability of youth to set goals for their future that are deemed worth working toward in the present (Hansen & McIntire, 1989; Quaglia & Cobb, 1996; Rojewski, 1997; Sherwood, 1989). Research suggests that educational aspirations provide an indication of one's plans for the future that include long-term educational attainment as well as intentions for career pursuits (Eccles, Wigfield, & Schiefele, 1998; Lent, Brown, & Hackett, 1994; Rojewski, 1999; Wilson, Peterson, & Wilson, 1993). However, educational aspirations also provide indications of intentions to drop out of high school (Rumberger, 1983).

A partial explanation for the reported lower educational attainment and associated lower achievement outcomes for rural youth may be that rural students experience unique internal conflict regarding the lack of career opportunities in their geographic region, their personal interests for educational and career attainment, and their desire to remain near their home communities (Hektner, 1995; Howley, 2006). Thus, rural youth may have lower educational aspirations and choose not to pursue higher education and related occupations. The influence of rural youth's residential preference on their educational plans for the future and their achievement will be examined in this study.

Youth's educational achievement is an important aspect of adolescence; as mentioned earlier, achievement outcomes have been recognized as indicators of long-term life trajectories and success (Rutter, 1983; Schoon et al., 2002). In particular, mathematics achievement is important because it serves as a gateway to life opportunities. Higher mathematics achievement is associated with better future educational and career options (Balfanz & Byrnes, 2006; Casey, Nuttal, & Pezaris, 1997; U.S. Department of Education, 1997). Moreover, higher math scores are associated with entry to college, as they relate to performance on college entrance exams such as the SAT or ACT (Casey et al., 1997). For low-income students specifically, math course-taking patterns are related to the pursuit of higher education (U.S. Department of Education, 1997). This study focuses on rural youth's mathematics achievement, examining the influences of selected school contextual factors, socioeconomic status, and residential preference.

In summary, this dissertation studies the ways in which schooling experiences influence the educational attainment and achievement for rural youth. The relation of school influences and socioeconomic status is examined in a national sample of youth who resided in rural communities during a time of significant social and economic change. The study provides insights into the importance of the school context in shaping rural students' educational achievement and future educational plans.

Brief Theoretical Overview

Studies of adolescent aspirations have varied in their use of theoretical perspectives. Though several theories can be found in the literature, including expectancy-value (Eccles, 1994; Neblett & Cortina, 2006) and circumscription and compromise (Gottfredson, 1981), social learning theory and social cognitive theory serve as the theoretical foundation for many aspiration-related studies (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Bandura et al., 2001; Farmer, 1985; Lent et al., 1994; Mau & Bikos, 2000; Mitchell & Krumboltz, 1996). The current study relies on a social cognitive theoretical framework to examine adolescent achievement and educational plans for the future in a sample of rural adolescents in 2004. Social cognitive theory posits that environmental factors, personal factors, and behavior interact to enable human functioning; central to this theory is the belief that personal factors related to cognitive processes such as self-beliefs of competency, or self-efficacy beliefs, play a leading role in determining outcomes (e.g., Bandura, 1986, 1993, 1999, 2001; Bandura et al., 2001; Grusec, 1992; Lent et al., 1994; Pajares, 2002). With this framework in mind, this study examines the role of school context-related factors and socioeconomic status as environmental influences on educational attainment-related outcomes. The study simultaneously includes an examination of the role of efficacy-related beliefs and selected other personal factors on those outcomes as well.

In recent years, developmental and educational psychologists have turned to schools as a context of development (Eccles & Roeser, 2003), examining both school- and classroom-level influences on achievement outcomes (Bosker & Witziers, 1995; D'Agostino, 2000; Luyten, 2003; Odden, Borman & Fermanich, 2004; Paa & McWhirter, 2000; Rutter, 1983; Rutter & Maughan, 2002; Schneider, 1985; Turner & Meyer, 2000) and on socioemotional and behavioral outcomes (Anderman, 2002; Cobb, McIntire, & Pratt, 1989; Eccles, 2004; Hedlund & Hine, 1995). The school context can be viewed broadly and examined from many vantage points. Eccles and Roeser (2003) provide a useful framework for conceptualizing how school contexts exert influence on students, explaining schooling contexts as inclusive of both distal and proximal influences, described in terms of four levels of experience. The framework posits that more proximal influences on students are their experiences with teachers and schools, while more distal influences can include how the district level and state or national level can control school structure and curriculum emphases (Eccles, 2004; Eccles & Roeser, 2003); all of these levels shape students' experiences in the school context. Examples of the school developmental influences include shaping youth academic achievement outcomes, motivational outcomes, career choices, and life trajectories (Eccles, 2004; Eccles & Roeser, 2003; Smith-Maddox & Wheelock, 1995).

Recent studies related to school effects have demonstrated that school context-related factors exert influence on student achievement outcomes (Bosker & Witziers, 1995; Nye, Konstantopoulos, & Hedges, 2004). For example, a recent meta-analysis that examined the influence of teachers on student achievement gains found that approximately 7-21% of the variance in student achievement outcomes can be explained by teacher effects. In that study, the authors concluded that the effect of the teacher on students' achievement was more significant in schools serving larger percentages of low-income students, as well as more significant for achievement outcomes in mathematics than in reading (Nye et al., 2004). Similarly, a meta-analysis of research pertaining to school effects for primary and secondary schools in the United Kingdom and the Netherlands reported that differences among schools, in terms of school climate and focus on academics among other things, accounted for as much as 6-10% of the differences in student achievement. This study, too, found a larger effect for mathematics achievement (Bosker & Witziers, 1995).

Though school effects on aspirations has received less research attention, scholars have demonstrated that aspects of schools, such as teacher aspirations (Wilson & Wilson, 1992), perceptions of learning environment (Majoribanks, 2004), and curricular tracking (Mau & Bikos, 2000) influence adolescent aspirations regarding educational and occupational pursuits. The literature that pertains to the relations of aspirations and school contexts for rural youth focuses more on discussing rural versus nonrural youth's aspirations (Alspaugh, 1998; Breen, 1989; Cobb et al.,1989; Haller & Virkler, 1993; Hansen & McIntire, 1989; Kannapel & DeYoung, 1999; Quaglia, 1989; Rojewski, 1999), rather than analyzing school characteristics or constructs that may influence aspirations as they develop. While these studies are useful in terms of providing information about the status of rural versus nonrural youth's aspirations, more research is needed that examines aspects of schooling during the critical period of adolescence. Such research will contribute to both the developmental research on schooling contexts as well as the literature on rural schools.

Purpose of Research Study

The purpose of this study is to learn more about the interrelations of several school-related environmental factors and personal factors and their influence on the educational plans and math achievement of rural high school students. The selected sample was rural adolescents who participated in the ELS: 2002 and 2004. Although the ELS is a national survey conducted by the U.S. Department of Education that includes over 15,000 students in more than 750 public, private, and Catholic schools, this study relies on a rural public school subsample of the survey population. This study uses data from 2,095 participants in the 130 public schools from the areas designated as rural who participated in both 2002 and 2004. Using social cognitive theory and the Eccles and Roeser (2003) approach to examining schools as developmental contexts, this study tests hypotheses related to how 10th-grade environmental influences of schools, teachers, and SES, relate to rural adolescents' educational expectations and achievement measured two years later. This study also tests hypotheses related to how selected personal factors such as residential preference and self-efficacy beliefs relate to educational expectations and achievement. This study further tests self-efficacy beliefs as a mediator for the influence of the selected schooling experiences and SES on educational expectations and achievement.

Summary

In summary, this study relies on data from the ELS: 2002 to examine the influence of selected environmental factors related to school contexts and SES and personal factors related to efficacy and residential preference on rural adolescent educational expectations and mathematics achievement as measured in the ELS: 2004. The study is grounded in social cognitive theory, but further guided by Eccles and Roeser’s (2003) framework for considering schools as developmental contexts. Its findings aim to inform the present understanding of how schools are influential to rural youth’s educational attainment-related outcomes. Further, the findings may serve as a guide for how rural schools and communities can better use schools as positive influences to improve rural youth’s life trajectories.

CHAPTER II

LITERATURE REVIEW

Aspirations for the future represent an important psychological construct, especially during adolescence, as they guide behavior toward long-term goal attainment pertaining to educational and career pursuits (Bandura, 1986; Eccles, 1994; Eccles et al., 1998; Hansen & McIntire, 1989; Lent et al., 1994; Quaglia & Cobb, 1996; Rojewski, 1999; Sherwood, 1989; Wilson et al., 1993). School achievement has been recognized as an important indicator of future life attainment (Rutter, 1983; Schoon et al., 2002). Various developmental influences shape aspirations and school achievement during adolescence, including family characteristics such as parental education level and occupation, income, and expectations for their child's attainment; individual characteristics such as ability-related perceptions; and school-related characteristics such as students' experiences in schools and classrooms (Behnke, Piercy, & Diversi, 2004; Eccles, 2004; Eccles & Roeser, 2003; Jodl, Michael, Malanchuk, Eccles, & Sameroff, 2001; Ley, Nelson, & Beltyukova, 1996; Majoribanks, 2003; Sargiani, Wilson, Petersen, & Vicary, 1990). This chapter (1) presents an overview of the complexities associated with the measurement and definition of the aspirations construct in extant research; (2) discusses the theoretical grounding for this study; (3) reviews the relevant literature pertaining to selected aspects of school contexts, socioeconomic status, geographic residential preference, and mathematics self-efficacy beliefs; and (4) presents the research questions and hypotheses that guide this study.

Aspirations:

Definition and Measurement in the Literature

Research on aspirations has focused on both educational and vocational plans. The focus of this dissertation is educational aspirations; however, there is considerable inconsistency in the definition and measurement of this construct. Some researchers emphasize that aspirations refer to a person's *hoped for* or *desired* education goal. For example, a longitudinal study by Wilson, Peterson, and Wilson (1993) measured educational aspirations thusly: "If you had your choice, how far would you really like to go in school?" (p. 164). In contrast, a large number of studies focus on a person's educational expectations. Bandura and colleagues, for example, asked research participants to indicate what "educational level they expected to complete" (Bandura et al., 2001, p. 193). Both the 1980 High School and Beyond Study (HSB) and the 1988 National Educational Longitudinal Study (NELS: 88) included the following item to measure educational plans: "As things stand now, how far in school do you think you will go." Students were given several response options, ranging from not completing high school to completing a Ph.D. or professional degree (e.g., M.D.). Though authors reporting on these data refer to their research as a study of aspirations, the measure used is technically a question about educational expectations (e.g., Coleman & Hoffer, 1987; Kao & Tienda, 1998; Mau, 1995; Mau & Bikos, 2000).

Other researchers have examined both idealistic and realistic educational plans for the future and have found similar response patterns and relatively high correlations for the two types of questions (Howley, 2006; Majoribanks, 1998). Howley (2006) relied on data from the 2002 Child Development Supplement to the Panel Study of Income Dynamics (PSID), which asked participants to report "the level of education they aspired to attain,…[and] the education level they expected to attain" (p. 67). When comparing responses to these two items, Howley (2006) found that participants expected to achieve slightly fewer years of educational study than they aspired to attain. Overall, response patterns were similar for both questions (Howley, 2006). In a study of Australian youth, Majoribanks (1998) used both an idealistic and a realistic measure to create a latent construct for educational aspirations. He asked 16-year-olds "what educational level…they would really like to achieve, if at all possible, when they were 25 years old" versus "what educational level they really expected to attain…when they were 25 years old" (p. 185). Marjoribanks (1998) reported that the correlations for the two items were .73 for female adolescents and .71 for male adolescents (p. 185).

Studies of rural youth also define and measure educational aspirations in different ways. Drawing on the HSB data, Cobb, McIntire, and Pratt (1989) examined rural students' educational expectations (e.g., "How far in school do you think you will get?"). Similarly, Hecktner examined the educational plans of rural youth using a realistic assessment from the Sloan Study of Youth and Social Development (e.g., "As things stand now, how far in school do you think you will get?"). By contrast, Wilson, Peterson, and Wilson's (1993) 10-year longitudinal study of rural youth included a measure of idealistic expectations (e.g., "If you had your choice, how far would you really like to go in school?"). Finally, Howley's (2006) study of rural and nonrural youth included both idealistic and realistic educational plans by asking students to indicate the level of education they aspired to attain and the level of education they expected to attain (p. 67).

This study may be among the first to use the Educational Longitudinal Study (ELS) 2002 and 2004 to examine educational expectations in a national sample of rural youth. To assess high school students' educational plans, the ELS included the following survey item: "As things stand now, how far in school do you think you will get?" Similar to the student survey item included in NELS: 88, response options ranged from dropping out of school to doctoral completion (U.S. Department of Education, 2002). The language suggests a realistic assessment of the student's plans regarding their educational future. No idealistic items pertaining to educational aspirations were included in the ELS survey. However, it is difficult for a researcher to assess how a student interprets the meaning of this question in the absence of a more idealistic question. When both idealistic and realistic questions are posed, the distinction may be clearer.

Focusing on rural youth, an important goal of the present study is to examine individual and school-related differences in educational expectations. Some researchers have examined the influence of family characteristics, such as income or socioeconomic status, parental aspirations for their children, and parental occupation (Blackwell & McLaughlin, 1999; Dyk & Wilson, 1999; Rainey & Borders, 1997; Rojewski, 1999; Wilson et al., 1993). A few studies have described school characteristics that may be important to educational expectations and aspirations (e.g., Blackwell & McLaughlin, 1999; Breen, 1989; Kannapel & DeYoung, 1999; Quaglia, 1989). While these studies are useful in providing information about the status of rural aspirations, a theoretical framework is needed to examine developmental influences associated with family and school contexts. Using social cognitive theory, this study examines the influence of selected school characteristics, socioeconomic status, efficacy-related beliefs, and residential preferences as developmental influences during adolescence that shape educational aspirations and school achievement outcomes for rural youth. This study does not examine changes in outcomes over time in association with developmental influences; however, it takes an important first step toward examining the developmental influence of school contexts on rural adolescent aspirations and achievement by examining influences at the 10th-grade year in relation to outcome variables measured two years later.

A Social Cognitive Theoretical Approach to the Study of Adolescent Educational Aspirations and Achievement

Social cognitive theory has been used by researchers to examine aspirations as a psychological construct with various environmental and personal influences (Bandura et al., 1996, 2001; Lent et al., 1994; Mitchell & Krumboltz, 1996). The theory's structure supports the interactions of environmental influences, personal influences, and behavior in such a way as to recognize that individuals are not passive agents of outside influence on their lives. Thus, social cognitive theory provides a balanced perspective on human development and functioning that acknowledges the complex interplay of both outside influences as well as internal processes. This study uses the social cognitive framework to examine the role of selected aspects of the school context and socioeconomic status as environmental influences on educational attainment-related outcomes. In addition, it examines the role of efficacy-related beliefs on those outcomes.

Social cognitive theory attributes a central role to cognitive processes. The theory posits that individuals are not mere subjects of their environments or genetic codes. Instead, individuals are believed to act as agents, sometimes referred to as human agency, on their own behalf in the varying contexts of their lives. Individuals make decisions and take actions that are influenced by social structures and conditions in the environment, as well as their own cognitive processing and decision-making (Bandura, 1986, 1989, 1999, 2001; Grusec, 1992; Lent et al., 1994; Pajares, 2002).

Self-efficacy beliefs, or individuals' view of their capabilities, lie at the heart of human agency (Bandura, 2001, 2002, 2006; Bandura et al., 2001). Social structures and environmental conditions have their influence on behavior in part based on their persuasive power on the cognitive processes associated with the formation of self-beliefs (Bandura, 1999; Pajares, 2002). While self-efficacy beliefs are central to agency, it is important to note that the two are not synonymous; rather, they are distinct. Human agency addresses behavior, adaptation over time, and change; self-efficacy beliefs act within human agency as guides for actions (Bandura, 2006, p. 164, 170). Defined as personal beliefs of one's ability to perform a certain task, self-efficacy beliefs serve as a motivation to initiate, maintain, or terminate behavioral actions (Bandura, 2006). In addition to examining the relationship between adolescents' academic self-efficacy beliefs and behavioral outcomes associated with educational achievement and future plans for schooling, this study further suggests that academic self-efficacy beliefs are shaped by interactions within school and family contexts.

Outcome Variables:

Educational Expectations and Mathematics Achievement

This study examines selected influences from participants' 10th-grade year (2002) on their educational expectations and achievement two years later. Adolescents' aspirations, as represented by educational expectations in this study, are an important psychological construct. Research has demonstrated that aspirations help adolescents direct their behavior, organizing and guiding their decisions toward a desired goal (Bandura, 1986; Eccles, 1994; Eccles et al., 1998; Lent et al., 1994; Rojewski, 1999; Wilson et al., 1993). Achievement, too, is an important outcome to analyze and has been the subject of interest to both policymakers and researchers alike for many years. In much of the school effects research, achievement has been used as an outcome measure with the ultimate goal of understanding the role of various aspects of the school context (school size, classrooms, teacher quality, peer relations, and educational resources) on student outcomes associated with measures of student learning (Allensworth & Easton, 2005; Bosker & Witziers, 1995; Bryk & Schneider, 2002; Eccles, 2004; Goldhaber & Brewer, 2000; Lee, 2000; Lee, Smith, Perry, & Smylie, 1999; Luyten, 2003; Nye et al., 2004; Odden et al., 2004).

Educational Expectations

During adolescence, children develop the cognitive skills that enable judgments about their plans for the future (Eccles, 2004; Nurmi, 1991, 2004). They develop aspirations related to schooling, occupation, and other aspects of adult life. Research suggests that educational aspirations provide an indication of future plans that include long-term educational attainment and career plans (Bandura et al., 1996; Eccles et al., 1998; Haller & Virkler, 1993; Lent et al., 1994; Majoribanks, 2003; Rojewski, 1999; Wilson et al., 1993), as well as intentions to dropout of high school (Rumberger, 1983). Adolescents with higher educational expectations tend to report expecting later transitions to marriage, parenting, and employment (Crockett & Bingham, 2000). Thus, educational aspirations are important to study as they provide an indication of adolescents' plans for their future.

In studies of rural youths' aspirations, researchers have mainly focused on differences between rural and nonrural youths' educational plans (e.g., Cobb et al., 1989; Haller & Virkler, 1993; Kannapel & KeYoung, 1999; Quaglia, 1989; Rojewski, 1999) and family characteristics that are related to youth's educational aspirations (e.g., Dyk & Wilson, 1999; Hansen & McIntire, 1989; Wilson et al., 1993). Though most researchers have reported that rural youth aspire to fewer years of education compared to their nonrural peers, more recent research has reported that gaps exist mainly in terms of postgraduate study (Howley, 2006). Research on the aspirations of rural youth suggests that a conflict exists between the desire to remain in their home communities versus the wish to pursue higher education and careers outside of the local area (Elder, King, & Conger, 1996; Hektner, 1995; Howley, 2006). Though it is understood that families exert powerful influence over the educational attainment of youth (e.g., Dyk & Wilson, 1999; Hansen & McIntire, 1989; Wilson et al., 1993), more research is needed that examines other influences, such as those associated with schooling contexts, on the development of rural youth's educational aspirations. Research that explains processes by which such influence takes place is also needed.

Mathematics Achievement

Achievement outcomes are important because educational attainment is recognized as a predictor of adult life experiences (Rutter, 1983; Schoon et al., 2002). In particular, mathematics achievement can be an important predictor of a youngster's future because it acts as a gateway to education opportunities and careers (Balfanz & Byrnes, 2006; Casey et al., 1997; U.S. Department of Education, 1997). Research has shown that performance on achievement tests that measure mathematics aptitude can act as the pathway to college entrance (Casey et al., 1997) and mathematics course-taking is especially important for low-income students as it positively associates with college attendance (U.S. Department of Education, 1997). Higher achievement in mathematics is related to college attendance and graduation, which is associated with better jobs in terms of compensation and satisfaction (ACT, 2008; Allen & Sconing, 2005). Research has demonstrated that students with higher scores on standardized tests that assess mathematics achievement, such as the ACT, are more likely to do well in entry-level college mathematics courses (Allen & Sconing, 2005).

In terms of research on rural youth's mathematics aptitude compared with that of nonrural youth, research has shown that rural youth's mathematics achievement is not as high as that of their suburban peers at 4th, 8th, and 12th grades (Provasnik et al., 2007, p. 50). By 12th grade, fewer rural youth achieve "advanced proficiency" on the National Assessment of Educational Progress (NAEP) mathematics assessments than suburban or urban youth (Provasnik et al., 2007, p. 53).

Owing to its documented influence on educational and occupational attainment, this study examines mathematics achievement in a national sample of rural youth. This study relies on a measure of mathematics achievement in the ELS: 2004, the first follow-up, when most study participants were in 12th grade. Study participants were given a mathematics achievement test consisting of items measuring aptitude in basic arithmetic, algebra, geometry, and more advanced mathematics topics as well (U.S. Department of Education, 2006c, p. 34). The mathematics achievement measure was created by the U.S. Department of Education based on scores from these mathematics tests and will be explained in more detail in Chapter 3.

Contributions of Environmental Influences on Educational Expectations and Mathematics Achievement

Consistent with social cognitive theory, research has demonstrated that developmental experiences associated with the features of the environment exert influence upon youth's self-beliefs and educational attainment-related outcomes (Bandura, 1999, 2001; Bandura et al., 1996, 2001; Farmer, 1985; Grusec, 1992; Lent et al., 1994). Examples of such environmental influences that can affect achievement and educational expectations include experiences associated with school contexts and aspects of parent and family life (Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Eccles, 2004; Eccles & Roeser, 2003; Gershoff, Raver, Aber, & Lennon, 2007; Leventhal & Brooks-Gunn, 2004; Mau & Bikos, 2000; McLoyd, 1998; Sampson & Laub, 1994; Smith, Brooks-Gunn, & Klevanov, 1997). This section reviews research pertaining to the environmental influences on educational aspirations and achievement examined in this study.

School Context-related Influences

It is widely accepted that schools have a long-term impact on youth development (e.g., Eccles, 2004; Eccles & Roeser, 2003; Meece & Eccles, in press; Rutter, 1983). The school effect on achievement outcomes, in particular, has received much attention. The nature of this influence is multifaceted, as the school context is multilayered (Eccles & Roeser, 2003). Students' experiences with curricular materials, teachers, and peers in classrooms have the most proximal influence on students. These experiences shape students' self-beliefs, educational expectations, and achievement outcomes. However, the larger school environment as well as state and national school policies can also wield influence on individual educational attainment-related outcomes (Eccles, 2004; Eccles & Roeser, 2003). This study examines academic emphases within schools, the relational contexts of schools, curricular tracking (high school program enrollment), and mathematics teacher beliefs about their role in student success, each of which has received prior research attention. An understanding of how these proximal influences relate to the educational attainment-related outcomes of rural adolescents is important because they are variables that can be changed or altered to maximize student educational attainment-related outcomes.

Before examining the research related to the four school context-related factors used in this study, it is appropriate to briefly discuss literature about school climate, a more general concept related to the school environment. In their compendium work regarding how to make high schools more engaging for urban students, the National Research Council and Institute of Medicine (2004) defined school climate as “the values, norms, beliefs, and sentiments associated with routine practices and social interaction in schools” (p. 97). Though school climate can be described as generally referring to attitudes, social support, and curriculum focus within schools, its definition and measurement have varied in research. A more positive school climate, however measured and defined, is related to more positive achievement outcomes (e.g., Allensworth & Easton, 2005; Battistich, Solomon, Kim, Watson, & Schaps, 1995; Battistich, Solomon, Watson, & Schaps, 1997; Boyd & Shouse, 1997; Eccles & Roeser, 2003; Lee & Burkam, 2003; Lee et al., 1999; Marks, 2000; National Research Council and Institute of Medicine, 2004; Phillips, 1997; Sellstrom & Bremberg, 2006; Sherblom, Marshall, & Sherblom, 2006; Shouse, 1996b; Wood, Kaplan, & McLoyd, 2007). More positive school climates relate to increased student engagement and educational attainment (Eccles, 2004; National Research Council and Institute of Medicine, 2004; Sherblom et al., 2006). Moreover, a positive school climate is especially important for schools that serve large percentages of socioeconomically disadvantaged students (Battistich, Solomon, Kim, Watson, & Schaps, 1995; Battistich, Solomon, Watson, & Schaps, 1997; Bryk & Driscoll, 1988; Marks, 2000; Phillips, 1997; Shouse, 1996a, 1996b, 1997).

This study examines two key aspects of school climate. The academic press of schools can be thought of as the degree to which an academic emphasis and focus on the curriculum is valued (National Research Council and Institute of Medicine, 2004, p. 99). The relational context of schools, for this study, represents the degree to which a culture of community and strong social supports is fostered (National Research Council and Institute of Medicine, 2004, p. 99). Research has found that a strong sense of community combined with an emphasis on academics and learning is associated with higher student educational attainment (Boyd & Shouse, 1997; Lee & Smith, 1996, 1999; Marks, 2000; Meece, Herman, & McCombs, 2003; Phillips, 1997; Shouse, 1996a, 1996b, 1997). The literature on academic press within schools and the relational context of schools is reviewed in the following sections.

Academic Press

An emphasis within the school on the importance of academics has a positive association with increased achievement outcomes (Lee, 2000; Lee et al., 1999; National Research Council and Institute of Medicine, 2004; Phillips, 1997). Academic press is defined by Lee, Smith, Perry and Smylie (1999) as “the extent to which school members, including teachers and students, experience a normative emphasis on academic success and conformity to specific standards of achievement” (p. 10). Academic press reflects a pervasive attitude that learning is valued and that high expectations are sincerely held for all students (National Research Council and Institute of Medicine, 2004). For this study, the academic emphasis within a school is viewed as a proximal influence on students as it is part of their daily experiences in their learning environment.

The relation of a school’s academic emphasis to student outcomes and achievement has been studied in both elementary-aged children (e.g., Sherblom et al., 2006) and adolescents (Lee & Smith, 1999; Lee et al., 1999; Phillips, 1997; Shouse, 1996a, 1996b, 1997). Using multiple items from NELS:88 First Follow-Up data, Shouse (1996a) examined the relation between academic press and students’ mathematics achievement in a national sample of high school sophomores. He used measures from principal, teacher, and student surveys. Principals reported on measures such as “teachers press students to achieve” and “students are expected to do homework,” and students reported on items such as “teaching is good.” (Shouse, 1996a, p.196). Shouse’s academic press index included measures of student course-taking, discipline, teacher instructional practices, homework policies, and others (Shouse, 1996a, p. 196-197). Results revealed that academic press and student achievement were positively associated. Increases in academic press within the school environment were associated with higher student achievement. Lee and Smith (1999) found similar results with Chicago public school adolescents. These researchers took measures for academic press from both teacher and student surveys; teachers responded to an item about the degree to which the school focused on helping students learn, and students responded to an item about whether teachers challenged them academically (Lee & Smith, 1999, p. 921). Lee and Smith (1999) reported that the presence of an academic press improved student achievement outcomes as measured by scores on reading and mathematics tests.

Beyond its influence on achievement specifically, an emphasis on academics and learning is also related to student academic engagement (Eccles & Roeser, 2003). More engaged students are less likely to leave school before graduating with a high school diploma (Eccles, 2004; Finn, 1989; Finn, 1993; Finn & Rock, 1997; National Research Council and Institute of Medicine, 2004). Little research has examined the influence of academic press on adolescents’ educational expectations. However, given its relation to academic engagement and achievement, the degree to which academics are emphasized within a school setting is likely to have a positive influence on students’ plans to complete or to continue their education (Eccles, 2004; Eccles & Roeser, 2003).

This study builds on prior research substantiating the influence of academic press on achievement and expands research by examining that influence in rural youth and schools. Further, this study expands research by examining the influence of academic press within the school environment on students' educational expectations and mathematics achievement.

Relational Context of Schools

Another important part of the school context is the aspect of the school as a community, which is conceptualized in this dissertation as the relational context of the school. Similar constructs have been examined in samples of both elementary-aged children (Battistich et al., 1995; Battistich et al., 1997; Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008; Sherblom et al., 2006) and adolescents (e.g., Bryk & Driscoll, 1988; Crosnoe, 2004; Crosnoe, Johnson, & Elder, 2004; Lee & Smith, 1999; Patrick, Ryan, & Kaplan, 2007; Philips, 1997; Ryan & Patrick, 2001; Shouse, 1997; Wood et al., 2007). The terms used to describe the relational or community-oriented aspects of school vary and include the following labels: classroom social climate (Patrick et al., 2007; Ryan & Patrick, 2001), school communitarian climate (Philips, 1997), classroom quality (Pianta et al., 2008), communality (Shouse, 1996a; 1996b; 1997), communal school organization (Bryk & Driscoll, 1988), social support (Lee & Smith, 1999; Lee et al., 1999; Rosenfeld, Richman, & Bowen, 2000), sense of community (Battistich et al., 1995; Battistich et al., 1997), student-teacher relationships (Crosnoe et al., 2004), social environment (Crosnoe, 2004; Patrick et al., 2007; Ryan & Patrick, 2001), school environment (Wood et al., 2007), and general school climate (Coleman & Hoffer, 1987; Sherblom et al., 2006). In this study, the relational context of the school is viewed as a proximal influence on students because it is part of their daily experience at school.

In measuring constructs pertaining to the relational context of schools, researchers have relied on data from national studies such as the National Educational Longitudinal Study (NELS) (Shouse, 1996a, 1996b, 1997), High School and Beyond (Bryk & Driscoll, 1988), and the National Longitudinal Study of Adolescent Health (Add Health) (Crosnoe, 2004; Crosnoe et al., 2004). Other significant studies that have examined the relational context of schools include the Chicago Annenberg Research Project and the Consortium for Chicago School Research (e.g., Lee & Smith, 1999; Lee et al., 1999) and intervention studies (e.g., Battistich et al., 1995; Battistich et al., 1997; Sherblom et al., 2006).

Studies using national datasets have consistently reported that the communal nature of schools is important for a range of student outcomes. Using data from the 1980 HSB survey, Bryk and Driscoll (1988) created an index for communal school organization, which they defined as social support and community within schools. The researchers used reports from students, teachers, and school administrators to assess this aspect of the school environment. Principals and teachers were asked about staff morale, and teachers were asked about teacher efficacy and happiness. Several indicators were taken from student data, including their perceptions of teacher interest, incidences of cutting class, attendance rates, and dropout status (Bryk & Driscoll, 1988, p. 48 & 51). Bryk and Driscoll (1988) found that schools that have higher ratings for communal organizations also had students with higher mathematics achievement at 12th grade. Similarly, using NELS:88 First Follow-Up data, Shouse (1996a) found that “communality,” as measured by principal, teacher, and student reports, is positively associated with 10th-grade student achievement outcomes. The measure for students inquired about the degree to which teachers were interested in them, whereas the staff-level measures focused on the degree to which staff had conflict or held negative attitudes about students (Shouse, 1996a). Researchers using data from the National Longitudinal Study of Adolescent Health (Add Health) have reported that strong relationships between students and teachers, or "intergenerational bonding" as they labeled it, is positively associated with higher student achievement outcomes (Crosnoe et al., 2004). In the Add Health study, adolescents in Grades 7 through 12 provided information about their relationships with teachers by responding to items about whether they thought their teachers cared about them and treated them fairly. Similarly, when using the same data to examine relationships at home and school, Crosnoe (2004) found that strong relations between students and teachers were associated with more positive student achievement outcomes.

In a series of studies involving Chicago high schools, (e.g., Lee & Smith, 1999; Lee et al., 1999) researchers examined the influence of social support on high school students' academic achievement and educational attainment. In this research, social support was defined as the "personal relations students have with people in and out of school, including teachers, parents, and other students, who may help them do well in school" (Lee & Smith, 1999, p. 2). Findings demonstrated that when students have strong social support, achievement outcomes are higher (Lee & Smith, 1999). Further, Lee and Smith found that students who reported strong social supports had higher achievement outcomes in schools that were also rated more highly in terms of academic press. The authors concluded that a combination of an emphasis on the curriculum and strong social supports is important for higher student achievement outcomes (Lee & Smith, 1999). Using data from a national sample of students in Grades 6 to 12 to examine a conceptually similar construct, Rosenfeld, Richman, and Bowen (2000) reported comparable findings. Students who reported higher perceptions of social support from teachers, parents, and friends were found to have higher self-efficacy, school engagement, and academic achievement (Rosenfeld et al., 2000).

In addition to its influence on achievement, positive relational contexts of schools are important to student educational plans for the future. Researchers using HSB data, for example, reported higher educational expectations associated with more positive school climates for a national sample of high school students (Coleman & Hoffer, 1987). In their study of school communal organization, which also relied on HSB data, Bryk and Driscoll (1988) reported that high school dropout rates were lower in schools rated more highly for communal organization. Similarly, in analyzing student reports from the High School Effectiveness Study supplement to NELS: 88, Lee and Burkam (2003) found that students who attended high schools that were characterized as having more positive teacher-student relations were less likely to have dropped out of school. In that study, “school social organization” was conceptualized as a construct consisting of student responses to questions that focused on the relationships betweens students and teachers. For example, students were asked about whether teachers were interested in and cared about them (Lee & Burkam, 2003, p. 371). Additional support for the importance of the relational context of schools can be found in Catterall’s analyses of NELS: 88 dropout data (Catterall, 1998). Catterall (1998) found that half of the dropouts reported the reason for dropping out was that they did not get along well with teachers and students.

In a study of over 300 urban adolescents and their families, Wood, Kaplan, and McLoyd (2007) reported that students who had more positive perceptions of the school environment had higher ratings for educational expectations. In the Wood et al. study (2007), the school environment was assessed by five Likert-scale items on a student questionnaire; examples of the items included “you feel close to others at your school” and “the teachers at your school treat the students fairly" (p. 421). Youth's educational expectations were assessed with two Likert-scale items on the student questionnaire that asked "how sure the child was he or she would (a) go to college and (b) finish college" (p. 421).

Few studies of rural youth have focused on the relational context, or communal aspect, of the school. Yet, rural schools are often described as serving as cultural and community centers and as institutions with a strong sense of community (Howley, 2006; Kannapel & DeYoung, 1999; Lyson, 2002; Rojewski, 1999). Rural schools are likely to look and be similar to the specific rural families and communities that they serve, and there is considerable variability across rural communities due to available industry and related wealth and tax base (Lee & McIntire, 1999; Roscigno & Crowley, 2001). There is also considerable variability in the size and configuration of rural high schools (see pp. 52-57 for this study's sample description). Therefore, some schools may foster a strong sense of community, while others may not. This type of variability underscores the importance of examining the relational context of rural schools to determine its relation to students' achievement and educational attainment. This study examines the relational context of schools as a school contextual factor and relies upon student-reported measures similar to those from related literature.

High School Program

Curricular tracking is a feature of schools whereby different academic programs (high school programs) with differing curriculum emphases are offered for students, presumably based upon interests and skills. Examples of common academic programs, or tracks, found in high schools include college preparatory programs that prepare youth for direct college entry post-high school, general or regular education programs, and vocational education programs that provide skills in a trade sufficient for entry into the workforce post-high school (Akos, Lambie, Milsom, & Gilbert, 2007; National Research Council and Institute of Medicine, 2004). For this study, high school program (vocational, general, or college preparatory) is conceptualized as a proximal influence because the experiences of the high school program affect the student directly on a daily basis and may in fact have lifelong effects in its influence on career options (Eccles, 2004; Griffin & Alexander, 1978; Rutter, 1983). Although common in most high schools, curricular tracking is controversial, and studies of its value have not yielded definitive answers (Eccles, 2004; Eccles & Roeser, 2003, National Research Council and Institute of Medicine, 2004; Oakes, 1986, 1987). The types of learning experiences afforded students varies substantially by high school program due to courses offered, instruction, teacher quality, and achievement expectations (Akos et al., 2007; Lucas, 1999; National Research Council and Institute of Medicine, 2004; Oakes, 1986, 1987; Talbert & Ennis, 1990).

Regarding educational plans, research provides some evidence that tracking has beneficial effects for academically high achievers, but similar results have not been found for those students placed in the noncollege preparatory academic tracks (Berends, 1995; Eccles, 2004; Eccles & Roeser, 2003). In a study that examined school-related influences on educational expectations using NELS: 88 data, Mau and Bikos (2000) found that one of the two largest predictors of educational expectations, before controlling for race and gender, was high school academic program.[1] Researchers using national data (HSB) also found that track associated positively and significantly with educational plans for the future (Berends, 1995; Vanfossen, Jones, & Spade, 1987). Students enrolled in the college preparatory tracks reported greater educational aspirations than students enrolled in other tracks (Berends, 1995;

[1] The other predictor was being enrolled in a private versus public school.

Mau & Bikos, 2000; Vanfossen et al., 1987).

Researchers have also used national data from the HSB to demonstrate associations between track placement and achievement, such that students in the college preparatory tracks have higher achievement outcomes (Lee & Bryk, 1988; Vanfossen et al., 1987). In addition, track placement ranks second only to prior achievement as a predictor of grades in high school in samples of urban youth (Mickelson & Heath, 1999). Research investigating track placement and achievement data in two school districts in different regions of the United States (the Midwest and the West Coast) found that even when youth had similar mathematics achievement entering their high school programs, students in the nonacademic tracks (e.g., vocational or general education) experienced lower achievement gains than students placed in more academically rigorous courses (Oakes, 1995).

For rural youth specifically, one study (Rojewski, 1999) found that they were more likely than nonrural youth to plan to enter the workforce after high school rather than attend college. Further, the study found that rural work-bound youth were more likely than their work-bound urban counterparts to be enrolled in the vocational track in high school (Rojewski, 1999).

Research suggests that curricular tracking is an important indicator of how schools influence adolescents' pathway to educational attainment and achievement. Currently, with the exception of the Rojewski (1999) study, little is known about the role of academic tracking on the educational expectations and achievement of rural youth. This study included an observed measure for high school program enrollment status as a school contextual influence.

Mathematics Teacher Beliefs About Student Success

Similar to academic press, relational context of schools, and high school program enrollment, the classroom teacher is an important proximal influence on students. Numerous studies have documented that teachers can play a significant role in shaping students' educational attainment and achievement and can exert a powerful, lasting influence on their outcomes (Eccles, 2004; Eccles & Roeser, 1999, 2003; Goldhaber & Brewer, 2000; Nye et al., 2004). These studies have examined the role of teachers' basic beliefs about students, learning, and themselves as teachers (Eccles, 2004; Eccles & Roeser, 2003; Lee, 2000; Lee, Dedrick, & Smith, 1991), teacher instructional and discipline practices (Eccles, 2004; Eccles & Roeser, 2003; Eccles et al., 1998; Roeser, Midgley, & Urdan, 1996), and teacher expectations for students (Brattesani, Weinstein, & Marshall, 1984; Eccles, 2004; Eccles & Wigfield, 1985; Eccles & Roeser, 2003; Jussim, Eccles & Madon, 1996; Jussim & Harber, 2005; Raudenbush, 1984; Rosenthal, 1994; Valencia, 1991). According to a recent meta-analysis of 17 studies of research on teacher effectiveness in promoting student achievement, between 7-21% of variance explained in student achievement gains is attributable to teacher effects (Nye et al., 2004). In examining data from Tennessee's Project STAR, Nye, Konstantopoulous, and Hedges (2004) found that the teacher effect on achievement outcomes was larger in schools serving higher concentrations of low-SES students. They concluded that teacher effects matter more in predominantly low-SES schools than in schools serving higher concentrations of middle-class and upper-class students (Nye et al., 2004).

This study focused on mathematics teachers' beliefs about their role in making students successful. Mathematics teachers' beliefs about student success was measured as a latent construct with three items from the ELS teacher survey. The items included teacher's attention to unique abilities and interests of students, teacher's use of effective methods of teaching, and teacher's enthusiasm or perseverance. The development of this measure was guided by research demonstrating that students learn more and have higher achievement outcomes in schools where teachers express a willingness to take responsibility for student learning (Bandura, 1993; Lee, 2000; Lee & Smith, 1996; National Research Council and Institute of Medicine, 2004). Specifically, Bandura's (1993) work examining teacher efficacy found that schools have higher student achievement outcomes when teachers report higher collective ratings about their abilities to influence students' academic outcomes. In another study, Lee (2000) relied on measures from NELS: 88 to examine the influence of teacher beliefs on achievement outcomes for over 11,000 students in 820 schools. Lee (2000) found that when teachers take responsibility for student learning, student academic achievement is higher and less related to the students' backgrounds. Lee and Smith (1996) reported similar findings. Taken together, these studies support the inclusion of teacher beliefs about their role in student success as a proximal school-related influence on students' academic achievement and attainment.

Little research has examined the influence of such teacher beliefs on rural student educational expectations and achievement outcomes. Some research suggests that teachers in rural communities may play more influential roles in youth's lives than teachers in nonrural areas (Dyk & Wilson, 1999; Hedlund & Hine, 1995; Rojewski, 1999). Teachers in rural schools tend to know their students over a long period of time, know extended family members of their students, take on additional visible leadership roles in the community, and personally know students' families (Hedlund & Hine, 1995). When compared with urban students, rural students' motivation may be more related to their teachers' creation of classroom environments that support students' needs and interests, such as needs for autonomy (Hardre & Reeve, 2003).

Additional research is needed to examine teachers' beliefs about student success and its role in shaping the educational achievement and attainment of rural youth. This study examines such teacher beliefs for their influence on their students' educational plans and mathematics achievement in a national sample of rural youth. The study builds on research that has found that when teachers express responsibility for student learning, student achievement outcomes are higher (Lee, 2000). Further, this study expands research by examining the influence of such teacher beliefs on student educational plans.

Socioeconomic Status (SES)

It is well established that socioeconomic status, poverty, and low-income status are key characteristics that influence adolescent educational attainment-related outcomes (e.g., Bandura et al., 2001; Conger, Conger, & Elder, 1997; Hansen & McIntire, 1989; McLoyd, 1998; Sirin, 2005; Smith, Brooks-Gunn, & Klebanov, 1997; Teachman, Paasch, Day, & Carver, 1997). This study includes SES as an environmental influence that shapes adolescent outcomes.

SES, as utilized in the proposed study, is a composite measure available in the ELS 2002 that includes parental education, occupation, and income. Researchers examining the effects of poverty, low-income status, and SES have differentiated the meanings of these terms (e.g., McLoyd, 1998; National Center for Children in Poverty, 2008). In research, poverty often means absolute poverty, the condition of having less than a minimum amount determined as necessary for meeting basic needs such as food, clothing, and shelter (McLoyd, 1998). The most common reference point for poverty used in research is the federal poverty index, which sets a threshold for income based on family size (McLoyd, 1998). For example, the poverty threshold for a family of four in 2007 was $20,650 (National Center for Children in Poverty, 2008). The federal income standards for meeting basic needs are recognized as low, and therefore many families may struggle in spite of having incomes slightly above the poverty index. Families that make less than twice the federal poverty threshold are often considered as low income (National Center for Children in Poverty, 2008). Finally, SES is a measure used in research that provides a measure of overall financial condition (Bradley & Corwyn, 2002; McLoyd, 1998) and social capital (Sirin, 2005). The definition and measurement of SES in research usually includes measures of family income, parental education, and parental occupation (McLoyd, 1998), as is the case in this dissertation. As some have explained, one benefit of SES for research purposes is that it contains elements that are likely to be more stable than income alone, such as parental education level and parent occupation (McLoyd, 1998). Though this study used the SES measure available in ELS, it relies on research that has examined both SES and family income. Both types of research demonstrate the influence of family financial situations on educational attainment-related outcomes.

SES is positively associated with aspirations and achievement outcomes. Poverty, low-income status, and lower-SES have been shown to relate to lower achievement outcomes (e.g., Conger et al., 1997; Corcoran, 1995; Dyk & Wilson, 1999; Haveman & Wolfe, 1995; McLoyd, 1998; Pagani, Boulerice, Vitaro, Tremblay, 1999; Sirin, 2005; Teachman et al., 1997). Researchers have found that children and youth who are poor are about twice as likely to have failed a grade or to have been expelled from school (Corcoran, 2001). A recent meta-analysis of SES and student achievement examined 58 journal articles published between

1990-2000, in which over 100,000 youth were studied (Sirin, 2005). Results showed a consistent relation between SES and achievement outcomes across the studies and provided an average mean correlation of .29 for the association of SES to various achievement measures (e.g., grade point average; various standardized achievement tests including scores on the Missouri Mastery Achievement Test, the Texas Assessment for Academic Scores, and the Stanford Achievement Test) (Sirin, 2005, p. 437, 424-429). Similar results have been found by researchers using national datasets. Peters and Mullis (1997), using data from the National Longitudinal Survey of Labor Market Experience of Youth, found significant relations between family income and student achievement-related outcomes in scores on standardized tests and years of schooling completed. A longitudinal study using data from the National Longitudinal Study of Young Men demonstrated that poverty in adolescence has lasting impacts on achievement over the life-course (Teachman et al., 1997). Adolescents who experienced poverty had overall lower achievement in terms of high school graduation rates, college-going rates, and total years of completed schooling, when compared with more affluent youth (Peters & Mullis, 1997; Teachman et al., 1997).

Research has also demonstrated that higher SES is associated positively with higher educational aspirations (Hansen & McIntire, 1989; Majoribanks, 2003; Mau & Bikos, 2000; Valadez, 1998). Using data from the HSB, Hansen and McIntire (1989) found that higher SES students had higher educational aspirations than lower SES students, such that the highest quartile SES students were about twice as likely to aspire to a Ph.D. as students from lower SES backgrounds. Further, about one-fourth of students in the lowest SES quartile expected not to continue their education beyond high school, compared to only four percent of students from the highest quartile SES (Hansen & McIntire, 1989). Using data from

NELS: 88, Mau and Bikos (2000) found that SES was the third largest predictor of students' educational expectations, after high school program enrollment and public versus private school status. Similarly, Valadez (1998) found that higher SES students in the NELS: 88 sample had higher educational aspirations and were more likely to follow through with those aspirations by applying to college.

Research has demonstrated that rural youth show similar patterns. In a study using NELS: 88 data, Rojewski (1999) reported that rural students in the lowest quartile SES were about twice as likely to report to be headed for work after high school completion compared with their counterparts in the highest quartile SES, who were about four times more likely to plan to attend college directly after high school (p. 147). Similarly, Conger, Conger, and Elder (1997), in a four-year, longitudinal study of 357 rural adolescents in Iowa, found that lower income status was associated with lower grades. In another study of 90 rural early adolescents in Georgia, researchers reported that family financial hardship had a negative effect on student achievement outcomes, as measured by a composite for academic performance in mathematics and reading (Brody et al., 1994). Finally, Blackwell and McLaughlin (1999) found that family poverty had a more negative effect on rural boys' than girls' aspirations.

This study includes SES as an environmental influence on rural youth's educational expectations and achievement. The measure used for SES is provided in the ELS and will be explained in more detail in Chapter 3.

Contributions of Personal Influences on Educational Expectations and Achievement Outcomes

While research demonstrates that SES and aspects of experiences in schools influence adolescents' educational attainment-related outcomes, it is important to acknowledge that personal factors also play a role in those outcomes. An important personal aspect that has been included in research and literature pertaining to achievement and aspirations is individuals' self-efficacy beliefs (Bandura, 2001; Bandura et al., 1996, 2001; Lent et al., 1994; Pajares & Miller; 1994; Randhawa, Beamer, & Lundberg, 1993). A second personal factor included in this study is rural youth's residential preference. Rural youth may experience a conflict between the pursuit of educational opportunities and career versus the desire to live in their local communities and near their families in adulthood (Elder et al., 1996; Hektner, 1995; Howley, 2006; Johnson, Elder, & Stern, 2005). Mathematics-related efficacy beliefs and geographic residential preference are included as latent factors that represent personal influences on the two outcome variables. Research related to these two factors is discussed in the following paragraphs.

Mathematics Self-efficacy Beliefs

Efficacy-related beliefs are central to social cognitive theory (Bandura, 1986; Bandura, 2001; Bandura et al., 1996, 2001; Lent et al., 1994) and are associated in research findings with educational attainment-related outcomes. Self-efficacy beliefs play a role in the educational achievement and aspirations-related choices of adolescents (Bandura, et al., 1996, 2001; Pajares & Miller, 1994). When examining competency beliefs for their predictive relation to behavioral outcomes, domain-specific beliefs are more predictive to particular domains of achievement such as mathematics (Bandura, 1997; Pajares & Miller, 1994). This study uses a domain-specific measure of self-efficacy, mathematics self-efficacy beliefs, because of its hypothesized relation to mathematics achievement, which serves as a gateway to future life outcomes including college attendance and graduation (Balfanz &

Byrnes, 2006; Casey et al., 1997; U.S. Department of Education, 1997).

Mathematics self-efficacy beliefs have been studied for over 20 years. Numerous studies have documented positive associations between higher mathematics self-efficacy and higher mathematics achievement outcomes (Meece, Wigfield, & Eccles, 1990; Pajares & Miller, 1994; Patrick et al., 2007; Randhawa et al., 1993). For example, in a study of 225 high school seniors in Canada, Randhawa, Beamer, and Lundberg (1993) reported that students' mathematics self-efficacy was positively associated with their scores on a standardized mathematics test. Similarly, Pajares and Miller (1994) found that higher mathematics self-efficacy beliefs were related to higher mathematics achievement on a standardized test of mathematics aptitude in a sample of 350 college undergraduates.

Academic self-efficacy beliefs also shape students' aspirations for career and educational attainment (Bandura et al., 2001). In a study of over 250 Italian youth, researchers found that students' academic self-efficacy beliefs influenced their self-reported academic aspirations in the amount of schooling they planned to acquire (Bandura et al., 2001). Similar to this study, Bandura et al.'s study (2001) included survey items that asked students to indicate the educational level they expected to complete, ranging from completing middle or high school to graduating from college.

The research above combines to guide this dissertation study's interest in the relation of mathematics self-efficacy beliefs to rural youth's educational expectations. Research suggests that mathematics self-efficacy beliefs are influential to mathematics achievement (Meece, Wigfield, & Eccles, 1990; Pajares & Miller, 1994; Patrick et al., 2007; Randhawa et al., 1993), academic self-efficacy is related to educational aspirations (Bandura et al., 2001), and mathematics achievement is a path to future educational and career opportunities

(Balfanz & Byrnes, 2006; Casey et al., 1997; U.S. Department of Education, 1997). Researchers have discussed that self-efficacy beliefs guide and direct behavior toward or away from a given task or activity (Pajares & Miller, 1994; Randhawa et al., 1993). High mathematics self-efficacy beliefs foster student confidence in taking mathematics-related coursework (Randhawa et al., 1993), which increases knowledge and skill development in mathematics. A recent U.S. Department of Education report on students' ELS mathematics achievement gains between the 2002 and the 2004 ELS test administrations found that students with higher achievement gains on the advanced mathematics-related test items were those who took more advanced courses during their last two years of high school, such as pre-calculus (U.S. Department of Education, 2008b). Higher achievement in mathematics has been demonstrated to associate with college attendance, college graduation, and job satisfaction (ACT, 2008; Allen & Sconing, 2005).

With this research as a guide, this study uses a social cognitive theoretical approach to examine mathematics self-efficacy beliefs and their influence on educational attainment-related outcomes in rural youth.

Geographic Residential Preference

An individual's residential preference may be an important consideration when examining rural adolescent educational attainment-related outcomes. Beginning with the 1980 HSB, researchers comparing rural and nonrural youth have found that rural college-bound youth placed a higher importance on moving away from their local community than did nonrural college-bound youth, while no differences were found between rural and nonrural work-bound youth (Cobb et al., 1989; Rojewski, 1999). Cobb et al. (1989) examined data from over 10,000 youth who participated in the HSB and reported that rural youth were more willing than urban youth to move away for a job they wanted. Sarigiani et al. (1990) reported similar findings for a sample of 500 rural and suburban adolescents. Interestingly, female adolescents in the Sarigiani study (1990) were less likely than their male peers to see themselves living in the local area 10 years into the future.

In a classic longitudinal study of approximately 400 rural youth in Iowa during the 1980s and 1990s, Johnson, Elder, and Stern (2005) reported that residential preference was associated with achievement outcomes and educational plans. Similar to the measures used in this study, the researchers measured “educational plans” by asking “how far do you think you will actually go in school?,” with responses ranging from dropping out of high school to Ph.D. or professional degree completion (Johnson et al., 2005, p. 107). Achievement in the study of Iowa youth was measured by youth’s self-reported grade point average (Johnson et al., 2005). The study found that youth with higher self-reported grades and higher educational attainment plans placed less importance on remaining in their local area and living near family (Elder et al., 1996; Johnson et al., 2005).

Researchers comparing rural and nonrural youth have often described rural youths’ aspirations as being lower than their nonrural peers (Bajema, Miller, & Williams, 2002; Blackwell & McLaughlin, 1999; Brookings Institution, 2003; Cobb, McIntire, & Pratt, 1989; Haller & Virkler, 1993; Hansen & McIntire, 1989; Hektner, 1995; Howley, 2006; Provasnik et al., 2007; Rojewski, 1999). More recent analyses have suggested that a significant difference exists only for postgraduate educational aspirations (Howley, 2006). Adolescent preferences to live near their families and communities in their adulthood may influence their educational aspirations and achievement. Rural youth tend to have higher educational and occupational attainment aspirations when they are willing to leave their rural communities to further their education and to pursue an occupation (Elder et al., 1996; Johnson et al., 2005; Rojewski, 1999).

Building on these studies, this dissertation examined the influence of rural youth's residential preference as measured during their sophomore year on their educational expectations and mathematics achievement two years later. This research expands prior research that has found a relation between rural youth's residential preference and educational attainment-related outcomes to a national sample. The study conceptualizes rural youth's geographic residential preference as a latent construct and relies on two indicators that assessed the importance of moving away and the importance of living near family.

Contributions of Environmental Influences on Self-efficacy Beliefs

Consistent with social cognitive theory, adolescent self-beliefs can be subject to many influences, including experiences in schools and classrooms, as well as factors associated with parent characteristics such as SES (Bandura, 2001; Bandura et al., 2001; Eccles, 1994; Pajares & Miller, 1994). Students' experiences in classrooms and with teachers help to shape their self-perceptions of ability and achievement values (Brattesani et al., 1984; Eccles, 2004). For example, researchers have examined how academics are emphasized within schools and classrooms in mastery versus performance goal orientations. Research during the past three decades has demonstrated a relation between school- and classroom-level mastery goal orientations toward learning and positive student self-beliefs about their academic competencies (e.g., Meece, Anderman, & Anderman, 2006; Roeser et al., 1996). Mastery goal orientations foster a learning environment in which students' learning and improvement is valued. This learning climate contrasts with a performance goal orientation in which competition for grades and recognition is encouraged (Meece et al., 2006). Similarly, researchers investigating school-level goal orientations found a significant positive relation between students' perceptions of a mastery goal orientation and self-reports of academic self-efficacy (Roeser et al., 1996). The sample for the Roeser, Midgely, and Urdan (1996) study consisted of nearly 300 students attending two middle schools near a major metropolitan area.

Research related to the role of certain types of teachers' beliefs has also demonstrated relations to students' academic efficacy (Ryan et al., 1998). In a classroom-level study of over 500 6th-grade students and their math teachers, researchers examined teachers' beliefs about their role in students' social and emotional well-being, students' academic efficacy, and students' help-seeking behavior among other things (Ryan et al., 1998). They reported that in classrooms where teachers reported being more concerned about students' social and emotional well-being, students with lower academic self-efficacy beliefs were less inhibited in their help-seeking behavior (Ryan et al., 1998). Such teachers appear to create a classroom social climate that is more nurturing and supportive of learning for all students (Ryan et al., 1998).

Researchers have found associations between the school's social environment and students' academic self-efficacy such that self-efficacy is higher when students reported more positive perceptions of their schools and classrooms (Felner, Aber, Primavera, & Cauce, 1985; Patrick et al., 2007; Ryan & Patrick, 2001). For example, research with urban high school students found that students who reported more positive feelings about teacher support had higher scholastic self-concept (Felner et al., 1985). Classroom-level research shows similar findings. In separate studies of 5th graders and 8th graders, researchers found (Patrick et al., 2007; Ryan & Patrick, 2001) that the classroom social environment, based on students' survey responses to items about students' perceptions of aspects of teacher and student support, was associated positively with both motivational and engagement-related outcomes (e.g., academic self-efficacy and self-regulated learning). Taken together, these research studies provide evidence documenting the relations between the school's social climate and adolescents' self-reports of academic efficacy.

Another influence related to school context that can influence self-beliefs of competency during adolescence in particular is curricular tracking. While the research on the value of curricular tracking appears to have mixed results (Eccles, 2004; Eccles & Roeser, 2003; George, 1993; National Research Council and Institute of Medicine, 2004; Oakes, 1986; 1987), researchers have suggested that membership in the noncollege preparatory tracks can negatively influence competency beliefs and attitudes toward school (Eccles, 2004; Eccles & Roeser, 2003; Gamoran, & Page, 1992; George, 1993; Oakes, 1986, 1987). However, few studies have empirically tested relations between curricular tracking and competency-related beliefs.

Researchers argue that the negative effect of lower socioeconomic status, or poverty, on educational attainment-related outcomes is often mediated through other factors, such as parenting processes (Duncan et al., 1998; Gershoff et al., 2007; McLoyd, 1998; Smith et al., 1997), chronic life stress (Evans & English, 2002), and the home environment (Smith et al., 1997; Votruba-Drzal, 2003; Yeung, 2002). Social cognitive theory suggests that cognitive processes associated with self-beliefs mediate the influence of SES on behavioral outcomes (Bandura, 2001). Consistent with a social cognitive framework, this study includes SES as an influence on rural youth's mathematics self-efficacy beliefs.

Summary of Literature Review

The purpose of this dissertation research is to use a social cognitive theoretical framework to examine the influence of environmental and personal variables on educational expectations and achievement among rural youth. As reviewed in this chapter, research has demonstrated that aspects of school contexts and socioeconomic status are influential to youth's education-related outcomes (e.g., Eccles, 2004; Eccles & Roeser, 2003; McLoyd, 1998). Rural youth may also face a unique conflict regarding whether to stay in their home communities or to leave for more promising educational and career opportunities elsewhere (Hektner, 1995; Howley, 2006; Kannapel & DeYoung, 1999; Rojewski, 1999). Building from research reviewed in this chapter, this study relies upon items from the U.S. Department of Education's ELS: 2002 and 2004 to measure the influence of the following latent constructs and observed variables on students' educational expectations and achievement: Academic Press, Relational Context of Schools, Mathematics Teacher Beliefs About Students Success, SES, High School Program, Mathematics Self-efficacy Beliefs, and Geographic Residential Preference. Analyses are conducted to further test whether mathematics self-efficacy beliefs mediate the influence of schooling contextual factors and socioeconomic influences on educational expectations and achievement.

Research Questions and Hypotheses

This study asked several research questions and posed hypotheses for each. There were hypotheses for direct and indirect effects. This section outlines the research questions and hypotheses for this study.

Direct Effects on Educational Expectations and Mathematics Achievement

Research focused primarily on urban youth has emphasized the important influence of schooling experiences, family socioeconomic status, and personal beliefs and preferences on adolescents' educational expectations and achievement. The following research questions and hypotheses are examined in this study:

1) Is academic press significantly related to adolescent educational expectations and achievement? I hypothesized that academic press would have a direct positive relation to student achievement and educational expectations.

2) Is relational context of schools significantly related to adolescent educational expectations and achievement? I hypothesized that the perceived relational context of the school would have a direct positive relation to student achievement and educational expectations.

3) Are mathematics teacher beliefs about students' success in school significantly related to adolescent educational expectations and achievement? I hypothesized that mathematics teacher beliefs would have a direct positive relation to educational expectations and achievement.

4) Is high school program significantly related to educational expectations and achievement? I hypothesized enrollment in more academically oriented tracks would be positively associated with educational expectations and achievement.

5) Is SES significantly related to adolescent educational expectations and achievement? I hypothesized that SES would be positively associated with adolescent educational expectations and achievement.

6) Is geographic mobility preference significantly related to educational expectations and achievement? I hypothesized that adolescents who place a higher importance on moving away and lower importance on living near family would have both higher educational expectations and higher achievement outcomes.

7) *Are mathematics self-efficacy beliefs significantly related to adolescent educational expectations and achievement?* I hypothesized that adolescents with more positive mathematics self-efficacy beliefs would have higher achievement outcomes and higher educational expectations.

Direct Effects on Mathematics Self-efficacy Beliefs

This study examines the utility of a social cognitive framework for understanding the influence of environmental (school and family) and personal influences on rural youth's educational expectations and achievement. In keeping with this theoretical framework, the following research questions and hypotheses that pertain to influences on mathematics self-efficacy beliefs are examined in this study:

1) Is academic press significantly related to mathematics self-efficacy beliefs? I hypothesized that academic press would have a positive direct relation to mathematics self-efficacy beliefs.

2) Is relational context of schools significantly related to mathematics self-efficacy beliefs? I hypothesized that perceived relational context of the school would have a positive direct relation to mathematics self-efficacy beliefs.

3) Are mathematics teacher beliefs about their role in student success significantly related to mathematics self-efficacy beliefs? I hypothesized that mathematics teacher beliefs about their role in student success would have a positive direct relation to mathematics self-efficacy beliefs.

4) Is SES significantly related to mathematics self-efficacy beliefs? I hypothesized that SES would have a positive direct relation to mathematics self-efficacy beliefs.

5) Is high school program significantly related to mathematics self-efficacy beliefs? I hypothesized that enrollment in more academically oriented tracks would have a positive direct relation to mathematics self-efficacy beliefs.

Research Question and Hypothesis Related to Mediation

More research is needed that uses a theoretical approach to examine and explain developmental processes by which school and family influences affect rural adolescents' performance in school and plans for their educational futures. Using a social cognitive theoretical approach, the following question and hypothesis regarding mathematics self-efficacy beliefs as a mediator was examined:

Do mathematics self-efficacy beliefs mediate the relations of academic press, relational context of schools, mathematics teacher beliefs, high school program, and SES to adolescent educational expectations and achievement? I hypothesized that the influence of academic press, the relational context of schools, mathematics teacher beliefs, SES, and high school program on educational expectations and achievement outcomes would be mediated, in part, through mathematics self-efficacy beliefs.

CHAPTER III

METHOD

This study used data available in the U.S. Department of Education's Educational Longitudinal Study conducted in 2002 and 2004 (ELS: 2002 and 2004), which were provided as a public-use data file by the U.S. Department of Education (see the section on participants for a description of ELS). The ELS: 2002 and 2004 builds on prior U.S. Department of Education national samples of the nation's youth, including both the 1988 NELS and the earlier 1980 HSB. Data from both NELS and HSB have contributed to the present understanding of adolescents' educational plans for the future, and ELS provides similar information with a more recent sample. The ELS: 2002 and 2004 allows the identification of students by level of urbanicity (i.e., urban, suburban, or rural) and school type (i.e., public, Catholic, or private), enabling the examination of *rural*, *public* school students only[1]. Because of the large sample size of ELS: 2002 and 2004, it is possible to study a sizable, diverse sample of students attending rural schools (*n* = 2,095 for the present study). Further, ELS: 2002 and 2004 provides data from the sampled students' parents, teachers, and school administrators on measures important for the theoretical underpinnings of this study, including 10th-grade school-, parent-, and personal-related latent factors and observed variables to assess how they may relate to 2004 educational expectations and achievement outcomes. Measures available in the ELS: 2002 and 2004 include student socioeconomic

[1] Though definitions of rural vary, for this study rural is defined according to the definition used by the Educational Longitudinal Study of 2002 (ELS 2002), which is "in a rural area, either inside or outside a metropolitan statistical area (MSA)" (U.S. Department of Education, 2004a, p. 40).

status (SES), high school program enrollment, math achievement, and educational expectations, as well as information on teacher beliefs about students' learning and aspects of school climate.

Relying on social cognitive theory (Bandura, 1986) while also drawing from the Eccles and Roeser (2003) framework for analyzing school contexts, this study examined selected influences on rural adolescents' educational expectations and achievement. Using structural equation modeling (SEM) procedures, a partial mediation model was proposed such that environmental factors associated with school and parental SES were expected to have both direct and indirect influence on educational expectations and achievement (see Figures 3.1 and 3.2). Mathematics self-efficacy beliefs was proposed as the pathway through which the proposed indirect influence would relate to the outcome variables educational expectations and achievement. Further, the proposed model included a personal factor related to residential preference (e.g., importance of remaining close to relatives) that was hypothesized to directly influence educational expectations and achievement outcomes. This model represents a partial mediation model, in that both direct and indirect effects were proposed, with efficacy-related beliefs as the mediator. The latent construct associated with geographic mobility was proposed to have only direct effects on the educational attainment-related outcomes. A set of indicators was proposed for each latent construct; their interrelation and their relation to students' educational expectations and achievement were examined.

This section provides details about the participants, measures, preparation of data for analysis, and the testing of the measurement model. Information about participants and measure descriptions are provided based on data from the ELS 2002/2004 and from SPSS descriptive analyses. The details of data preparation will be reviewed as will information about testing the measurement model.

Participants

As part of the ELS 2002/2004, the U.S. Department of Education surveyed 15,325 randomly selected high school sophomores in 752 randomly selected public, Catholic, and private high schools across the United States in 2002. From each school, approximately 25 students in 10th grade were randomly selected for participation and invited to participate. Asian and Hispanic students were over-sampled relative to their proportion of the U.S. student population (U.S. Department of Education, 2004a). Further, the parents, teachers, school librarians, and school administrators of the participating students were also surveyed (U.S. Department of Education, 2004a).

In 2004, a follow-up survey was conducted, in which 14,713 students who had participated in 2002 were surveyed again. Thus, the size of the national sample from which the rural, public school sample for this study was drawn was 14,713 students. The U.S. Department of Education tried to include all students from the 2002 survey, regardless of whether they were still students at their base-year schools. While most students from the 2002 survey were enrolled in their same school in 2004, some were not. By 2004, some of the 2002 participants had enrolled in different schools, were early high school graduates, home-schooled, or had dropped out of school altogether. Students who were not in their base-year schools were given surveys tailored to their current situation (e.g., dropout, home-schooled, transfer-student). To ensure that the 2004 sample was representative of the spring 2004 class of high school seniors nationally, the sample was "freshened," meaning new

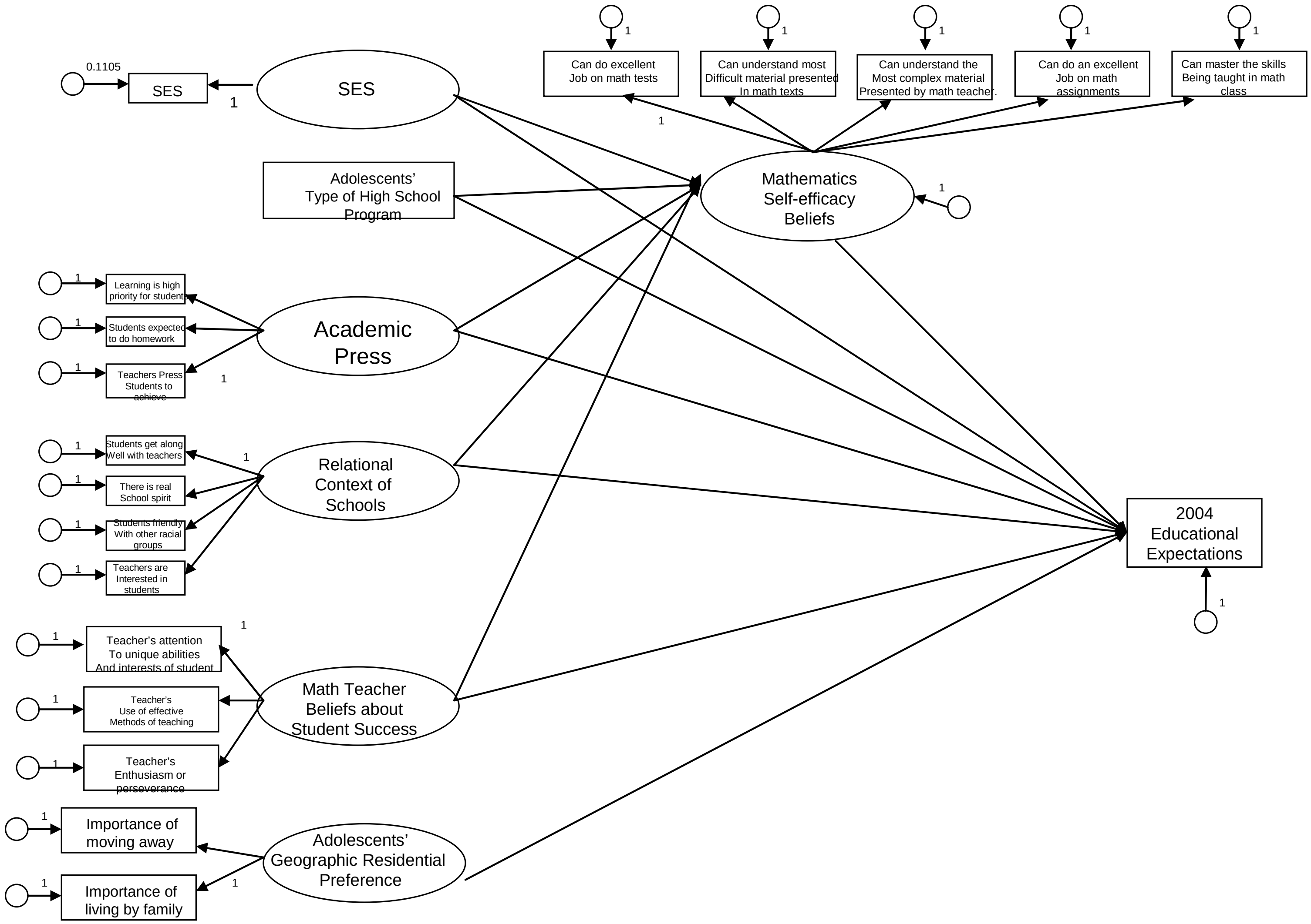

Figure 3.1: Proposed model for educational expectations depicting both measurement and structural components. All latent factors are correlated. For purposes of visual clarity and ease of viewing, those relationships are not depicted.

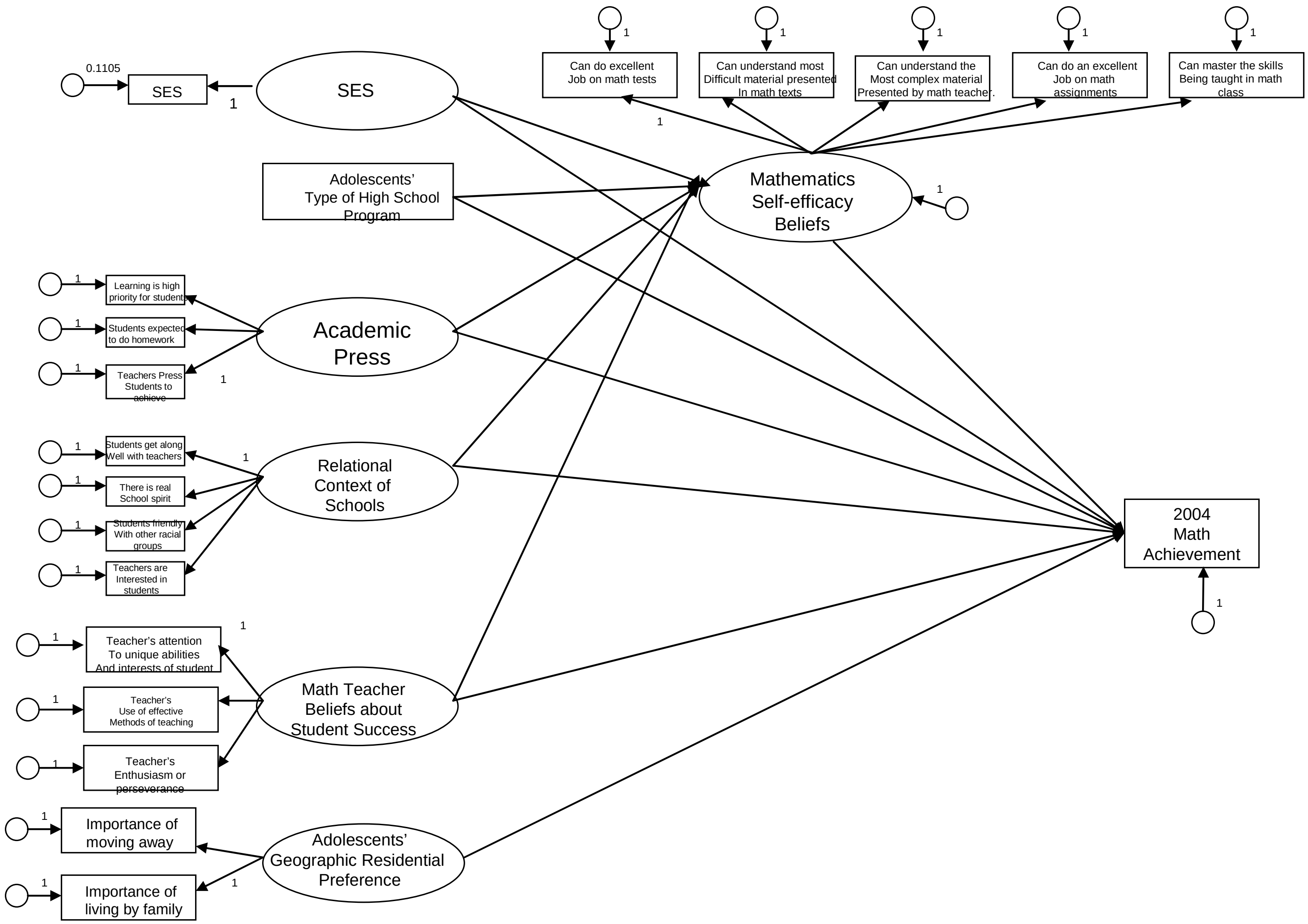

Figure 3.2: Proposed model for mathematics achievement depicting both measurement and structural components. All latent factors are correlated. For purposes of visual clarity and ease of viewing, those relationships are not depicted.

students were included who had not been participants in 2002. This study does not include any of the students added to “freshen” the sample because they lack 2002 data.

To obtain the sample for this study from the national sample surveyed in both 2002 and 2004, all students who attended rural, public schools (n = 2,491) were selected. Not all of these rural, public school students were included in the analyses, however, due to their ineligibility based on a lack of information pertaining to the selected outcome variables under investigation. Rural, public school students who did not have a score on the math achievement test were omitted from the sample, as were students who selected “don’t know” for their response to the outcome variable related to educational expectations.[2] For these two reasons, 396 students were omitted from the total rural, public school sample of 2,491, reducing the initial sample to a final sample of 2,095 rural, public school students.

The student sample is described below as is the information available about parents, teachers, and school administrators.

Students

The analysis dataset included the 2,095 rural, public school students who were participants in both the ELS 2002 and 2004, had a 2004 math achievement test score, and provided a response other than “don’t know” to the question pertaining to their educational expectations. Although all 2,095 students were in 10th grade during the ELS: 2002, not all were seniors by 2004. Nearly 82% of the sample had progressed to 12th grade, but about 2% were in other grades. Of the remaining students in the sample, less than 1% were home-schooled, 4% had completed high school, 5% were dropouts, and nearly 7% were non-

[2] Of the 2,491 rural, public school students total, there were 231 students (or about 9%) who answered “don’t know” to the educational expectations question; 185 of these students had a math achievement test score. The “don’t know” students were omitted from the analyses due to the impossibility of assigning a rank-order value for “don’t know” versus the other response possibilities ranging from “dropout” to “M.D.” General descriptive information is provided about this group of students in Appendix A.

respondents. Most respondents would have reached the age of 18 (55%) or 19 (38%) by the end of calendar year 2004. The basic demographic characteristics of the student sample were as follows: 51.1% were female; 76.9% were White, 8.5% were Black or African American; 6.3% were Latino or Hispanic; 3.4% were Asian or Pacific Islander; 1.4% were American Indian or Alaska Native; and 3.5% reported more than one race. Some 31% of the students in this sample were in families with incomes below $35,000, while another 48% were in families making between $35,000 and $75,000. Approximately 13% of this sample lived in families with annual incomes between $75,000 and $100,000, and about 8% lived in families making over $100,000 per year. Twenty-four percent were in the lowest quartile for SES,[3] and 20.9% were in the highest quartile for SES.

The student sample for this study attended 130 rural schools across the United States, with 47% of students in schools in the South, 29% in schools in the Midwest, 14% in schools in the Northeast, and 10% in schools in the West.[4] Students attended a variety of types of schools: less than 1% attended schools in which the grade span started in the elementary grades (K-5); 10% attended schools in which the grade span started in the middle grades (6-8); 83% attended schools in which the grade span started in the 9th grade; and 6% attended schools in which the grade span started in the 10th grade.[5] Regarding school size, total school enrollment was included as an item, with categorical response options, in the school administrator's survey. These data indicated that one-third of the rural sample attended

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[3] SES quartiles are determined by taking the SES measure and dividing the range of possible values for SES into quartiles. The SES measure will be described later in this section and is a composite created by the U.S. Department of Education consisting of five equally weighted parts (both parents' education, both parents' occupation, and family income).

[4] These regional divisions are provided in the ELS: 2002 and 2004 ECB, as created by ELS.

[5] Grade span configuration as described here represents the way the information was collected from school administrators and provided in the ELS 2002/2004 ECB. Specific information as whether a school is K-12 versus 3-12, for example, is not available.

schools of 1,000 to 2,500 students, and 44% attended schools with fewer than 600 students. Of these students, 25% attended schools with fewer than 400 students.

Parents

For each student, the parent questionnaire was completed by only one respondent, who was required to be either the parent or the guardian most familiar with the student. Parents self-reported demographic information pertaining to race/ethnicity as follows: 72.2% White, 7.8% Black or African American, 4.8% Latino or Hispanic, 2.9% Asian or Pacific Islander, 1.0% American Indian or Alaska Native, and 1.4% reported more than one race. Questionnaires for nearly 10% of the parents have missing data for race/ethnicity because they left the question blank in the ELS 2002 survey. Parental self-reported educational levels were distributed as follows: 3.6% of parents were high school dropouts; 26.3% obtained a high school diploma or GED; 12% have a 2-year degree; just more than 20% have a 4-year degree; 8.8% have a Master’s Degree; and 2.6% have a Ph.D., M.D., or some other advanced degree. The remaining parents attended either a 2-year or 4-year college but did not graduate. Only 2% of mothers and 0.2% of fathers reported being unemployed, and only 3.7% of mothers and 2.3% of fathers reported being a homemakers as their occupation.

Teachers

Results from teachers who taught math to one or more of the study participants were used. Teacher identification numbers were not made available in the public use datafile. It is not possible to determine how many teachers are included in this survey, as the teachers are tied to the students in the survey, rather than students tied to teachers. Demographic information about teachers was not available in the public use datafile. Each teacher surveyed had a least one student who participated in the ELS 2002. It is also possible that some teachers may have taught more than one student who participated.

School Administrators

Each school had the person considered to be the school administrator or principal complete a survey that contained questions about the overall school. Survey results from school administrators in schools with participating students were included (n = 130). Demographic information about school administrators is not available in the public use datafile.

Measures

This study uses two outcome variables, educational expectations and achievement, which are observed measures provided by the ELS 2004. The study also includes six latent factors as predictor variables (i.e., Academic Press, Relational Context of Schools, Math Teacher Beliefs, Socioeconomic Status (SES), Geographic Residential Preference, Mathematics Self-efficacy Beliefs), each with indicators provided in the dataset. There is one observed variable (High School Program), which also serves as a predictor in the model. The six latent factors and the one observed variable were measured on the ELS 2002 surveys. All variables used in the model are explained in this section, beginning with the two observed outcome variables first, followed by a description of the variables used as predictors.

Outcome Variables

Educational expectations. This measure comes from the 2004 student survey. Students reported how much education they expected to complete, which is a question used in both ELS and NELS. The specific question students answered is: “As things stand now, how far in school do you think you will get?” Response options are: 1 = *Less than high school graduation*; 2 = *GED or other equivalency only*; 3 = *High school graduation only*; 4 =

Attend or complete a 2-year college/school; 5 = *Attend college, but not complete a 4-year degree*; 6 = *Graduate from college*; 7 = *Obtain a Master's degree or equivalent*; 8 = *Obtain a Ph.D., M.D., or other advanced degree*; 9 = *Don't know*. When creating the public-use datafile, the U.S. Department of Education imputed scores that were missing for all eligible participants (U.S. Department of Education, 2006b); therefore, there were no missing data for this measure in this sample.

Mathematics achievement. The achievement measure comes from the score students received on the math achievement test administered to 2004 participants[6] as part of the ELS 2004. The measure used in this study represents the math standardized T score, as provided in the ECB for the ELS 2002/2004. The math standardized T score provides information on student performance relative to 12th-grade students who took the test as part of the ELS 2004.[7] The variable has a mean of 50 and a standard deviation of 10, with a minimum score of 23.67 and a maximum score of 79.85. The use of this measure of achievement provides information about how individual students, or groups of students, performed relative to the national average (U.S. Department of Education, 2006c, p. 41). This achievement measure was created by the U.S. Department of Education and is made available in the ECB in the public use datafile.

Students who did not have a score for the math test were not included in the sample. Reported alpha coefficients for the math tests are .91 and .89 for Form 1 and Form 2 respectively (U.S. Department of Education, 2003, p.61). The test contained items from

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[6] Of note, only 2004 participants who were in the same school as 2002 were administered the math achievement test (U.S. Department of Education, 2005c).

[7] As described in the ECB, "although the T score is reported for all F1 in-school responding students (including transfer students), regardless of grade level, the comparison group for standardizing is the 12th grade population" (U.S. Department of Education, 2006b, measure description in ECB, no page number).

"arithmetic, algebra, geometry, data/probability, and advanced topics" and was "divided into process categories of skill/knowledge, understanding/comprehension, and problem solving" (U.S. Department of Education, 2006c, p. 34). The items used on the math achievement tests are items used previously on other tests, including the 1988 NELS, NAEP, and the Programme for International Student Assessment (PISA). NAEP is a national test of students in multiple subject areas that provides student assessment data that are comparable across states. PISA is an international test administered to 15-year-olds in industrialized countries around the world (U.S. Department of Education, 2006c, p. 34).

Predictor Variables

The study also conceptualized Academic Press, Relational Context of Schools, Math Teacher Beliefs about Student Success, Socioeconomic Status (SES), Geographic Residential Preference, Mathematics Self-efficacy Beliefs, with reflective indicators that were available as items in the ELS: 2002. The model also used High School Program as a predictor of the outcomes, which was also measured on the ELS: 2002 survey. The specific variables selected are described below.

Academic press. This latent factor measure of school climate was created for this study. The ELS: 2002 Administrator Survey included several questions related to aspects of the school climate that were specific to the degree of academic emphasis within the school and were selected as indicators of the "Academic Press" latent factor. The selected items included: "Teachers at this school press students to achieve academically," "Students place a high priority on learning," and "Students are expected to do homework." Respondents answer the questions using a five-point Likert-type scale ranging from 1 = *not accurate at all* to 5 = *very accurate*.

Relational context of schools. This latent factor was created for this study and included four questions that were taken from student survey questions pertaining to their school and teachers. Students were asked how much they agreed or disagreed with the following statements: a) “Students get along well with teachers;” b) “There is real school spirit;” c) “Students make friends with students of other racial and ethnic groups;” and d) “Teachers are interested in students.” Respondents were asked to answer the questions using a four-point Likert-type scale ranging from 1 = *strongly agree* to 4 = *strongly disagree*. The four items were reverse coded, such that higher scores indicate stronger agreement for each item selected.

Mathematics teacher beliefs about student success (Math Teacher Beliefs). This latent factor was created for this study. It included three questions taken from the ELS 2002 math teacher survey items. The indicators measuring teacher beliefs about what influences student success came from teacher responses to the following single question with multiple sub-parts: “When students are successful in achieving intended goals or objectives, it is often attributed to one of the following sources. In your opinion, how important is each source of success: a) teacher’s attention to the unique interests and abilities of the student; b) teacher’s use of effective methods of teaching; and c) teacher’s enthusiasm or perseverance.” Respondents were asked to rate their responses to each item on a four-point Likert-type scale ranging from 1 = *extremely important* to 4 = *not at all important*. The three items were reverse coded such that higher scores indicated higher importance for each item selected.

Socioeconomic status (SES). This study includes a latent factor for SES, which has only one indicator. The indicator is a composite variable created by the U.S. Department of Education based on information provided in the parent surveys or by students if parent data were missing. The composite variable included five equally weighted measures: both parents' or guardians' educational level, both parents' or guardians' occupation, and family income. In contrast to the other predictor variables used in this study, the SES composite measure is depicted in the model as a single observed indicator. Because there is only one indicator, it was necessary to set the value of the error variance for model identification purposes. The reliability estimate for SES is .74 (U.S. Department of Education, 1995), the observed variance is .425, and the error variance equals .1105 (using formula of .26 * observed variance) (W.B.Ware, personal communication, April 1, 2008). The U.S. Department of Education imputed missing data for this measure.

Geographic residential preference. A latent factor for geographic residential preference was created for this study with two reflective indicators. The indicators were taken from two survey items asked as part of the following question: "How important is each of the following to you in your life?;" a) "living close to parents and relatives;" and b) "getting away from this area of the country." Responses were provided on a three-point Likert scale with the following options: 1 = *Not important*, 2 = *Somewhat important,* and 3 = *Very important*. The item for importance of "living close to parents and relatives" was reverse coded such that higher scores indicated less importance.

Mathematics self-efficacy beliefs. A latent factor for student efficacy-related beliefs was created for this study. It included indicators taken from responses to math self-efficacy questions on the study survey. There were five math-related items that focused on self-efficacy beliefs. The selected items included: a) "I'm confident I can do an excellent job on my math tests;" b) "I'm certain I can understand the most difficult material presented in math texts;" c) "I'm confident I can understand the most complex material presented by my math teacher;" d) "I'm confident I can do an excellent job on my math assignments;" and e) "I'm certain I can master the skills being taught in my math class" (U.S. Dept of Education, 2003). Responses were provided on a four-point Likert scale with the following responses: 1 = *Almost never*, 2 = *Sometimes*, 3 = *Often*, and 4 = *Almost always*. Higher scores on these items indicated more positive self-beliefs related to their math competencies.

High school program. On the ELS 2002 student survey, students were asked "If you had to limit yourself to one of the following three choices, which comes nearest to describing your high school program?" Response options were 1 = *General*, 2 = *College preparatory (academic)*, 3 = *Vocational (including technical or business)*. The U.S. Department of Education imputed missing data for this measure. This measure was recoded such that the general education and vocational education programs were combined into one variable and given a label of 1; college preparatory remained in its original form with a label of 2. The research literature supports this coding procedure that treats enrollment in college preparatory programs as a more academically rigorous track (Akos et al., 2007; National Research Council and Institute of Medicine, 2004).

Preparation of Data for Analysis

This section provides details regarding the preparation of the data for analysis. Some background information explaining the data from ELS will be provided first, followed by information about the construction of the analysis dataset. The process for examining the measurement model is provided next. The chapter concludes with a brief summary.

Background Information on the Data

It is important to explain that the ELS 2002 is based on the random selection of schools across the United States and then a subsequent random selection of 10th-grade students per school. Of the randomly selected schools that agreed to participate (n = 752), approximately 25 students in 10th grade per school were randomly selected for participation and invited to voluntarily participate. A total of 15,325 students agreed to participate in the study in 2002, and a total of 14,713 of these students participated again in 2004 (n = 14,713) (U.S. Department of Education, 2004b).

Applying Sample and Design Weights

The U.S. Department of Education provides the ELS 2002 and 2004 data to the public upon request via an Electronic Codebook (ECB). In the ELS sample design, schools were randomly selected, then students within those selected schools were randomly selected. The design of the ELS also included the over-sampling of Asian and Hispanic students. Final design weights take into account the unequal probabilities of school and student selection, the fact that not all who were selected agreed to participate, and also the over-sampling of Asians and Hispanics. The weights help ensure that analyses represent the population under study. A school weight variable is available for researchers interested in which the school is the unit of analysis and a student weight variable is available for researchers interested in which the student is the unit of analysis. The unit of analysis for this study is the student and a student weight variable (F1PNLWT) was used in the analyses. This student weight variable is for the sample of 14,713 students who were participants in both the 2002 and 2004[8] (U.S. Department of Education, 2006b). Any potential problems that may be associated with the possibility of students nested, or clustered, within schools are accounted for by the use of the selected student weighting variable, as it takes into account design effects and prevents the

[8] Technically, the variable also applies to 2004 participants who chose not to participate in 2002 and for whom data were imputed by the U.S. Department of Education. Such a participant would have been someone randomly selected for ELS 2002, who agreed to participate, but then subsequently did not complete the survey, for example, but then did participate in 2004.

under-estimation of standard errors (U.S. Department of Education, 2004b). Additionally, there are variables that identify both strata and clusters within strata; both were used as part of the identification of the complex sample design programming for use with Mplus (U.S. Department of Education, 2004a). Although students are nested in schools in the ELS, students are not nested, in the traditional sense, within classrooms. The survey design was such that teachers included in the ELS 2002 were included by virtue of student participation rather than the alternative, which is having students included by virtue of being students in certain teachers' classrooms.

Software Support

The software used to support this study was SPSS 15.0, SAS 9.1.3, Mplus Version 5, and Microsoft Excel. SPSS 15.0 was used to build the initial dataset as well as to support descriptive analyses. SAS was used for imputation procedures. Mplus was used for the CFA and SEM analyses; Mplus is the recommended SEM software for use with this dataset owing to its utility with categorical variables, complex sample designs, and multiple imputed data. Microsoft Excel was used to calculate the reliability measure coefficient H (see pp. 72-73), as well as to calculate the significance of the indirect and total effects in the final models.

Construction of Analysis Dataset

A dataset was constructed by extracting relevant variables and weights from the ELS 2002/2004's ECB. The ECB provides the data for all ELS 2002 and 2004 participants on all measures, requires the preselection of variables, and provides directions for how to create datasets based on the variables selected. The dataset was created in SPSS 15.0. Because of the complex sample design, the following weights and flags were included in the dataset creation process: a strata variable, a primary sampling unit variable, a student design weight, and a variable designating 10th-grade cohort status. Owing to the complex sample design, it is necessary to include the entire sample of 14,713 when running the analyses because the student design weight, strata variable, and primary sampling unit values work together based on the inclusion of the entire sample. Using Mplus software, it was possible to run the analyses using all 14,713 cases for the purposes of the inclusion of the design weights variables, while simultaneously restricting the sample for model analyses purposes to the selected rural, public school students only (n = 2,095).

Recoded measures. As described in the Measures section, eight items were reverse coded. These included four indicators for the latent factor “relational context of schools;” three indicators for the latent factor “math teacher beliefs about student success;” and the “importance of living by family” item for the latent factor “geographic residential preference.” The review of the measures also led to a consolidation of the three responses for high school program enrollment into two categories as follows: the general education and vocational education programs were combined into one variable and given a label of 1; college preparatory remained in its original form with a label of 2. The research literature supports this coding procedure. The college preparatory program is considered to be a more academically rigorous track when compared to general and vocational education programs (Akos et al., 2007; National Research Council and Institute of Medicine, 2004). Research suggests that students enrolled in college preparatory programs have higher educational plans for the future (Berends, 1995; Mau & Bikos, 2000), while students in the noncollege preparatory programs tend to have lower academic achievement outcomes (Berends, 1995; Bryk & Thum, 1989; Coleman & Hoffer, 1987; Eccles & Roeser, 2003; Lee & Smith, 1995; Mickelson & Heath, 1999). Next, the variable for the primary sampling unit (PSU) (or the clustering of schools within strata) had to be recoded to ensure that each PSU had a unique identifier for Mplus to read. The ELS has two or three PSUs per stratum, coded as 1, 2, or 3 for each stratum. Mplus requires unique identifiers for each PSU; therefore, PSU's were recoded to maintain their association with their stratum but have a unique identifier (e.g. Stratum 1 – PSU 1, PSU 2, PSU 3; Stratum 2 – PSU 4, PSU 5, PSU 6).

Finally, this analysis treats the outcome variable educational expectations as a continuous variable, with 1 ranked as lowest and 8 ranked as highest. For purposes of this dissertation, students who answered "don't know (9)" were excluded from the analysis. In the analyses for this study, the more years of education a student reported plans for acquiring, the higher the educational expectations (constrained for values of 1-8). This approach to the use of educational expectations for analyses is consistent with prior research (e.g., Haller & Virkler, 1993; Howley, 2006; Mau, 1995; Mau & Bikos, 2000; Rojewski, 1999; Wilson et al., 1993).

For examining missing data and for descriptive analyses, a separate dataset was created in SPSS 15.0 that contained only the selected rural, public school students. As described earlier, not all rural, public school students were included in the analyses. In addition to the students who selected "don't know" above, students who did not have a score on the math achievement test were also omitted from the analyses. With these two omissions final sample was 2,095 rural, public school students. Appendix A provides descriptive information on the students who responded "don't know" to the educational expectations question.

Missing data. The model analysis dataset (n = 2,095) was screened for missing data using SPSS 15.0. The majority of indicators had missing values that ranged from 3.2% to

13.5%; only five indicators had missing values higher than 13.5%. These measures were the five indicators for math self-efficacy, which ranged from 24.6% missing to 29.5%. It should be noted that certain variables (SES, 2004 Grade Achievement, 2004 Educational Expectations, and Type of High School Program) that were used for this study had already been screened by the U.S. Department of Education, and imputation procedures were used to handle missing data for all eligible participants. These four measures had no missing data in this sample (*n* = 2,095).

Given the percentages of missing data, multiple data imputation procedures were conducted. The ELS was specifically designed to be able to accommodate needs for data imputation because the data for key demographic variables are complete (U.S. Department of Education, personal communication, February 4, 2008). Because there was no missing data on key demographic variables (U.S. Department of Education, personal communication, February 4, 2008), multiple imputation is an accepted practice for handling missing data (Schafer, 1997; Schafer & Graham, 2002).

Multiple data imputation procedures were conducted in consultation with the Odum Institute at the University of North Carolina at Chapel Hill. First, the master SPSS dataset was converted to SAS. Then, Proc MI in SAS 9.1.3 was used to impute the data; 20 datasets were created for conducting the model analyses, based on recommendations from the Odum Institute. Schafer and Graham (2002) suggest that the amount of missing data may be used to assess the number of imputed datasets that is most adequate, citing an example of as much as 80% missing and the use of 20 imputed datasets (Schafer & Graham, 2002, p. 169). The imputation procedures replaced missing values in a probabilistic manner, so that each dataset was different from the others. The 20 datasets were converted to 20 comma-delimited files for use with Mplus Version 5 for the analyses. Both confirmatory factor analyses and structural equation modeling analyses were conducted using the imputed datasets. Mplus analyzed all 20 imputed datasets simultaneously and provided averages of the unique solutions for each dataset. All indicators for the following latent factors were imputed: Academic Press, Relational Context of Schools, Math Teacher Beliefs about Student Success, Adolescents' Geographic Residential Preference, and Mathematics Self-efficacy Beliefs.

Analysis Procedures for the Examination of the Measurement Model

Once the 20 imputed datasets were created, confirmatory factor analyses (CFA) were conducted using the imputed data to evaluate the components as specified in the measurement model. CFA is an analysis technique that provides an indication of the relationship between the factors and their respective indicators and is recommended as a precursor to SEM analyses to evaluate the measurement model components (Brown, 2006). The procedures and results for the CFA are provided in this section.

The model components are identical for the two models tested in this study; one model tests for the relation of selected factors to the outcome variable educational expectations, while the other model tests for the relation of selected factors to the outcome variable math achievement (See Figure 3.1 for a depiction of the latent factors and their respective indicators). The CFAs were conducted using Mplus Version 5.0 with the maximum likelihood estimator (MLR), which is used by Mplus with complex datasets and is recommended for use with non-normal data (Muthen & Muthen, 2007, p.484). The commands for accounting for stratification, cluster, and weight were used by specifying the variable name for each, as is the procedure in Mplus.

Importantly, the guidelines for interpreting CFA and SEM are the same, with the exception that in the SEM, the paths are specified among the predictor and outcome variables, and those paths must be evaluated for their significance. No such paths are specified for the CFA. If the measurement model provides a good fit to the data, the CFA will reveal that the indicators included for the latent factors all have significant loadings, and the correlations between them will not be too high (.85 or higher). Typically, researchers rely on the chi-square (χ^2) statistic and its corresponding probability value, as well as goodness-of-fit indices such as the standardized root mean square residual (SRMR), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis Index (TLI) for model evaluation among others that are available, depending upon which software program suits the analyses (Brown, 2006). When using multiple imputed datasets, Mplus provides mean scores for the chi-square test statistic, as well as mean scores for the model fit indices. When interpreting the chi-square test statistic for use with confirmatory factor analysis, a non-significant probability-level ($p > .05$) is desired, and a lower chi-square value is better.

When using multiple imputed datasets, however, Mplus does not provide a test for the significance of chi-square statistic. Mplus does provide a mean chi-square value, so researchers can evaluate changes in the value of the chi-square test statistic if modifications are made to the model and it is retested. For example, respecified models may result in lower chi-square values and the interested researcher may want to know this despite the unavailability of information about whether the chi-square test statistic is significant.

Therefore, because this study used multiple imputed datasets, other goodness-of-fit indices were consulted to determine the degree to which the model fit the data, including SRMR, RMSEA, CFI, and TLI. It should be noted that larger sample sizes can influence the test for chi-square significance, sometimes resulting in a significant probability level ($p < .05$) when other goodness-of-fit indices indicate a good fit. Therefore, it is important to consider a variety of measures to assess model fit when conducting both CFA procedures and SEM.

Like its treatment of the chi-square test statistic, Mplus provides a mean for each of the goodness-of-fit indices based on the analyses of the data from the 20 imputed datasets. The guidelines for interpreting the goodness-of-fit indices are as follows: SRMR value should be less than .08; CFI and TLI should be at or near .95 or greater; and RMSEA should be .06 or less (Brown, 2006; Kline, 2005). Paths between factors and their indicators were retained if statistical significance was found.

Modification indices are typically provided by software programs as part of SEM analyses and can serve as a guide to possible weaknesses in the model, such as a need to correlate variables or error terms. Higher values on the modification indices may be of concern. Modification indices are not available in Mplus, however, when using multiple imputed datasets. Therefore, model respecifications in this study were made without the aid of modification indices as a guide to possible modifications to improve model fit. Modifications can be made to the model, resulting in a respecified model, based on evaluations of the modification indices or reflections on the model so long as they are made based on substantive reasons (Brown, 2006; Kline, 2005). Examples of substantive reasons for model respecification, as provided in Brown, include situations when multiple items are used from a questionnaire, and those items contain similar wording or contain reverse wording, as well as reflections on the research literature that yield support for model modifications (Brown, 2006, p. 181). However, changes to the originally proposed model mean that the research has taken on an exploratory nature. Because the model is no longer in its proposed form, the researcher should acknowledge that changes to the model were made rendering the a priori specified model altered from its original form. Of note, the models were respecified in this study, and findings reported in this dissertation are meant as such.

Coefficient H is provided in this study as a measure of the reliability of the latent factors (Hancock & Mueller, 2001)[9] and was calculated with the assistance of the Odum Institute at the University of North Carolina at Chapel Hill. Coefficient H provides information about how the latent construct and its measured indicators are related in the context of the estimated model (Hancock & Mueller, 2001, p. 213). The calculation of coefficient H relies on the squaring of the indicator loadings, which eliminates any problems of negative, or opposite sign, factor loadings. Hancock and Mueller (2001) assert that the reliability of the construct should not be lower than the loading of its single best indicator. These researchers suggest that a minimum reliability level for H may be .70, but also indicate that lower reliability may be tolerable[10] (Hancock & Mueller, 2001, p. 210). However, when retaining a construct with a lower reliability in model analyses, any significant findings associated with that construct should be qualified as potentially limited by the reliability of the construct and are suggestive of the need for further study (G. Hancock, personal communication, August 13, 2008).

[9] For an example of the use of coefficient H in applied research, see Whiteside-Mansell et al., 2007.

[10] For an example of a published article in which a lower than .70 coefficient H was used, see Whiteside-Mansell et al., 2007.

Figure 3.3 depicts the measurement model for this study. The confirmatory factor analyses were conducted on the proposed latent factors. Each latent factor was tested individually, with the exception of those that were under-identified. As explained by Brown (2006), measurement models are subject to a condition known as model identification and must be identified in order to be tested in CFA. Model identification pertains, in part, to the amount of known versus unknown information, such as set paths versus freely estimated parameters (Brown, 2006, p. 62). In order for a CFA to be possible, a latent factor must have at least three (just-identified) or more (over-identified) indicators (Brown, 2006, p.71). For this study, the overall model for use in the SEM analyses (containing both structural and measurement components) is over-identified, meaning it has positive degrees of freedom, and as such requires the use of goodness-of-fit indices (Brown, 2006, p. 71). However, not each individual factor within the SEM model met the conditions for identification. Because one factor (Geographic Residential Preference) was under-identified (having only two indicators) and two factors (Academic Press and Math Teacher Beliefs about Student Success) were just-identified (with three indicators), it was necessary to first conduct CFA on the over-identified factors. Once it was known that the over-identified factors provided a good fit to the data, one of them (Relational Context of Schools) was combined with the under-identified factor (Geographic Residential Preference) to test it for model fit. This procedure was done because assessment of model fit is not possible for under-identified and just-identified models, but combining them with over-identified models is an acceptable method for assessing the factor for fit to the data using the goodness-of-fit indices (S. Christ, personal communication, April 9, 2008). Additionally, the over-identified factor Relational Context of Schools was also combined with each of the just-identified factors, separately, to test those factors for model fit (S. Christ, personal communication, April 9, 2008). After the testing of the individual factors, factors were tested together by adding one after another until all six latent factors were tested simultaneously. The CFA procedures and findings are reported next.

Results of Confirmatory Factor Analyses

This section provides the results of the confirmatory factor analyses for the latent factors in this study. The findings are summarized in Table 3.1.

Relational Context of Schools

There were four indicators for the Relational Context of Schools latent factor (see Figure 3.1). This latent factor provided an acceptable fit to the data, as shown in Table 3.1. All indicator loadings were significant with the exception of the one preset to one. Correlations among indicators range from .19 to .37. Coefficient H was used as an estimate of the reliability for this factor with this sample (see pp. 72-73); the reliability value was .60. Despite its lower than optimal reliability, the factor was retained for use in the model. The techniques for evaluating CFA as outlined by Brown (2006) were met. The literature supports such a construct. There are also published studies with similar H coefficients for factors (e.g., Whiteside-Mansell et al., 2007).The findings of this study, however, were qualified by the .60 reliability as in need of further study.

Mathematics-related Self-efficacy Beliefs

There were five indicators for adolescents' efficacy-related beliefs (See Figure 3.1). Initial results from this CFA provided a poor fit to the data, with mean χ^2 = 172.351, CFI = .963, TLI = .927, RMSEA = .126, and SRMR = .024. Research suggests that correlated errors often occur when indicators have similar wording or are reverse worded (Brown, 2006, pp. 181-182). An examination of the indicators for this factor found that three of the indicators contained language that referred to a difficult task, such as taking a test, or learning complex material. The three indicators that pertained to something difficult were: a) "I'm confident I can do an excellent job on my math tests;" b)"I'm certain I can understand the most difficult material presented in math texts;" and c) "I'm confident I can understand the most complex material presented by my math teacher." Correlations among the errors for these three items were added as follows: correlations among the errors for items a and b, and among the error terms for items b and c. The CFA was conducted with the model respecified with the two correlations added, and the revised model provided a good fit to the data, as shown in Table 3.1. All indicator loadings were significant with the exception of the one preset to one. Correlations among indicators ranged from 0.70 – 0.82. Coefficient H was used as an estimate of the reliability for this factor with this sample; the value was 0.94.

Mathematics Teacher Beliefs About Student Success

This factor has only three indicators and is therefore "just identified." It was examined using CFA procedures to look at the indicator loadings on the factor because in just-identified models the significance of the indicator loadings can be assessed. All indicator loadings were significant, with the exception of the one preset to one. Correlations among indicators ranged from 0.41 to 0.50. Coefficient H was used as an estimate of the reliability for this factor with this sample; the value was 0.74.

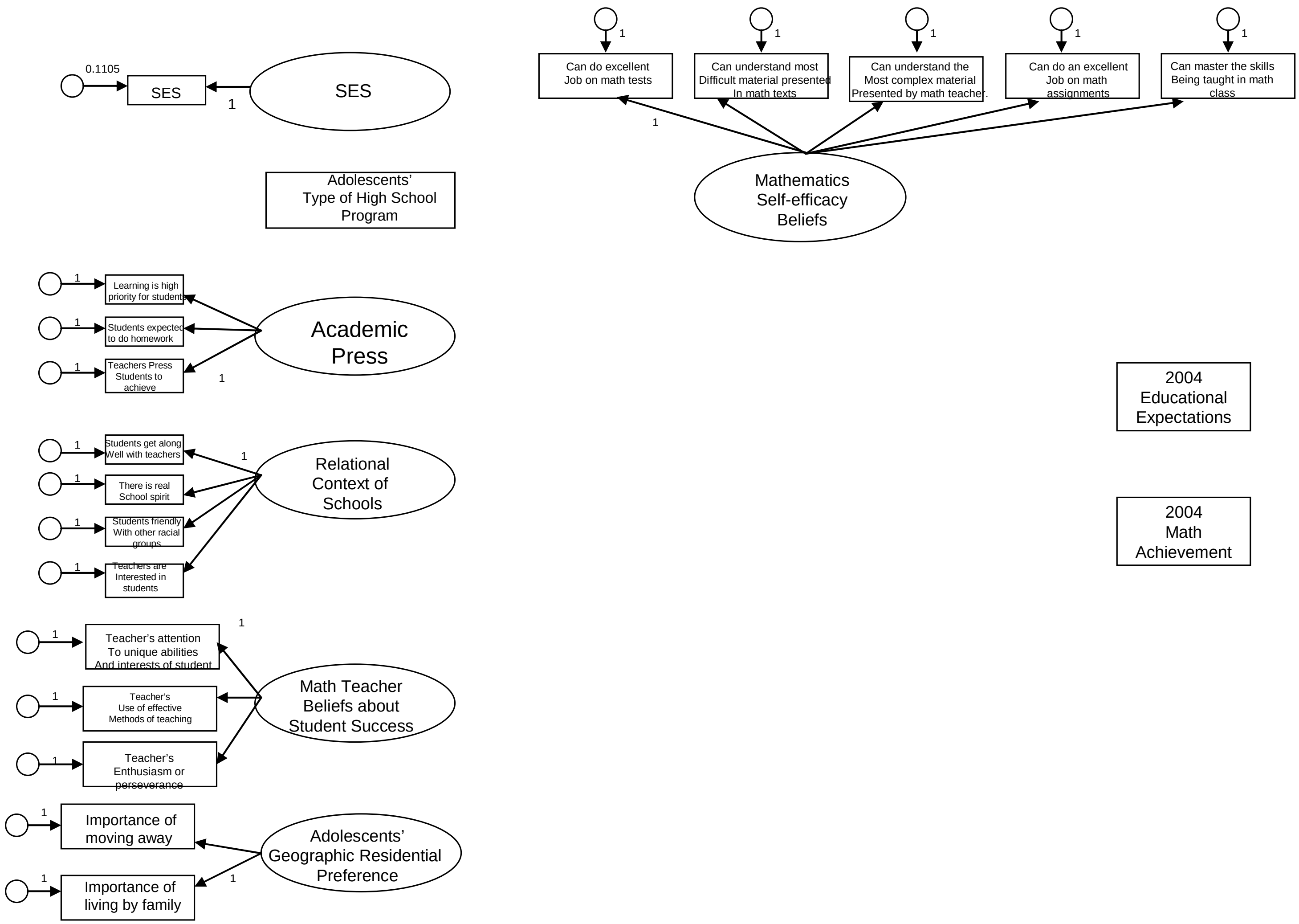

Figure 3.3: Measurement Model. All latent factors are correlated. For purposes of visual clarity and ease of viewing, those relationships are not depicted. Both outcome variables are depicted here, but they were tested in separate models.

Academic Press

This factor has only three indicators and is, therefore, “just identified.” It was examined using CFA procedures to look at the indicator loadings on the factor. All indicator loadings were significant, with the exception of the one preset to one. Correlations among indicators ranged from 0.45 to 0.53. Coefficient H was used as an estimate of the reliability for this factor with this sample; the value was 0.75.

Geographic Residential Preference and Relational Context of Schools Combined

Because the latent factor Geographic Residential Preference had only two indicators, it was combined with the Relational Context of Schools for conducting CFA to enable the examination of the model fit using the fit indices. The two indicators for Geographic Residential Preference were students’ preference for moving away from the area and the importance they place on living near their family. The indicators for Relational Context of Schools remained the same as previously tested. The CFA analyses indicated that the two factors combine to provide a good fit to the data, as provided in Table 3.1. All indicator loadings were significant with the exception of the indicators preset to one. The correlation among the two indicators for Geographic Residential Preference was 0.24. Coefficient H was used as an estimate of the reliability for Geographic Residential Preference with this sample and was calculated for the two-item factor; the value was 0.39. Despite its lower than optimal reliability, the factor was retained for use in the model for the structural equation model analyses. The techniques for evaluating CFA as outlined by Brown (2006) were met and the literature supports these indicators as influential to the outcomes of this study. As Hancock and Mueller explain (2001, p. 200), the use of a factor for the representation of a construct should never be worse than the use of the strongest single indicator alone. Findings will be qualified by the low reliability.

Academic Press and Relational Context of Schools Combined

The just-identified latent factor Academic Press was combined with Relational Context of Schools for testing its fit to the data using CFA procedures. The three indicators for Academic Press and the four indicators for Relational Context of Schools remained the same as previously explained. The CFA analyses indicated that the two factors combine to provide a good fit to the data, as provided in Table 3.1. All indicator loadings were significant with the exception of the indicators preset to one.

Math Teacher Beliefs and Relational Context of Schools Combined

The just-identified latent factor Mathematics Teacher Beliefs was combined with Relational Context of Schools for testing its fit to the data using CFA procedures. The three indicators for Teacher Beliefs and the four indicators for Relational Context of Schools remained the same as previously explained. The CFA analyses indicated that the two factors combine to provide a good fit to the data, as provided in Table 3.2. All indicator loadings were significant, with the exception of the indicators preset to one.

Combining the Six Latent Factors

After evaluating the latent factors individually, analyses were conducted on the factors as a group by adding one additional factor at a time to Relational Context of Schools and Mathematics Teacher Beliefs about Student Success grouping until the test included all six latent factors. These analyses relied upon the modified Mathematics Self-efficacy Beliefs factor. With the addition of each factor, CFA results were evaluated and each time the models provided an acceptable fit to the data. All indicator loadings remained significant, with the exception of the indicator set to 1. Results for the CFA that correlates all latent factors, are provided in Table 3.2.

Summary of Findings from Confirmatory Factor Analyses

Confirmatory factor analyses were conducted on the components of the measurement model proposed for this study. Each latent factor and its corresponding indicators was examined using CFA procedures. Because the factor Geographic Residential Preference was under-identified and because the factors for Academic Press and Math Teacher Beliefs about Student Success were just-identified, they were tested in combination with the factor for Relational Context of Schools in order to assess their fit to the data, and the results were reported as such in Table 3.1. In total, two modifications were made, and they were made to the latent factor for mathematics self-efficacy beliefs; two correlations were added among error terms. All proposed model components were kept for further analyses during the SEM procedures, including the Relational Context of Schools and Geographic Residential Preference despite their reported H values being lower than 0.70. The lower reliabilities for these two factors required that all results pertaining to them be reported as limited and in need of further study. The literature guiding this study provided evidence to support the inclusion of both factors. Prior research related to the Relational Context of Schools has found that this aspect of school context is related to educational attainment-related outcomes (e.g., Bryk & Driscoll, 1988; Crosnoe et al., 2004; Lee & Smith, 1999; Wood et al., 2007). The research guiding this study also indicated that the preference to remain in their local rural communities may relate to lower educational attainment outcomes in rural youth, particularly as it applies to graduate study (Elder et al., 1996; Hektner, 1995; Howley, 2006; Johnson et al., 2005; Rojewski, 1999).

Table 3.1

CFA Results

Latent Factor	Mean Chi-square (sd)	Mean CFI (sd)	Mean TLI (sd)	Mean RMSEA (sd)	Mean SRMR (sd)	H Coefficient
Relational Context of Schools	1.188	1.0	1.005	0.00	0.007	.60
	(0.357)	(0.0)	(0.002)	(0.001)	(0.001)	
	df = 2					
Math Self-efficacy Beliefs	9.174	0.99	0.995	0.031	0.006	.94
	(1.52)	(0.00)	(0.001)	(0.004)	(0.001)	
	df = 3					
Geographic Residential Preference and Relational Context of Schools	3.784	1.0	1.012	0.000	0.008	.39
	(1.0)	(0.0)	(0.003)	(0.000)	(0.001)	(for Geographic Residential Preference)
	df = 8					
Academic Press and Relational Context of Schools	12.286	0.999	1.002	0.002	0.017	.75
	(1.79)	(0.002)	(0.006)	(0.003)	(0.001)	(for Academic Press)
	df = 13					
Math Teacher Beliefs about Student Success and Relational Context of Schools	13.410	0.999	0.999	0.004	0.015	.74
	(1.886)	(0.001)	(0.003)	(0.004)	(0.001)	(for Math Teacher Beliefs)
	df = 13					

Table 3.2

Correlations Among Latent Factors

Latent Factors	Standardized Estimate
Relational Context of Schools with:	
Mathematics Self-efficacy Beliefs	0.25***
Math Teacher Beliefs about Student Success	-0.00
SES	0.04
Academic Press	0.12*
Geographic Residential Preference	-0.40***
Mathematics Self-efficacy Beliefs with:	
Math Teacher Beliefs about Student Success	0.01
SES	0.24***
Academic Press	0.02
Geographic Residential Preference	-0.05
Math Teacher Beliefs about Student Success with:	
SES	-0.04
Academic Press	0.05
Geographic Residential Preference	0.05
Academic Press with:	
SES	0.21***
Geographic Residential Preference	0.04
Geographic Residential Preference with:	
SES	0.09*

Note: Standardized estimates are reported from Mplus (Version 5.0) analyses, which are based on mean values calculated from the 20 multiple imputed datasets.

* Correlation is significant at the $p \leq .05$ level (two-tailed test).

** Correlation is significant at the $p \leq .01$ level (two-tailed test).

*** Correlation is significant at the $p \leq .001$ level (two-tailed test).

Summary

This chapter provided descriptions for participants and the measures used for the analyses. Additionally, this chapter explained the preparation of the data for analysis, including how the dataset was constructed. The measurement aspects of the model were presented, as were results from the confirmatory factor analyses. All model components were retained for further analyses, though slight modifications were made to one latent factor by correlating two error terms. Further, it was noted that the latent constructs for Relational Context of Schools and Geographic Residential Preference have lower than desired coefficient H reliability scores; therefore, while both were retained for further analyses, any findings are subject to this potential limitation and are noted as such.

CHAPTER IV

RESULTS

This chapter provides results from the descriptive analyses and the structural equation modeling analyses (SEM). First, the descriptive analyses for the variables used as predictors in the SEM analyses are presented, followed by descriptive analyses for the two outcome variables Educational Expectations and Mathematics Achievement. Next, the procedures for the structural equation modeling are explained. Then, the results of the structural equation modeling for the two different outcome variables are provided. The chapter ends with a brief summary of the findings.

Appendix A provides descriptive information on the students who responded “don’t know” to the educational expectations question. These students were more likely than the other types of respondents to be in a general high school program, have lower scores on the mathematics achievement test, be male, and be an ethnic or racial minority.

Descriptive Analyses

The descriptive analyses were conducted using SPSS 15.0. The dataset of rural, public school students (*n* = 2,095) was used for these analyses. Analyses included screening the data to assess normality, outliers, and missing values, as well as assessing collinearity among the latent constructs. The results from these analyses are provided in this section.

Descriptive Statistics for the Predictor Variables in the SEM Model

Using the dataset for the rural public school sample (*n* = 2,095), the data were screened to assess normality, outliers, and missing values. Means, standard deviations, ranges, skewness, and kurtosis for the predictor variables in the model were checked and are reported in Table 4.1. The variable for SES in the model is quantitative. The variable for high school program enrollment is categorical with three response options: 1 = *General*, 2 = *College preparatory (academic)*, 3 = *Vocational (including technical or business)*. The students' program enrollment distribution in 10^{th} grade was: 37.5% General; 52,8% College preparatory; and 9.7% Vocational (including technical or business). There was no significant correlation between SES and High School Program enrollment.

Collinearity was assessed by examining the correlations among the variables, none of which reached 0.85 or higher (Kline, 2005, p. 56). The internal consistency reliability was reported as part of the confirmatory factor analyses (CFA) analyses in the prior chapter as coefficient H on the factors (see pp. 72-73). CFA enabled the evaluation of discriminant and convergent validity; no concerns were identified as factors were not too highly correlated, and indicators were related but not too highly correlated. Appendix C provides correlations for indicators of each latent factor (see Tables C.1-C.5) as well as correlations among the latent factors (see Tables C.6 and C.7).

As explained earlier, percentage of missing values was computed for these variables. Missing values ranged from 3.2% to 13.5% for most variables. The five variables pertaining to measurement of Mathematics Self-efficacy Beliefs, however, had higher percentages of missing values, ranging from 24.6% to 29.5%. As described previously, imputation procedures were used to handle missing data (see pp. 68-69).

Descriptive Statistics for the Outcome Variable: Educational Expectations

For this study, the outcome measure educational expectations was treated as a continuous variable. Using the rural sample for this study (*n* = 2,095), the outcome measure was screened for outliers and missing values, and none were found. Mean, standard deviation, range, skewness, and kurtosis are reported in Table 4.2.

Approximately 90% of the youth in this study plan to pursue some form of higher education beyond high school. Of this group, 22% plan to attend a 2-year college; 35% plan to obtain a 4-year degree; 20% plan to obtain a Master's degree; and 11% plan to obtain a Ph.D. or M.D. Less than 1% reported plans to drop out of high school, and only 1% reported plans to obtain a general education equivalent (GED) instead of a high school diploma. Approximately 6% of the sample indicated plans for obtaining a high school diploma only.

Descriptive Statistics for the Outcome Variable: Mathematics Achievement

As explained in Chapter 3, the mathematics achievement score used in this study is the standardized T-score, as provided by the U. S. Department of Education in the Electronic Codebook for ELS. The variable has a mean of 50 and a standard deviation of 10. Using the study sample, the variable was screened for normality, outliers, and missing values. There were no outliers nor missing values. Means, standard deviations, ranges, skewness, and kurtosis are reported in Table 4.3. Half of the students have scores between 43.41 and 56.89. Additionally, 25% of the students have scores above 56.89, while 25% have scores below 43.41.

Table 4.1

Predictor Variables in Model:
Means, Standard Deviations (S.D.), Range, Skewness, and Kurtosis

Variable Name	n	Mean	Median	S.D.	Range	Lowest	Highest	Skewness	Kurtosis
SES	2095	-.058	-0.14	0.65	3.88	-1.90	1.98	0.38	-0.25
Learning is high priority	1872	3.50	4	0.70	3	2	5	-0.27	-0.24
Students expected to do homework	1872	4.10	4	0.83	3	2	5	-0.57	-0.42
Teachers press students to achieve	1872	4.00	4	0.71	3	2	5	-0.33	-0.09
Students get along well with teachers	2011	2.80	3	0.56	3	1.00	4.00	-1.03	2.05
There is real school spirit	2010	2.86	3	0.75	3	1.00	4.00	-0.38	-0.01
Students friendly with other racial groups	1992	3.13	3	0.65	3	1.00	4.00	-0.48	0.71
Teachers are interested in students	2016	2.85	3	0.68	3	1.00	4.00	-0.50	0.57
Teacher’s attention to unique abilities and interests of student	1812	3.12	3	0.53	3	1	4	0.01	0.76
Teacher’s use of effective methods of teaching	1830	3.30	3	0.54	3	1	4	0.00	-0.27
Teacher’s enthusiasm or perseverance	1828	3.49	4	0.55	3	1	4	-0.48	-0.39
Importance of moving away	2029	1.75	2	0.77	2	1	3	0.46	-1.19
Importance of living by family	2029	1.90	2	0.65	2	1	3	0.10	-0.65
Can do excellent job on math tests	1580	2.56	2	0.92	3	1	4	0.29	-0.91

Variable Name	n	Mean	Median	S.D.	Range	Lowest	Highest	Skewness	Kurtosis
Can understand the most difficult material presented in math texts	1578	2.37	2	0.94	3	1	4	0.30	-0.78
Can understand the most complex material presented by math teacher	1525	2.45	2	0.97	3	1	4	0.17	-0.95
Can do an excellent job on math assignments	1493	2.64	3	0.93	3	1	4	0.06	-0.96
Can master the skills being taught in math	1477	2.65	3	0.92	3	1	4	0.01	-0.92

Table 4.2

Educational Expectations:
Means, Standard Deviations (S.D.), Range, Skewness, and Kurtosis

Variable Name	n	Mean	Median	S.D.	Range	Lowest	Highest	Skewness	Kurtosis
2004 Educational Expectations	2095	5.72	6	1.50	7	1	8	-0.38	-0.71

Table 4.3

Math Achievement:
Means, Standard Deviations (S.D.), Range, Skewness, and Kurtosis

Variable Name	n	Mean	Median	S.D.	Range	Lowest	Highest	Skewness	Kurtosis
2004 Math Achievement*	2095	49.98	49.76	9.56	56.18	23.67	79.85	-0.03	-0.42

* From math test standardized *T* score, with a mean of 50 and a standard deviation of 10.

Procedures for Testing Proposed Theoretical Model

Structural equation modeling (SEM) served as the analytical tool for this dissertation study. SEM is particularly well suited as an analysis technique for this study owing to its ability to include latent constructs, its suitability for use with large samples, and its usefulness in informing model re-specification. Most of the constructs in the proposed study are latent and difficult to measure directly. Given the interest in the hypothesized interrelations of these latent constructs and observed variables, SEM is an appropriate analysis technique because it affords the analysis of a prespecified model with theoretical grounding, which depicts the direction of hypothesized influence. Further, SEM enables the respecification of proposed models based on analyses (Kline, 2005). Thus, the use of SEM enabled the testing of the proposed model's relations among latent constructs and observed variables as well as provided information for model modifications.

This study tested two separate models, one for each outcome variable. The models were identical with the exception of the outcome variable. Models depicting both the structural and measurement components for the two outcome variables are shown in Figures 4.1 and 4.2 and reflect the modifications made during the confirmatory factor analyses procedures (the addition of two correlations among error terms for one latent factor). As shown in Figures 4.1 and 4.2, the environmental-related latent constructs (Academic Press, Relational Context of Schools, Mathematics Teacher Beliefs about Student Success, and SES) and the observed variable high school program were hypothesized to have both direct and indirect relationships to the outcome variables under study. In terms of the expected indirect influence, the latent factor Mathematics Self-efficacy Beliefs was proposed to mediate, in part, the influence of the school-related factors and SES on the outcome variables. The latent predictive factor Geographic Residential Preference was proposed to have a direct effect on the outcome variables, but no indirect influence was proposed. Key to this study's proposed model is the hypothesis that self-efficacy beliefs mediate, in part, the influence of the environmental factors on educational attainment-related outcomes. As conceptually explained by Baron and Kenny (1986), mediation provides an explanation of how one variable has its influence (or relation) on another variable (i.e., the mediator is the mechanism through which the influence occurs). As part of the SEM procedures, mediation was assessed.

The same basic evaluation guidelines were used for the SEM results as were described in Chapter 3 for the CFA results (see pp. 69-74). A determination as to whether a good model fit existed was based upon assessing the totality of the evidence provided by the goodness-of-fit indices, as well as an examination of the parameter estimates for their significance. Because SEM includes paths among latent constructs with hypothesized directional influence (which CFA does not), the paths were also examined for their significance. Model respecification was possible based on interpretation of results (see pp. 69-74). Nonsignificant paths within the structural model were deleted as part of model respecification.

Mplus Version 5.0 was used for the SEM analyses, with MLR as the estimator (Muthen & Muthen, 2007, p. 484). MLR is used by Mplus with complex datasets and is often recommended for use with nonnormal data (Muthen & Muthen, 2007, p. 484), as was the case with the data used for this study. The analyses were performed using the 20 imputed datasets. The commands for accounting for stratification, cluster, and weight were utilized by specifying the variable name for each.

When using multiple imputed datasets in Mplus, the statistical significance of the presence of mediation is not provided. Obtaining the statistical significance of the presence of mediation for the model is possible by testing the model separately for each imputed dataset. Therefore, after concluding the SEM analyses in Mplus, it was necessary to test the two final models for each outcome variable in each of the 20 datasets to check for the significance of the mediation (L. Muthen, personal communication, April 13, 2008). Once significance had been tested for each of the 20 imputed datasets individually for educational expectations and mathematics achievement, it was necessary to assess all 20 imputed datasets simultaneously. Though Mplus does not provide such analysis, it is possible using a technique provided by Yuan (2001). Thus, mediation was assessed for each final model using data from all 20 test results, as provided by Yuan (2001) and recommended by the Odum Institute (S. Christ, personal communication, April 15, 2008a).

Yuan (2001) outlined a procedure for testing the significance of mediation effects. This procedure was conducted for this study in consultation with the Odum Institute at the University of North Carolina at Chapel Hill. The Yuan (2001) procedure relies on information from each of the 20 imputed datasets The information used to conduct the Yuan procedure included indirect effect, standard error for the indirect effect, the variance of the indirect effect, the mean indirect effect for the 20 datasets, and the sum of the 20 mean indirect effects subtracted from the indirect effects for each dataset. Using Microsoft Excel, this information was used to calculate a *t* statistic and corresponding degrees of freedom (*df*) for the mediation effect of mathematics self-efficacy beliefs for each predictor variable in each final model. Additionally, the results from the 20 imputed datasets provided a total effect. This information allowed for the testing of the significance of the total effect as well the testing of significance for the indirect effect. Thus, when the SEM model evaluation revealed the presence of an indirect effect, the use of the Yuan procedures enabled the assessment of whether the effect was statistically significant.

The results from the SEM analyses for each model are presented next. First, the SEM analyses and result for the model testing educational expectations are presented, followed by the SEM analyses and results for the model testing achievement.

SEM Analyses for Educational Expectations

SEM analyses were conducted on the model as depicted in Figure 4.1, which represents the revision made during the CFA analyses (see Chapter 3, pp. 74-81). This model examined the interrelations of latent factors and one observed variable with the educational expectations measure from the ELS: 2004 as an outcome. Analysis of the parameter estimates revealed that the following four proposed paths were not significant: Academic Press to Mathematics Self-efficacy Beliefs; Academic Press to Educational Expectations; Math Teacher Beliefs about Student Success to Mathematics Self-efficacy Beliefs; and Math Teacher Beliefs about Student Success to Educational Expectations. Mplus provides only a two-tailed test for significance values. Therefore, when examining the significance levels of the paths, it was necessary to translate the Mplus two-tailed test significance values into one-tailed test significance values because this dissertation study had proposed positive, directional hypotheses. Model results for the chi-square (χ^2) and goodness-of-fit indices were: $\chi^2 = 193.54$ (S.D. = 10.22; df = 144); CFI = 0.99; TLI = 0.99; RMSEA = 0.01; and SRMR = 0.02.

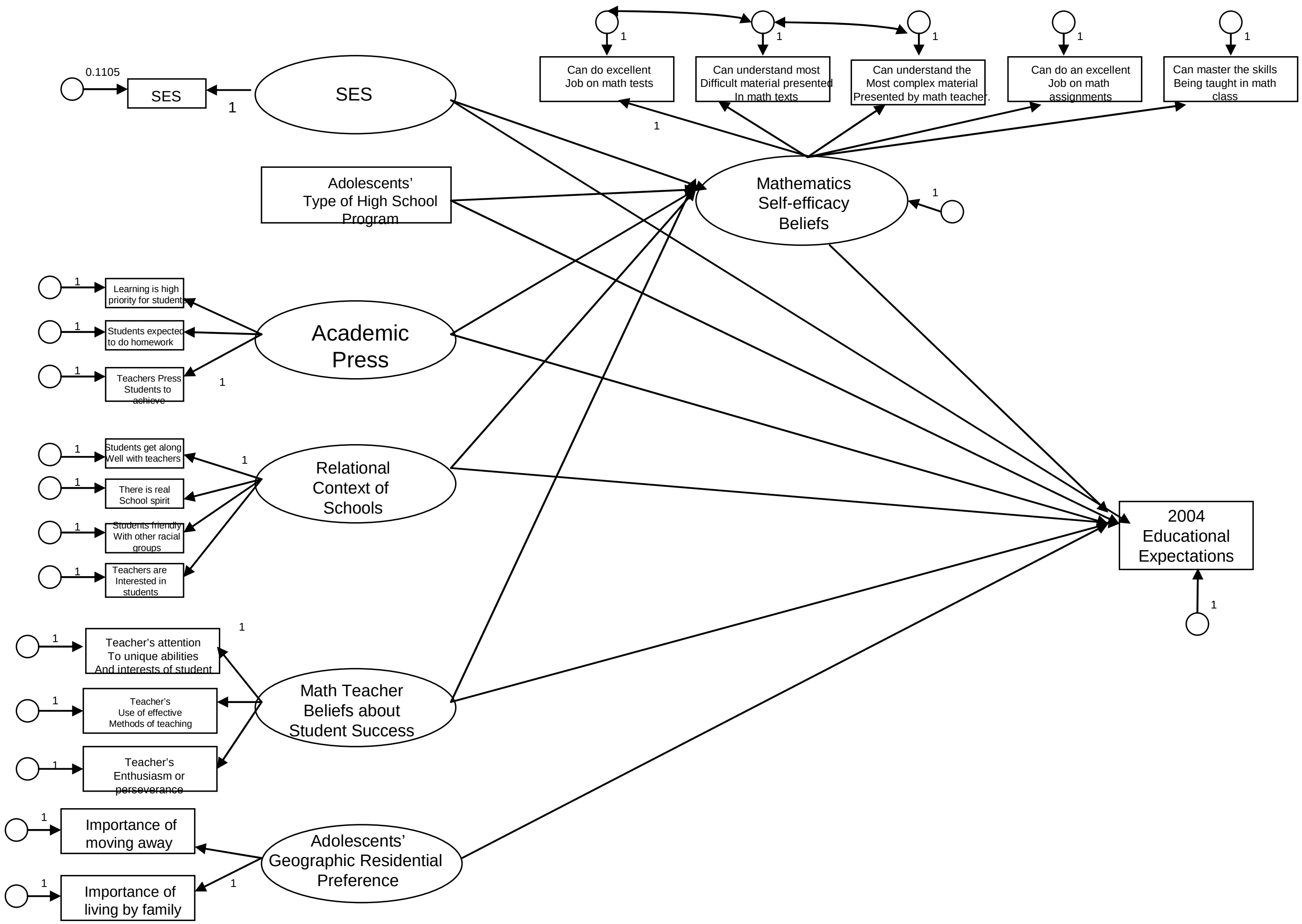

Figure 4.1 Revised model for educational expectations depicting both structural and measurement components. All latent factors are correlated, but for visual clarity and ease of viewing the relationships are not depicted.

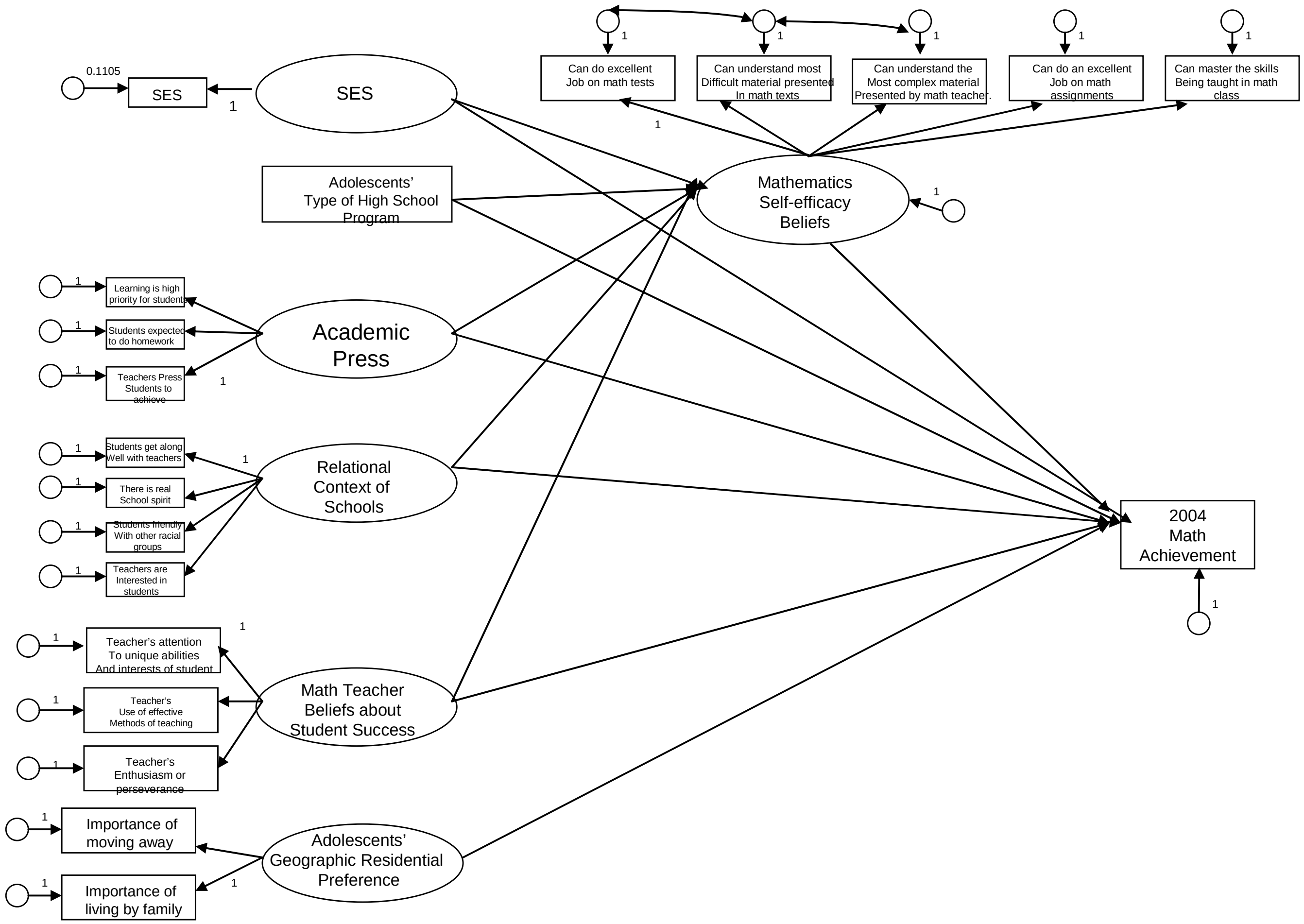

Figure 4.2: Revised model for mathematics achievement depicting both structural and measurement components. All latent factors are correlated, but for visual clarity and ease of viewing the relationships are not depicted.

Though the goodness-of-fit indices provided values within an acceptable range, the nonsignificant paths were removed, and a respecified model (see Figure 4.3) was tested. The revised model results, as reported in Figure 4.3, indicated that the revised model provided a good fit to the data and explained almost a quarter (0.23) of the variance in students' self-reported educational expectations. All paths were significant; all but one path were significant at the $p < .01$ level, and the path for Geographic Residential Preference that was not significant at the $p < .01$ level was significant at the $p < .05$ level. The SEM tests on the revised model for educational expectations revealed that Figure 4.3 provided a good fit to the data. The model analyses revealed that both direct and indirect effects were present, indicating that Mathematics Self-efficacy Beliefs partially mediated the influence of SES, High School Program, and Relational Context of Schools on Educational Expectations.

At this point, the significance of mediation effects were unknown. Using the procedure outlined in Yuan (2001), analyses revealed that the mediation effect was significant for each of the three predictor variables, as was the total effect (indirect and direct combined) for the three predictor variables (Relational Context of Schools, High School Program, and SES). The findings are summarized in Table 4.4. Table 4.5 provides a summary of direct effect, indirect effect, and total effect for the influences on educational expectations, as depicted in the final revised model presented in Figure 4.3.

Summary of Educational Expectations Analyses

SEM analyses conducted on the revised model for the educational expectations outcome found that two of the latent variables (Academic Press and Math Teacher Beliefs about Student Success) did not have significant direct or indirect effects on educational expectations and self-efficacy beliefs. A revised model that did not include these two

Table 4.4

Educational Expectations: Tests for Significance of Indirect and Total Effects

Name	*t* statistic	*df**
SES → Efficacy-related Beliefs → Educational Expectations	4.416	19
High School Program → Efficacy-related Beliefs → Educational Expectations	2.826	19
Relational Context of Schools → Efficacy-related Beliefs → Educational Expectations	3.772	19
Total Effect SES (direct & indirect)	14.07	19
Total Effect High School Program (direct & indirect)	10.482	19
Total Effect Relational Context of Schools (direct & indirect)	3.507	19

* Each value is significant at the p < .05 level for one-tailed test, t > 1.729.

Table 4.5

Indirect and Direct Effects for Personal and School-related Influences of Educational Expectations

Variable Name	Indirect	Direct	Total
Geographic Residential Preference	__	.10	.10
Relational Context of Schools	.03	.11	.14
Adolescent's High School Program	.01	.23	.24
SES	.02	.29	.31
Adolescent's Efficacy-related Beliefs	__	.11	.11

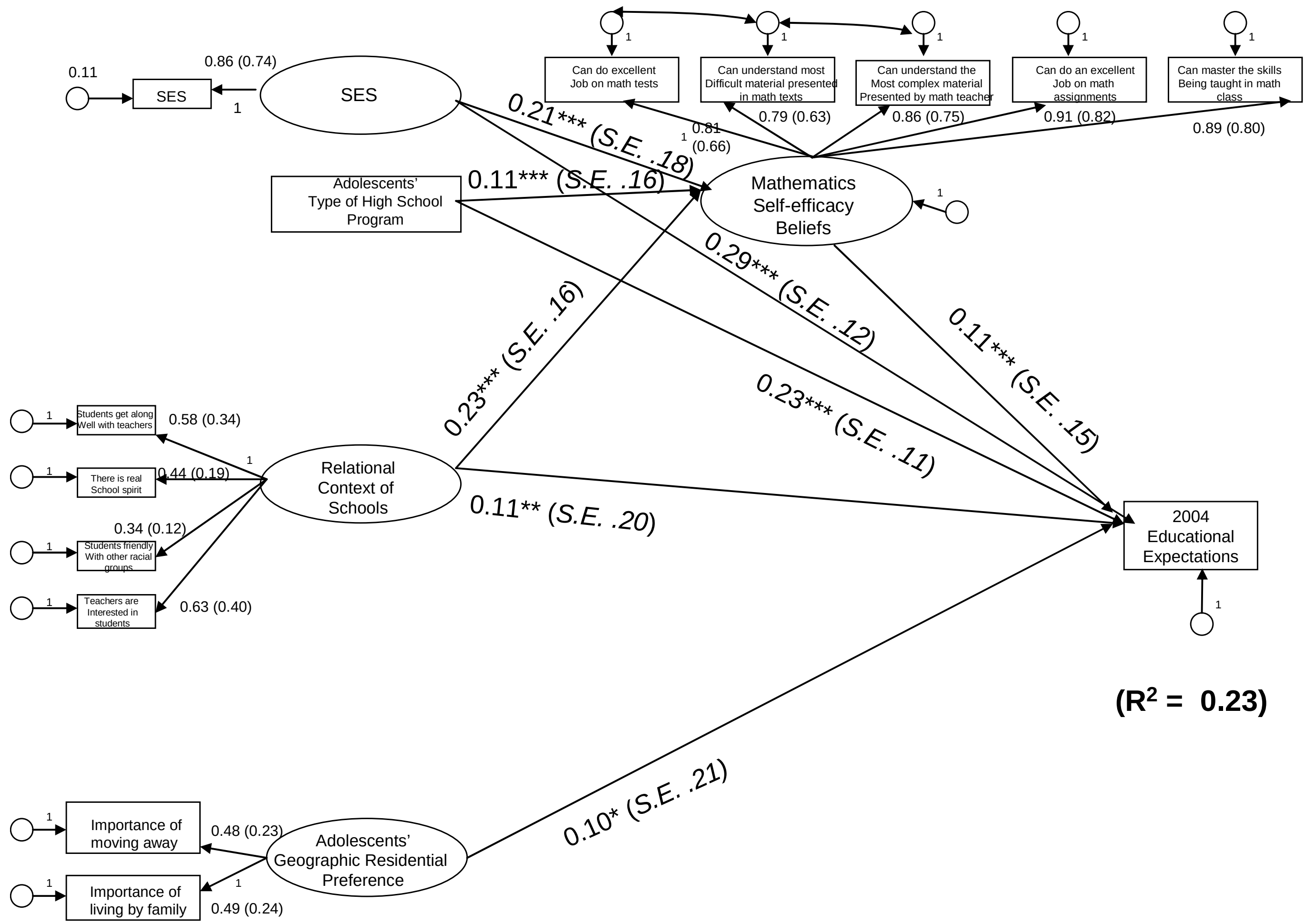

Figure 4.3: Final revised model for educational expectations depicting both measurement and structural components. Mean χ^2 = 105.685 (df = 64), Mean CFI = 0.995, Mean TLI = .993, Mean RMSEA = 0.018, Mean SRMR = 0.017. Standard Errors (S.E.) are reported italicized in parentheses. Paths are reported as Standardized Estimates. The R^2 estimate for the total model is reported in parentheses. * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$. All latent factors are correlated, but for purposes of visual clarity and ease of viewing, those relationships are not depicted.

nonsignificant latent factors was tested and found to provide a good fit to the data. Further tests were conducted to determine whether the indirect and total effects were significant for SES, High School Program, and Relational Context of Schools. The findings indicated significant indirect and total effects for these variables.

Thus, the revised model demonstrated that certain environmental influences associated with the school context and socioeconomic status when rural adolescents were in 10th grade directly influenced their self-reported expectations for the educational futures two years later. Further, these environmental influences also played an indirect role in predicting educational expectations two years later through their significant relation to adolescents' mathematics self-efficacy beliefs. In addition, this model demonstrated that adolescents' geographic residential preferences when they were sophomores in high school were related to their educational expectations two years later. High school sophomores who placed higher importance on moving away and less on living near family reported plans for more years of education two years later. As the model depicted in Figure 4.3 shows, the total amount of variance explained in educational expectations by the selected environmental and personal factors was 23 percent. This research is a step toward better understanding the influence of family and school contextual factors on rural youth's educational plans for the future. Further, this research may indicate that youth's own interests for residence in their adulthood bears some influence on their long-term educational plans. However, it is necessary to note that this finding may be limited by the construct reliability. At minimum, this finding suggests more study is needed. These findings and possible implications will be discussed further in Chapter 5.

SEM Analyses for Mathematics Achievement

Following the analyses on the educational expectations outcome, SEM analyses were conducted on the model that examined the interrelations among factors for the mathematics achievement variable in the ELS: 2004. Like the SEM for educational expectations, the model used for this analysis included the revision made during the CFA analyses (see Chapter 3, pp. 74-81). Mplus Version 5.0 was used for the analyses. Procedures for interpreting analyses for this model were consistent with those explained earlier in this chapter (see pp. 88-92).

Analysis of the parameter estimates revealed that the following six paths in the revised model were not significant: Academic Press to Mathematics Self-efficacy Beliefs; Academic Press to Achievement; Math Teacher Beliefs about Student Success to Mathematics Self-efficacy Beliefs; Math Teacher Beliefs about Student Success to Achievement; Geographic Mobility Preference to Achievement; and Relational Context of Schools to Achievement. Model results for the chi-square (χ^2) and goodness-of-fit indices were: $\chi^2 = 254.288$ (S.D. = 10.194; *df* = 144); CFI = 0.984; TLI = 0.979; RMSEA = 0.019; and SRMR = 0.025. Though the goodness-of-fit indices provided values within an acceptable range, the nonsignificant paths were removed, and a revised model (as depicted with findings in Figure 4.4) was tested. The revised model results, as reported in Figure 4.4, indicated that the revised model provided a good fit to the data. All paths were significant at the $p < .001$ level.

The SEM tests on the revised model for achievement revealed that the model provides a good fit to the data, explaining 30% of the variance in mathematics achievement. The SEM analyses of the model indicated that mathematics self-efficacy beliefs partially mediated the influence of SES and High School Program on achievement outcomes. Thus, the model analyses revealed that both direct and indirect effects were present for these two predictor variables. Further, the SEM analyses indicated that Mathematics Self-efficacy Beliefs fully mediated the influence of Relational Context of Schools on achievement; unexpectedly, there was no direct effect. Just as in the case of the SEM analyses for Educational Expectations, Mplus could not test for mediation significance when using multiple imputed datasets. Therefore, further testing was necessary to evaluate whether the indirect effects were significant. The same procedure for testing the significance of mediation effects (Yuan, 2001) was used for the Mathematics Achievement model as for the Educational Expectations model.

The Yuan (2001) method was used to calculate a *t* statistic and corresponding degrees of freedom (*df*) for the mediation effect of Mathematics Self-efficacy Beliefs for the following predictor variables and factors in the revised model: Relational Context of Schools, High School Program, and SES. In the case of Relational Context of Schools, mathematics self-efficacy beliefs fully mediate the effect on Mathematics Achievement. The results from the 20 imputed datasets provided a total effect, as well as the indirect effect for both SES and High School Program. This information allowed for the testing of the significance of the total effect as well the testing of the indirect effect, using the Yuan (2001) method. The findings from these analyses revealed that the mediation effect was significant for each of the three predictor variables, as is the total effect (indirect and direct combined) for the two predictor variables (High School Program and SES) that were only partially mediated by Mathematics Self-efficacy Beliefs. The findings are summarized in Table 4.6 and Table 4.7.

Table 4.6

Mathematics Achievement Tests for Significance of Indirect and Total Effects

Name	*t* statistic	*df**
SES → Efficacy-related Beliefs → Achievement	5.73	19
High School Program → Efficacy-related Beliefs → Achievement	3.5	19
Relational Context of Schools → Efficacy-related Beliefs → Achievement	6.15	19
Total Effect SES (direct & indirect)	17.13	19
Total Effect High School Program (direct & indirect)	7.31	19

* Each value is significant at the p < .05 level for one-tailed test, t > 1.729

Table 4.7

Indirect and Direct Effects for Personal and School-related Influences of Achievement

Variable Name	Indirect	Direct	Total
Relational Context of Schools	.06	__	.06
Adolescent's High School Program	.03	.16	.19
SES	.06	.35	.41
Adolescent's Efficacy-related Beliefs	__	.27	.27

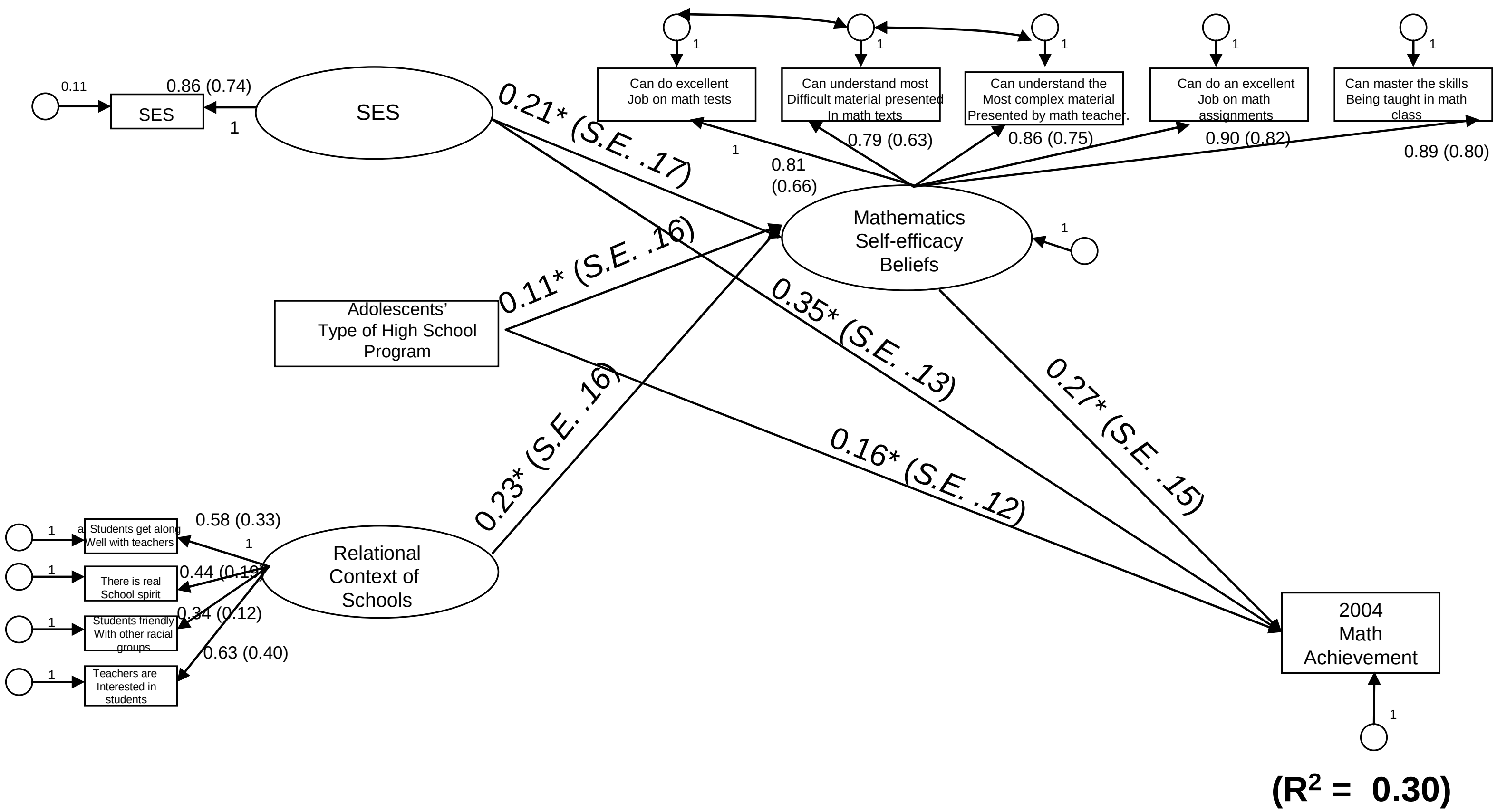

Figure 4.4: Final revised model for mathematics achievement depicting both structural and measurement components. Mean χ^2 = 116.516 (*df* = 64), Mean CFI = 0.991, Mean TLI = .987, Mean RMSEA = 0.027, Mean SRMR = 0.017. Standard Errors (S.E.) are reported italicized in parentheses. Paths are reported as Standardized Estimates. The R^2 estimate for the total model is reported in parentheses. * $p \leq .001$. All latent factors are correlated, but for purposes of visual clarity and ease of viewing, those relationships are not depicted.

Summary Mathematics Achievement Analyses

SEM analyses conducted on the revised model for the achievement outcome found that three of the latent variables (Academic Press, Math Teacher Beliefs, and Geographic Mobility Preference) did not have significant direct effects on the outcomes. A revised model excluding the three nonsignificant latent factors was subsequently tested and found to provide a good fit to the data. Further tests found both indirect and total effects were significant for SES and High School Program. The full mediation effect of the influence of Relational Context of Schools was also found to be significant.

Thus, the revised model demonstrated that certain environmental influences associated with the school context and socioeconomic status during 10th grade directly influenced rural youth's mathematics achievement even when measured two years later. Further, these influences were indirectly related to mathematics achievement two years later through their significant relation to adolescents' mathematics self-efficacy. The total amount of variance explained in educational expectations by the selected environmental and personal factors was 30%. This finding is an important step toward better understanding the influence of school contextual factors on adolescent achievement in math, indicating that high school program and the relational context of schools may be important to predicting students' mathematics achievement in 12^{th} grade. Because the reliability of the Relational Context of Schools is lower than optimal, the findings must be qualified by this limitation and are in need of further study. Additionally, the results showed the predicted influence of SES on students' mathematics achievement, as well as on students' mathematics self-efficacy beliefs. These findings and possible implications will be discussed further in the next chapter.

CHAPTER V

DISCUSSION

This chapter first discusses the major findings for educational aspirations and achievement, as well as social cognitive theory as a framework supporting the aims of this study. Next, the significant findings are discussed for both outcomes. Then, a brief discussion of the nonsignificant findings and possible explanations for these findings are provided. The final section includes implications of the study's findings for future research, an acknowledgement of study limitations, and a brief conclusion.

The Educational Aspirations and Mathematics Achievement of Rural Youth in ELS: 2004 Sample

A social cognitive framework of environmental and personal influences was used to examine sources of variation in educational expectations and mathematics achievement. The final model of the relations for rural youth's educational expectations explained approximately 23% of the variance among students, and the final model for mathematics achievement explained approximately 30%. Before discussing the findings for the model, a brief discussion of the findings regarding rural educational expectations and mathematics achievement in 2004 is provided.

Educational Expectations

Previous research suggests that educational expectations have a significant influence on actual educational attainment, career choices, and lifetime outcomes (Eccles, et al., 1998; Lent et al., 1994; Rojewski, 1999; Wilson et al., 1993). When compared to rural youth of nearly 25 years ago, it is clear that rural youth of today have higher educational expectations for educational attainment. Based on national data, Cobb, McIntire, and Pratt (1989) reported that 23% of rural high school seniors in 1980 planned to obtain only a high school diploma; 23% planned on graduating from a four-year college; and about 12% planned on graduate study (p. 13). At the time, rural youth's educational plans for the future differed from their nonrural peers in that urban and suburban youth were more likely to indicate plans for completing a four-year degree (26% and 28%, respectively) and plans for graduate study (26% and 26%, respectively) (Cobb et al., 1989, p. 13). Only 14% of urban and suburban participants indicated they would end their educational careers with a high school diploma (Cobb et al., 1989, p. 13). Researchers have analyzed the educational expectations of the total ELS: 2004 sample by locale (rural, urban, suburban) to find that a majority of rural and nonrural youth had plans for at least some college (86% and 87%, respectively) (U.S. Department of Education, 2005c, p.17). Analyses further showed that 34% of rural youth planned to graduate from a four-year college, as did 33% of urban youth and 35% of suburban youth (U.S. Department of Education, 2005c, p.17). Approximately 30% of rural youth planned to obtain a graduate degree, while 39% of urban youth and 36% of suburban youth reported plans for graduate study (U.S. Department of Education, 2005c, p.17). Thus, a comparison of the ELS: 2004 data to earlier national studies reveals that both rural and nonrural youth's educational plans for their future have changed over the last 25 years such that both groups aspire to more years of education.

Mathematics Achievement

Mathematics proficiency serves as an important gateway for future educational and occupational opportunities (Balfanz & Byrnes, 2006; Casey et al., 1997; U.S. Department of

Education, 1997). Descriptive analyses of the math achievement scores used for this study found that rural youth's mean mathematics achievement score was 49.98, which was very close to the ELS sample mean of 50 for the 12th-grade students nationwide. As explained in the measure description provided in Chapter 3, the math achievement test contained items testing students' knowledge of basic arithmetic, algebra, geometry, data/probability, and advanced topics and tested students on their knowledge and problem-solving abilities (U.S. Department of Education, 2006c, p. 34). Although not the focus of this study, published reports by the U.S. Department of Education provide more insights into the performance of rural youth for the various areas of the mathematics test. When comparing the mathematics achievement of all high school seniors in the ELS 2004,[1] only 34.9% of rural youth as compared with 38.8% of suburban youth demonstrated mastery of intermediate-level mathematics (U.S. Department of Education, 2005c, p. 15). A total of 3.3% of rural students compared with 4.3% of suburban students demonstrated mastery in solving complex word problems and advanced mathematics (U.S. Department of Education, 2005c, p. 15). These differences suggest that more research is needed on rural youth's mathematics achievement relative to nonrural youth and on what impact lower achievement in mathematics may have on long-term educational attainment and lifetime achievement. This study offers findings regarding significant influences that are related to school, socioeconomic status, and personal characteristics.

These data combine to indicate that the majority of rural youth plan to pursue at least some college education, but they may not have adequate preparation in advanced

[1] This is not the same sample as studied in this dissertation. This study restricted the sample to those who participated in 2002 and 2004, did not include any new students added to freshen the sample, and did not limit its analysis to students who were high school seniors only. The U.S. Department of Education Study cited herein refers to only high school seniors and is inclusive of the new students added to freshen the sample so that findings could be generalized to the entire senior student population in 2004.

mathematics. It appears that fewer rural students, compared to nonrural students, may have acquired the mathematics skills and knowledge base required for success in mathematics at the college level. As discussed previously, rural schools face a number of challenges in advancing the mathematics proficiency of their students. Rural schools have difficulty attracting and retaining highly qualified teachers, especially in the area of mathematics (Gandara et al., 2001; Monk, 2007; Peske & Haycock, 2006; U.S. Department of Education, 2005a) and rural schools are less likely to offer the types of rigorous academic training programs offered in nonrural schools (Provasnik et al., 2007).

Support for Social Cognitive Framework

This study used a social cognitive framework to examine the interrelations of selected 10th-grade school-related environmental influences, parent-related environmental influences (SES), personal influences associated with self-efficacy and geographic residential preference, and 12th-grade behavioral outcomes in terms of educational expectations and math achievement. As indicated in the models depicted in Figures 4.1 and 4.2 (see pp. 92-93), the study tested for direct relations of the environmental and personal influences on the outcomes, as well as for indirect relations of the environmental influences as mediated by the personal factor pertaining to self-efficacy beliefs. This study's findings support the use of social cognitive theory for explaining the interrelations of the influences and outcomes examined in this dissertation, as is discussed in the following paragraphs.

Social cognitive theory posits that human functioning is a result of the complex interplay among environmental, personal, and behavioral factors (Bandura, 1986). Using this framework as a guide, this study proposed that aspects of school contexts and socioeconomic status were environmental influences on youth outcomes, that mathematics self-efficacy beliefs and residential preference were personal influences on youth outcomes, and that youth's educational aspirations and mathematics achievement were behavioral factors that resulted from the interrelation of these influences. This study's proposed model placed mathematics self-efficacy beliefs as a mediator of the environmental influences on the behavioral outcomes, but direct relations were expected as well. Bandura's social cognitive theory explains that self-efficacy beliefs are domain specific (Bandura et al., 2001; Bandura, 1997), such that how one feels about one's competencies for math, for example, are specifically related to math-related outcomes. In the case of the outcome educational expectations, mathematics achievement has been shown to act as a path to higher educational attainment (ACT, 2008; Allen & Sconing, 2005; Balfanz & Byrnes, 2006; Casey et al., 1997; U.S. Department of Education, 1997). Thus, mathematics self-efficacy beliefs are important to youth's educational expectations and ultimate life trajectories because they serve to guide and direct behavioral choices either toward or away from mathematics coursework (Randhawa et al. 1993). Social cognitive theory is complementary to the Eccles and Roeser (2003) framework for analyzing schools as developmental contexts with proximal and distal influences.

Consistent with social cognitive theory, this study found that mathematics self-efficacy beliefs were significantly and positively related to both mathematics achievement and educational expectations. These findings are consistent with prior research conducted with other student populations (Bandura et al., 2001; Eccles, 1994; Meece et al., 1990; Pajares & Miller, 1994; Patrick et al., 2007; Pintrich & DeGroot, 1990; Randhawa et al., 1993). Pajares and Miller (1994) used a social cognitive framework to examine the relation of mathematics self-efficacy beliefs as a mediator of the influence of prior math experiences and gender on math achievement. Pajares and Miller (1994) reported that mathematics self-efficacy beliefs were positively associated with math performance on a standardized test assessing math aptitude. Randhawa, Beamer, and Lundberg (1993) reported similar findings in a study of 225 high school seniors in Canada. Prior aspirations-related research has found relations for self-efficacy beliefs and educational plans for the future that are similar to those found in this study (Bandura et al., 2001). In a study of Italian adolescents' aspirations, Bandura et al. (2001) demonstrated that academic self-efficacy influenced youth's educational plans for the future, as measured by participant reports on what educational level they expected to complete, ranging from completing middle school and high school to graduating from college.

Researchers have explained the relations of self-efficacy beliefs and educational attainment-related outcomes by suggesting that such findings demonstrate that how people feel about their abilities predicts behavioral choices and outcomes (Pajares & Miller, 1994, p. 200). For example, one's perceived ability in mathematics may direct one's behavior toward mathematics, either fostering a math-seeking or math-avoiding behavior that may influence course-taking patterns (Randhawa et al., 1993). Similarly for aspirations-related outcomes, researchers have explained that self-efficacy beliefs represent how students feel about their ability to perform the task or assignment (Bandura et al., 2001; Eccles, 1994). Engagement in mathematics will shape math knowledge, skills, and abilities, which can be revealed by tests of math aptitude. Research demonstrated that ELS students with higher mathematics achievement gains between 2002 and 2004 were those with more advanced coursework in mathematics (U.S. Department of Education, 2008b). Students who have higher educational aspirations are more likely to believe they can successfully complete a certain level of education (Bandura, 1989; Bandura et al., 2001; Eccles, 1994). This study demonstrates that mathematics self-efficacy relates to educational goals.

In this study, mathematics self-efficacy beliefs also served to explain the relations between certain environmental factors and the two educational attainment-related outcomes. Specifically, the relation of socioeconomic status and high school program enrollment to rural youth's educational expectations and mathematics achievement was mediated, in part, by mathematics self-efficacy beliefs. Similarly, the association of the relational context of schools was mediated by youth's mathematics self-efficacy beliefs. For this aspect of the school context, there was full mediation for the relation to mathematics achievement and partial mediation for the relation to educational expectations. These findings demonstrate that selected environmental influences are associated with rural youths' educational plans and mathematics achievement through their relation to youth's competency beliefs.

These mediation findings are consistent with Bandura's conceptualization of social cognitive theory and prior research. Bandura explained that SES influences behavior in part through its influence on self-beliefs (Bandura, 2001). Motivation and tracking researchers have discussed the negative consequences of curricular tracking on students' attitudes toward school and their competency beliefs for students who are enrolled in the noncollege preparatory tracks (Eccles, 2004; Eccles & Roeser, 2003; George, 1993; Oakes et al., 1992). Researchers have called for analyses that help to explain how differential high school curricular programs (i.e., tracks) influence educational outcomes (Oakes et al., 1992). This research demonstrated that curricular tracking influences rural youth through its association with their mathematics self-efficacy beliefs. Though other researchers have reported relations between ability grouping and self-efficacy beliefs (Salili & Lai, 2002; Usher & Pajares, 2006), this may be among the first studies to demonstrate the relation of high school program enrollment to mathematics self-efficacy beliefs in a national rural sample.

Finally, this study's findings are also similar to past research on the link between the relational context of the school and students' self-efficacy beliefs. The results of this study support earlier findings that demonstrate positive relations between self-report measures of academic self-concept and teacher support for high school students (Felner et al., 1985). The findings are also consistent with classroom-level research in which middle school students' perceptions of positive, student-centered classroom social environments were found to influence their academic efficacy beliefs, which in turn influenced engagement-related outcomes inclusive of achievement (Patrick et al., 2007; Ryan & Patrick, 2001). Though the items of analysis in the present study asked students about their experiences in schools rather than in classrooms per se, the findings support previous research emphasizing the social context of the classroom (Patrick et al., 2007; Ryan & Patrick, 2001). When combined with a focus on learning and academics, positive school relational contexts can have a positive influence on student achievement (e.g., Boyd & Shouse, 1997; Lee & Smith, 1999; Meece et al., 2003; National Research Council and Institute of Medicine, 2004).

Taken together, the findings of the present study are consistent with Bandura's conceptualization of social cognitive theory, in which efficacy beliefs lie at the heart of the relations among environmental, personal, and behavioral factors (Bandura, 2001). This study contributes to the existing literature by studying these relations in a national sample of rural youth and by examining 10^{th}-grade influences on outcomes two years later. The focus on mathematics self-efficacy beliefs may also hold particular significance for rural youth because they are less likely to be taught mathematics by highly qualified teachers and may have less access to higher level mathematics courses (Gandara et al., 2001; Monk, 2007; Peske & Haycock, 2006; Provasnik et al., 2007; U.S. Department of Education, 2005a). Thus, rural youth may have fewer opportunities to build and foster beliefs in their mathematics capabilities. Their future is further complicated by the fact that mathematics achievement has been shown to act as a gateway to college and career options (ACT, 2008; Allen & Sconing, 2005; Balfanz & Byrnes, 2006; Casey et al., 1997; U.S. Department of Education, 1997).

Finally, these findings offer support for future research using a social cognitive approach to examine the influence of rural youth's school experiences on educational attainment and achievement outcomes. This study demonstrated significant relations among adolescents' socioeconomic status, certain aspects of their schooling experiences, mathematics self-efficacy beliefs, and educational attainment-related outcomes, explaining between 23% and 30% of the variance among participants in the study. The following sections provide a discussion of additional significant relations that were found as part of this research study.

Additional Significant Influences on Rural Students' Educational Plans and Mathematics Achievement

This study proposed that several factors associated with adolescents' schooling contexts and SES would have both direct and indirect relations to the educational attainment-related outcomes. A direct relation for adolescents' residential preference was also hypothesized. Overall, the findings were mixed relative to the hypothesized relations. As presented in Chapter 4, this study found significant associations for the relation of Socioeconomic Status, High School Program Enrollment, and the Relational Context of

Schools to youth's educational expectations and mathematics achievement. Significant relations were also found for the association of adolescents' geographic residential preference and their educational expectations. The significant findings are discussed in this section, in order of their strength of influence.

Socioeconomic Status

Prior research indicating the important relation between SES and education-related outcomes in children and youth guided this study's inclusion of SES as a potential influence on rural youth's educational expectations and mathematics achievement (e.g., Bandura et al., 2001; Conger et al., 1997; Hansen & McIntire, 1989; McLoyd, 1998; Mau & Bikos, 2000; Rojewski, 1999; Sirin, 2005; Teachman et al., 1997). This study found significant direct and indirect relations for SES. Consistent with prior research on the relations of SES (or family income) to achievement and educational plans for the future (Bandura et al., 2001; Conger et al., 1997; Hansen & McIntire, 1989; McLoyd, 1998; Mau & Bikos, 2000; Rojewski, 1999; Sirin, 2005; Teachman et al., 1997), the present study demonstrated that higher SES was positively associated with higher mathematics self-efficacy beliefs, higher mathematics achievement, and higher educational expectations. In fact, SES had the strongest influence of all the factors in the model.

This study's findings regarding the relation of SES to educational expectations are consistent with prior research with national and urban samples (e.g., Hansen & McIntire, 1989; Huston, Duncan, & McLoyd, 2005; Mau & Bikos, 2000; Rojewski, 1999), as well as with rural samples (Brody et al., 1994; Conger et al., 1994; Rojewski, 1999). Hansen and McIntire (1989) analyzed the 1980 HSB study participants and reported that SES was positively associated with higher educational aspirations. Similarly, when examining the

1988 data, Mau and Bikos (2000) reported that SES was the third strongest predictor of youth's educational plans for the future before including race and gender in the analyses. In another study using NELS: 88 data, Rojewski (1999) found that SES was related to adolescents' postsecondary plans. Youth in the lowest SES quartile were more likely to be work bound after high school, whereas adolescents in the highest SES quartile were more likely to be college bound (Rojewski, 1999, p. 147). Though rural youth in the NELS: 88 database were more likely to be work-bound than urban youth, the effect of SES was similar in both geographical groups (Rojewski, 1999).

Studies examining the relation of SES to achievement have found results comparable to those in this study. Sirin's (2005) meta-analysis of 58 published studies between 1990-2000 analyzing over 100,000 youth demonstrated a consistent relation between SES and student achievement. Using national samples such as the National Longitudinal Study of Young Men (Teachman et al., 1997) and the National Longitudinal Survey of Labor Market Experience of Youth (Peters & Mullis, 1997), other researchers have reached similar conclusions that children and adolescents who are poor or near-poor do not achieve at levels comparable to children who are not poor (see also, McLoyd, 1998; Smith et al., 1997). Researchers using samples of rural youth have found comparable results. In a longitudinal study of rural Iowa youth, Conger, Conger, and Elder (1997) reported finding a significant relation between family finances and educational achievement, as measured by grade point average (GPA), such that children in more financially secure homes had higher grades. Likewise, researchers examining rural African-American youth in families in rural Georgia found that family financial resources related to academic achievement in both mathematics and reading, such that financial hardships were associated with lower achievement (Brody et al., 1994).

These findings are consistent with a social cognitive framework for analyzing the relations of SES to educational attainment-related outcomes and the consideration of self-efficacy beliefs as a partial mediator of this association. This study conceptualized adolescents' SES as a proximal influence, expecting that an adolescent's SES has an impact on daily activities, opportunities, and experiences. In explaining findings for the relation of SES and achievement-related outcomes in rural youth, researchers have focused primarily on the home environment. The lack of financial security can lead to family conflict that affects the quality of parenting behavior and the learning experiences of children in the home (Brody et al., 1994; Conger et al., 1997). In addition, poor families, urban and rural alike, are more likely to live in communities with a concentration of poverty. Such poor communities tend to have fewer resources for their families and their children (Brody et al., 1994; Duncan & Brooks-Gunn, 1997; Sirin, 2005). Their local schools may serve higher concentrations of poor children and youth and may have to do so with fewer financial and community resources (Duncan & Brooks-Gunn, 1997, p. 2; Sirin, 2005).

Rural schools may be particularly challenged to serve the educational needs of all students due to regional economic conditions. Many rural communities have faced negative economic changes in the industries upon which they have historically depended for their livelihood, such as agriculture and manufacturing (Gibbs et al., 2005). Rural schools are dependent upon local revenue, at least in part, for financial support (Monk, 2007), and the resources they offer their students are likely to resemble conditions in the community (Roscigno & Crowley, 2001). Rural schools located within poor communities often face higher operational costs, such as higher per pupil transportation costs and higher teacher salary expenditures (Monk, 2007). Research has demonstrated that in rural and remote schools, African-American and Native American children and youth are more likely to attend schools serving higher concentrations of poor students (Provasnik et al., 2007). These schools are among the hardest to staff (Provasnik et al., 2007). Thus, rural schools may be challenged to have the resources they need to serve the diverse needs of their children while simultaneously serving higher concentrations of low-income and poor students.

This study contributes to existing literature by examining the relations of SES to educational plans and mathematics achievement in a national sample of rural youth and by examining sophomore year influences on outcomes two years later. This study's findings may hold particular significance for rural youth because of limited community and school resources to offset the effects of low SES status on rural youth and the limited educational and vocational opportunities for rural youth after high school. More longitudinal research is needed on the influences of SES status on rural youth's educational attainment-related outcomes to better inform our understanding of its implications for overall educational attainment and how rural schools can be used as resources to improve their youth's educational outcomes.

High School Program Enrollment

This study included an analysis of the relation between high school program enrollment and rural youth's mathematics achievement and educational plans for the future, hypothesizing both direct and indirect relations. Mathematics self-efficacy beliefs were hypothesized to mediate, in part, the relation of high school program enrollment to educational attainment-related outcomes (Eccles, 2004; Eccles & Roeser, 2003; Oakes et al., 1992; Salili & Lai, 2003). Building from the Eccles and Roeser framework for analyzing schools as developmental contexts, high school program enrollment was conceptualized as a proximal influence associated with the school context (Eccles & Roeser, 2003). Results demonstrated that high school program enrollment had both direct and indirect relations to rural youth's mathematics achievement and their educational plans for the future. Rural youth enrollment in college preparatory programs was associated with higher mathematics self-efficacy beliefs, higher mathematics achievement, and higher educational expectations. Though significant direct relations were found, mathematics self-efficacy beliefs partially mediated the influence of high school program enrollment on the outcomes.

This study's findings are consistent with prior research on the influence of high school tracking (Berends, 1995; Lee & Bryk, 1988; Mau & Bikos, 2000; Mickelson & Heath, 1999; Oakes, 1995; Oakes et al., 1992; Rojewski, 1999; Vanfossen et al., 1987). Though the issue of curricular tracking is controversial, this dissertation's findings mirror prior research that demonstrated track placement's positive association with achievement outcomes (Lee & Bryk, 1988; Mickelson & Heath, 1999; Oakes, 1995; Vanfossen et al., 1987). Specifically, recent prior research with urban youth found that track placement ranked second only to prior achievement as a predictor of high school achievement, such that students in the more academically rigorous tracks had higher achievement (Mickelson & Heath, 1999). In other studies of urban youth, researchers have also reported that students placed in the lower tracks in high school experienced lower gains in mathematics achievement during high school than students with similar prior achievement in mathematics who were placed in the higher tracks (Oakes, 1995).

When examining the relation of high school program enrollment to educational plans, researchers have also demonstrated associations between track placement and level of educational aspiration. Researchers have found that high school program enrollment was the second largest predictor of students' educational plans for the future, after private versus public school enrollment (Mau & Bikos, 2000). Researchers have reported that rural youth are more likely than nonrural youth to be work-bound rather than college-bound (Rojewski, 1999). Further, researchers have reported that rural work-bound youth in NELS: 88 were more likely to be enrolled in the vocational educational program than were nonrural youth who were work-bound (Rojewski, 1999). Finally, this study's finding of an indirect relation, as mediated through mathematics self-efficacy beliefs, is consistent with research discussing that placement in noncollege preparatory tracks is associated with lower self-perceptions of competence and poorer attitudes toward school (Eccles, 2004; Oakes et al., 1992; Salili & Lai, 2003; Usher & Pajares, 2006).

Researchers have explained the association between track placement and achievement by pointing out that students in college-preparatory tracks are more likely to be taught by more experienced and highly qualified teachers and to have classroom settings that encourage higher order thinking and promote autonomy (Mickelson & Heath, 1999). Students in other tracks are more likely to be in classrooms where teachers may rely on drill-and-practice instructional techniques, rather than constructivist, engaging learning activities (Mickelson & Heath, 1999). Placements in tracks other than college-preparatory programs limit students' opportunities to enroll in higher level mathematics courses during their high school years (Oakes, 1986, 1987). Other explanations for these findings have included the influence of peers and the relationships forged in ability-grouped classrooms, as well as differential teacher expectations for different academic tracks (Eccles, 2004; Eccles & Roeser, 2003; Oakes et al., 1992; Salili & Lai, 2003). Few, if any, studies have examined tracking in rural samples; thus, much of what is known about the influence of curricular tracking in high schools is based on research with urban youth (e.g., Mickelson & Heath, 1999; Oakes, 1995).

Researchers have called for more study of the processes by which high school program enrollment has its influence (Oakes et al., 1992). This study used a social cognitive framework to examine and explain the relation of high school program enrollment to educational attainment-related outcomes in a national sample of rural youth. Extending prior research, the results showed that mathematics self-efficacy beliefs partially mediated the relation of high school program to achievement-related outcomes (Bandura et al., 2001; Eccles, 2004; George, 1993; Oakes et al., 1992).

Relational Context of Schools

This study used a latent construct to represent the relational context of schools. The conceptualization of the latent construct was shaped by prior research that indicated that an important aspect of the school context is the degree to which a culture of strong social supports and sense of community is fostered within the school (Bryk & Driscoll, 1988; Crosnoe et al., 2004; Lee & Burkam, 2003; National Research Council and Institute of Medicine, 2004; Shouse, 1997). This study tested both direct and indirect effects for the influence of the relational context of schools on rural youth's educational expectations and their mathematics achievement. The study found both indirect relations via mathematics self-efficacy beliefs and direct relations for the association to educational expectations. However, only indirect relations via mathematics self-efficacy beliefs were found for the association to students' mathematics achievement.

Consistent with other studies (Catterall, 1998; Lee & Burkam, 2003; Wood et al., 2007), this study found positive associations between aspects of the relational contexts of the school environment and adolescents' educational plans. Researchers analyzing NELS: 88 data have shown that adolescents who attend small- and medium-sized schools (i.e., fewer than 1,500 students) characterized as having more positive teacher-student relations are less likely to drop out of high school (Lee & Burkam, 2003). In another analysis of NELS: 88 data, Catterall (1998) reported that students who dropped out of school indicated they did not get along well with teachers and students. Focusing more specifically on educational aspirations, Wood, Kaplan, and McLoyd (2007) reported positive relations between urban adolescents' educational plans for the future and their more positive perceptions of the school environment. The present study extends these findings to a national sample of rural youth.

Researchers have explained these findings by discussing the importance of students' positive experiences in their classroom environments, including their perceptions of their teachers' support and students' support for learning, as important for building students' confidence in their abilities to perform required tasks and to take actions that lend themselves to higher achievement outcomes (Patrick et al., 2007, p. 93; Ryan & Patrick, 2001). With regard to completing high school, researchers have explained that positive relations among students and teachers operate at both the school and the individual level (Lee & Burkam, 2003, p. 386). Overall positive relations foster a school social organizational climate that operates to the benefit of the student through school engagement and school completion (Lee & Burkam, 2003). Though public schools cannot select their students, the teachers and school staff can alter their approach to interactions with students to better facilitate positive interactions.

The finding of no direct effect for the association between the relational context of schools and mathematics achievement was unexpected. Though research on the importance of this aspect of a school's overall climate to achievement outcomes provided support for proposing a direct effect (e.g., Bryk & Driscoll, 1988; Crosnoe et al., 2004; Shouse, 1997), none was found. This study's finding of no direct relation suggests that in this sample of rural youth, students' experiences of the social supports within school are related to their self-beliefs of competency. Further, students' experiences of the social supports within the school have their influence on their mathematics achievement through their positive relation to the mathematics self-efficacy beliefs.

Despite this limitation, the results on the relational context of the school have important implications for rural youth. Contributions of this research include its examination of the relational context of schools in a national sample of rural youth and its finding of significance for the influence of the relational context of schools on youth's educational attainment-related outcomes two years later. Few studies, if any, have examined the relational context of rural schools specifically. Researchers have described rural schools as positive environments that serve as important community centers for rural areas (Howley, 2006; Kannapel & KeYoung, 1999; Lyson, 2002; Rojewski, 1999). Yet, the present study's findings suggest that there are differences in how rural students perceive the social supports within their schools. Those students with more positive experiences of the relational contexts of their schools were found to have more positive mathematics self-efficacy beliefs and higher educational outcomes.

As reported in Chapter 3, the participants in this study attended a wide range of schools in terms of size (see pp. 56-57). In recent decades, small rural schools have been consolidated into larger schools serving multiple communities (Howley, 1996; Monk, 2007).

Such consolidated schools have resulted in the bringing together of students from diverse communities with different rural and social identities within the same environment (Monk, 2007). Previous evidence suggests that smaller school environments act as a protective factor for higher achievement outcomes, particularly for lower SES rural youth (e.g., Coldarci, 2006; Howley, 1996).

To summarize, this study demonstrates that when rural youth held more positive views of the relational contexts of their schools, they had higher mathematics self-efficacy beliefs and higher educational expectations. The study also found that rural students' more favorable reports of the relational context of school were positively related to their mathematics self-efficacy beliefs, which in turn positively related to the measure of mathematics achievement used in this study. The results are consistent with previous research using national and urban samples (e.g., Lee & Burkam, 2003; Wood et al., 2007). More important, prior research has shown that rural dropout rates are higher (Provasnik et al., 2007) and that school dropouts tend to report leaving school because they do not get along well with teachers and students (Catterall, 1998). Not surprisingly then, schools with more positive relations between students and teachers have lower dropout rates (Lee & Burkam, 2003). Thus, the findings suggest, as with urban schools, the relational context of rural schools is important to their students' educational attainment. Rural students who attend schools with positive relational contexts and social supports expect to continue their education beyond high school.

Geographic Residential Preference

This study included a latent factor for rural youth's geographic residential preference. The inclusion of a latent factor for geographic residential preference was guided by research suggesting that rural youth may experience unique internal conflict regarding the lack of career opportunities in their geographic region, their personal interests for educational and career attainment, and their desire to remain near their home communities (Elder et al., 1996; Hektner, 1995; Howley, 2006). With this literature as a guide, this study tested the hypothesis that rural youth who place a higher emphasis on moving away from the area and less importance on living near their relatives would have higher achievement and educational expectations. The results revealed a significant positive relation between geographic residential preference and youth's educational expectations, but no relation to mathematics achievement.

The finding for educational expectations is consistent with prior research (Elder et al., 1996; Johnson et al., 2005; Rojewski, 1999). In Rojewski's analyses (1999) of NELS: 88 data, he reported that rural youth who reported plans for college attendance placed a higher importance on moving away from their local community than did nonrural youth. Similar findings were reported in a longitudinal study of rural youth and families in Iowa (Elder et al., 1996; Johnson et al., 2005). Cross-sectional analyses of the Iowa youth at 12th grade found positive associations between rural youth's residential preference and their educational plans for the future and achievement, as measured by students' self-reports (Johnson et al., 2005). Longitudinal analyses of the Iowa rural youth at 8th grade and 11th grade found that plans for higher educational attainment were more likely among youth who attached less importance to remaining in their rural communities (Elder et al., 1996). Researchers have suggested that as adolescents mature and develop higher life aspirations, they may lessen their ties to their families and communities as they come to accept that they must leave their rural homes in order to pursue their goals (Johnson et al., 2005).

This study extends prior research with Iowa youth to a national sample of rural youth using national data collected in 2004. Additionally, this study may also be among the first to conceptualize residential preference as a latent construct and examine its relation in a structural equation model. In examining NELS: 88 data, Rojewski (1999) reported that moving away was more important for college-bound rural youth than for college-bound nonrural youth. This study of rural youth's residential preference, coupled with Rojewski's findings (1999), may explain their overall lower educational attainment relative to their nonrural peers. This study's findings are limited by the low reliability of the latent construct and more research is necessary to better inform our understanding of this relation.

Nonsignificant Influences on Rural Students' Educational Plans and Mathematics Achievement

It was hypothesized that several additional factors associated with rural adolescents' schooling contexts (e.g., Academic Press and Mathematics Teacher Beliefs About Student Success) would have both direct and indirect relations to the educational attainment-related outcomes. Significant relations were found for High School Program and Relational Context of the Schools. However, as presented in Chapter 4, no significant direct or indirect relations were found for Academic Press and Math Teacher Beliefs about Student Success. These nonsignificant findings are discussed in this section.

Academic Press

Though Academic Press is an important aspect of the school context that relates to educational outcomes (Lee, 2000; Lee et al., 1999; National Research Council and Institute of Medicine, 2004, p. 97; Phillips, 1997; Sherblom et al., 2006; Shouse, 1996a, 1996b, 1997), this study did not find evidence of direct nor indirect relations between Academic Press and adolescents' educational expectations and mathematics achievement. The findings are inconsistent with prior research, which has found that a strong emphasis on the curriculum and value for learning positively influence student academic engagement-related outcomes (e.g., Eccles & Roeser, 2003; Finn, 1989; 1993; Finn & Rock, 1997; Lee et al., 1999; National Research Council and Institute of Medicine, 2004).

There are several plausible explanations for the inconsistent finding. First, Academic Press was measured by three indicators that were taken from the school administrator survey. When measuring Academic Press, some prior studies have used both student- and teacher-reported measures of their perceptions of the Academic Press within the school in addition to school administrator-reported measures (Shouse, 1996a, 1996b; 1997). Other studies have relied solely on teacher and student reports for measurement of the construct instead (Lee & Smith, 1999; Lee et al., 1999; Philips, 1997). Motivational researchers have demonstrated that student perceptions of their learning environments are important to examine when trying to understand educational outcomes, as they may differ from teacher reports on related items (Meece et al., 2006; Meece et al., 2003; Schunk & Meece, 1992). Proponents of ecological models of human development also discuss the relevance of individual perceptions of their environments and experiences (e.g., Bronfenbrenner, 1977). Therefore, this study's measurement of Academic Press with only a school administrator survey may explain the lack of significant findings. Consistent with this explanation, adolescents' responses to survey items assessing the relational context of their schools were significantly related to the outcomes assessed in the study.

Second, the variability in the responses to the items for this factor may explain the lack of significance (See Table 4.1, p. 86). Most school administrators rated the Academic

Press items highly, as indicated by their mean scores ranging from 3.5 to 4.1 on a 5-point Likert scale; the average standard deviation was approximately .74. Similar scores on this item for all students would not relate to differential student outcomes. Third, the proposed relations between Academic Press and the educational outcomes were not based on research with rural samples. Prior researchers have not examined subgroup differences in national samples (Shouse, 1996a, 1996b; 1997) or have mainly examined urban (e.g., Lee, 2000; Lee et al., 1999) or suburban (e.g., Phillips, 1997) samples. More study is needed to better understand how to measure Academic Press in rural schools.

Math Teacher Beliefs About Student Success

The design of the teacher beliefs construct for the present study was guided in part by Lee's (2000) research using NELS: 88 data to examine the influence of teacher beliefs on student achievement outcomes. Lee (2000) relied on items similar to those used in this study and reported that student achievement outcomes were higher in schools where teachers' ratings were higher. Though this study used similar items to hypothesize influences on both achievement and educational expectations, no significant relations were found.

Similar to the nonsignificant findings for Academic Press, there are several plausible explanations for why no significant relations were found. First, measurement issues may play a role in its lack of significance. Motivational researchers have discussed the importance of students' perceptions of classroom and school environments on their educational attainment-related outcomes (Meece et al., 2006; Meece et al., 2003; Schunk & Meece, 1992; Urdan, Midgely, & Anderman, 1998), as have proponents of ecological models of human development (e.g., Bronfenbrenner, 1977). Although these teachers reported differentiated instruction based on student needs, student reports of their teachers' instructional styles often differ from the teacher-reported data (Meece et al., 2006). Second, like the responses for Academic Press, there was little variation in teacher scores on the items used to reflect this latent construct (See Table 4.1, p. 86). Third, the Lee study (2000) that guided this research used a national sample, while this study was restricted to rural youth only. Perhaps this construct does not operationalize similarly in rural youth. Last, prior studies that found significance relied on reports from teachers of multiple academic subjects, but this study's measures were limited to input from mathematics teachers only. Future research using ELS data should consider including both math and English teachers in testing the influence of teacher beliefs on educational expectations.

Summary of Findings

This study found significant direct and indirect relations for the influence of 10^{th}-grade SES, High School Program Enrollment, and the Relational Context of Schools on rural youth's educational plans for the future and their math achievement measured two years later, such that approximately 23-30% of the variance in student outcomes was explained. The Relational Context of the Schools' relation to achievement, however, was mediated by students' Mathematics Self-efficacy Beliefs; no direct relations were found. The study also found a significant effect for the relation of geographic residential preference and rural youth's educational plans; no effect was found for this influence on mathematics achievement. This study's findings suggest that rural youth's connections to their families, communities, and schools in 10^{th} grade are predictive of their educational plans two years later. Also, these findings demonstrate that aspects of rural students' experiences in their schools may influence their educational attainment outcomes and do so in part through their association with youth's self-beliefs of competency.

This study's findings regarding the influence of High School Program enrollment may be particularly important to rural youth because they lack access to advanced coursework in high school when compared to opportunities provided to nonrural youth (Provasnik et al., 2007). There is evidence that rural youth's achievement was lower than that of suburban youth (Provasnik et al., 2007; U.S. Department of Education, 2005c, p. 15). Rural youth's lack of opportunity to take advanced coursework (Provasnik et al., 2007) and the finding of the link between higher track enrollment and higher educational attainment may make access to college preparatory programs and to advanced coursework even more important for rural youth.

Though this study had expected to find significant direct and indirect relations for the association of Academic Press and Mathematics Teacher Beliefs about Student Success to students' educational attainment-related outcomes, no significant relations were found. Possible explanations for the lack of significance include that the measurement of the construct does not include student reports and that the constructs may not operate the same in rural samples. More research using rural student reports pertaining to Academic Press and their perceptions of their teachers' beliefs about student success is necessary.

Finally, though this study demonstrates the utility of social cognitive theory for examining these relations, this study is limited due to lack of any analyses of possible reciprocal relations among the factors; reciprocity is also posited by social cognitive theory (Bandura, 2001). It is possible, for example, that youths' prior mathematics achievement and reported educational aspirations played a role in their choice of or placement in a particular high school program, as curricular enrollment decisions may have been made prior to 10^{th} grade (Oakes et al., 1992). These analyses were beyond the scope of this study. Similarly, structural equation modeling procedures were used to test hypothesized relations in this study. Though longitudinal relations were examined, no definitive conclusions can be drawn about cause and effect relations based on correlational data.

Implications for Future Research

This study's findings provide guidance for future studies of rural youth's educational outcomes. Key implications for future research are outlined briefly in this section. First, this study demonstrates the utility of a social cognitive framework for examining and explaining relations among rural youth's educational outcomes and selected developmental influences. Future studies of rural youth may consider the use of a similar approach. Although prior research has informed awareness of lower rural educational attainment (e.g., Brookings Institution, 2003; Cobb et al., 1989; Rojewski, 1999), more research is needed that examines school-related processes through which rural youth's aspirations and school achievement develop. The current study indicates that a social cognitive theoretical approach will help to expand our knowledge of such processes and influences.

Second, longitudinal analyses are needed to examine the present study's model components for their relation to college-going and college-completion rates (i.e., years of schooling completed). Such analyses would be especially informative if they included comparisons among rural and nonrural youth. Longitudinal analysis of school-contextual influences on educational attainment is necessary to increase understanding of the roles of schooling in rural versus nonrural youth. It may not be enough to examine educational aspirations and expectations alone. While the gap between rural and nonrural youth's four-year college aspirations appears to have closed over the last three decades, their college attendance rates and college graduation rates may not have closed. Rural youth's mathematics achievement relative to nonrural youth may indicate that there is a readiness difference, such that rural youth may not be as academically prepared for their stated aspirations (Provasnik et al., 2007; U.S. Department of Education, 2005c). Rural youth's math achievement scores may put them at a disadvantage in terms of access to college. More study in this area is needed.

Third, future researchers should build from this study's findings regarding the importance of schooling contexts to examine additional aspects of schooling, such as the influence of teacher expectations. Extant research has demonstrated relations between teacher expectations and student educational attainment-related outcomes (e.g., Jussim et al., 1996; Jussim & Harber, 2005). Much of the research on rural teachers has focused on their educational expectations for their students with conflicting findings. Studies in the 1980s indicated that rural teachers held lower expectations than urban teachers for their students' college attendance (Cobb et al., 1989) and expected their students to stay in the local area after high school (Ley, Nelson, & Beltyukova, 1996). These studies are noteworthy because research also suggests that low-income rural youth in particular rely more on other community members, rather than family, when making future education decisions (Dyk & Wilson, 1999). In contrast, a recent qualitative study indicated that teachers were more likely to expect students to leave the local area to build a successful life (Hedlund & Hine, 1995). More research on rural teacher expectations is needed.

Researchers should also seek to better understand and measure how different aspects of school climate combine to affect school engagement and achievement. As discussed by the authors of *Engaging Schools*, it is important to examine both the school's value of academics and the social supports within the school (National Research Council and Institutes of

Medicine, 2004). Some evidence suggests that social support without a strong academic focus does not have the same positive effect as when both elements are present (Lee & Smith, 1999). Though this study did not find a significant relation between Academic Press and the educational-attainment-related outcomes, more research is needed to understand the differential roles of Academic Press and social support within rural schools.

Next, researchers should examine the influence of SES on educational expectations and achievement in national samples over time, using readily available data from the HSB, NELS, and ELS studies. Comparisons of rural and nonrural youth over time will inform our understanding of whether the impact of SES on rural youth's educational attainment differs from that of nonrural youth. In the present study, SES was found to have the strongest influence among the variables in the model. As research expands into more aspects of school contexts, such as the influences of peers, teacher expectations, or instructional approaches, SES should remain a consideration in proposed models. Ideally, a better understanding of the developmental influences of school contexts can lead to intervention programs that help youth to overcome any negative influences of lower SES.

Another important next step is to better understand the role of residential preference in rural youth's behavioral outcomes (i.e., their achievement-related choices). Researchers need to understand if rural youth have a preference for remaining in the local community, if that preference influences their achievement-related choices, and what differentiates rural youth who are willing to move away from those who are not. If researchers and policymakers seek to understand overall U.S. student achievement when rural high school students underachieve relative to their nonrural peers, then the issue of residential preference as a possible influence on rural youth's choices needs to be clarified because it may explain an important aspect of the relative underachievement of rural youth. It may be important for future research to consider residential preference in rural youth as a latent construct, rather than to measure it with a single variable. A latent construct may better afford the opportunity to capture the complexities associated with the rural students' choices regarding their future residence.

Future researchers need to examine potential moderators of the relations found in this study, including the effect of race and ethnicity, gender, SES, and school size. Researchers studying constructs similar to those examined in this study have found differences among groups and across schools (e.g., Coladarci, 2007; Mau & Bikos, 2000; Sirin, 2005; Valadez, 1998). Finally, the school-related factors that were found to be nonsignificant should serve to initiate further research on Academic Press and teacher beliefs about student success in rural schools. These findings may demonstrate that what works well for urban and/or suburban youth may not necessarily work well in rural schools. More research is necessary, especially research that focuses on student perceptions of these constructs.

Limitations of this Dissertation Study

While this study informs our understanding of rural adolescent development and the influence of schooling contexts and personal factors on educational attainment, it is not without limitations, several of which are important to identify. First, the data are from a secondary dataset and were not collected for the specific purposes outlined in the present study. Second, this study is limited because it did not evaluate the potential moderating effects of gender, race or ethnicity, and SES. Further, this study is limited due to its focus on all rural youth in the ELS: 2002 and 2004 sample; it does not account for differences within rural populations that exist across the U.S. Rural schools and communities differ throughout the country, varying in terms of student demographics, size, teacher quality, school resources, and geographic isolation (Arnold et al., 2007; Peske & Haycock, 2006; U.S. Department of Education, 2005a). Similarly, the study does not include data on suburban and urban youth and may not generalize to those populations. Future studies should examine the influences included in this study across geographical samples to better understand differences among schools and locales. Additionally, it is important to point out that the outcome variable educational expectations is limited, too, in that it refers to students' plans for their future rather than their actual behavior. Relatedly, the ELS study is limited by its examination of the participants beginning in their sophomore year. Sample selection may have excluded the students who already dropped out of school. There are also limitations due to biases in student participation whenever informed consent is used and to sample attrition (approximately 4%) from 2002 to 2004. Another limitation of this study is that it does not control for prior mathematics achievement. Therefore, it is possible that students' level of mathematics achievement in 10^{th} grade may explain relations and variance in the models examined in this study. The ELS: 2002 contains 10^{th} grade mathematics achievement data and such information could be used in future studies. This study is also limited by the mixing of measurement methodologies for the school contextual influences (i.e., student level measures for High School Program and Relational Context of the School versus school level measures for Academic Press and Mathematics Teacher Beliefs about Student Success). Future analyses using hierarchical linear modeling techniques (HLM) are recommended. Finally, the findings associated with the construct for Geographic Residential Preference and the Relational Context of Schools are limited by their low reliability rating. The findings related to these constructs are in need of further study.

Conclusion

The purpose of the study was to extend existing literature in at least two important ways: 1) to contribute to the rural education research literature by providing insights into the developmental aspects of schooling contexts and personal factors on rural youth's educational expectations and achievement and 2) to contribute to adolescent research literature by providing new information on the interrelations of selected schooling contexts, mathematics self-efficacy beliefs, and adolescents' educational expectations and achievement. This study may be among the first studies to use ELS to examine rural youth's educational expectations and mathematics achievement. It may also be among the first studies to use structural equation modeling to examine latent constructs related to family socioeconomic background, rural school contextual factors, residential preferences, and mathematics self-efficacy beliefs in a national rural sample. Social cognitive theory was used as a guiding theoretical foundation, and mathematics self-efficacy beliefs were used as a mediator in the proposed model. The most important finding from this study may be its demonstration of mathematics self-efficacy beliefs as a mediator of school context and SES on achievement and educational plans for the future.

This study demonstrated that certain aspects of schooling contexts matter, namely high school program enrollment and the relational context of the schools. These features of school experiences offer a promising opportunity to positively shape rural youth development. This study adds to the literature on the role of school contexts as important to adolescents' academic and career trajectories. A greater number of rural youth today plan to attend 2- or 4-year colleges. Greater access to an academically rigorous curriculum is needed to ensure their successful attainment of educational goals. Such access should lead to higher achievement and higher college-going rates for rural youth. Similar outcomes can be expected for rural schools that work to establish more supportive environments with increasingly positive relationships between students and teachers. At a time when so much national political attention has been focused on public education and holding schools accountable for helping all children to succeed, this study affords an opportunity for viewing schools as valuable resources through which to foster higher educational attainment.

APPENDIX A

DESCRIPTIVE STATISTICS FOR "DON'T KNOW" STUDENTS

A main focus of this dissertation study was rural youth's educational expectations. The descriptives analyses for the students who answered "don't know" to the question regarding educational expectations are provided in this section for the interested reader. Table C1 provides means, standard deviations, and other information on the variables analyzed in the model for the 185 students responding "don't know." Though the total number of rural public school students in 2004 who responded "don't know" was 231, this analysis is limited to the 185 of those who were still in school, as evidenced by the presence of a mathematics achievement test score.

When comparing the 185 students who selected "don't know" as their response to the question on educational expectations to the 2,095 students who provided an estimation of the amount of school they would complete, some interesting differences are found. First, academic differences are evident. The "don't know" students had lower average scores on the math achievement tests (mean score = 45.32 versus mean score = 49.98, respectively). Over half (51%) were in the "general" high school program track but only 38% of the study sample (n = 2,095) were enrolled in the "general" program. Second, there are gender and minority status differences: 57 percent of the "don't know" students were male adolescents whereas 49% of the study sample (n = 2,095) were male students. In terms of race and ethnicity, 36% of the "don't know" students identified themselves as a racial or ethnic minority, compared with 23% of the total study sample (n = 2,095). The "don't know" students were more likely than the total study sample to be English language learners (10% versus 6%, respectively). Additionally, more of the "don't know" students than the study sample were in the lowest quartile for SES (31% versus 25%, respectively) and had parents who were high school dropouts (7% versus 4%, respectively). Further, the “don’t know” students were less likely than the study sample to live with both their mother and father (51% versus 60%, respectively), and more likely to live with their mother only (21% versus 15%, respectively). Finally, consistent with other educational attainment-related data that reports underachievement in the South relative to other regions (Swanson, 2004), over half (52%) of the “don’t know” students were from the South.[1]

In summary, there are small but important differences between the students who answered “don’t know” to the educational expectations question and the students who provided a response that indicated their level of educational plans. These are students who remain enrolled in school but do not indicate their plans for their future educational attainment. This is an area for future research.

[1] Percentages for the other regions were: Northeast = 7%; Midwest = 29%; and West = 11%.

Table A1

"Don't Know" on Educational Expectations (n = 185): Means, Standard Deviations (S.D.), Range, Skewness, and Kurtosis

Variable Name	Mean	n	S.D.	Range	Lowest	Highest	Skewness	Kurtosis
2004 Math Achievement*	45.30	185	8.55	42.56	22.49	65.05	-0.12	-0.41
2004 Educational Expectations	n/a							
SES	-0.22	185	0.60	2.86	-1.69	1.17	0.20	-0.39
Learning is high priority	3.29	170	0.80	3	2	5	-0.08	-0.69
Students expected to do homework	3.92	170	0.86	3	2	5	-0.37	-0.58
Teachers press students to achieve	3.90	170	0.71	3	2	5	-0.46	0.39
Students get along well with teachers	2.78	174	0.63	3	1	4	-0.67	1.01
There is real school spirit	2.89	174	0.76	3	1	4	-0.53	0.26
Students friendly with other racial groups	3.16	172	0.69	3	1	4	-0.77	1.21
Teachers are interested in students	2.81	171	0.68	3	1	4	-0.53	0.63
Teacher's attention to unique abilities and interests of student	3.14	164	0.63	2	2	4	-0.11	-0.49
Teacher's use of effective methods of teaching	3.28	165	0.54	2	2	4	0.10	-0.51
Teacher's enthusiasm or perseverance	3.50	165	0.54	2	2	4	-0.35	-1.12

* From math test standardized T score, with a mean of 50 and a standard deviation of 10.

Table A1 (continued)

"Don't Know" on Educational Expectations (n =185): Means, Standard Deviations (S.D.), Range, Skewness, and Kurtosis

Variable Name	Mean	n	S.D.	Range	Lowest	Highest	Skewness	Kurtosis
Importance of moving away	1.77	166	0.78	2	1	3	0.42	-1.22
Importance of living by family	1.96	166	0.67	2	1	3	0.04	-0.74
Can do excellent job on math tests	2.2	110	0.83	3	1	4	0.77	0.29
Can understand the most difficult material presented in math texts	1.97	112	0.85	3	1	4	0.76	0.18
Can understand the most complex material presented by math teacher	1.97	109	0.81	3	1	4	0.58	-0.04
Can do an excellent job on math assignments	2.13	108	0.84	3	1	4	0.70	0.18
Can master the skills being taught in math	2.11	106	0.85	3	1	4	0.62	-0.02

* From math test standardized T score, with a mean of 50 and a standard deviation of 10.

APPENDIX B:

DESCRIPTIVES INFORMATION

Table B1

*Frequencies for Model Variables with Missing Data**

Indicator Name	N	Missing	% Missing
Learning is high priority	1872	223	10.6
Students expected to do homework	1872	223	10.6
Teachers press students to achieve	1872	223	10.6
Students get along well with teachers	2016	79	3.8
There is real school spirit	2011	84	4
Students friendly with other racial groups	2010	85	4.1
Teachers are interested in students	1992	103	4.9
Teacher’s attention to unique abilities and interests of student	1812	283	13.5
Teacher’s use of effective methods of teaching	1830	265	12.6
Teacher’s enthusiasm or perseverance	1828	267	12.7
Importance of moving away	2029	66	3.2
Importance of living by family	2029	66	3.2
Can do excellent job on math tests	1580	515	24.6
Can understand the most difficult material presented in math texts	1578	517	24.7
Can understand the most complex material presented by math teacher	1525	570	27.2
Can do an excellent job on math assignments	1493	602	28.7
Can master the skills being taught in math	1477	618	29.5

*2004 Educational Expectations, 2004 Achievement, SES, and High School Program have no missing data.

APPENDIX C:

CORRELATION ANALYSES

Correlations Among Indicators For Latent Factors

Tables C1 – C5 provide the correlations among the indicators for five factors in the model: Academic Press, Relational Context of Schools, Math Teacher Beliefs about Student Success, Geographic Residential Preference, and Mathematics Self-efficacy Beliefs.

Table C1

Correlations of the Indicators for Academic Press

Indicators		Teachers press students to achieve	Learning is high priority for students	Students expected to do homework
Teachers press students to achieve	Pearson Correlation	1	0.45(**)	0.45(**)
	Sig. (2-tailed)		0.00	0.00
	N	1872	1872	1872
Learning is high priority for students	Pearson Correlation	0.45**)	1	0.53(**)
	Sig. (2-tailed)	0.00		0.00
	N	1872	1872	1872
Students expected to do homework	Pearson Correlation	0.45(**)	0.53 (**)	1
	Sig. (2-tailed)	0.00	0.00	
	N	1872	1872	1872

** Correlation is significant at the $p \leq 0.01$ level (2-tailed)

Table C2

Correlations of the Indicators for Relational Context of Schools

Indicators		A	B	C	D
Students get along well with teachers					
	Pearson Correlation	1	0.25 (**)	0.18(**)	0.35(**)
	Sig. (2-tailed)		0.00	0.00	0.00
	N	2016	2007	2007	1987
There is real school spirit					
	Pearson Correlation	0.25(**)	1	0.18(**)	0.26(**)
	Sig. (2-tailed)	0.00		0.00	0.00
	N	2007	2011	2002	1981
Students friendly with other racial groups					
	Pearson Correlation	0.18(**)	0.18(**)	1	0.21(**)
	Sig. (2-tailed)	0.00	0.00		0.00
	N	2007	2002	2010	1982
Teachers interested in students					
	Pearson Correlation	0.35(**)	0.26(**)	0.21(**)	1
	Sig. (2-tailed)	0.00	0.00	0.00	
	N	1987	1981	1982	1992

** Correlation is significant at the $p \leq 0.01$ level (2-tailed)

Table C3

Correlations of the Indicators for Math Teacher Beliefs about Student Success

Indicators		A	B	C
Attention to unique abilities and interests of student	Pearson Correlation	1	0.52 (**)	0.42(**)
	Sig. (2-tailed)		0.00	0.00
	N	1812	1812	1810
Teacher's use of effective methods of teaching	Pearson Correlation	0.52(**)	1	0.49(**)
	Sig. (2-tailed)	0.00		0.00
	N	1812	1830	1828
Teacher's enthusiasm or perseverance	Pearson Correlation	0.42(**)	0.49(**)	1
	Sig. (2-tailed)	0.00	0.00	
	N	1810	1828	1828

Correlation is significant at the $p \leq 0.01$ level (2-tailed)

Table C4

Correlations of the Indicators for Geographic Residential Preference

Indicators		Import of living by family	Importance of getting away from this area
Importance of living by family	Pearson Correlation	1	0.23(**)
	Sig. (2-tailed)		0.00
	N	2029	2020
Importance of getting away from this area	Pearson Correlation	0.23(**)	1
	Sig. (2-tailed)	0.00	
	N	2020	2029

** Correlation is significant at the $p \leq 0.01$ level (2-tailed).

Table C5

Correlations of the Indicators for Mathematics Self-efficacy Beliefs

Indicators		Can do excellent job on math tests	Can understand difficult math texts	Can understand difficult math class	Can do excellent job on math assignments	Can master math class skills
Can do excellent job on math tests	Pearson Correlation	1	0.79(**)	0.72(**)	0.73(**)	0.71(**)
	Sig. (2-tailed)		0.00	0.00	0.00	0.00
	N	1580	1565	1512	1484	1471
Can understand difficult math texts	Pearson Correlation	0.79(**)	1	0.76(**)	0.71(**)	0.70(**)
	Sig. (2-tailed)	0.00		0.00	0.00	0.00
	N	1565	1578	1517	1486	1473
Can understand difficult math class	Pearson Correlation	0.72(**)	0.76(**)	1	0.78(**)	0.78(**)
	Sig. (2-tailed)	0.00	0.00		0.00	0.00
	N	1512	1517	1525	1482	1469
Can do excellent job on math assignments	Pearson Correlation	0.73(**)	0.71(**)	0.78(**)	1	0.81(**)
	Sig. (2-tailed)	0.00	0.00	0.00		0.00
	N	1484	1486	1482	1493	1463
Can master math class skills	Pearson Correlation	0.71(**)	0.70 (**)	0.78(**)	0.81(**)	1
	Sig. (2-tailed)	0.00	0.00	0.00	0.00	
	N	1471	1473	1469	1463	1477

** Correlation is significant at the $p \leq 0.01$ level (2-tailed).

Correlations Among Latent Factors

Tables C6 and C7 provide the correlations among the latent factors in the model. Values are reported separately for each of the two models (Achievement and Educational Expectations) owing to slight differences between the values.

Table C6

Correlations Among Latent Factors for Educational Expectations Outcome Model

Latent Factors	Standardized Estimate
Relational Context of Schools with:	
Mathematics Self-efficacy Beliefs	0.25***
Math Teacher Beliefs about Student Success	-0.00
SES	0.04
Academic Press	0.12*
Geographic Residential Preference	-0.40***
Mathematics Self-efficacy Beliefs with:	
Math Teacher Beliefs about Student Success	0.01
SES	0.24***
Academic Press	0.02
Geographic Residential Preference	-0.05
Math Teacher Beliefs about Student Success with:	
SES	-0.04
Academic Press	0.05
Geographic Residential Preference	0.05
Academic Press with:	
SES	0.21***
Geographic Residential Preference	0.04
Geographic Residential Preference with:	
SES	0.09*

Note: Standardized estimates are reported from Mplus (Version 5.0) analyses, which are based on mean values calculated from the 20 multiple imputed datasets.

* Correlation is significant at the $p \leq .05$ level (two-tailed test).

** Correlation is significant at the $p \leq .01$ level (two-tailed test).

*** Correlation is significant at the $p \leq .001$ level (two-tailed test).

Table C7

Correlations among Latent Factors for Mathematics Achievement Outcome Model

Latent Factors	Standardized Estimate
Relational Context of Schools with:	
Mathematics Self-efficacy Beliefs	0.25***
Math Teacher Beliefs about Student Success	-0.01
SES	0.04
Academic Press	0.12*
Geographic Residential Preference	-0.22*
Mathematics Self-efficacy Beliefs with:	
Math Teacher Beliefs about Student Success	0.01
SES	0.24***
Academic Press	0.02
Geographic Residential Preference	-0.01
Math Teacher Belief about Student Success with:	
SES	-0.04
Academic Press	0.05
Geographic Residential Preference	0.00
Academic Press with:	
SES	0.21***
Geographic Residential Preference	0.06
Geographic Residential Preference with:	
SES	0.08*

Note: Standardized estimates are reported from Mplus (Version 5.0) analyses, which are based on mean values calculated from the 20 multiple imputed datasets.

* Correlation is significant at the $p \leq .05$ level (two-tailed test).

** Correlation is significant at the $p \leq .01$ level (two-tailed test).

*** Correlation is significant at the $p \leq .001$ level (two-tailed test).

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