Direct and Indirect Effects of School Learning Variables on Black 10th Graders' Academic Achievement

by

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(ABSTRACT)

The purpose of this study was to estimate the direct and indirect effects of certain school learning variables on the academic achievement of Black 10th graders. Simultaneously looking at variables associated with student background characteristics (i.e., gender and socioeconomic status); the school (i.e., students' perceptions of the school environment, teachers, and teaching); family (i.e., parental expectations and involvement); and students (i.e., educational aspirations and motivation) a model of academic achievement was constructed.

Responses to questions from a large, nationally representative dataset (i.e., the National Educational Longitudinal Study of 1988 or NELS:88) were employed to test the model. The 1,766 Black students participating in the study in both 1988 and 1990 formed the sample. Following a test of the overall model using a program of linear structural relations (LISREL), developed by Joreskog &

Sorbom (1989), the magnitude of path coefficients were examined for significance.

Prior achievement produced an overwhelmingly large effect on later achievement. Socioeconomic status (SES) produced a large effect and students' perceptions of teachers produced a small although statistically significant effect on achievement. In addition, prior achievement, SES, and parental aspirations also influenced student aspirations. Student motivation was affected by prior levels of achievement, gender, and SES. Findings indicate that despite high educational aspirations of both Black children and their parents, these aspirations often affect neither student achievement as measured by scores on standardized tests nor student motivation.

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Given present levels of disparity in the process of education for students of color and women, I wonder not why many drop out of school. Rather I marvel at the number of those who persist. I am deeply grateful to God to be counted as one of the successes.

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TABLE OF CONTENTS

Page

Abstract ii

Acknowledgements iv

List of Tables vii

List of Figures viii

CHAPTER

1. **INTRODUCTION** 1
   Background 1
   Problem Statement 6
   Purpose 9
   Research Questions 11

2. **REVIEW OF SELECTED LITERATURE** 13
   Past Research on School Learning Theory 13
   Variables Consistently Appearing in Models of School Learning 17
   School Learning Variables and the Achievement of Black 10th Graders 32

3. **METHODOLOGY** 48
   Data 48
   Design and Analysis 49
   Plan of Analysis: The Path Model 50
   Assessment of Fit 52
   Subjects 54
   Sampling 54
   Weighting of Responses & Non-responses 55
   Variables included in the Model 56
   Operational Definitions 57
   Miscellaneous Variables 59

4. **RESULTS** 60
   Student Profile 60
   Results from the Path Analysis 88
   Effects on Academic Achievement 99
   Effects on Student Motivation 103
   Effects on Student Aspiration 106

5. **DISCUSSION** 111

CONCLUSION 127

TABLE OF CONTENTS (Continued)

Page

REFERENCES 132

APPENDICES 143

A. CODEBOOK 144

B. Figure A1-A5: Antecedent Causes of Prior Achievement, School Environment, Perceptions of Teachers, Parental Aspirations, and Parental Involvement 155

C. VITA 162

List of Tables

Table **Page**

1A Weighted Composite Variables' Correlations, Means and Standard Deviations 94

1B Unweighted Composite Variables' Correlations, N (In Parentheses) and Associated Probabilities . . 95

2 Number of Cases, Mean, Standard Deviation, Minimum and Maximum Values of Unweighted Composite Variables for a Model to Test the Direct and Indirect Effects of School Learning Variables on the Academic Achievement of Black 10th Graders . . . 96

3 Measures of Overall Fit and R^2 for the Model to Test the Direct and Indirect Effects of School . . Learning Variables on the Academic Achievement of Black 10th Graders 97

4 Direct, Indirect, and Total Effects of Variables Influencing the Academic Achievement of Black 10th Graders 101

5 Direct, Indirect, and Total Effects of Variables Influencing the Motivation of Black 10th Graders . 105

6 Direct, Indirect, and Total Effects of Variables Influencing the Aspiration of Black 10th Graders . 108

List of Figures

Figure		Page
1	Direct and Indirect Effects of Variables Influencing the Academic Achievement of Black 10th Graders	10
2	Parents' Annual Income for 1987	62
3	Highest Educational Level of Parents	64
4	Student Household Composition: Presence of Male or Female Parent or Guardian in the Home	65
5A	8th and 10th Grade Reading Proficiency Scores	67
5B	8th and 10th Grade Math Proficiency Scores	70
5C	8th and 10th Grade Science Proficiency Scores	72
6	Students' Perceptions of Fairness of Discipline at their Schools	75
7	Students' Perceptions that Students are Friendly with other Races	76
8	Students' Beliefs that Students Get Along Well with Teachers	77
9	Students' Perceptions that Teaching is Good at their Schools	78
10	Students Belief that Teachers' Praise their Hard Work	79
11	Students' Feelings that They are Often Put Down by their Teachers	80
12	Students' Perceptions of Parents Aspirations for Them	83
13	Students' Involvement of their Parents in Discussions to Take the ACT/SAT and Go to College	84
14	Students' Plans for College after High School	85
15	Students' Thoughts regarding How Far in School they Think they Will Get	87

List of Figures, Continued

Figure		Page
16	Amount of Time Spent on Homework per Week by Students	89
17A	Years of Math Completed by Students	90
17B	Years of Science Completed by Students	91
17C	Years of Language Courses Completed by Students	92
18	Reconstruction of Figure 1: Nonsignificant Paths Deleted	98
19	Significant Paths to Black 10th Graders' Achievement	100
20	Significant Paths to Black 10th Graders' Motivation	104
21	Significant Paths to Black 10th Graders' Aspirations	107
A1	Direct Effects of Background Variables on Prior Achievement of Black 10th Graders	156
A2	Direct Effects of SES on the School Environment as Perceived by Black 10th Graders	157
A3	Significant Paths to Black 10th Graders' Perceptions of Teachers and Teaching	158
A4	Significant Paths to Black 10th Graders' Perceptions of Parental Aspirations for Them	159
A5	Significant Paths to Black 10th Graders' Perceptions of Parental Involvement	160

CHAPTER 1

INTRODUCTION

Background

The achievement of students has long been of concern to parents, academicians, policy makers and the general public. Countless models have been developed to explain variability in student achievement (Donovan, 1984; Keith & Benson 1992; Keith & Page, 1985; Martinez-Ponz & Zimmerman, 1990; Reynolds, 1989; Young & Fraser, 1992). For minority students, research has traditionally focused solely on their background characteristics. That is, attempts have been made to predict or explain minority students' academic achievement from background characteristics of their families (i.e., socioeconomic status or home possessions as indicators of affluence); the students themselves (e.g., ethnicity or gender); and from characteristics ascribed to them (typically ability, self-esteem, locus of control, and motivation). (See Burlew, 1979; Crumpton & Tolbert, 1975; Curry, E. W. et al. 1975; Flaugher, 1971; Fry, P. S. & Coe, K. J., 1980; Heussenstam, F. K. & Hoepfner, R. , 1971; Johnsen, K. P. & Medley, M. L., 1978; Lloyd, D. N., 1967; and Suchman, E. A., 1968). Other studies have sought to explain varying graduation rates among minorities by looking at factors inhibiting or enhancing their persistence in high school and college (American Council on Education, 1989;

American Council on Education, 1988; Astin, 1982; Fleming, 1984; Ogbu, 1990; Pounds, 1987; Spring, 1989).

From these and similar studies, the term "at-risk" has been applied to students who were more likely than others to drop out of school. More often than not, at-risk status has been ascribed to students by virtue of their membership in an ethnic minority group (i.e., typically Black or Hispanic); social minority group (i.e., teen-age females considered at risk of dropping out of school due to pregnancy); or if they lived in an inner city and were poor (Jones and Watson, 1990).

While background and socioeconomic status (SES) undoubtedly factor into at-risk status for poor and minority students, these variables may only partially explain the level of academic achievement attained. Furthermore, they may merely play an indirect role in explaining the phenomenon in relation to other causal factors. Thus studies focusing on student background characteristics alone may result in the labeling of students as at-risk by virtue of their membership in a minority group apart from their ability. According to Winfield (1991):

> . . . using the term at-risk to describe the students often produces "victim blaming" and suggests that the causes for being at risk for failure actually emerge from the student, his or her family, or his or her culture rather than from social, political and economic conditions. (p.6)

In light of the foregoing, some researchers have proposed adopting a broader definition of at-risk which focuses on other causes in addition to background characteristics of students. Pallas (1989), for example, asserted that "... young people are at risk, or educationally disadvantaged, if they have been exposed to inadequate or inappropriate educational experiences in the family, school, or community" (p. 3). Cueller and Cueller (1990) concluded that it is the combination of student characteristics and school conditions which affect students' decisions to drop out of school. These include lack of teacher interest in students and an unfair disciplinary system. Wehlage and Rutter (1986) reported:

> . . . it is not clear if measured characteristics such as low educational/occupational aspiration, weak sociability, negative school attitudes, low self-esteem, and external sense of control are brought to the school or produced by school experiences (p. 375).

Models focusing on background characteristics of students alone often cannot explain why students possessing one or more "risk" characteristics do not drop out of school; nor why students possessing none of these characteristics drop out. Moreover, reliance on these models seldom lead to improvements in educational service delivery since backgrounds of students are difficult, if not impossible, to change.

The model presently proposed includes background student variables as possible causes or explanations of student achievement. Also included are measures of school and home environments, as well as other student characteristics. These are gender, socioeconomic status, prior achievement, student perceptions of the school and teachers, student perceptions of parents' aspirations for them and parental involvement, as well as measures of students' aspirations and motivation. All are believed causally related to student achievement.

This study was conducted using a nationally representative sample of Black 10th graders (N=1,766). Data were collected during the base year of the National Center for Education Statistics (NCES) National Education Longitudinal Study of 1988 (NELS:88) and the first follow-up (1990). Path analysis, a method for studying causal patterns among a set of variables (Pedhazur, 1982), was used to estimate direct and indirect effects of parental, school and student variables on these students' achievement.

The application of path analytic techniques represents a major point of departure from experimental methods designed to gather evidence of causal relations. With true experimentation, random assignment to control and treatment groups as well as manipulation of independent variables are

prerequisites. Quite often in social science research, satisfying these conditions is untenable.

Keith (1993) differentiated experimental from non-experimental research. He noted:

> In nonexperimental . . . research, there is generally no manipulation of the independent variable; rather, existing variation is studied to make inferences about the extent of the influence of one variable on another. Nonexperimental research does not demonstrate causality with the same degree of assurance as does experimental research. But when analyzed properly, causal inferences can be made from nonexperimental research.
>
> (In addition one) can examine the effects of many variables in combination, thus modeling real-word complexity (p. 37).

He also indicated that non-experimental methods may be preferred over experimental methods in applied settings such as schools where (1) randomization is often difficult, if not impossible, and (2) some independent variables are simply not randomly assignable.

Simultaneously looking at hypothesized factors believed to affect achievement of Black students, the present study will model the "real-world complexity" of Black 10th graders' academic achievement by separating correlations among causal influences into direct and indirect effects.

Problem Statement

Ogbu (1991) documented three problems with existing theories and explanations of variability in minority students' school performance:

> First, they ignore the historical and wider societal forces that can encourage or discourage the minorities from striving for school success. Second, they do not consider a group's collective orientation toward schooling and striving for success as a factor in academic achievement. They assume that school success is a matter of family background and individual ability and effort. And third, the theories fail to consider the minorities' own notions of the meaning of and the "how-to" of schooling in the context of their own social reality. (p. 6)

A more adequate explanation of variability in minority students' school success, he added, would focus on and incorporate perceptions and understandings held by minority students. The present study relies solely on the responses and perceptions of Black students.

Yet studies advancing the theme of minorities and poor students as at risk may be problematic in yet a fourth way. They may, perhaps unwittingly, foster a bias in perception among teachers of minority students. A perceptual bias could prove detrimental to the academic achievement of students to the extent that once perceived as at-risk or "educationally disadvantaged," teachers teach accordingly. This phenomenon, referred to in the literature as self-fulfilling prophecy (Babad, 1993; Babad, 1990; and Brophy, 1983), has received considerable attention. According to Jussim (1986), self-fulfilling prophecies occur in three sequential stages:

(1) Teachers develop expectations based on stereotyping and status of students

(2) Teachers treat students differently depending on these expectations, and

(3) Students react to this treatment in expectancy-confirming ways.

The prevalence of lowered teacher expectations for and higher incidences of punitive sanctions imposed against minority students has been well documented (Cueller & Cueller, 1990; Cummins, 1986; Oakes, 1987; Ogbu, 1990; Pollard, 1989; Wehlage & Rutter, 1986; and Weinstien, Madison & Kolinsky, 1995). They reported how lowered teacher perceptions often contributed to some minority students dropping out of school.

Ogbu (1990; 1992) provided insight into the process by which students react in what Jussim (1986) referred to as "expectancy-confirming ways." Ogbu stated that for many Black students, school learning tends to be equated with the learning of the culture and language of White Americans at the expense or detrimental displacement of their own social identity and self-worth. In addition, he added, social pressures which might include barriers to the opportunity structure, incidences of racism, and evidence that Blacks typically have not been equally rewarded for their educational achievement as have their White peers often discourage minority students from adopting the attitudes and behaviors that enhance school learning (1990; 1992).

The prophecy can be seen as coming full circle when minorities, in turn, adopt and display in-school behaviors that are contrary to their school success. Evidence includes operating from a frame of reference of lowered expectations and beliefs regarding their own ability or disengaging from the schooling process thereby confirming stereotypes and perceptions previously held. These students, in turn, may become at risk of (1) subsequent expulsion for disciplinary reasons, (2) placement on academic probation or suspension as a result of low grades, or (3) dropping out.

Purpose

Whether Black students are dropping out of school on their own accord or are being forced out, their disproportionate numbers among all school leavers is a cause for concern. At a minimum the need exists to reverse both lowered perceptions and negative expectations of minority students. As a place to start, rather than focusing on minority students considered "at-risk," research might better inform policy and practice if variables possibly impacting the academic success of minority students are identified and factors associated with their success modeled.

> In particular, there is a need to identify what Bloom calls "alterable variables" which are associated with those students' academic success. Theoretically,

> alterable variables represent factors in the student or environment which can be manipulated in some way to enhance school performance (Pollard, 1989, p. 298).

The body of knowledge known as school learning theory (Haertel, Walberg & Weinstein, 1983) provides a framework for modeling causal influences of students' school achievement.

The purpose of this study is to examine the direct and indirect effects of variables believed to influence the academic achievement of Black 10th graders (See Figure 1). Because it is believed that academic achievement is an outgrowth of schools, parents, and students operating synchronously and synergistically, the model includes measures of students' perceptions of the school environment, teachers and teaching, parents' educational aspirations for their children and parental involvement, as well as characteristics of students' themselves (i.e., measures of students' educational aspirations and students' motivation to achieve). From the simultaneous inclusion of multiple variables one can determine, within the confines of restrictions imposed, which from among these variables exert the greatest, unique influence on academic achievement. Testing indirect effects along with direct effects permits examination of mediational processes implied by school learning theory. That is, testing both direct and indirect effects is necessary to "advance theory and understanding of

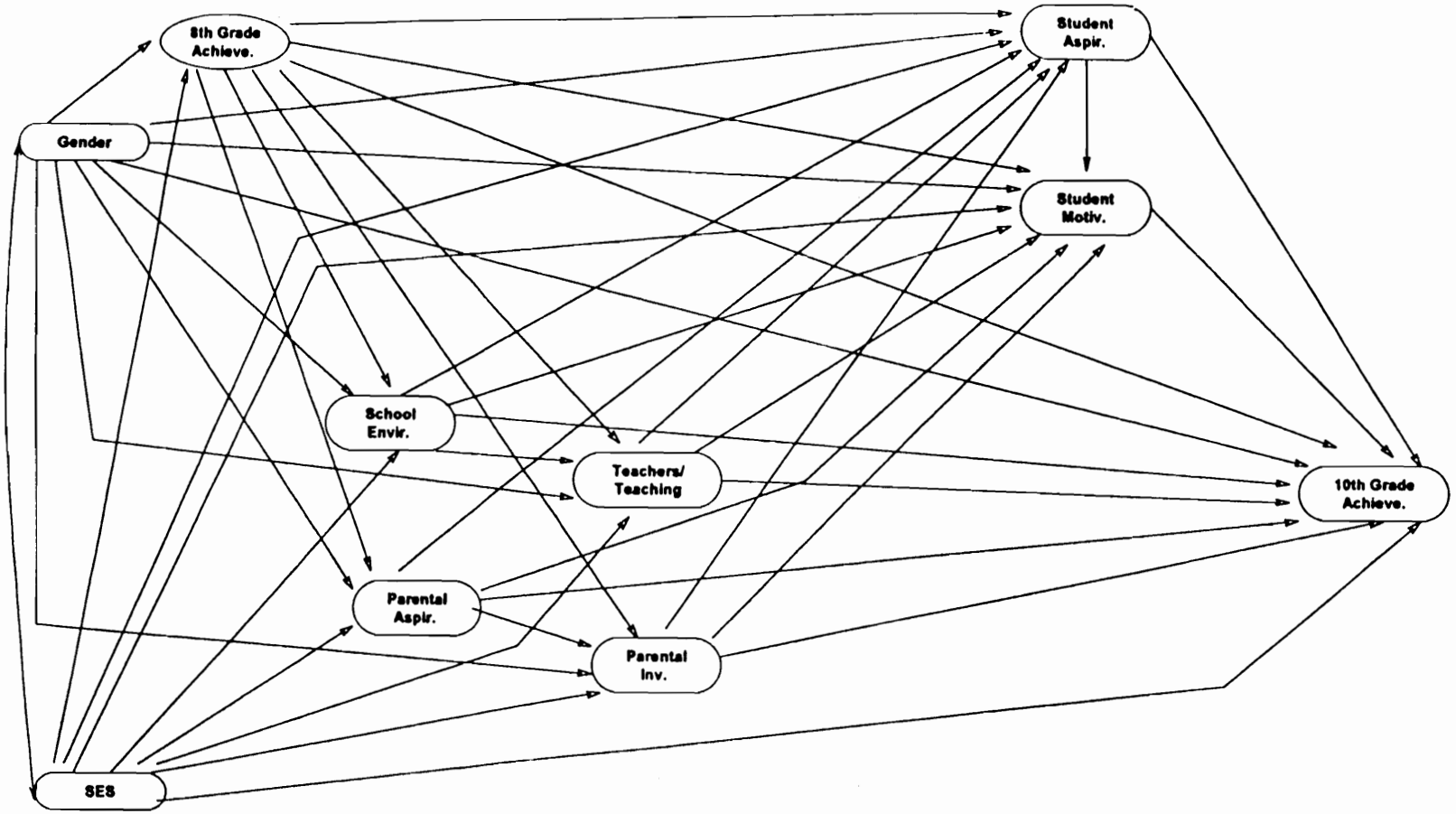

Figure 1: Direct and Indirect Effects of School, Parent and Personal Variables on Black 10th Grade Students' Academic Achievement

catalytic or suppressor effects of indicator variables in educational applications" (Keith & Benson, 1992, p. 85). Furthermore, both are needed to represent the complexity involved.

Research Questions

It is hypothesized that the variability in achievement among Black 10th graders can be explained by the interrelationships among the ten variables outlined above. Of primary interest is the interrelationship among the eight endogenous variables whose causes or sources of variation are believed to lie within the model. These are prior achievement in 8th grade, perceptions of the school environment and teacher effectiveness, perceived parental aspirations for children, measures of parental involvement, students' own educational aspirations, students motivation to achieve as evidenced by time spent on homework and courses, and achievement in 10th grade. These relationships will be examined while controlling for two exogenous variables whose causes or sources of variation are assumed to lie outside the model. The exogenous variables are gender and socioeconomic status (SES).

The following questions, again controlling for gender and SES, guide the present investigation.

- To what extent is the model adequate to explain Black students' academic achievement?
- To what extent does a prior measure of achievement explain future achievement?
- To what extent can in-school variables such as student perceptions of the school environment and teachers explain variability in their academic achievement?
- To what extent can parents' expectations for and involvement with their children's post-secondary plans explain variability in children's achievement?
- To what extent can variables regarding the students themselves (i.e., students' educational aspirations and motivation to achieve) explain variability in their academic achievement?
- Of the influences of school and parents, which exerts the greatest causal influence on achievement through student aspiration and motivation?

CHAPTER 2

REVIEW OF SELECTED LITERATURE

To support this study, a review of literature was conducted. Specifically, the review was conducted in order to (1) examine past research on school learning theory; (2) glean from this body of knowledge which variables appear consistently in present models of school learning; and (3) substantiate a theoretical framework or model of indicators of academic achievement for Black 10th graders.

1. Past Research on School Learning Theory.

Herbert Walberg has remained a major contributor to the literature and body of knowledge known as school learning theory. Walberg developed, in 1980, a theory of educational productivity which "guided the compilation of more than 120 research syntheses of approximately 8,000 small-scale experimental and correlations studies . . . and 23 regression analyses" (Reynolds & Walberg, 1992). In a now classic article, Walberg and colleagues (Haertel, Walberg & Weinstein, 1983) synthesized eight (8) psychological models believed foundational to school learning theory. These models set forth the conditions deemed essential for student learning and are summarized below in chronological order.

The John Carroll Model (1963). A pre-existing condition for learning, according to the Carroll model, was the degree to which students both (1) were allotted needed time to learn and (2) who invested the allotted time in mastery of content. Five constructs formed the basis of his model: aptitude, perseverance, ability to comprehend instruction, opportunity to learn, and quality of instruction.

The Bruner Model (1966). Bruner viewed instruction as the means by which the learner becomes self-sufficient. Of utmost importance to Bruner was an individual's predisposition toward learning. The ideas of self-sufficiency and predisposition for learning correspond to motivation to learn. Bruner believed that the instructor was responsible for maintaining the proper balance between instruction, feedback, and uncertainty. Instruction was to be based on optimum structuring and sequencing. He also advocated incorporating a system of rewards and punishments as motivators for learning.

The Cooley and Leinhardt Model (1975). Cooley and Leinhardt focused on the relationship between school practices and school performance as predictors of both academic achievement and student attitudes. In

particular, school performance was seen as the result of five constructs: initial abilities, opportunity to learn, motivators, structure, and instructional events.

The Bloom Model (1976). According to Bloom, prior achievement, reading comprehension, verbal intelligence, attitude toward the subject matter, self-concept of the learner and attitude toward the school were prerequisites for school learning to be maximized.

The Glaser Model (1976). Glaser's model consisted of four components. These included assessment of (1) competencies and skills to be achieved; (2) the initial state from which learning begins; (3) conditions to be implemented to produce change from the learner's initial state to the desired state of competence, and (4) procedures to determine the short- and long-term outcomes of the conditions implemented.

The Harnischfeger & Wiley Model (1976). This model emphasized background characteristics (i.e., of teacher, student, and curriculum/institution), teaching-learning process, and outcomes. Pivotal to their research was the belief that pupil outcomes are mediated through pupil pursuits: The number of courses

taken and total active learning time expended influence pupil outcomes.

The Gagne Model (1977). Gagne proposed that learning proceeds through eight phases: activating motivation, informing learner of objectives, directing attention, stimulating recall, providing learning guidance, enhancing retention, promoting transfer of learning, and eliciting performance and providing feedback.

The Bennett Model (1978). Bennett outlined a six-variable model of school learning: amount of coursework, time allocated to curriculum activity, total active learning time, total content comprehended, achievement on curriculum tasks, and feedback.

These models were instrumental in the construction and advancement of school learning theory but merely represented a starting point for future research. That is they successfully documented the importance of six of the ten variables presently proposed: (1) prior measures of aptitude or achievement, (2) teacher quality and quality of instruction, (3) student attitudes and aspirations, (4) student motivation/time spent on coursework, (5) the school and classroom environment, and (6) feedback on or measures

of later stages of achievement. The need continues to exist for research testing specific variables falling within these broad constructs. Research is also needed which includes parental influences as well as background characteristics of students. Moreover, given that school achievement is a dynamic and interactive process, research on both direct and indirect effects on achievement is needed in order to "promote understanding of (their) catalytic or suppressor effects" (Keith & Benson, 1992, p. 85). One can examine, for instance, whether students' perceptions of the quality of instruction significantly impacts their achievement directly or indirectly through their aspirations, motivation, or coursework.

2. Variables Consistently Appearing in Models of School Learning.

Walberg's theory of educational productivity converged on nine factors viewed as likely correlates or possible causes of school learning (Haertel, Walberg & Weinstein, 1983; Walberg, 1982; Walberg, 1981). He grouped these into three basic constructs. These were (1) instruction, including both quality and quantity; (2) social-psychological environment, with elements of class, home, and

peer environments and the influence of media/amount of television viewed; and (3) aptitude, such as developmental age, ability, and motivation. Of primary interest to Walberg and others were eight of the original nine factors: four were labelled essential factors and four supplementary. Essential factors included student ability, student motivation, quality of instruction, and quantity of instruction. Supplementary factors included the classroom's social-psychological environment, education-stimulating conditions in the home, education-stimulating conditions in the peer group, and exposure to such forms of mass media as television (Haertel, Walberg & Weinstein, 1983).

Much of the work of Walberg and colleagues, in the Bloom tradition, has focused on analyses of "alterable" vs. "static" variables believed to influence school learning (Pollard, 1989). Keith (1988) and Keith and Benson (1992), in similar fashion, proposed testing the effects of "manipulable influences" on academic achievement or grades. Keith (1988) hypothesized that there are five manipulable influences which affect school learning. Four were among the educational productivity models of Walberg. These include quality and quantity of instruction, student ability, and motivation. The fifth variable, time needed for learning, is from the Carroll tradition. In fact, the literature review produced numerous studies in the Carroll-

Bloom-Walberg tradition. The principal differences among studies centered around two basic questions, namely: (1) how constructs were to be operationalized and (2) which variables were to be included and which were to be excluded. Most researchers analyzed the relationship between two or three of the educational productivity factors in correlation or regression studies. An overview of these studies is presented below: grouped under headings proposed as influences on academic achievement in the present model. The thrust here is to gather evidence of the suitability of the proposed measures to explain the variability in students' academic achievement.

Background Variables. For the present study, gender and socioeconomic status represent the exogenous, background variables. These variables consistently appear in previous studies of student achievement.

Prior Achievement. Again in the Carroll-Bloom-Walberg tradition, prior achievement, as an indicator of behaviors and aptitudes students bring to the instructional setting, has been shown to be a solid predictor of future achievement (Haertel, Walberg & Weinstein, 1983). It is typical to include as a measure of prior achievement the scores of students on a standardized test administered in prior years

(See Cool & Keith, 1991; Donovan, 1984; Fehrman, Keith & Reimers, 1987; Keith, 1993; Keith & Benson, 1992; Keith & Cool, 1992; Keith, Keith, Bickley & Singh, 1992; Reynolds & Walberg, 1992; and Singh et al., 1995).

School Influences on Students' Academic Achievement

For the present study, school environment refers to the social attitudes held by students which may foster or hinder students' academic achievement. While schools represent one of the myriad of institutions operating within American society, they represent a subset of society within themselves. In this regard schools may be seen as having their own culture (i.e., prescribed set of norms and values) and identity. School variables are included in the present model because it is believed that schools exert their own unique influence on the academic achievement of its students through its climate or environment and teachers.

School Environment. Maehr & Fyans (1990) referred to the school environment as school culture. They reported findings from three studies designed to determine how school culture, family, and student background characteristics influenced student motivation and achievement. For their study achievement was measured by responses to a subset of items in Math, Science, and English from the Metropolitan

Achievement Test--Sixth Edition. Student motivation was measured from questionnaire responses regarding attributions of success and failure, sense of competence, test anxiety, perceived value of education, expectations of success, and continuing motivation (p. 13). Looking at responses of 4,002 10th graders randomly sampled from Illinois' public schools, they compared "the influence of school culture to other 'subjective cultures' that likely influence the adolescent, specifically those associated with peer group(s) and family" (p. 21). After conducting a factor analysis they concluded that motivation is highly associated with and causally related to school achievement and (2) school culture accounted for more variation in student motivation than did press of the family. In their model school culture mediated the effects of family press on motivation and, ultimately, achievement (p. 24). Their results are keenly relevant in that they provide evidence of the role of the school environment in shaping both motivation and achievement of students. They also point to the possible need to enhance the educational environment in order to ultimately influence student motivation and achievement.

Fraser, Welch & Walberg (1986), Reynolds & Walberg (1992) and Walberg, Fraser & Welch (1986) tested models of educational productivity applying both multiple regression and analysis of linear structural relations (LISREL), and

found the academic (i.e., classroom) environment to be a significant independent predictor of achievement when using teachers' perceptions of the environment. The present study differs in that (1) influence of the overall school environment as opposed to the classroom environment, is of interest and (2) students represent the unit of analysis. Thus while the effect of the environment on academic achievement will be tested, responses of students who specified their perceptions of the school and classroom environment will be used rather than perceptions of teachers.

Students' Perceptions of Teachers and Teaching. The inclusion of students' perceptions of teachers and teaching is based on the premise that general support from teachers positively impacts the academic achievement of students. Wehlage and Smith (1992) summarized the impact of effective teachers and teaching:

> When teachers take on the role of mentor, friend, and confidant as well as instructor . . . and when classrooms come to be characterized by learning activities that are meaningful for students and demand their active involvement, alienated students can develop a high level of engagement that results in achievement. (pp. 93-94)

Students' perceptions of teachers and teaching have been included in studies of academic achievement by Keith

and colleagues to test both their direct and indirect effects on academic achievement. For example, Keith and Cool (1992) tested the direct and indirect effects of students' perceptions of quality of instruction along with measures of ability, motivation, homework, and academic coursework on the achievement of a sample of 25,875 high school students participating in the High School and Beyond study. Achievement was an average of students' scores on standardized tests of Reading and Math. These students were sophomores in 1980 and seniors in 1982. A similar study was conducted by Cool and Keith (1991) looking at 28,051 high school seniors. In both analyses, the direct effect of instructional quality was significant. There is direct correspondence between the measures used to operationalize the teacher effectiveness variable in the studies of Keith et al. to those proposed for the present analysis. That is, both studies use responses of students to questions regarding the quality of instruction and general interest of teachers in students.

Parental Influences on Students' Academic Achievement.

Keith, Keith, Bickley & Singh (1992) as well as Singh et al. (1995), reported that research on the effects of parental involvement on students' academic achievement varies (1) by age of students, with involvement being more

effective for elementary than for high school students; and (2) according to the measure of learning used, with grades being more easily influenced than test scores. Certainly it is a variable that should not be ignored. The literature review produced uniform agreement that parental involvement was important but measures of involvement were divergent. Following is a summary of selected findings on the effect of parental involvement as measured by two variables: parental educational aspirations for students and parental involvement in students' social and school/academic activities.

Parental Educational Aspirations for Students. Parents' educational aspirations for their children is included in the proposed model because it is generally accepted that parents' aspirations and expectations of children's performance represent "an important mechanism by which parents influence children's self-concept and expectancies as well as their academic behaviors" (Thompson, Alexander, & Entwisle, 1988, p. 427). Among the hypotheses tested, Thompson and colleagues sought evidence to answer the question, "Do household configurations (i.e., single/dual-parent) influence parent's ability estimates for and expectations of their children?" Sampled were 825 first graders and 800 parents (typically mothers). Three sets of

predictors were used: (1) background characteristics of students which included gender and ethnicity; (2) home environment indicators which included parents' education, parent employment, number of siblings, and designations of mother-father households, mother-extended households, mother-father extended households; and (3) a prior measure of achievement, (i.e., the California Achievement Test). Within households where a parent at least lives with another adult, the parent expressed higher expectations for student grades than did the parent in a household headed by one adult. Thompson et al. (1988) also reported that such expectations had a significant total effect on grades. While grade attainment has a different meaning and connotation from achievement, particularly when achievement is measured by scores on a standardized test, their findings are relevant to the proposed research as it demonstrated a relationship between parental expectations and grades as a measure of student achievement.

Reynolds & Lee (1991) factor-analyzed measures of the home environment which included socioeconomic status, home resources, parent expectations, and parent-child communication. Their analysis supported two factors: home family resources and communication-interaction as well as the hypothesis that parent's expectations have a significant effect on their children's educational attainment. For

their study, however, the construct parental expectations was included in a factor they termed the "family resource dimension" which consisted of measures of parents' socioeconomic status, parental expectations, parents' school involvement, and home resources. While these variables are proposed for inclusion in the present model, with the exception that home resources has been included in the SES composite, they will be configured differently in order to estimate the effects of parental involvement apart from measures of socioeconomic status. Namely socioeconomic status, which includes a measure of home resources or family income, will be included as an exogenous variable in the present study. Parental expectations and involvement will represent measures of a separate, endogenous factor (i.e., parental influences).

Parental Involvement. Several researchers have examined the impact of parental involvement on the academic achievement of students. Reynolds (1991), measuring parental involvement as a function of the degree to which parents visited school that year, served as a volunteer at school, or attended school events, found parental involvement to exert a significant indirect effect on science and math achievement for an 8th grade sample. Fehrmann, Keith & Reimers (1987) measured parental

involvement as a weighted composite of five questions: "My parents (or guardians) almost always know where I am and what I am doing." "How much has each of the following persons influenced your plans for after high school." (This was separated into two questions--one measuring influence of mother and the other measuring influence of father.) "My mother (stepmother or female guardian) keeps close track of how well I am doing in school." "My father (stepfather or male guardian) keeps close track of how well I am doing in school." The measure of achievement was grades. For their sample of 28,051 seniors selected from the first round (1980) of the High School and Beyond Longitudinal Study they found that parental involvement had a moderate effect (.129) on grades. This suggested that increased parental involvement contributed to higher grades. In a study by Keith, Keith, Bickley & Singh (1992), parental involvement was shown to have an even stronger direct effect on achievement (.287). In their study parental involvement had four indicators. These included measures of parental aspirations for children, family monitoring of homework and family rules, parent-student discussions of school activities, and parental participation in school activities. Achievement was measured by a series of standardized tests in reading, math, science, and social studies. The study of Singh et al. (1995) indicated that among four components

of parental involvement--parental aspirations, parent/child communications regarding school, the home environment, and parental participation in school activities, parental aspirations had the strongest effect on academic achievement.

Because the present study samples an older cohort, variables selected as indicators of parental involvement are viewed as more "age-appropriate." Specifically, a measure of parental involvement will be students' responses to the extent they discuss with parents activities geared toward post-secondary education.

Student Influences on their Academic Achievement. It is believed that student achievement is influenced by what goes on in the school and home environments. However, a theory of school learning would be incomplete without taking into account students' frames of reference and their personal efforts toward achievement. For the present study, student influences include measures of students' educational aspirations (i.e., how far in school the student wants to go or how much schooling he or she thinks he or she will get) and student motivation (i.e., as it relates to self preparation for further education, evidenced by time spent on homework and coursework).

Students' Educational Aspirations. Aspiration is included in the proposed model since it is perceived as a "motivator of individual behavior that develop(s) in the context of individuals interacting with others at home, at school and in other settings" (Johnson, 1992, p. 111). Arthur Reynolds (1991) tested students' educational expectations as an intervening influence on eighth grade achievement in math and science. Expectations were measured in response to the question, "As things stand now, how far in school do you think you will get?" Although Reynolds stressed the importance of including students' aspirations in a model of achievement, it does not appear that he estimated its effect on science or math achievement. It may be that the path from students' aspirations to achievement was measured in an initial estimation of his model and found to be insignificant, resulting in his excluding the variable from further analysis. However, this point was not made in the article and one is left to speculate why he emphasized the inclusion of the variable but did not estimate its path.

Student Motivation. For the present study, student motivation will be measured by responses to questions regarding the amount of time spent on homework as well as amount of academic coursework. Keith and colleagues (Keith, 1988; Keith & Benson, 1992; and Keith & Cool, 1988) have

operationalized amount of time spent on homework and taking academic courses as indicators of academic motivation.

Reynolds (1991) investigated the relationship between student motivation and science and math achievement. Motivation was measured by responses to the questions: How often do you (1) "try harder if you get bad grades" and (2) "try hard to do my best in school." He concluded from his study of 3,116 8th graders that academic motivation exerted small direct and indirect effects when geographic (i.e., urbanicity), home, peer, and school variables were included in the model. Keith & Cool (1992) found aspiration to exert significant direct effects on achievement as well as indirect effects through homework and coursework on an HSB cohort when measures of ethnicity, gender, family background, ability, coursework, and homework were included in the model. They defined motivation as willingness to persevere on learning tasks. Furthermore, both the direct and indirect paths from aspiration to achievement were found to be significant in a study by Cool and Keith (1991). Aspiration was found to exert a significant direct effect on achievement for a cross-section of social and ethnically mixed, low income students when multiple measures of motivation, the home environment, time on task, media, quality of instruction, peer environment, social

environment, grade and sex were included in the model (Uguroglu & Walberg, 1986).

In addition to the belief that time spent on homework is an indicator of motivation, a commonly held belief is that students taking more rigorous coursework are more likely to excel academically. This was a major focus in the National Commission on Excellence in Education's 1983 report, A Nation at Risk: The Imperative for Educational Reform. The Commission proposed that more rigorous coursework would reverse (1) an apparent slide into mediocrity which our youth, it was suggested, have evidenced and (2) improve declining test scores, the premier measure of academic achievement for the Commission.

According to Keith & Benson (1992), instructional time (i.e., amount of coursework), is critical to theories of school learning. They added that "(t)ime spent on academic courses has a greater influence on achievement than time spent on nonacademic courses" (p. 86). Here academic courses referred to coursework in English, mathematics, physical science, biological science, social science, and foreign language. Achievement was measured by grades. For their study, using data collected from students responding to each of three waves of the High School and Beyond (HSB) survey (N = 12,142), they found that coursework in the subject areas outlined above had the strongest direct effect

on high school grades; even more so than ability. This was true whether students were White, Black, Hispanic, Asian-American, or Native American. Keith & Cool (1992) also found quantity of instruction, as defined by the number of courses taken, to exert a strong direct influence on academic achievement among the 1980 sophomore cohort (N=25,875) who were seniors in 1982. Walberg & Shanahan (1983) found the simple correlations between quantity of instruction (indexed by the number of courses taken in English, math, foreign languages, history, and science) and academic achievement to be moderate to strong (i.e., ranging from .39 to .52) for a sample of 24,159 students. Furthermore, applying multiple regression they found all coefficients significant beyond the .001 level.

3. A Model of School Learning and Achievement for Black 10th Graders

From the Supreme Court decision of 1954 mandating the desegregation of schools (i.e., the Brown vs. Topeka decision) to the 1964 Civil Rights Act, and up to the present time, a major goal of scholars and educators, social scientists, and policy makers has been to ensure equality in education for minority students. In many instances this has translated into equality of access (i.e., to the same building), not equality in education. That is, while Black

and White students often have access to the same education, attend the same schools, and sit in the same classrooms, their educational experiences often differ.

Some minority students have been required to negotiate incidences of lowered expectations, racism, sexism, and other obstacles over and above the regular demands of the curriculum. These conditions may conflict with or undermine their achievement (Johnson, 1992). Other minority students have not found the matriculation process difficult and fraught with obstacles or barriers. Because findings are mixed one might question the underlying assumption of an "open" or "equal" opportunity structure. It stands to reason, however, that students who find the school environment as affirming or, at the very least, hospitable, and who have positive perceptions of their teachers will more likely be the students who fare better in school. It also stands to reason that students whose parents value education and share in their plans for attaining higher levels of education are more likely to attain it. Finally, what students bring to the educational setting by way of aspirations and motivation will affect their educational outcomes.

The present model will permit examination of these variables and their effects on achievement. Specifically the relationship between Black 10th graders' school

achievement and their perceptions of the school environment and teachers, home influences, and personal attributes will be examined.

The present analysis represents a point of departure from traditional studies in that consideration is given to both the academic and social aspects of education within the context of Black students' experiences and perceptions. Thus their operative reality--what really goes on in the life of Black students as Black students perceive it--is of primary interest. Gibson and Ogbu (1991) noted:

> . . . conventional explanations have given insufficient attention to understanding why minorities behave the way they do from the point of view of the minorities themselves; instead, they have evaluated the behaviors of minorities from the perspective of the dominant group's perceptions of their own social reality or from the perceptions and interpretations that the dominant group members have of the social realities of minorities (p. 6).

A review of the literature was carried out to find studies (1) whose unit of analysis was Black students, (2) which sought to model their school experiences, and (3) cast these experiences in simultaneous equations. To say the least, the literature was scant. Thus in addition to quantitative analyses, the literature review relied on qualitative studies as well. The literature as reviewed is categorized below by measures included in the present model of school achievement.

Background Variables. The two background variables included in the present model are gender and SES. Slaughter & Epps (1987) reported that in some studies of Black youth, SES had no relationship with achievement when high school grades were the achievement indicator. Gender and SES exhibited small but significant effects when ability and achievement tests were used.

While gender differences are known to exist with regard to variables such as standardized achievement, their findings are inconclusive. Some researchers have reported that high school boys have higher aspirations than high school girls. Others have reported findings of higher aspirations among girls. Still others have reported no sex differences at all as it relates to achievement (Wilson & Wilson, 1992).

Research findings vary on the contribution of SES to achievement and to achievement-producing attributes such as motivation and aspiration, particularly as it relates to high school achievement. Nonetheless researchers tend to agree that the presence or absence of family support is likely to influence whether students will go on to college.

> In families where college attendance is taken for granted (i.e., an underlying assumption that college attendance is expected), a higher percentage of college enrollment has been reported. On the other hand, in families where college attendance is not taken for granted, adolescents' educational aspirations were

> likely to be influenced by environmental variables other than the family (Wilson & Wilson, 1992, p.53).

Gibson and Ogbu (1991), writing about differences in academic attaintment between lower and middle class students, as well as differences between Black and White students stated:

> ... the academic achievement gap between the lower and middle class is smaller among blacks than among whites, and black students' school success is not strongly correlated with social class, i.e., with parents' education, income, or socioeconomic status (p.6).

Yet it stands to reason that students from more affluent homes will typically have greater access to resources which are likely to foster their school success. Furthermore, it is believed that parents' involvement with college plans will differ across levels of socioeconomic status.

Measuring Achievement of Minority Students. A major controversy reported in the literature centers around the use of standardized tests as proxy measures of ability or achievement for Black students. Ogbu (1979) observed that most would agree that Black students, on the average, tend to do less well than their White peers on certain measures of achievement. However, considerable disagreement exists as to why this may be true. A major hypothesis advanced during the 1950's and 1960's was that the achievement gap

between Black and White students was environmentally determined. Proponents of this theory believed that environmental causes could be addressed by changing the environment of the school. In particular, Chief Justice Earl Warren and members of the Supreme Court concluded in the Brown vs. Topeka decision that the segregation of Black children from White children, regardless of whether school facilities were equal, resulted in an inferior education for Black students.

Another theory offered by policy makers to explain differential performance of Black students is the theory of deprivation. Proponents of this theory also believed that schools could create educational equality. However the objective was to intervene in the lives of poor children at the earliest possible age and provide them with rich and stimulating school environments. From these theories the notions of compensatory education had its origins and programs such as Head Start and Title I emerged.

Other theorists seeking to explain differences in achievement measures focused on perceived genetic differences and advanced the notion of genetic inferiority as the sole explanation for the low achievement of minority children. Proponents of the genetics theory believed that it was the family environment which determined the pattern of a child's achievement and that the impact of schools was

insignificant by comparison. Arthur Jensen (1972, 1973) was and perhaps remains one of the most loquacious advocates of this view.

Closely aligned with Jensen's genetic deprivation theory are the works of James Coleman and Christopher Jencks. The Coleman Report (Coleman et al., 1966) concluded that the single most important variable in determining a child's academic achievement was the educational and social background of the child's family. The second most important factor was the educational and social background of the child's peer group. Jencks et al. (1972) reanalyzed the Coleman Report and concluded: (1) the schools can do little if anything to close the gap between the "disadvantaged" (i.e., Black) and the "advantaged" (i.e., White) learner; (2) school achievement depends on cognitive skills, an innate characteristic; (3) background is the principal determinant of educational attainment; (4) school reform measures such as compensatory spending and integration can do very little, if anything, to substantially reduce cognitive inequality; (5) the quality of education has little effect on future income; and (6) the achievement of complete economic equality would require the actual redistribution of income.

Ryan (1976) refuted the deprivation theorists and contended that rather than viewing children as culturally or

educationally deprived one should view school as culturally depriving. His notions are reflected in the core curriculum movement, still active to date, which seeks to develop effective schools and effective curricula. Proponents of this view have argued that minority children are more or less forced to receive their education in a learning environment that is culturally or linguistically different from the one familiar to them at home. As a result many minority children have difficulty acquiring the content and style of learning that is required to master the curriculum materials and learning ways to succeed in school (Helms, 1992; Hilliard, 1987; Hoover, Politzer & Taylor, 1987; Taylor & Lee, 1987).

Although the gap is narrowing, the scores on standardized tests and the graduation rates of minority students typically lag behind those of their White peers. In the early years of schooling (i.e., pre-kindergarten and first grade), scores on standardized tests of Black and White students are nearly indistinguishable (Ginsburg & Russell, 1980; Lee, V., Winfield, L. F. & Wilson, T. C., 1991; Ryan, 1976). The gap widens with increased schooling. One wonders, what gives rise to subsequent declines? Or, as Wehlage and Rutter (1986) expressed the dilemma, "How much do school contribute to the problem?"

School Influences. Relationships between students and their peers as well as those between students and teachers, created and fostered within the school environment, can have a dynamic impact on the school success of students. To the extent that high school represents a rite-of-passage to young adulthood, this transition holds critical significance. All students approach this period with certain beliefs and expectations. For Black students the dynamics of this transition may be confounded by lowered expectations, racial biases and acts of hostility. Because these factors are unique to them, their perception of the school environment and teachers is important. In fact it is believed that the school environment will exert a very strong influence on their academic achievement both directly and through students' perceptions of teachers and teaching. The extent of that influence (i.e., the relationship between perceptions of the school environment and achievement as well as the relationship between perceptions of teachers and teaching and achievement) will be measured and evaluated based on the magnitude of path coefficients.

Perceptions of Students regarding the School Environment. Eccles, Lord & Midgley (1991) conducted research regarding the educational environment and its influence on adolescents. They reported that, "for some

children, the adolescent years mark the beginning of a downward spiral in school-related behaviors and motivation that often lead to academic failure and school dropout" (Eccles, Lord & Midgley, 1991, p 521). They related these declines to person-environment theory.

> According to person-environment theory, behavior motivation, and mental health are influenced by the fit between the characteristics individuals bring to their social environments and the characteristics of these social environments . . . Individuals are not likely to do very well or be very motivated if they are in social environments that do not fit their psychological needs (p. 521).

It is believed that if Black students have negative perceptions of the school environment, these perceptions will have a negative effect on their achievement. Furthermore, if Black students have positive perceptions of the school environment, these perceptions will have a positive effect on their achievement.

Perceptions of Students regarding Teachers. Purkey (1978) outlined four levels of invitation at which teachers relate to students. The four levels of invitation, adapted to describe relations depicted between predominantly White institutions/teachers and Black students are:

Intentionally disinviting, These relations are characterized by messages of discouragement and defeat. A student is made to feel as though he or she doesn't

belong in the class or school; that their skills and knowledge are inferior to others.

Unintentionally disinviting: These are relations characterized by mixed messages between teachers and students. For dialogues across race (i.e., White teacher/Black student) these mixed messages typically take the form of well-intended yet condescending remarks: "You write well for a Black student" or "Student X, why don't you tell me what it is like to be Black and live in the ghetto" (the major assumption being that the student is knowledgeable of "ghetto" life or that he or she can speak for a class of people).

Unintentionally inviting: These are relations characterized by teachers who have the natural ability to interact with students from different cultures and ethnicities but who lack awareness and knowledge of them. These teachers typically verbally express a genuine appreciation for diversity or multiculturalism yet never quite seem to find the time to include examples in their lessons of Blacks who are fully functioning in society.

Intentionally inviting: These are relations characterized by teachers who have transcended the previous levels and are able to provide instruction and

foster a supportive classroom atmosphere reflecting appreciation of differences whether racial or physical.

For the present analysis, responses of students to questions about teachers and the quality of teaching (i.e., whether students get along well with teachers; whether teaching is good at school; whether teachers praise their hard work; and whether they feel teachers put them down) will permit a qualitative assessment of whether they view student/teacher relations as inviting. The influence of students' perceptions of teachers and teaching on their achievement will be measured.

Parental Influences

Pollard (1989) tested parental, student and teacher influences on achievement. Conducting a multivariate analysis of variance (MANOVA), she compared high-achieving minority students with low-achieving minority students on social-psychological variables hypothesized to be associated with school performance. These included social attitudes regarding education and race; self-perceptions of ability; general social support; teacher support; parental influences (i.e., parental support, parental aspirations for students, and the child's involvement in activities outside of school); students' school involvement (i.e., with peers and

in-school activities); and active problem solving. Univariate analyses showed statistically significant differences in self-perceptions of ability, general social support, teacher support, parental influences, and active problem solving at the .001 alpha level. It can be seen that, although reviewed under the heading of parental aspirations, her findings apply equally to student and school variables included in the proposed study.

Student Influences

While parental and school factors are hypothesized to exert significant influences on the academic achievement of students, so do their own efforts and aspirations. A basic fundamental verity is this: In addition to parents' aspirations and input as well as the responsibility of teachers and schools, the student plays a major role in his or her academic success. Those personal characteristics of students such as motivation and educational aspirations which affect achievement will be examined.

Student Aspirations. Wilson-Sadberry, Winfield & Royster (1991) as well as Clark (1983) found that the educational aspirations of Black students from supportive family networks were relatively high regardless of parents' level of education and occupation. Ogbu (1979, 1990, and 1992) reported that Black students typically have high self-

esteem and aspirations. He also suggested that these Black students educational plans and realities may not be in line with their aspirations. A reason for this mismatch include historical evidence that Black students often do not get the same return on their educational investment as White students (Collins, 1989; Ogbu, 1992; Winfield, 1991). Black students have observed in their communities, for instance, the effects of chronic unemployment among those desiring to work, job ceilings, and other social policies and practices which have historically kept minorities from advancing economically. Thus school appears to some as futile.

Donovan (1984) examined the effect of educational aspirations of Black youth in a path model. The outcome variable was persistence in educational pursuits where persistence was represented by a continuous variable ranging from no persistence (dropout) through persistence with some difficulty (intermit) to complete persistence. The sample was comprised of 403 low-income youth attending colleges across the United States. Her study permitted the test of the effects of students' perceptions of grades as well as the effects of ability on persistence. However, her hypothesis that aspiration (i.e., as measured by response to the question, "How many years do you want to stay in college?") would exert significant effects on persistence

seemingly was not tested or, at the very least, was not reported.

Student Motivation. Ogbu (1990) examined societal and school factors influencing the academic achievement of minority students. With regard to Black students he observed that having been historically denied equal educational opportunity:

> American society has probably discouraged minorities from investing their time and effort into the pursuit of education and the maximization of educational accomplishments. The experience of such denial may also have discouraged minorities from developing a widespread tradition of striving for academic achievement (p. 50).

Whether this phenomenon is operating to influence the achievement of Black students can be determined by looking at responses to how much time they spend on homework and amount of courses taken, as measures of motivation, as well as responses to questions regarding how far in school they plan to go or whether they plan to go to college after high school, as measures of aspirations.

The present study will contribute to the body of knowledge on achievement or school learning in several ways. First, there is the common consensus that differences exist between Black and White students in terms of selected outcome/achievement measures. However, most studies employ a cross-race paradigm and draw inferences therefrom. That

is, most studies look at the student population overall and make generalizations to Black students. Few studies have relied solely on the Black experience to explain the phenomenon of Black student achievement. Another unique factor of the present study is the fact that it draws from a large, nationally representative sample of Black students. While a handful of studies have focused on Black students, they have been limited both geographically and in terms of sample size. The present study is more rigorous methodologically in that multiple factors of achievement are examined simultaneously using recent national longitudinal and cross-sectional data.

CHAPTER 3

METHODOLOGY

Data

In the spring of 1988, the National Center for Education Statistics (NCES) instituted the first stage of a comprehensive longitudinal study: the National Education Longitudinal Study of 1988 (NELS:88). NELS:88 was part of an effort to obtain data relative to students' school experiences and activities, values and aspirations, and family and home characteristics (NCES, 1992). In the 1988 base year a stratified national probability sample of 24,599 eighth graders attending 1,052 high schools was selected for participation. Of these, 20,062 participated and provided usable data. The database also contains scores of students from cognitive tests in four subject areas (reading, math, science, and social studies). Moreover, data were collected from students' parents, teachers, and school administrators. The cohort was originally surveyed in 1988. Follow-up surveys were administered in 1990, 1992, and 1994. More than 75% of the 1988 base year cohort remained active participants through the second follow-up conducted in 1992. Results from the third, 1994 follow-up are not presently available. In 1994, the cohort members are expected to be in postsecondary institutions or part of the workforce (NCES, 1992).

Design and Analysis

The present study employs a non-experimental, multi-equation design (Pedhazur & Schmelkin, 1991). This permits examining the impact of the independent variables on the final outcome achievement variable. At the same time, the relationships between the independent variables can be estimated. For example in the present study, composites will be formed and regressed in succession from the outermost endogenous variable (i.e., achievement) to the innermost endogenous variable (i.e., prior achievement). All endogenous variables will be regressed on the two exogenous variables gender and SES.

Path analysis, a method for studying causal patterns among a set of variables, will be used to estimate the effects of school, parental, and student variables on students' academic achievement. The phrase "causal patterns" is used not to assert that one variable causes the other. Rather, it is suggested that were a causal relationship to exist, the pattern of causation would be in the direction of the arrow: A change in the variable at the tail of the arrow would result in a change in the variable at the arrow's head (Keith, 1988; Loehlin, 1987). Keith (1988) succinctly stated the relationship between causality and correlation:

> (W)hile correlation does not imply causality, one can use correlational (i.e., nonexperimental) data to provide evidence of causation. This is the approach of path analysis, and it is accomplished by combining nonexperimental or correlational data with an explicit theory of cause and effect. In fact, cause and effect are inferred from the theory, and the correlations simply provide fuel for the calculations. (p. 347)

The present study relies on school learning theory, previous research, and knowledge of factors commonly associated with the academic achievement of minority students for the selection and ordering of variables in the equations. Simultaneously looking at multiple variables, the path analytic technique will separate correlations among variables into direct and indirect effects. Version 7 of the program of Linear Structural Relations (LISREL 7), developed by Joreskog and Sorbom (1989), will be used to (1) estimate path coefficients to determine which factors exert the greatest, unique influence on academic achievement both directly and indirectly and (2) assess the overall goodness of fit of the model to the sample data.

Plan of Analysis: The Path Model. A full structural equation model is comprised of two parts: (1) a structural model which specifies hypothesized, causal relations among latent, unobserved variables and (2) a measurement model which relates measured variables to their latent constructs. Because the present model uses only observed variables

combined in composites, it does not include a measurement portion. Only the structural portion of the path model will be estimated. Missing data will be deleted pairwise.

The estimated path coefficients represent standardized regression coefficients and are interpreted as direct effects, controlling for other variables in the model. Direct effects represent the partial effect of independent variables regressed on one or more additional variables arranged in temporal or successive order (Pedhazur, 1982). Indirect effects represent paths through other mediating variables. The logic of path analysis is such that variables believed to cause other variables appear first in the model. Thus moving from left to right the endogenous variables, first seen as effects, subsequently become causes of variables ordered to the right of them. The causes of the exogenous variables are assumed to be outside the model and are not analyzed.

A final advantage of path analysis using LISREL is that it provides fit indices to evaluate the model. The model originally specified is modified to best explain the data (Joreskog and Sorbom, 1989). Paths are deleted from the analysis if nonsignificant or their probability is less than .05. It is when all nonsignificant paths have been deleted and estimates for the final path model have been obtained that the model is interpreted.

Assessment of Fit. Version 7 of LISREL (Joreskog & Sorbom, 1989) provides four indices of overall fit for the model: The chi-square statistic, the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), and the root mean-square residual.

Chi-square is a test of the null hypothesis that the model is plausible in the population in that the difference between the input covariance matrix and the implied covariance matrix as specified by the model is nonsignificant. A significant chi-square means rejection of the null hypothesis, indicating a significant difference between input and implied matrices. However it is often found that with large sample sizes, even small differences between the input and implied covariance matrices can lead to the rejection of the null hypothesis (Byrne, 1989; Cool & Keith, 1991). Thus other indices of fit are also examined to the evaluate the model. Among these are the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), and the root mean square residual (RMSR). Both the GFI and the AGFI (which adjusts for the number of degrees of freedom in the model) represent the ratio of the sums of squares accounted for in the model to the total sums of squares of the estimated population matrix (Byrne, 1989). Both are interpreted like regular correlation coefficients in that

the closer the index is to 1.0, the better the fit of the model.

The root mean square residual (RMSR) represents the average discrepancy between the elements in the sample and hypothesized covariance matrices. It is more or less a kind of average of the fitted residuals. The lower this index the better the fit of the model as it suggests that the differences between the elements of the implied and the input covariance matrices are small.

In addition to the global measures of model fit, LISREL generates detailed parameter estimates. These only make sense, however, to the extent that the model represents a reasonable fit overall. Quite useful in interpreting parameter estimates is the calculation of the ratio of the t-value to its standard error. T-values are computed by LISREL for every free parameter to be estimated. The t-value provides evidence of whether or not a parameter is significantly different from zero and, as a rule of thumb, should be greater than 2 to be statistically significant (Byrne, 1989). Small t-values indicate paths whose effects are non-existent. These paths are deleted in the model-fitting process and the model is then re-estimated. R^2 is a measure of the amount of variance in the dependent variable explained by a linear combination of the independent variables. For the present study, $R^2_{achievement}$ reflects the

amount of variance explained by a combination of the structural parameters prior achievement, school environment, teacher effectiveness, parental aspirations, parental involvement, student aspirations, and student motivation.

Subjects

The sample for the present study is comprised of the 1,766 Black students who were sophomores in 1990 and 8th graders in 1988.

Sampling. NELS:88 employed a two-stage, stratified random probability sample design to obtain its sample. The sampling strata were comprised of schools by type of governance or control: public (77%), Catholic (9%) and other private (14%). Schools were stratified by the nine Census divisions, racial composition of the schools, 8th grade enrollment, and urbanicity (i.e., central city, county surrounding central city, and rural areas). Random samples were then drawn for Black and White students. [Note: Hispanics and Asians were over-sampled to permit analyses within these populations (NCES, 1992).] In 1990, 2,220 Black students were selected to participate in the first follow-up. Of the 2,220 students selected, 1,766 met the dual criteria of having remained in school and having completed surveys in both 1988 and 1990. Thus 80% of the Black students who were eligible to participate in the

first-follow up completed surveys in 1990. Students not included or not participating 1990 had either dropped out of school, were out of the country, refused to participate in this wave, were participating in home study, unlocatable, institutionalized, or deceased (NCES, 1992).

Weighting of Responses and Non-response. The weighting of responses required a very elaborate, complex design and is explained in comprehensive detail in the First Follow-Up users manual (NCES, 1992). Following is a much abbreviated description of the weighting procedure.

The survey data were weighted to compensate for unequal probabilities of selection and to adjust for the effects of nonresponse. Weights were calculated in two main steps. First, each case selected was assigned a base year design weight based on his or her probability of selection into the sample. The weight reflected both the probability of selecting the school and the probability of selecting the student within the school during the base year. This design weight, unadjusted for student nonresponse, was then multiplied by the inverse of the case's probability of selection for the first follow-up. Second, the design weights were adjusted for nonresponse using a technique referred to as multidimensional raking. Here weighted response rates were computed separately within cells or

subgroups (e.g., by race and urbanicity). The weight was applied to cases selected for inclusion in both the base year and first follow-up. Use of this weight permits making unbiased projections to all Black students who were 10th graders in 1990 (NCES, 1992).

Variables Included in the Model

It is hypothesized that the variability in achievement among Black 10th graders can be explained from the interrelationship of ten composite variables. Of primary interest are the interrelationships among eight endogenous variables: (1) prior achievement, (2) students' perceptions of the school environment, (3) their perceptions of teachers and teaching (i.e., quality of instruction), (4) parental aspirations for students, (5) parental involvement, (6) student aspirations , (7) student motivation, and (8) achievement (See Figure 1). Of secondary interest is the interrelationship between these eight measures and the two exogenous variables gender and SES.

To form the composites, responses from selected questions were converted to z-scores and averaged. Prior to forming composites, Cronbach's alpha was calculated for each scale to determine if selected survey items hang together well within that scale and to ensure the propriety of grouping them into a composite. Operational definitions of

composites appear below along with the reliability coefficient. Attached as Appendix A is the codebook which details the survey questions used for this study, frequency of responses, coding, and labels.

Operational Definitions:

NOTE: Data were extracted from first follow-up student files unless otherwise specified.

Gender: A dichotomous variable scored 0 for male and 1 for female.

SES: A composite developed by NCES from data extracted from parent files which included responses indicating father's and mother's education, father's and mothers occupation, and family income.

Prior Achievement:

The average of students' IRT scores on standardized tests of reading, math and science (8th grade data obtained in 1988).

[Cronbach's alpha (α): .85]

School Environment:

Discipline is fair at school.

Students are friendly with other racial groups.

[Cronbach's alpha (α): .73]

Teachers/
Teaching: Students get along well with teachers.

The teaching is good at school.

When respondent works hard, teachers praise effort.

In class I often feel put down by teachers.

[Cronbach's alpha (α): .86]

Parental
Aspirations:

How far in school father wants respondent to go.

How far in school mother wants respondent to go.

[Cronbach's alpha (α): .87]

Parental
Involvement:

How often respondent discussed preparing for the ACT/SAT with parents.

How often respondent discussed going to college with parents.

[Cronbach's alpha (α): .97]

Student
Aspirations:

How far in school respondents think they will get.

Does respondent plan to go to college after high school?

[Cronbach's alpha (α): .87]

Student
Motivation:

How much time spent on homework in school.

How much time spent on homework out of school.

How much coursework in:

General Math
Algebra I
Geometry
General Science
Physical Science
Biology
English
Foreign Language

[Cronbach's alpha (α): .47]

Academic Achievement:

The average of students' scores on standardized tests of reading, math and science.

[Cronbach's alpha (α): .94]

Miscellaneous Variables

Student ID:

A seven-digit identifier uniquely assigned to each student. The first two digits of the ID represent the stratum identification number for the case. The middle three digits are the primary sampling unit. Both link the student to the school. The last two digits are unique to the student within the school.

F1PANFLG: Flag used to select students responding to both base year and first follow-up questionnaires.

F1PNLWT: Panel weight used to generalize to the population of students who were 10th graders in 1990. Adjusts for non-response.

CHAPTER 4

RESULTS

In addition to estimating the path model, descriptive statistics were obtained regarding students and their families. These are profiled below, followed by results of the path analysis. These data are reported in valid percentages, which exclude missing data.

Student Profile

Students were dispersed geographically across the Northeast (16%), North Central (14%), South (64%) and Western (6%) regions of the United States. Of these, 42% lived in areas described as urban areas or cities having at least 25,000 inhabitants. Twenty-seven percent (27%) lived in suburban areas or counties surrounding urban areas. The remaining 31% lived in rural areas or farmlands.

Fifty two percent (52%) of respondents were female, 48% were male. Their socioeconomic status, calculated as z-scores, ranged from a low of -2.838 to a high of 1.972. Nearly 43% were categorized in the lowest quartile (Quartile 1) and 13% in the highest (Quartile 4). Twenty-five percent (25%) were in Quartile 2 and 19% in Quartile 3. Thus 68% of families were ranked in the lowest two quartiles.

Total family income reported by parents in 1987 indicated that many live in poverty. Nearly 33% of parents

reported incomes under $10,000 per year. Thirty-two percent (32%) reported incomes between $10,000 and $25,000. Twenty-five percent (25%) reported incomes ranging from $25,000 to $50,000. Ten percent (10%) reported incomes in excess of $50,000 (See Figure 2). Thus 65% of families reported incomes below $25,000.

With regard to parents' education, students reported that 15% of fathers and nearly 18% of mothers did not complete high school whereas 28% of fathers and a little more than 30% of mothers held a high school diploma. The percentage of fathers reported as having completed vocational school or two years of college was 8.8%. Six percent (6%) of fathers attended a 4-year college but had no degree. Among mothers slightly more than 12% attended vocational school or a two-year college and a little more than 8% attended a 4-year college but had no degree. Thus nearly 58% of fathers and 68% of mothers had less than a college degree. Approximately 9% of fathers and 9% of mothers had a bachelor's degree. For fathers, students reported that 3.7% held a masters degree and 2.4% a medical, doctoral, or law degree. For mothers, students reported that nearly 6% held a masters degree and 2% a medical, doctoral, or law degree. Nearly 27% of students did not know or simply did not report fathers' highest degree

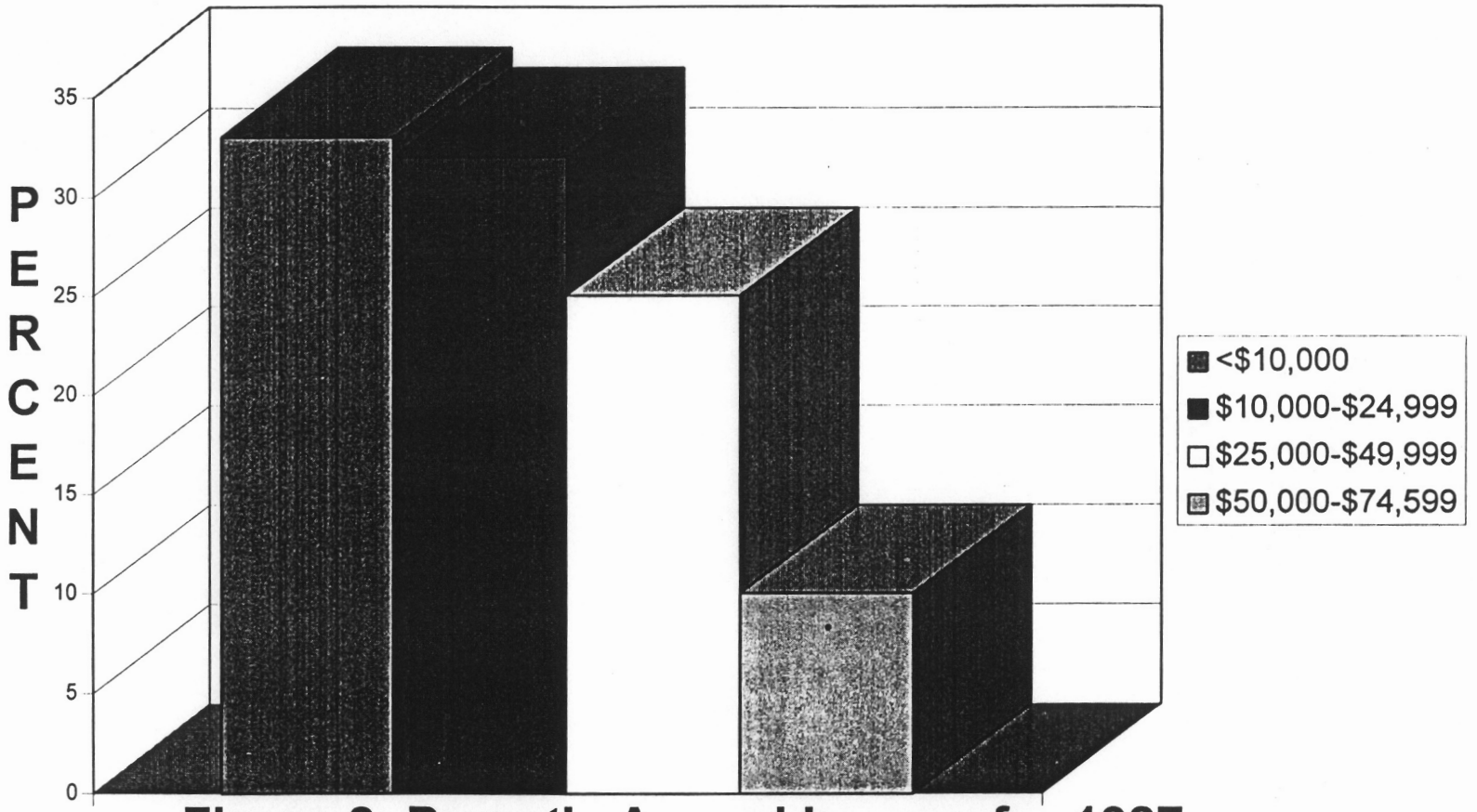

Figure 2: Parent's Annual Income for 1987

compared to a little more than 14% who did not know or did not report mother's highest degree. (See Figure 3.)

Fifty-nine percent (59%) of students reported that either their father or stepfather lived in the same household. Another 10% indicated that another adult male (not to include an older brother, uncle or grandfather) lived in the same household. Data were missing for 31% of students regarding the presence of a father or father figure living in the same household. Approximately eighty seven percent (87%) of students reported living in a household with their mother or stepmother. The remaining 13% indicated that another adult female lived in the household. Figure 4 depicts the percentage of student households in which the father, stepfather, or other adult male is present. Depicted too are the percentage of households in which the mother, stepmother or other adult female is present.

Most students live in households where they were the only child (45%) followed by those having one brother or one sister (35%) in the same household. Approximately 13% of students indicated they had two brothers or two sisters living in the household. Five percent (5%) of respondents had three brothers living in the same household compared to 4% who had three sisters living in the same household. Two percent (2%) of students reported having more than three

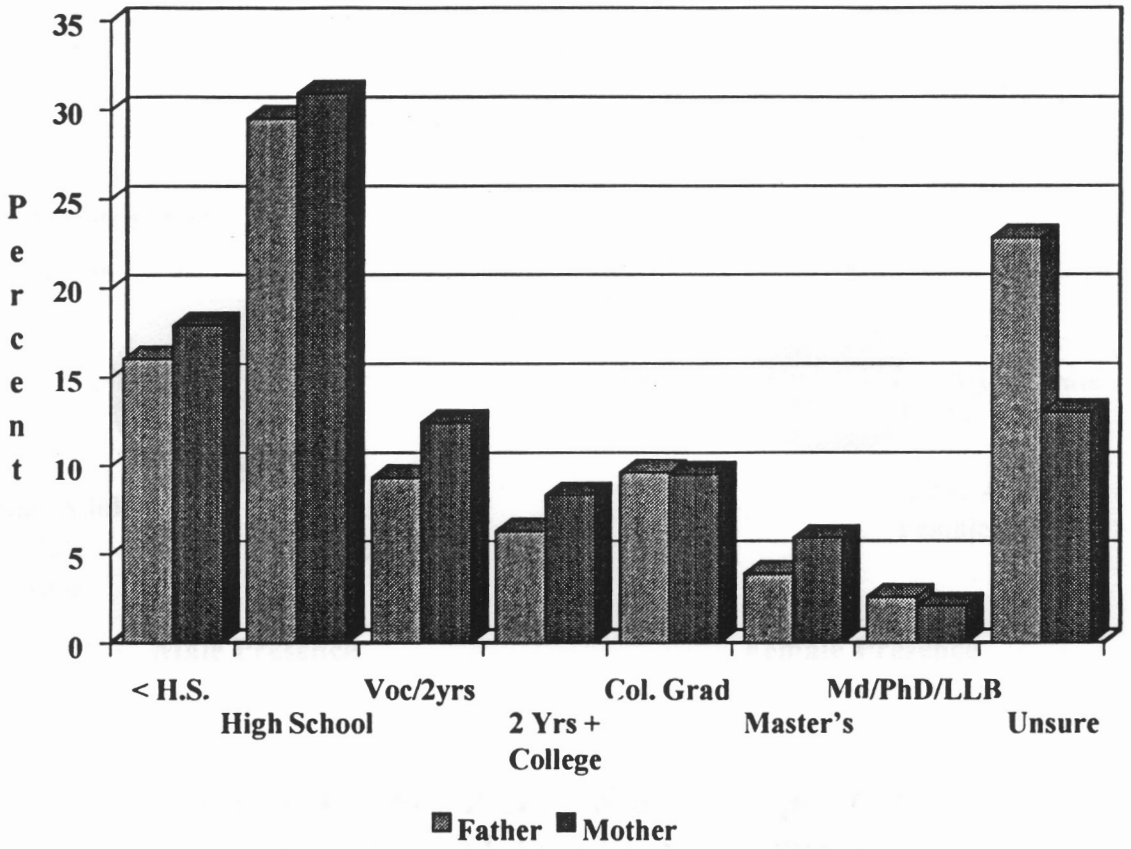

Figure 3: Highest Level of Parents' Education

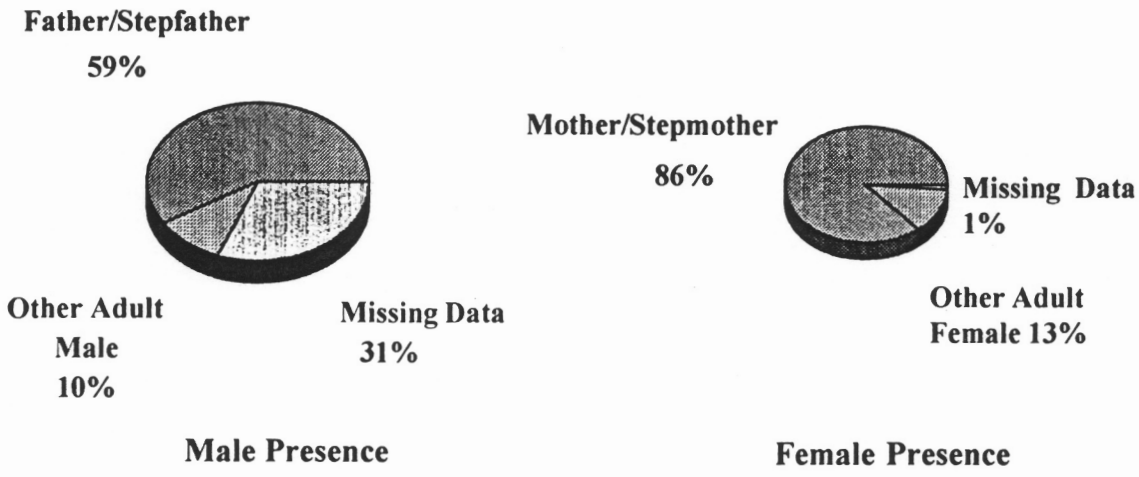

Figure 4: Student Household Composition: Presence of Male & Female Figures in the Home

brothers living in the same household. Three percent (3%) of students reported having more than three sisters living in the same household.

Achievement Variables. Achievement tests were administered during the spring semesters of students' 8th and 10th grade years. The achievement test scores used for the present study are tests of overall proficiency in reading, math, and science as well as IRT scores in reading, math, and science. The proficiency scores, which are grouped in categories, were used to obtain qualitative descriptions of patterns of achievement among the Black 10th graders. The use of proficiency scores is based on the assumption that tested skills follow a building-block pattern: The skills required to master the basic level of proficiency are deemed necessary to achieve proficiency at the next higher level. This pattern is followed until the highest level of proficiency has been achieved (NCES, 1994). Proficiency test results are presented below, followed by a discussion of students' IRT scores.

8th and 10th Grade Proficiency Scores. The distribution of scores among Black 8th graders on the test of reading proficiency in 1988 were as follow: 22% read below Level 1, 57% read at Level 1, and 21% read at Level 2. By the 10th grade, 18% were reading below Level 1, 49% at Level 1, and 33% at Level 2. (See Figure 5A.) Reading

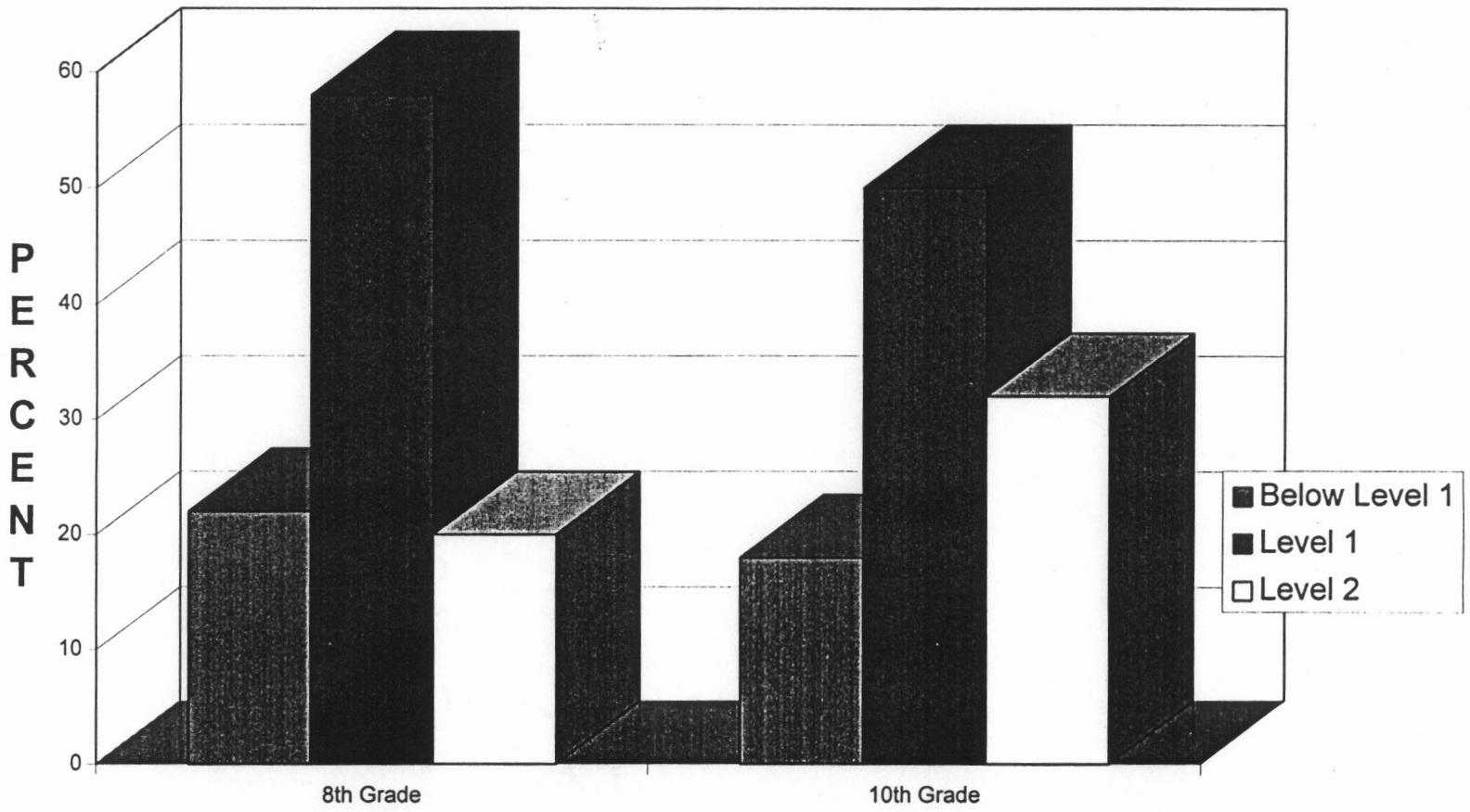

Figure 5A: 8th and 10th Grade Reading Proficiency Scores

Level 1 refers to students' simple reading comprehension, including ability to reproduce detail and the author's main thought. Reading Level 2 refers to the ability to make inferences beyond the author's main thought as well as understand and evaluate abstract concepts (NCES, 1990). By the 10th grade, 18% of students were reading below Level 1, 49.3% were reading at Level 1, and 32.7% were reading at Level 2.

Proficiency scores in mathematics were re-scaled by NCES after administration of the 1988 battery and prior to administration of the 1990 battery. A by-product of this re-scaling is that there are differences in categories of math proficiency reported in 1988 from those reported in 1990. That is, in 1988 students were classified as proficient in math at the following levels: "Below Level 1," "At Level 1 but below Levels 2 and 3," "At Levels 1 and 2, but below Level 3," or proficient at "All Three Levels." In 1990 Math Level 4 was added. Math Level 1 refers to students' ability to perform simple arithmetical operations on whole numbers. Math Level 2 refers to simple operations with decimals, fractions, and roots. Math Level 3 refers to simple problem-solving, requiring conceptual understanding and/or the development of a simple solution strategy. Math Level 4 refers to the ability to understand more complex mathematical concepts and formulate multi-step solutions to

word problems. [Note: In 1992, Math Level 5 was added to the categories which indicated students' proficiency in solving complex, multi-step word problems and the ability to demonstrate knowledge of mathematics materials found in advanced mathematics courses (NCES, 1992).] In 1988 the percentage of sampled Black 8th graders who scored below Level 1 was 27%, 48.2% scored at Level 1, 17.3% scored at Level 2, and 7.5% scored at Level 3. Again, Math Level 4 had not yet been classified in 1988. In 1990 the percentage of Black 10th graders scoring below Level 1 was 19.4%, 42.8% were at Level 1, 15.8% were at Level 2, 14.9% were at Level 3, and 7.1% were at Level 4. (See Figure 5B.)

A system for classifying students' proficiency in Science was not in place in 1988 nor 1990. Rather the classificatory system was developed later from NELS data in the context of another project and added to the database (NCES, 1992). Four categories of Science proficiency (Below Level 1 as well as Levels 1, 2, and 3) were identified; the first three categories apply to students tested in 1988 and all four categories apply to students tested in 1990. Science Level 1 refers to students' understanding of everyday science concepts; "common knowledge" that can be acquired in everyday life. Science Level 2 refers to students' understanding of fundamental science concepts upon which more complex science knowledge can be built. Science

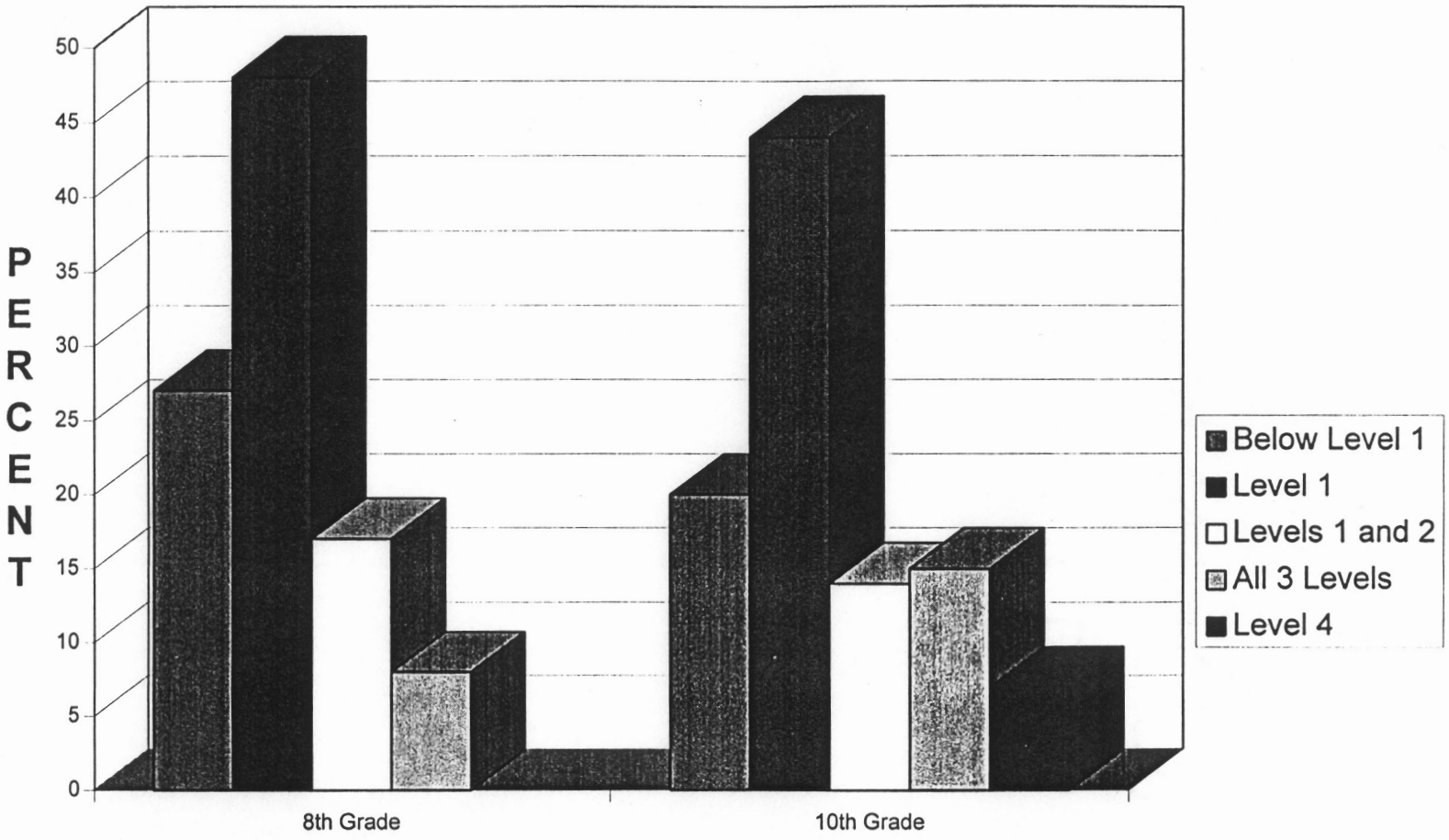

Figure 5B: 8th and 10th Grade Math Proficiency Scores

Level 3 refers to students' understanding of relatively complex scientific concepts; typically requiring an additional problem-solving step (NCES, 1992). In 1988, the distribution of Overall Science Proficiency scores among Black 10th graders were as follow: 46.1% scored below Level 1, 41.7% scored at Level 1, and 12.3% scored at Level 2. In 1990, 40% of these same students scored below Level 1, 38.4% scored at Level 1, 17.2% scored at Level 2, and 4.0% scored at Level 3. (See Figure 5C.)

The IRT-Theta scores, which are continuous in nature, were used to generate correlations and, ultimately, estimate path coefficients. IRT-Theta scores are distributed as t-scores with a mean of 50 and a standard deviation of 10. Unlike proficiency scores, IRT-Theta scores may be used to estimate gains in knowledge over years whereas proficiency scores can be used to assess gains over a one-year period only (NCES, 1992). In 1988 the sample of Black 8th graders' Reading IRT-Theta scores ranged from a low of 24.14 to a high of 63.49 compared to students in general whose scores range from 23.29 to 63.49. In 1990, Black students' IRT Theta scores ranged from 22.27 to a high of 71.86 compared to students in general whose scores ranged from 22.18 to 71.86. Black students' scores ranged from nearly 3 standard deviations below the mean to slightly more than 1 standard deviation above the mean in 1988. This was true of

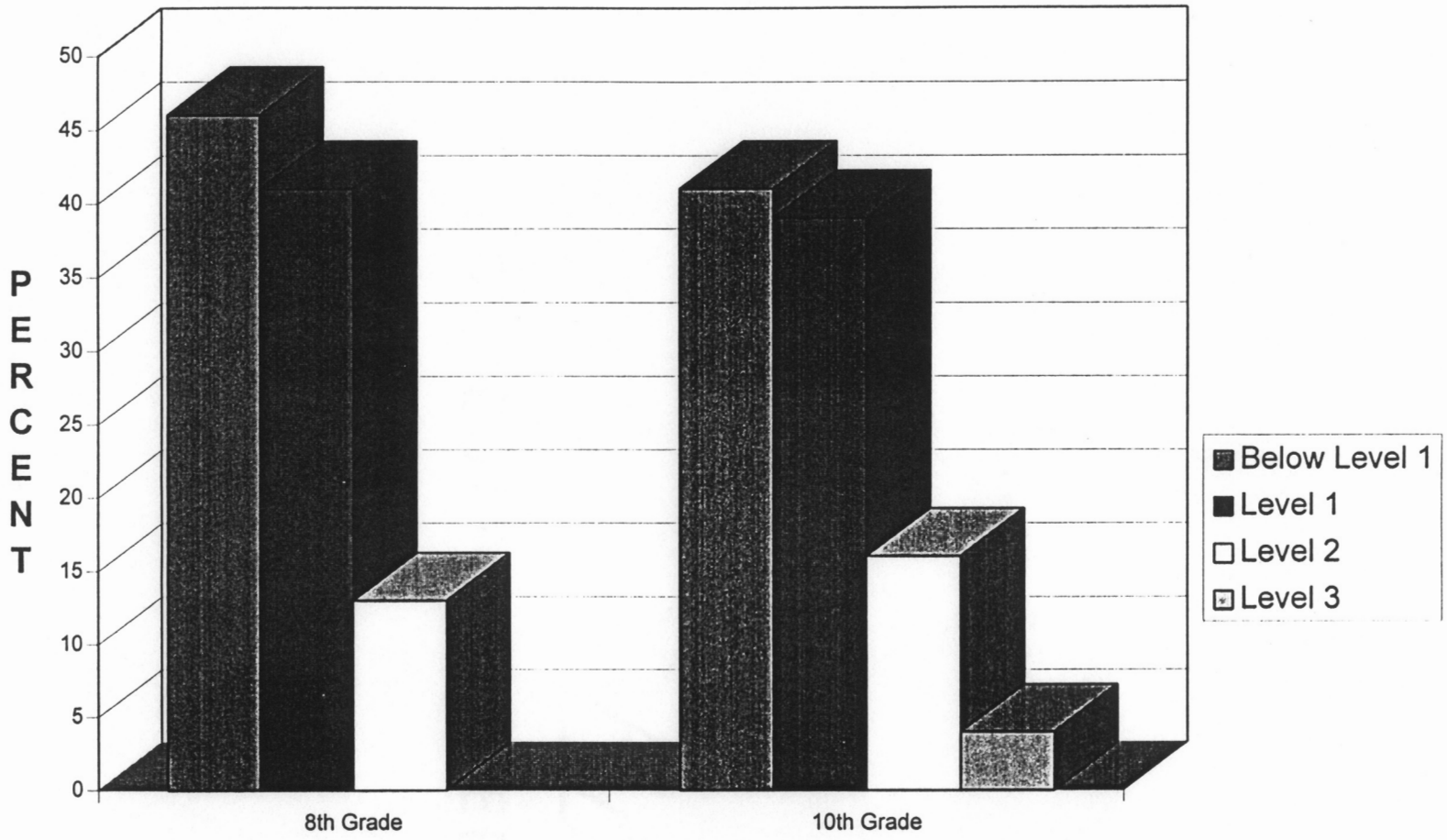

Figure 5C: 8th and 10th Grade Science Proficiency Scores

students in general. In 1990, Black students' scores ranged from nearly 3 standard deviations below the mean to 1 standard deviation above the mean. This, again, was true of the students in general. By 1990 Black students' scores in reading were nearly 1 standard deviation higher than they were in 1988.

Black students' 1988 Math IRT-Theta scores ranged from a low of 24.14 to a high of 63.49 compared to a low of 23.29 to a high of 63.49 for the students in general. In 1990 the Black students' IRT-Theta scores ranged from 25.71 to 72.91. Black students' scores ranged from nearly 2.5 standard deviations below the mean to slightly more than 1 standard deviation in 1988. In 1990 their scores ranged from nearly 2.5 standard deviations below the mean to slightly more than 2 standard deviations above the mean, indicating a near increase of 1 standard deviation in math proficiency from 1988 to 1990 at the high end. Scores were only slightly improved at the low end.

Black students' 1988 Science IRT-Theta scores ranged from 23.20 to 66.65. In 1990 these students' scores ranged from 25.37 to 74.78. Their scores reflect an increase in Science proficiency of 21% of a standard deviation at the low end to a near 1 standard deviation increase at the high end.

To permit their simultaneous estimation with other variables in the model, the IRT scores in reading, math, and science were converted to z-scores and averaged to obtain the 8th grade measure labeled "prior achievement" and the 10th grade measure labeled "achievement." The z-scores are distributed with a mean of zero and a standard deviation of 1.

School Variables.

Student responses to questions regarding the school environment and teacher effectiveness reveal that most have positive perceptions of both. Their perceptions are summarized in Figures 6 through 11. Nearly 82% either agree or strongly agree that discipline is fair at their schools. The nearly 18% remaining disagree or strongly disagree. Nearly 89% of the sample think students are friendly with students of other races, contrasted with only nearly 11% who disagree or strongly disagree. An overwhelming 92.6% think students get along well with teachers and 81% either agreed or strongly agreed that teaching is good at their schools. Nearly 81% of students agreed or strongly agreed that teachers praise their hard work. Finally, 84% disagreed or strongly disagreed with a statement indicating that they often feel put down by their teachers. Sixteen percent (16%) agreed or strongly agreed that their teachers often put them down. Student responses indicate that most

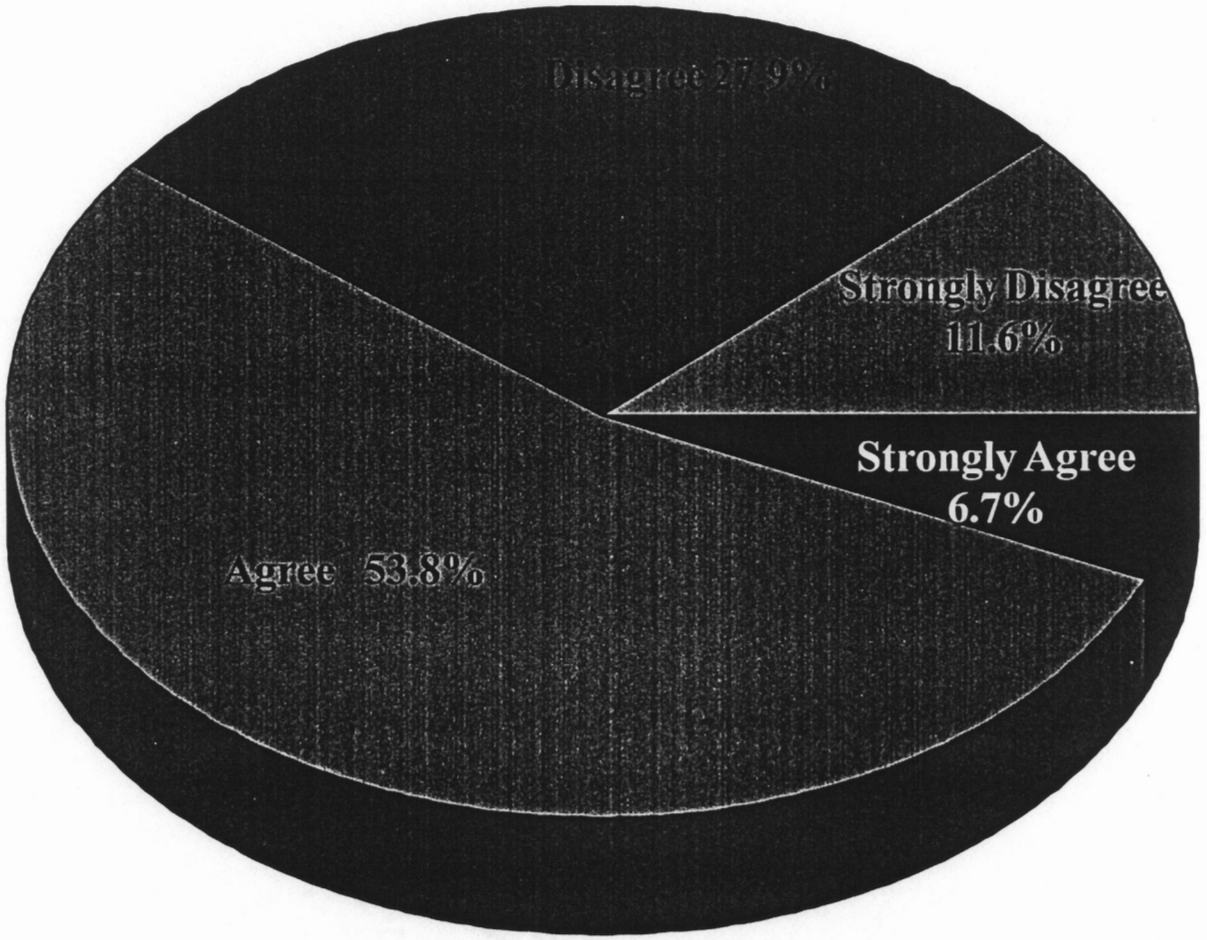

Figure 6: Students' Perceptions that Discipline is Fair at their Schools

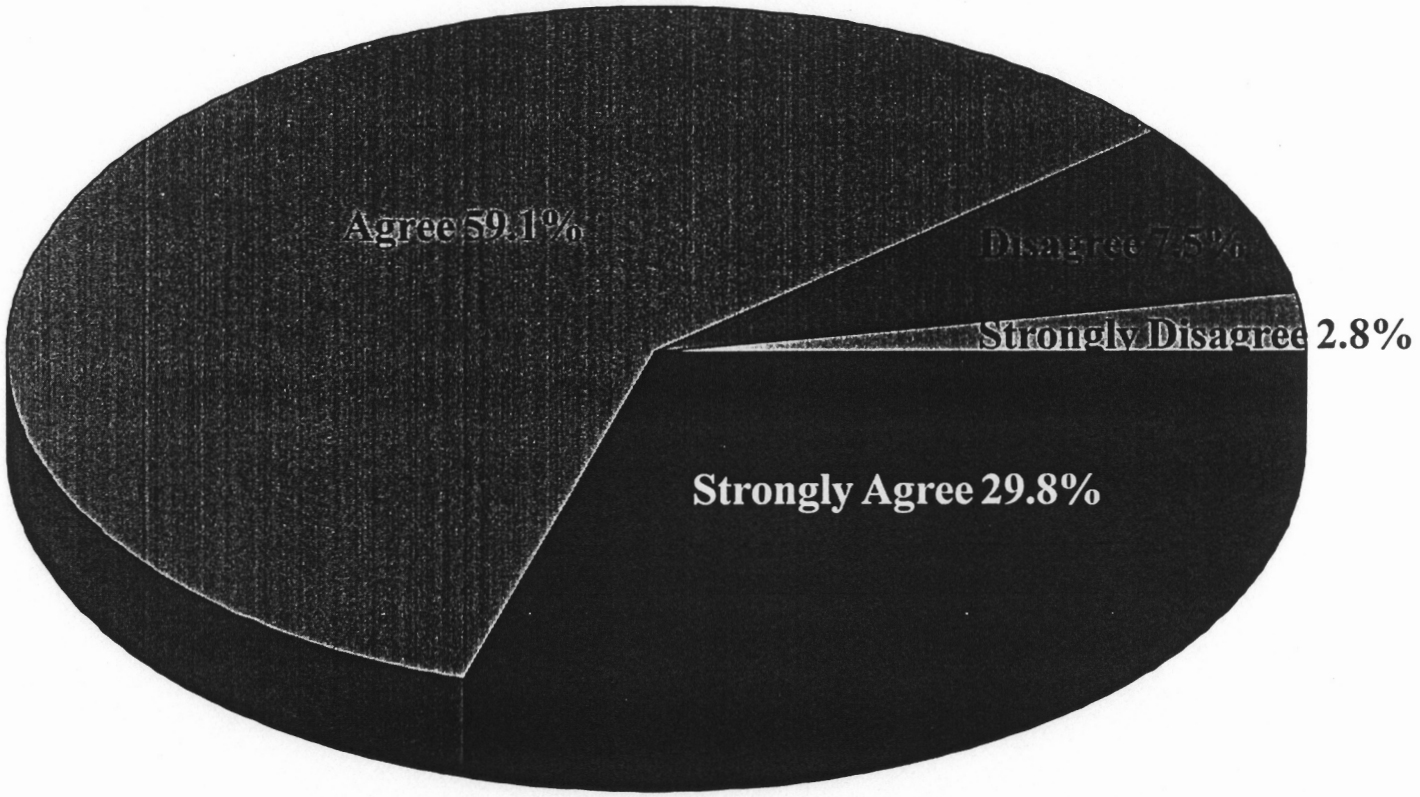

Figure 7: Students' Perceptions that Students are Friendly with other Races

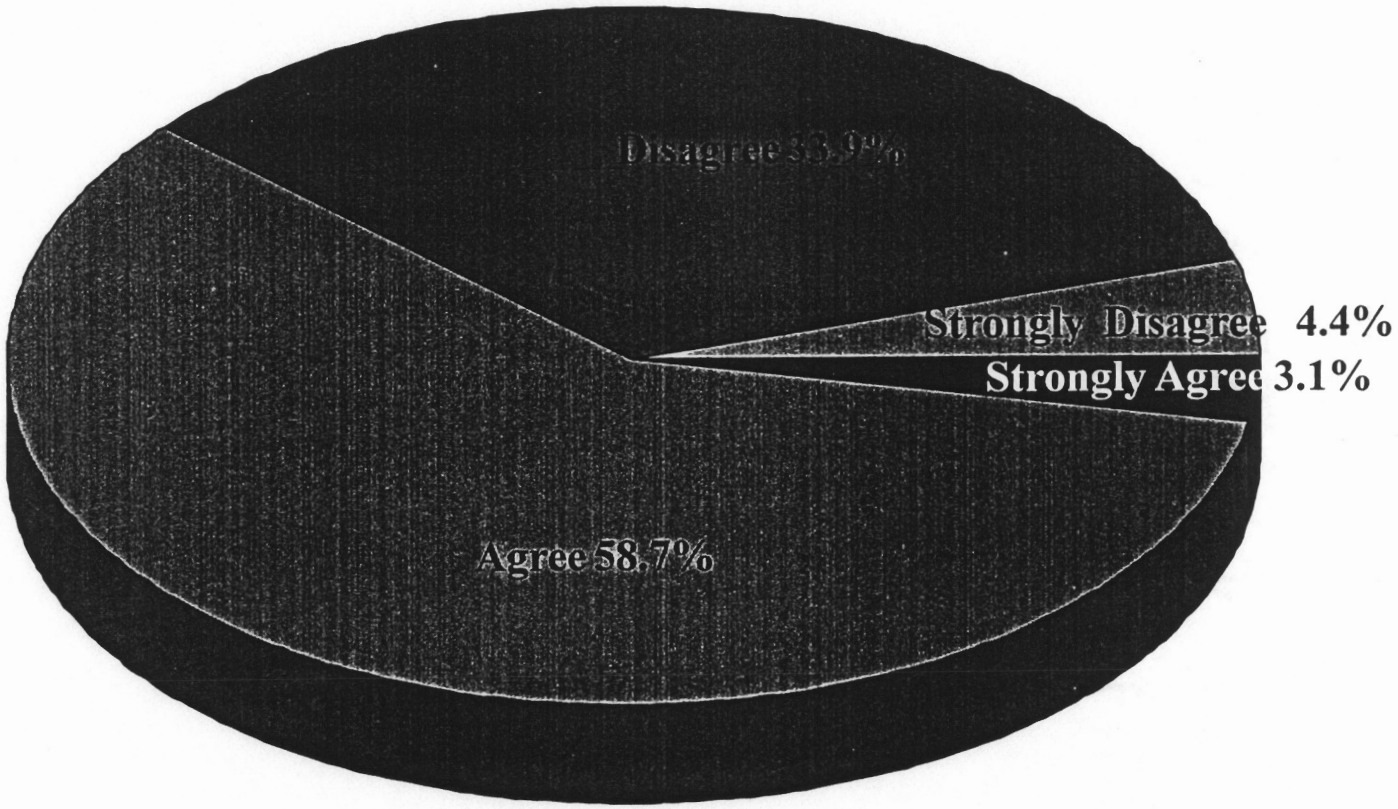

Figure 8: Students' Beliefs that Students Get Along Well with Teachers

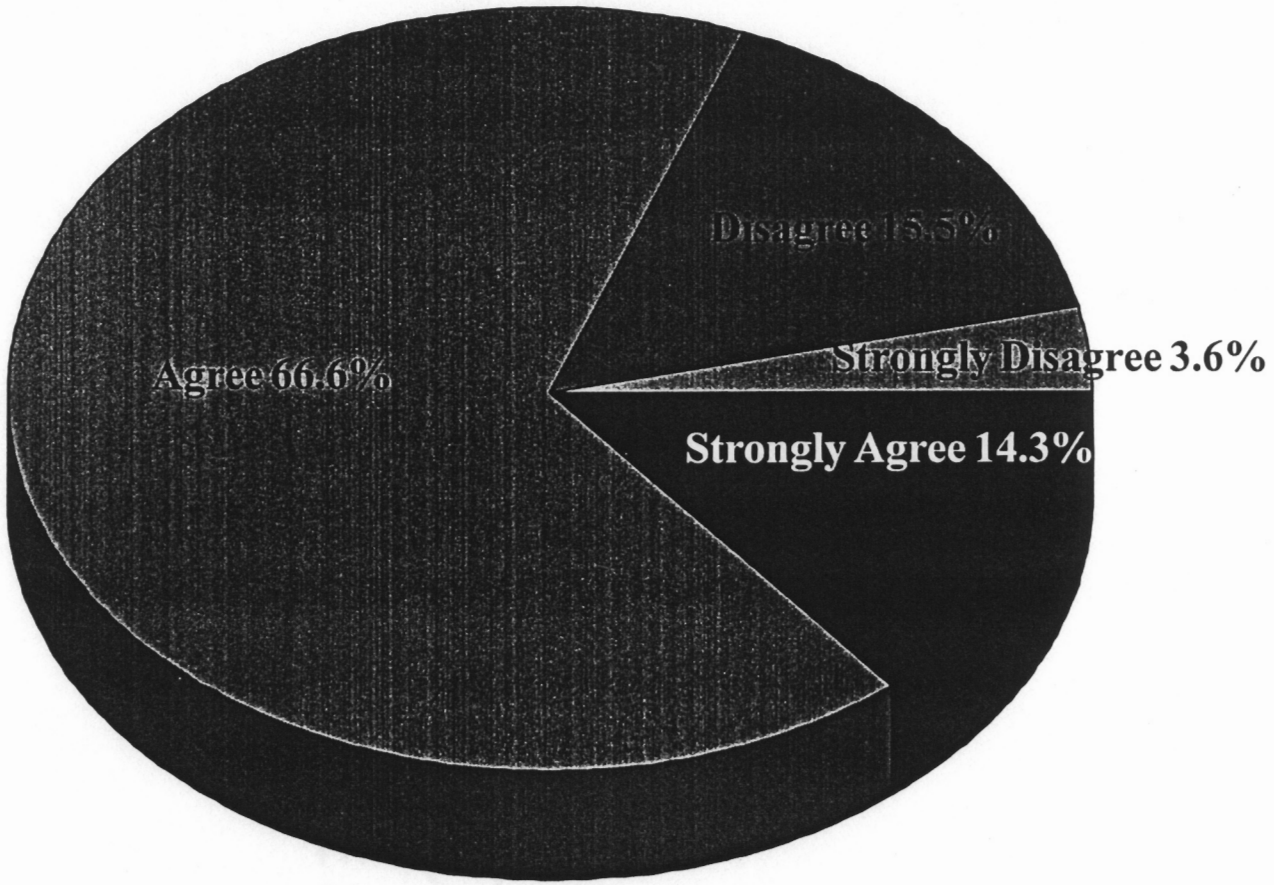

Figure 9: Students' Perceptions that Teaching is Good at their Schools

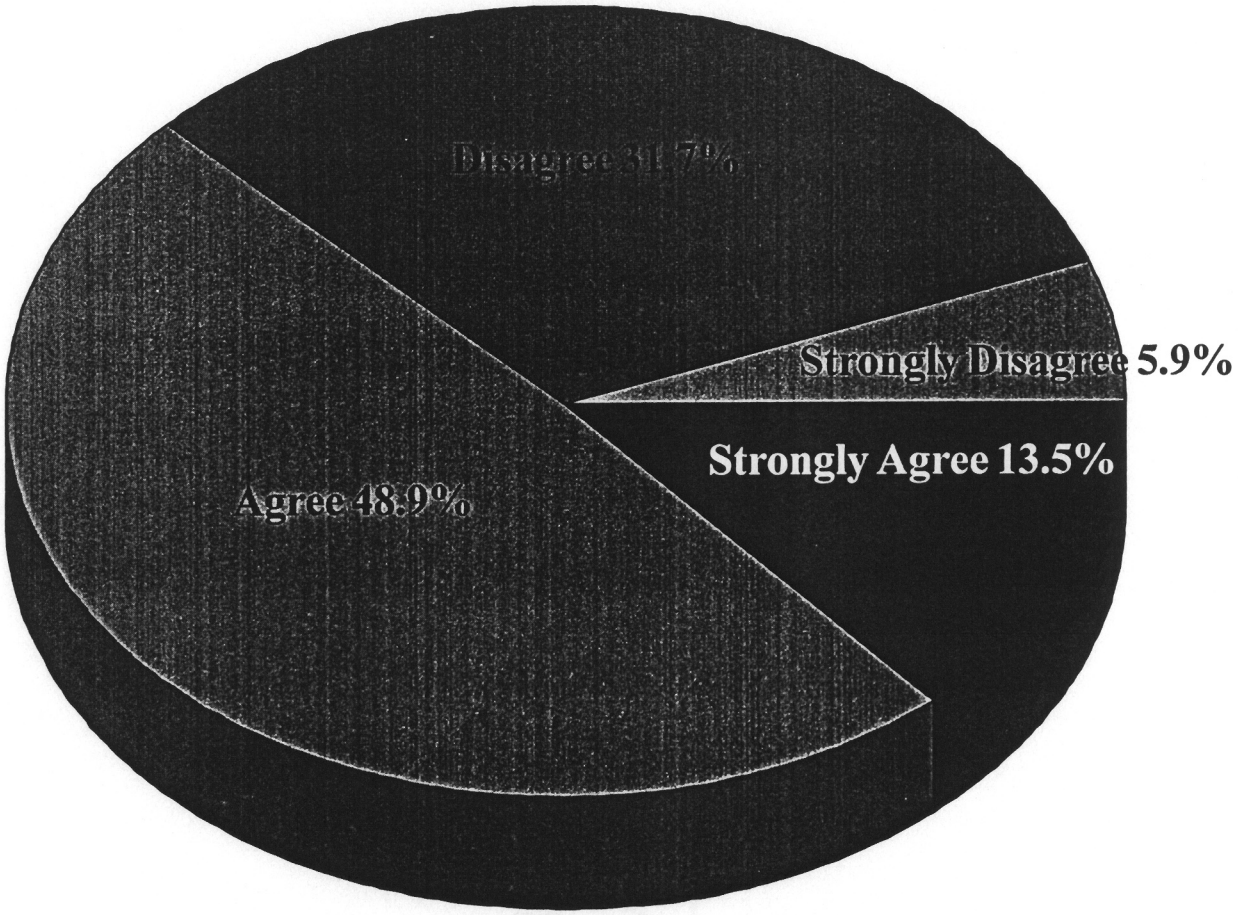

Figure 10: Students' Belief that Teachers Praise their Hard Work

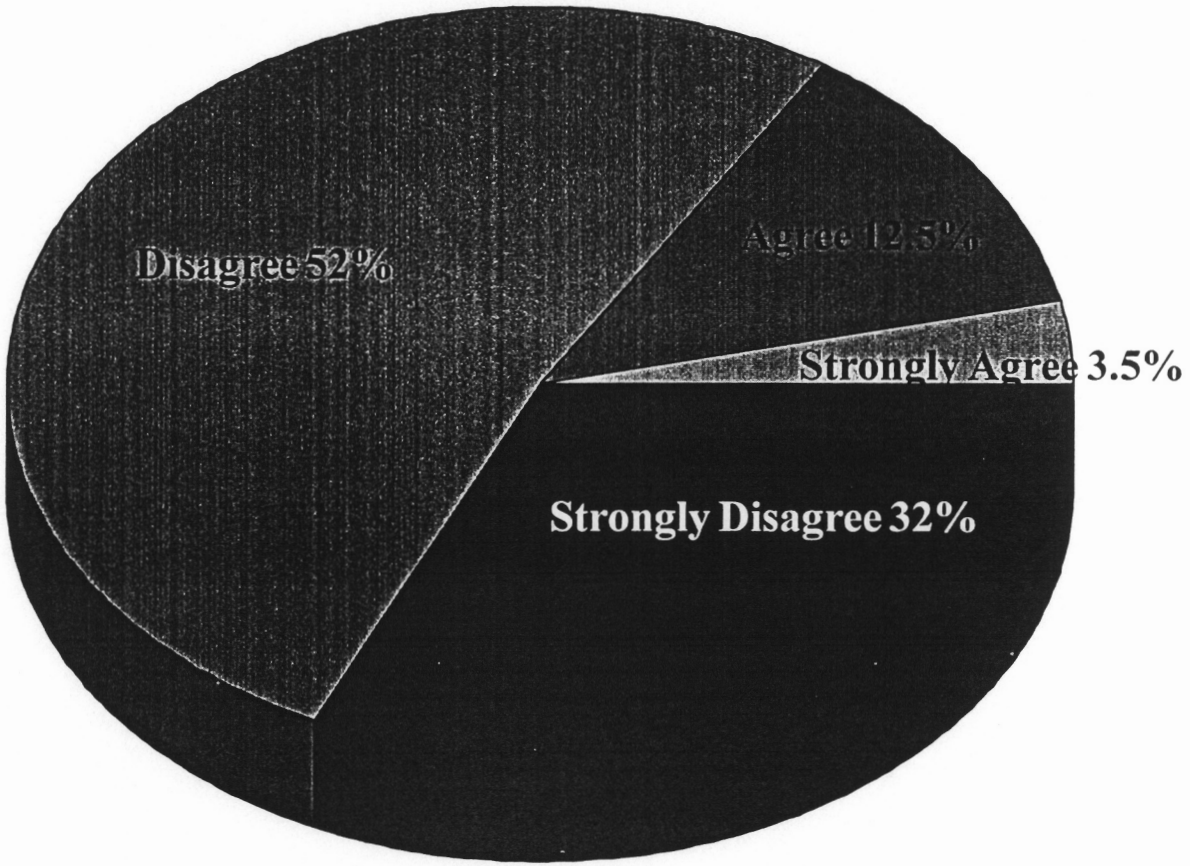

Figure 11: Students' Feelings that they are Often Put Down by their Teachers

perceive, on the average, that students get along with teachers, discipline is fair, students are friendly with other racial groups, the teaching is good at their school, and teachers praise their hard work. Most students indicated that they did not feel put down by their teachers.

Parental Aspirations and Parental Involvement. Students indicated that nearly 30% of mothers wanted them to complete graduate school and 41% wanted them to graduate from college. The percentage of mothers who wanted their children to attend a four-year college was 12% and nearly 5.5% wanted their children to attend a 2-year college. Nearly 5.5% of mothers wanted their children to attend a vocational school after high school. Students indicated that 4.5% of mothers at least wanted them to graduate from high school. A small percentage of students (1.5%) indicated that their mothers' aspirations for them were less than a high school education.

Fathers, on the average, held high aspirations for their children as well. Twenty six percent (26%) of fathers wanted their children to complete graduate school and 42% wanted them to get a bachelor's degree. Nearly 13% of fathers wanted their children to attend a four-year college. Equal numbers of fathers wanted their children to graduate from high school (5.3%) as did those fathers who wanted

their children to attend a two-year college (5.3%). Nearly 7% wanted their children to go to a vocational school after college. Slightly more than 1% wanted their children to get less than a high school degree. Figure 12 compares students' perceived aspirations of mothers and fathers.

Students were asked how often they discuss taking the ACT/SAT with parents. Students were also asked how often they discuss going to college with parents. Response options were "Never," "Sometimes," and "Often." Responses indicate that the ratio for students who "Often" discuss going to college with their parents (48%) to those who "Often" discuss taking the ACT/SAT (15%) is slightly more than 3:1, indicating that students are much more likely to discuss going to college with their parents than they are to discuss taking the ACT/SAT. The ratio for students who "Never" discuss taking the ACT/SAT (45%) to those who "Never" discuss going to college with their parents (nearly 13%) is 3.5:1, further indicating that students are more likely to discuss going to college than taking the ACT/SAT with parents. Nearly equal percentages of students "Sometimes" discuss taking the ACT/SAT (40%) as those who "Sometimes" discuss going to college with their parents (40%). (See Figure 13.)

Student Aspirations. As Figure 14 suggests, most students plan to go to college right after high school

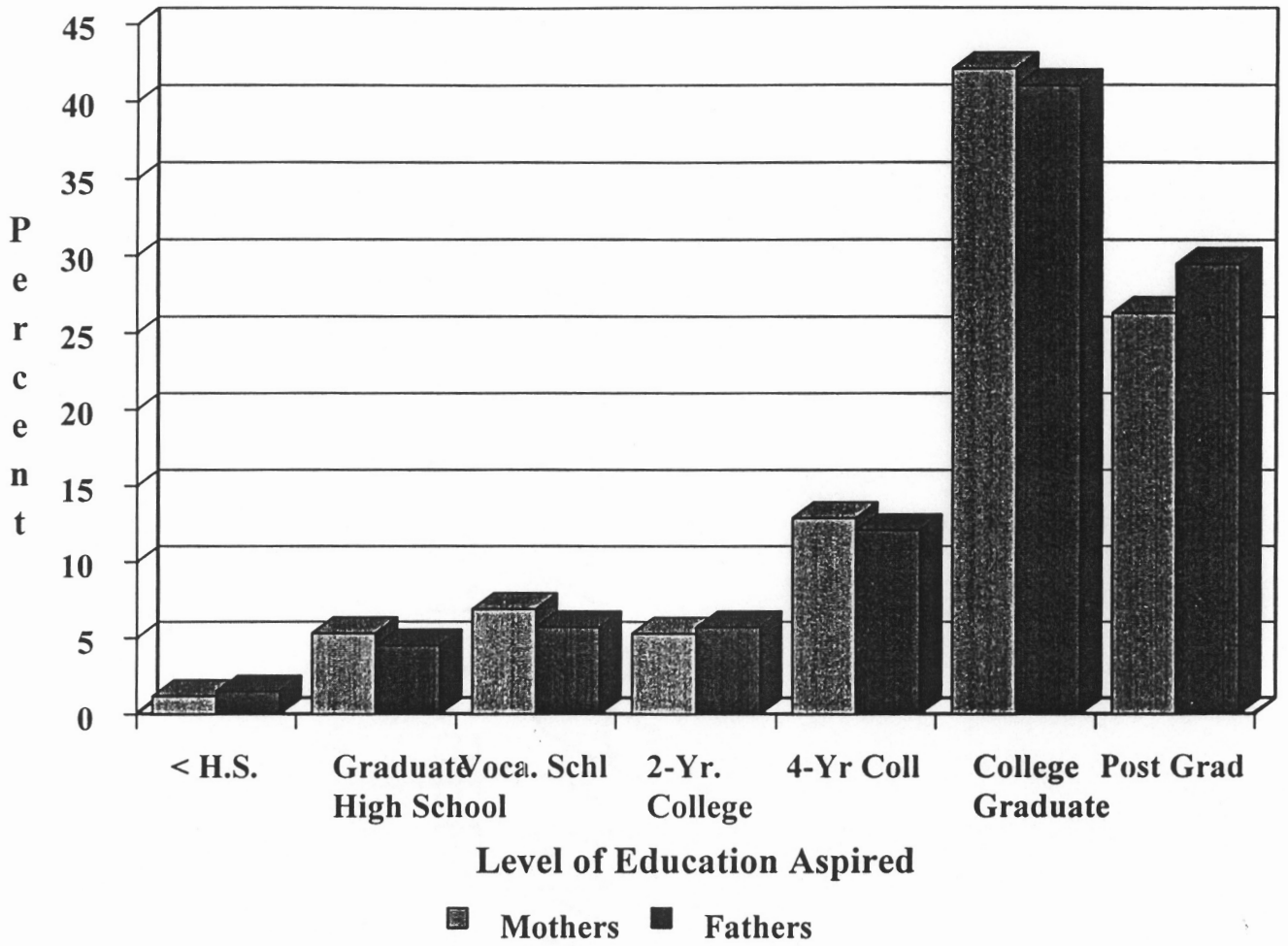

Figure 12: Students' Perceptions of Parents' Aspirations for Them

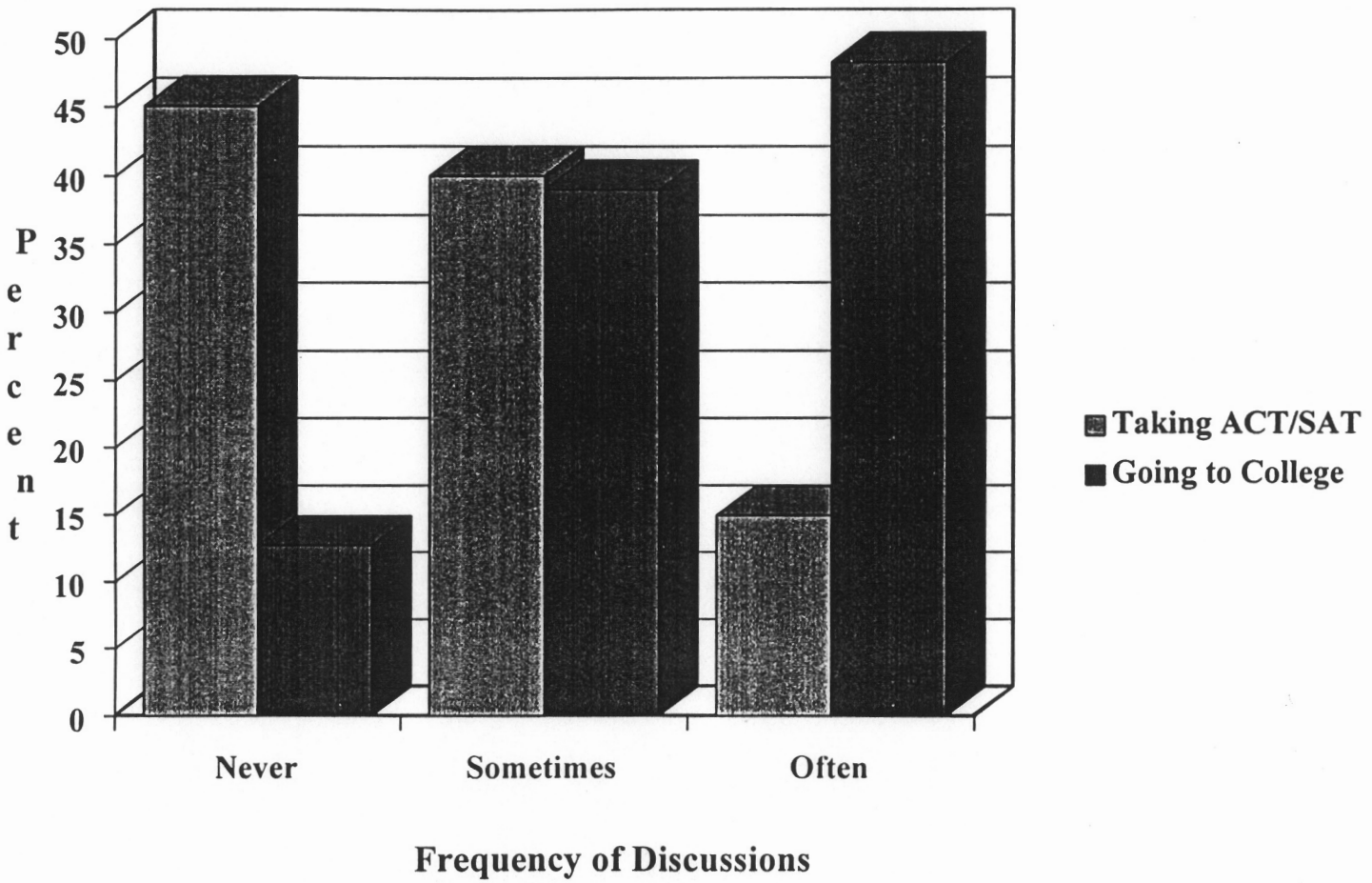

Figure 13: Students' Involvement of Parents in Discussions re: Taking ACT/SAT and Going to College

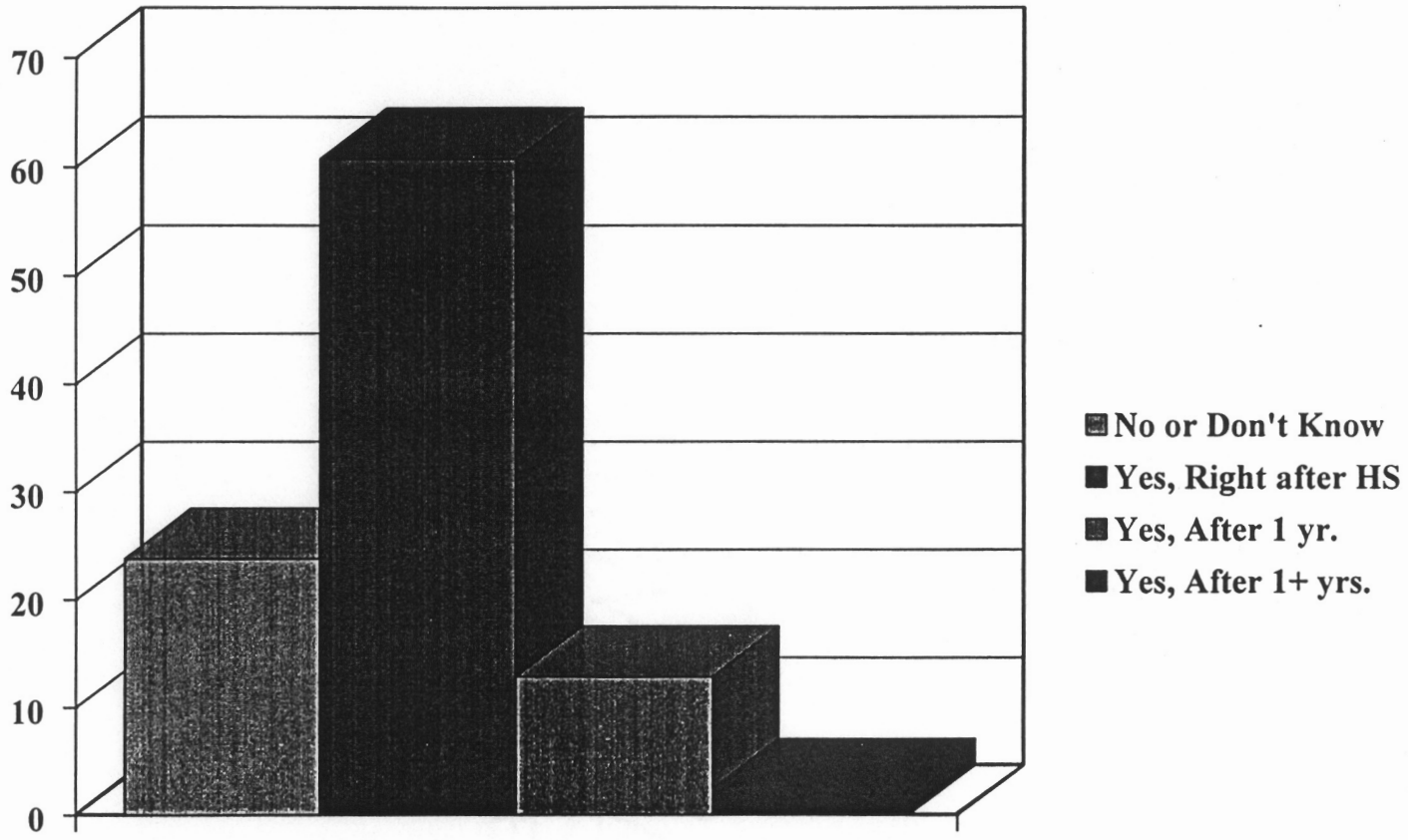

Figure 14: Students Plans to Go to College after High School

(60%). Sixteen percent (16%) indicated they would attend college after one to two years. However, a sizable portion of students have undefined or underdefined career aspirations as it relates to academic pursuits. This is reflected in nearly 24% who indicated they either "Don't Know" if they are going to college or said "No," they don't plan to go college.

Figure 15 details how far students think they will get in school. Less than 2% said they would not complete high school and another 13% said they would go no further than high school. Slightly more than 3% indicated they would attend a trade school for less than 2 years while nearly 8% indicated they would attend a trade school for up to two years after high school. Slightly more than 19% indicated they would get up to 2 years of college. A little more than 27% indicated that they would at least finish college. Finally, 12% indicated they would complete a Master's degree program and nearly 16% indicated they would complete a MD or Ph.D. program.

Student Motivation. Nearly 62% of students indicated they spend one hour or less on homework in school during a week. Nearly 19% spend 2-3 hours on homework in school. Approximately 12% reported spending 4-6 hours per week in school on homework. The remaining 7% indicated that they spend at least 7 hours per week in school on homework.

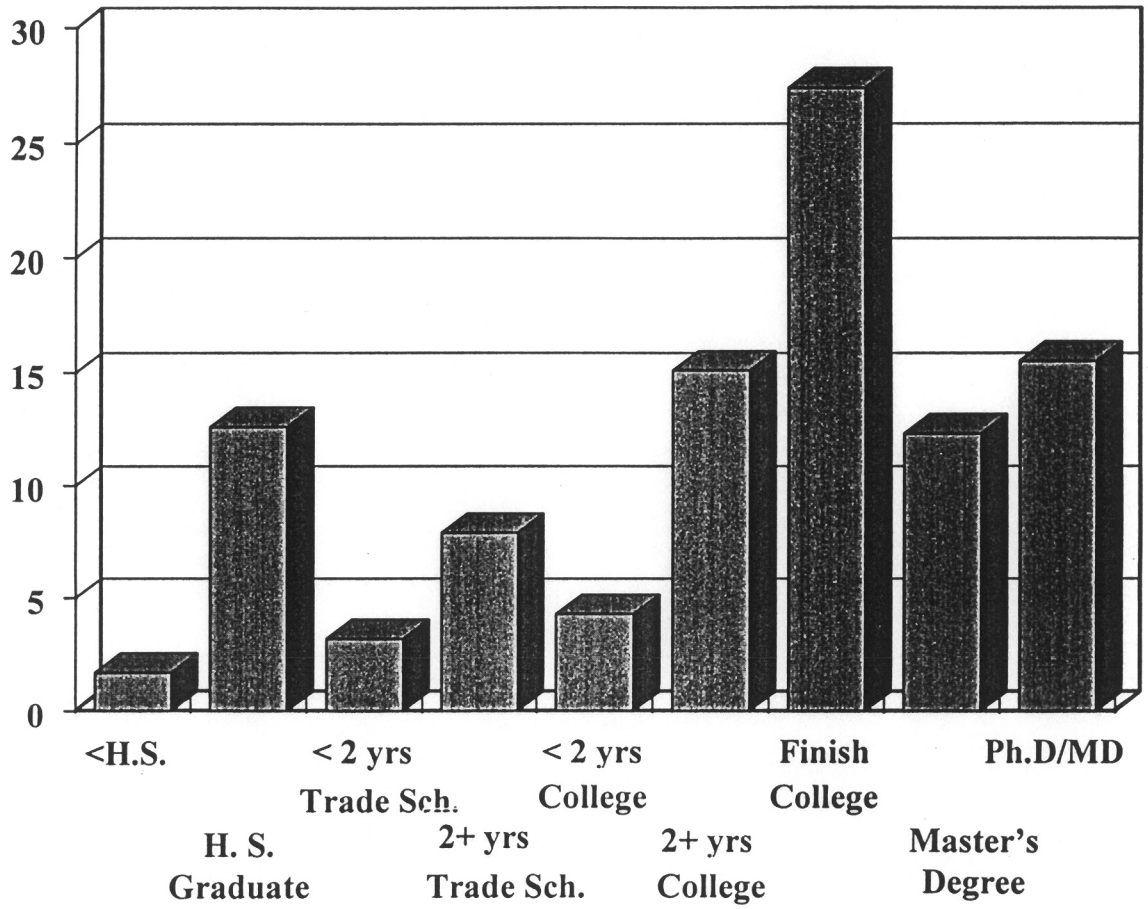

Figure 15: Students' Thoughts Regarding How Far in School They Think They Will Get

Nearly 35% spend an hour or less on homework out of school per week. Many students (33%) reported spending 2-3 hours on homework out of school. Slightly more than 15% indicated spending 4-6 hours per week on homework. The remaining 17% indicated that they spend more than 7 hours per week on homework out of school. The breakdown of student-reported responses to the number of hours they spend on homework both in and out-of-school are presented in Figure 16.

Student responses indicate that most did not take general math (approximately 58%). However, 58% indicated that they took one year or more of Algebra I. More than 37% of the sophomores completed one year or more of Geometry. While 66% of students did not take general science and 51% did not take physical science, nearly 77% completed at least one year of biology. Nearly all students (95%) completed at least one year in English and half (50%) one year of a foreign language. Quantity of coursework in Math, Science, English, and Foreign Language are presented in Figures 17A to 17C.

Path Analytic Results

A rule of thumb provided by Pedhazur (1982) for the interpretation of effects is to delete all paths whose coefficients are less than .05. Keith & Cool (1992) offered

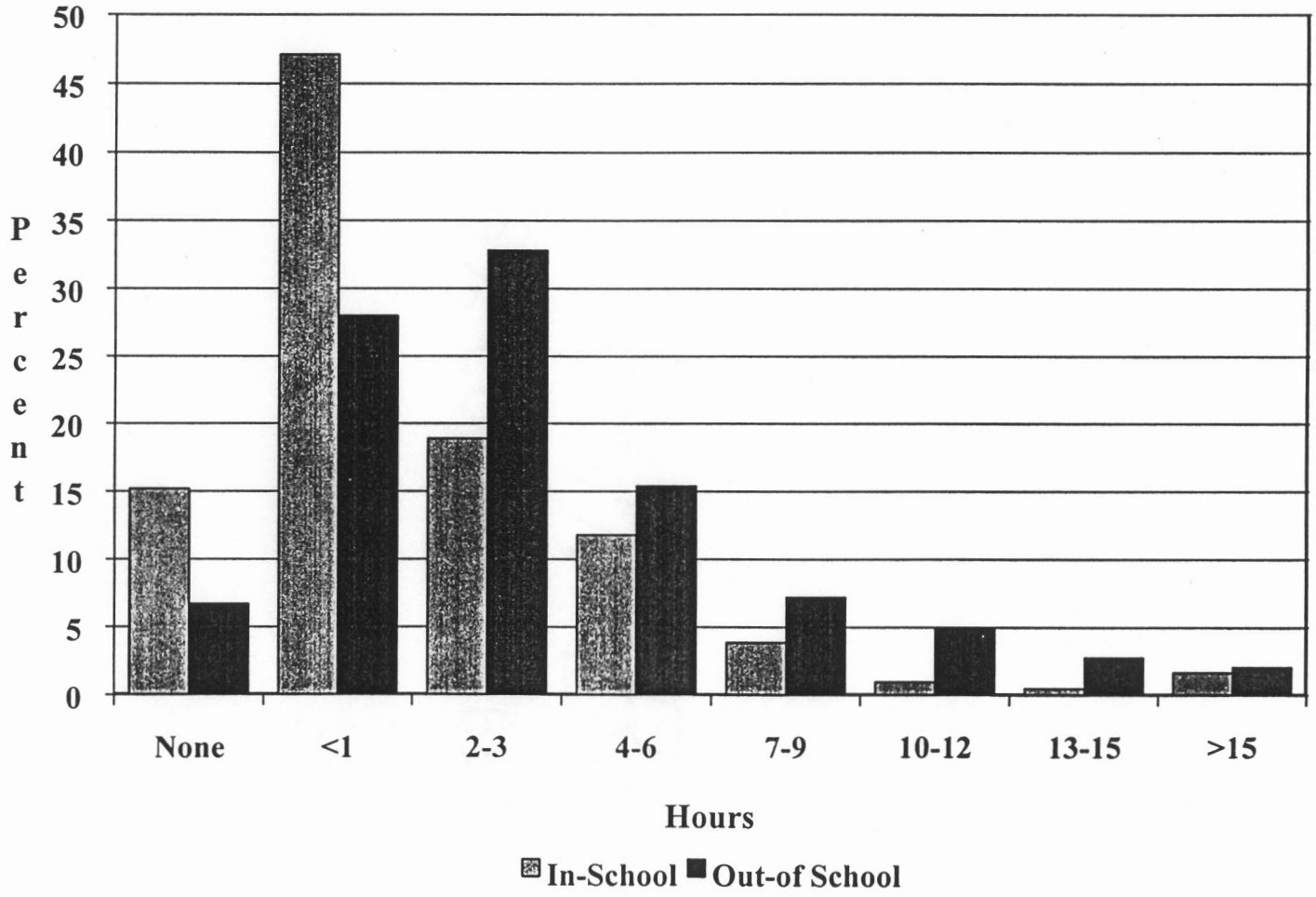

Figure 16: Amount of Time Spent on Homework per Week by Students

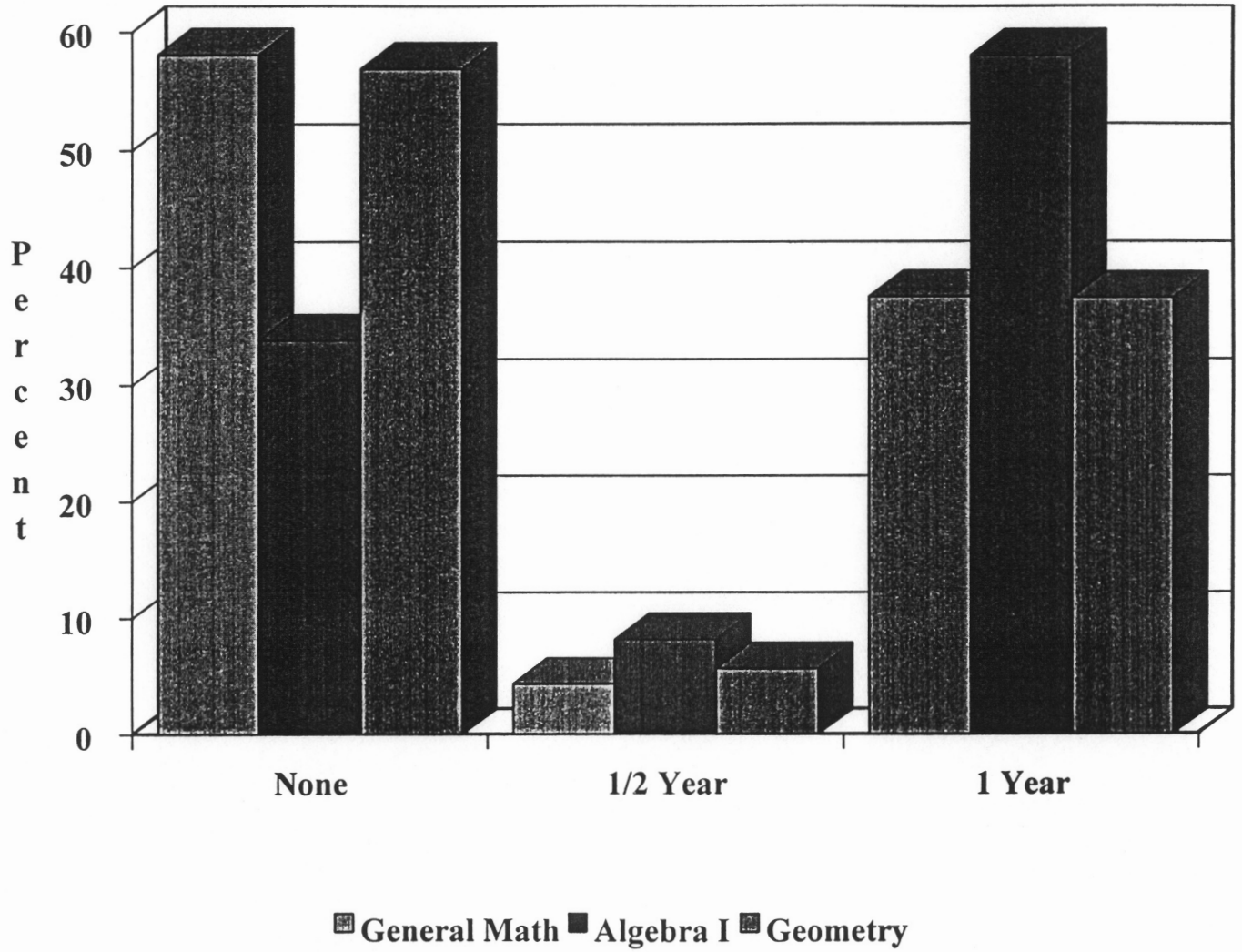

Figure 17A: Years of Math Completed by Students

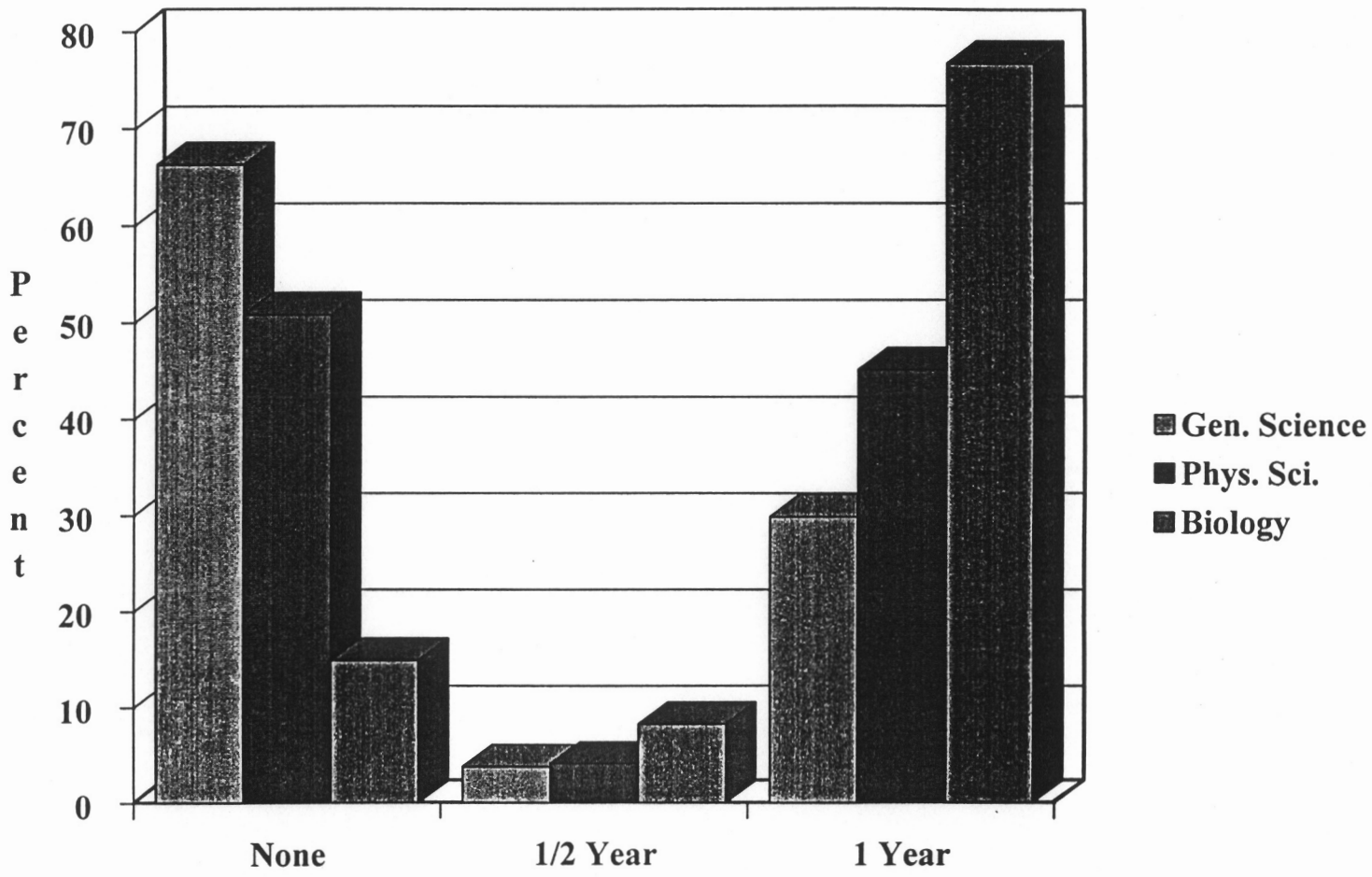

Figure 17B: Years of Science Courses Completed by Students

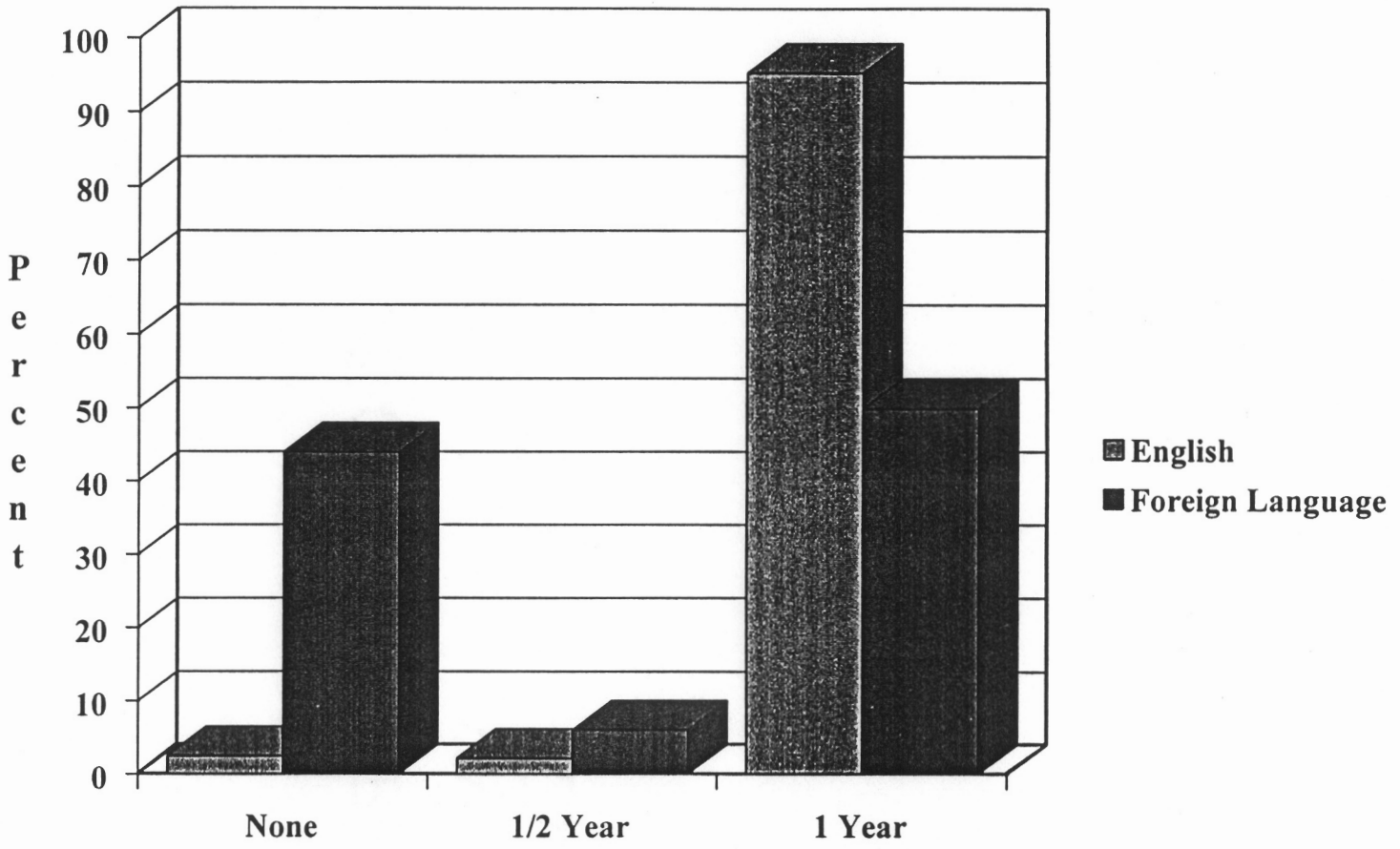

Figure 17C: Number Years of Language Courses Completed by Students

an additional "qualitative aid" to the interpretation of these coefficients.

> (P)aths greater than .05 may be interpreted as small but meaningful effects, paths above .10 to .15 as moderate effects, and paths above .25 as powerful effects (p. 214).

Given this interpretive guide, the following sections examine the effects of background, school, home and student variables on student achievement.

The present model is a simple model of academic achievement. Table 1A represents the weighted correlations, means, and standard deviations for the composites. Table 1B is composed of unweighted correlations which are based on actual sample size and associated probabilities. Table 2 contains the unweighted (sample) means, standard deviations, minimum and maximum scores. The reduced model, with insignificant paths deletedm is represented by Figure 18. Chi-square likelihood ratio and other measures of fit as well as R^2 for the model appear in Table 3.

For this study the Chi-Squared value is 57.48 with 21 degrees of freedom ($p = .000$). As was stated earlier, Chi-Square is often significant when analysis is based on a large sample. Thus other measures of model fit are relied on to assess overall model fit. These include the goodness-of-fit (GFI) and the adjusted goodness of fit (AGFI) indices as well as the root mean square residual (RMSR), all defined

Table 1A

Composite Variables' Correlations, Means, and Standard Deviations

Variables	1	2	3	4	5	6	7	8	9	10
1. Gender	1.000									
2. SES	-.069	1.000								
3. Prior Ach.	.065	.315	1.000							
4. Schl. Env.	.033	.101	.061	1.000						
5. Teachers	.049	-.007	.117	.364	1.000					
6. Parent Aspir.	.106	.290	.234	.053	.036	1.000				
7. Parent Inv.	.036	.172	.095	.170	.191	.251	1.000			
8. Student Asp.	.097	.180	.170	.106	.115	.367	.276	1.000		
9. Student Mot.	.109	.231	.310	.118	.088	.071	.214	.104	1.000	
10. Achievement	.039	.373	.864	.106	.157	.198	.132	.207	.295	1.000
M	.508	-.404	-.058	.042	.048	-.031	.015	.058	-.023	-.042
SD	.500	.756	.855	.722	.662	.942	.857	.772	.396	.879

Table 1B

Composite Variables' Unweighted Correlations, N (In Parentheses), and Associated Probability

Varaibles	1	2	3	4	5	6	7	8	9	10
1. Gender	1.000 (1766) P=.									
2. SES	-.025 (1765) P=.148	1.000 (1765) P=.								
3. Prior Ach.	.049 (1654) P=.023	.396 (1653) P=.000	1.000 (1654) P=.							
4. School Env.	.037 (1570) P=.070	.066 (1570) P=.005	.092 (1475) P=.000	1.000 (1570) P=.						
5. Teachers	.066 (1570) P=.005	.026 (1570) P=.152	.120 (1475) P=.000	.360 (1544) P=.000	1.000 (1570) P=.					
6. Parent Aspir.	.108 (1054) P=.000	.332 (1054) P=.000	.271 (991) P=.000	.094 (1006) P=.001	.102 (1008) P=.001	1.000 (1054) P=.				
7. Parent Inv.	.092 (1360) P=.000	.158 (1360) P=.000	.061 (1291) P=.015	.131 (1302) P=.000	.134 (1298) P=.000	.296 (913) P=.000	1.000 (1360) P=.			
8. Student Aspir.	.079 (1508) P=.001	.285 (1508) P=.000	.253 (1416) P=.000	.114 (1444) P=.000	.116 (1444) P=.000	.495 (1011) P=.000	.364 (1307) P=.000	1.000 (1508) P=.		
9. Student Motiv.	.061 (1249) P=.016	.246 (1249) P=.000	.305 (1176) P=.000	.071 (1229) P=.007	.127 (1226) P=.000	.172 (824) P=.000	.153 (1063) P=.000	.201 (1178) P=.000	1.000 (1249) P=.	
10. Achievement	.021 (1577) P=.201	.430 (1577) P=.000	.870 (1485) P=.000	.123 (1489) P=.000	.158 (1488) P=.000	.270 (985) P=.000	.091 (1262) P=.001	.284 (1399) P=.000	.302 (1191) P=.000	1.0000 (1577) P=.

Table 2

Number of Cases, Mean, Standard Deviation, Minimum and Maximum Values of Unweighted Composite Variables for a Model to Test the Direct and Indirect Effects of School Learning Variables on the Academic Achievement of Black 10th Graders

Variable	Cases	Mean	StdDev	Minimum	Maximum
Gender	1766	.52	.50	0	1
SES	1765	-.44	.80	-2.84	1.97
Prior Achiev.	1654	.00	.88	-1.87	2.85
School Envir.	1570	.00	.73	-2.58	1.54
Teachers	1570	.00	.64	-2.62	1.68
Parent. Aspir.	1054	.00	.94	-3.14	0.96
Parent. Involv.	1360	.00	.85	-1.46	1.38
Student Aspir.	1508	.05	.79	-1.80	2.15
Student Motiv.	1249	-.01	.37	-1.63	1.12
Achieve-ment	1577	.00	.90	-1.81	3.07

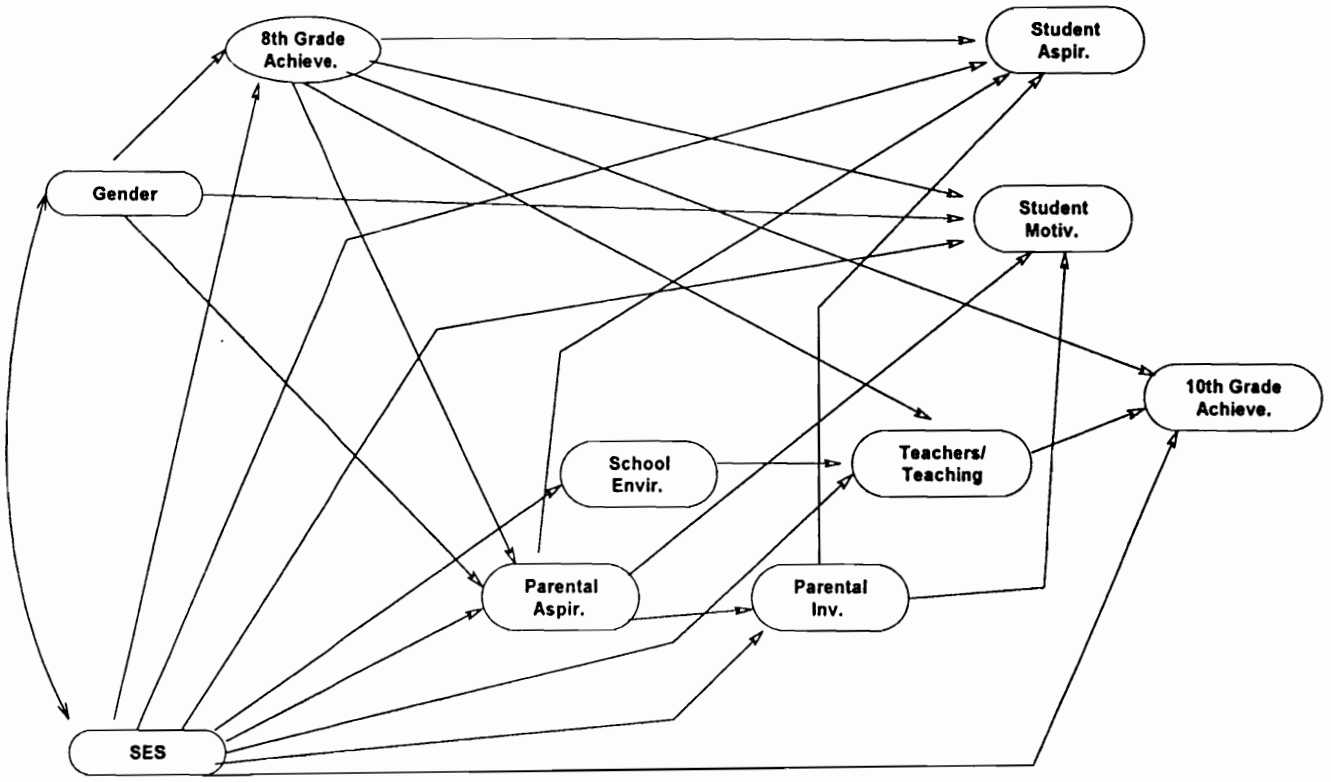

Figure 18: Reconstruction of Figure 1 with Non-significant Paths Deleted

TABLE 3

MEASURES OF OVERALL FIT AND R^2 FOR THE MODEL TO TEST THE DIRECT AND INDIRECT EFFECTS OF SCHOOL LEARNING VARIABLES ON THE ACADEMIC ACHIEVEMENT OF BLACK 10TH GRADERS

Chi Square (X^2) with 29 degrees of freedom:	57.48 (p=.000)
Goodness of Fit Index:	.987
Adjusted Goodness of Fit Index	.965
Root Mean Square Residual	.023
R^2	.761

above. The values for these indices are .987, .965, and .023 respectively. Again, the GFI index (.987) and the AGFI (.965) being close to one and interpreted like correlation coefficients, represent a good fit of the model. Likewise the RMSR of .023, being low and representing the average discrepancy between elements of the input and the implied covariances, represents a good fit. Because these indices suggest a good fit to the data overall, the path coefficients can be meaningfully interpreted.

The results of primary interest for this study are the estimates of significant paths to academic achievement, student motivation, and student aspirations directly, or through one or more variables in the model. The results of these structural relations are discussed below.

Effects of Independent Variables on Black 10th Graders' Academic Achievement

Antecedent causes of academic achievement are graphically depicted in Figure 19. Table 4 contains the direct, indirect, and total effects of significant independent variables in the model on students' academic achievement.

The strongest direct influence on achievement was from prior achievement. The β coefficient of .844 strongly suggests that students who do well in prior years are more likely to do well in later years. Indirect effects from

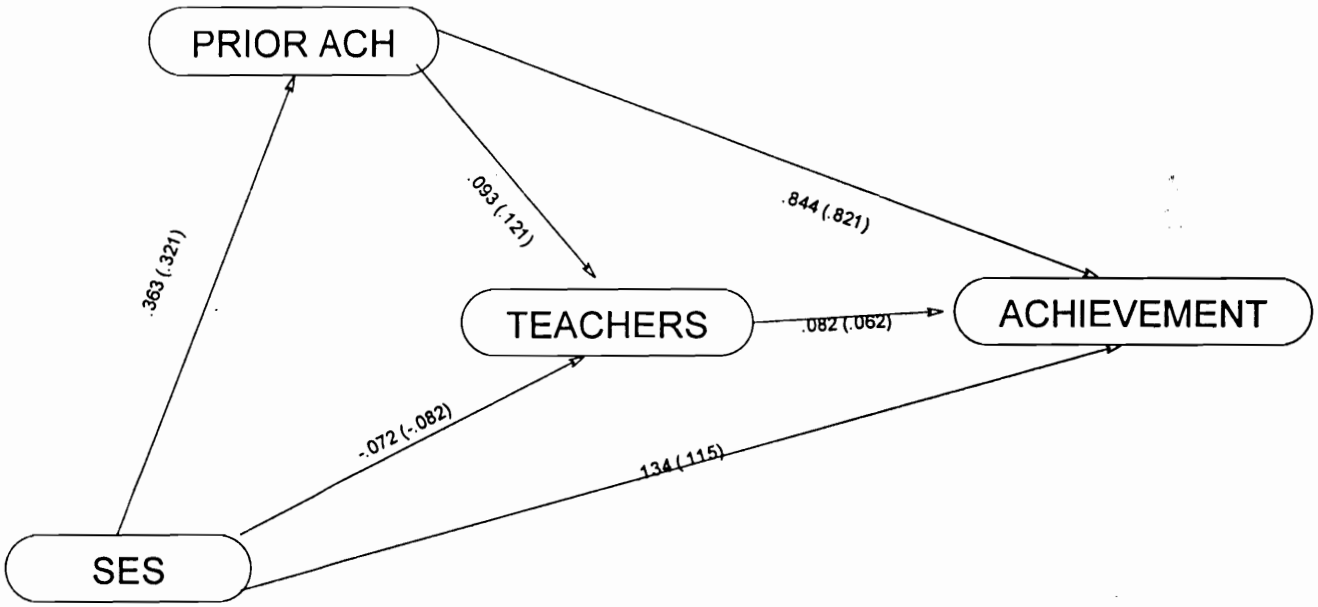

Figure 19: Signficant Paths to Black 10th Graders' Achievement

Note: Standardized coefficients appear first followed by metric coefficients in parentheses.

TABLE 4

DIRECT AND INDIRECT EFFECTS ON ACADEMIC ACHIEVEMENT OF BLACK 10TH GRADERS

VARIABLES	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
Gender	-----	.127	.072
SES	.134	.305	.439
Prior Achievement	.844	.007	.851
School Environment	-----	.027	.027
Teachers	.082	.000	.082
Parental Aspirations	-----	.000	.000
Parental Involvement	-----	.000	.000
Student Aspirations	-----	.000	.000
Student Motivation	-----	.000	.000

prior achievement through other variables in the equation to academic achievement were not significant (.007).

Socioeconomic status provided the next best explanation of achievement. The path coefficient was moderate (.134) and suggests that students of higher social status tend to score higher on tests of achievement. However, the direct effect of socioeconomic status (.134), coupled with indirect effects through all other structural relations (.305), is much stronger as evidenced by a total effect of .439. Thus SES not only has a direct effect on achievement but also affects academic achievement through other variables. When these variables (i.e., prior achievement, school environment, perceptions of teachers/teaching, parental aspirations, parental involvement, student aspirations, and student motivation) are controlled for and their common effects partialled out from one another, one might typically assume that students of high SES will score high on an achievement test also. The direct effect from teachers to academic achievement was small yet significant (.082).

While gender did not exert a significant influence on academic achievement directly, through prior achievement and parental aspirations gender exerted a small, yet significant effect (.072), indicating that girls scored higher than boys on standardized measures of achievement.

Finally, small but significant effects on achievement

were exerted from students' perceptions of teachers and very small but significant indirect effects were exerted from students perceptions of the school.

Effects on Student Motivation

Figure 20 depicts the antecedent causes of student motivation. The direct, indirect, and total effects are presented in Table 5.

The effects of gender, SES, and prior achievement, parental aspirations, and parental involvement on student motivation were significant. Prior achievement, the effect of which is moderate (.259), exerted the greatest influence on motivation. Students who have done well in the past are more likely to do well in the future. Furthermore, given the positive effect of gender, girls are more likely to exhibit higher motivation by spending more time doing homework and taking a greater number of academic courses. Here the effect of prior achievement on student motivation (.120) is nearly 36% greater than the effect of SES (.079) and 30% greater than the effect of gender (.084). The indirect effects of gender and prior achievement on student motivation were quite small (.012 and -.003 respectively). The indirect effect exerted by SES on motivation was small as well (.046) but, coupled with the small direct effect of SES (.079), can be interpreted as moderate (.125).

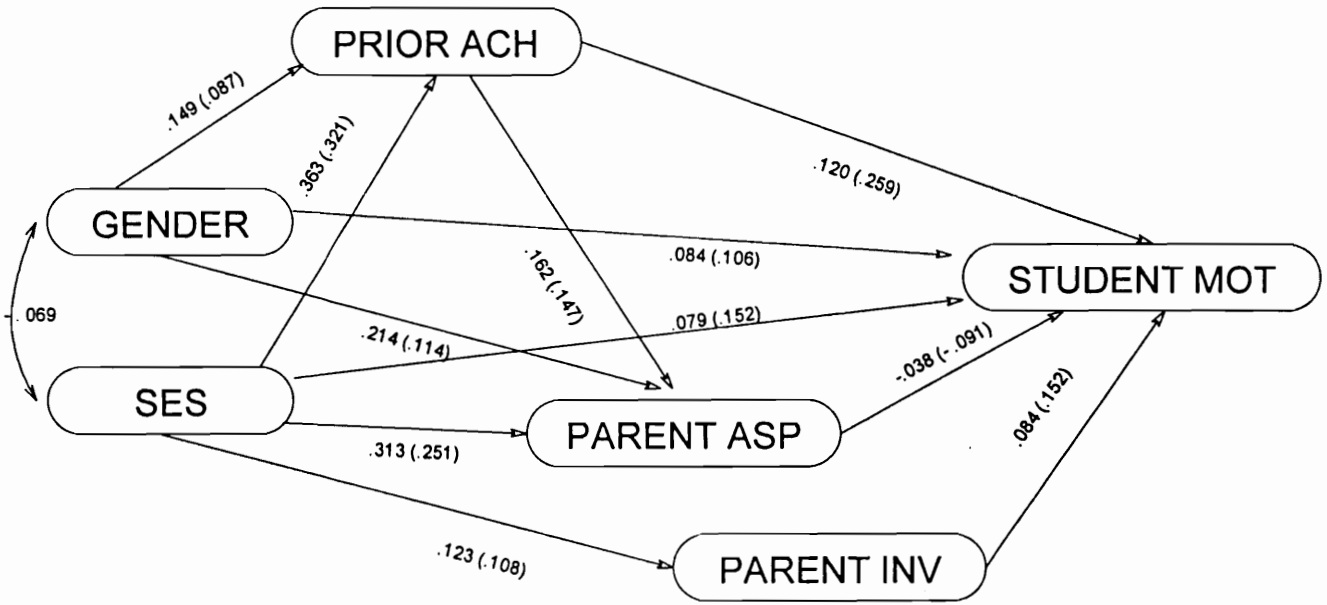

Figure 20: Significant Paths to Black 10th Graders' Motivation

Note: Standardized coefficients appear first followed by metric coefficients in parentheses.

TABLE 5

DIRECT AND INDIRECT EFFECTS ON STUDENT MOTIVTION OF BLACK 10TH GRADERS

VARIABLES	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
Gender	.084	.012	.096
SES	.079	.046	.125
Prior Achievement	.120	-.003	.117
School Environment	-----	.000	.000
Teachers	-----	.000	.000
Parental Aspirations	-.038	.017	-.051
Parental Involvement	.084	.000	.084
Student Aspirations	-----	.000	.000

Parental involvement showed a small, significant effect on student motivation (.084) controlling for other variables. This suggests that students who discuss taking the ACT/SAT or going to college with their parents are typically the students who spend more time on homework and take academic courses.

The direct effect of parental aspirations on student motivation is negative (-.038) but when looking at the total effect (-.021) it is reasonable to interpret these effects as negligible. According to these results parents' aspirations had a negligible negative relationship with motivation as shown by homework time and courses taken. It may be more reasonable to conclude that the effect of parental aspirations on motivation, according to these data, is so small that results are inconclusive, suggesting the need for further empirical investigation.

Effects on Student Aspirations

Figure 21 presents the antecedent causes of academic achievement. Direct, indirect, and total effects of significant independent variables on academic achievement are presented in Table 6.

The greatest direct causal influence on students' aspirations, controlling for other variables in the model, is from parental aspirations (.250). Coupled with its

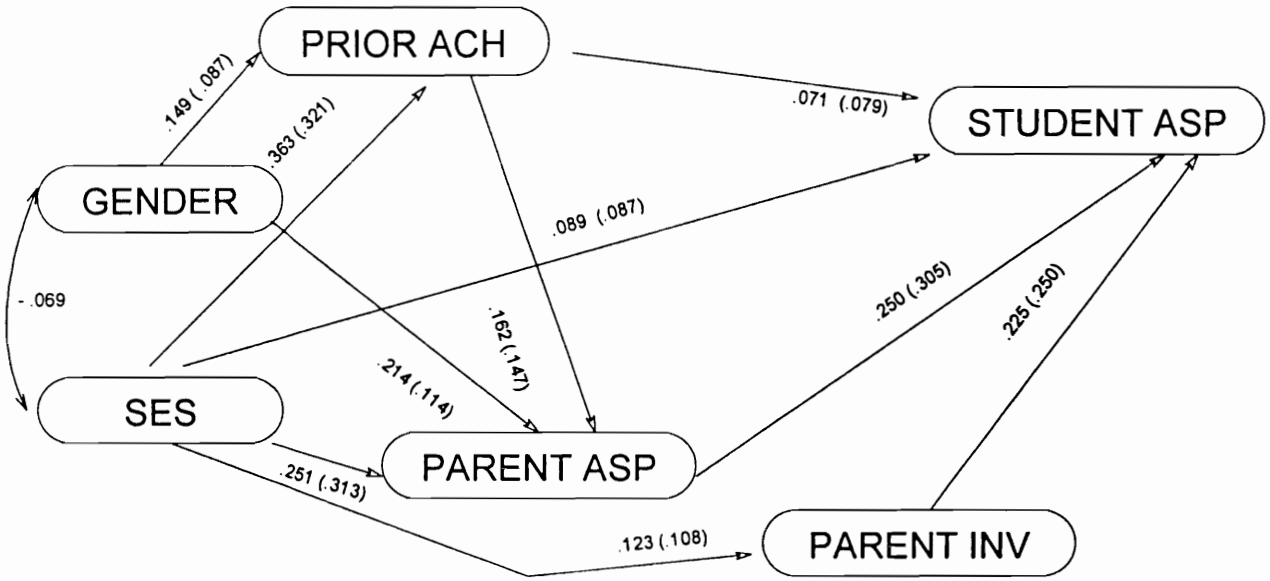

Figure 21: Significant Paths to Black 10th Graders' Aspirations

Note: Standardized coefficients appear first followed by metric coefficients in parentheses.

TABLE 6

DIRECT AND INDIRECT EFFECTS ON STUDENT ASPIRATIONS OF BLACK 10TH GRADERS

VARIABLES	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
Gender	-----	.081	.081
SES	.089	.163	.252
Prior Achievement	.071	.048	.119
School Environment	-----	.000	.000
Teachers	-----	.000	.000
Parental Aspirations	.250	.040	.295
Parental Involvement	.225	.000	.225

indirect effects (.049), the total effect is .295. It suggests that if parents hold high aspirations for their children, their children will hold high aspirations for themselves. This is a powerful indication of the importance of parents holding high aspirations for their children as well as the ready transferability of these aspirations to their children.

Parental involvement also evidenced a strong causal influence on student aspiration (β = .225). Since there were no intervening variables between parental involvement and student aspirations there was no indirect effect. The direct effect of SES (β = .089) on student aspirations may be interpreted as small yet meaningful. However after taking into account its indirect effect through other variables in the model, the total effect of SES on student aspirations increased to a level which would be interpreted as moderate. The effect of SES increased from .089 to .252. Likewise the effect of prior achievement, which is small yet significant (β = .071), increases from .071 to .119 when its indirect effect (.048) is taken into account. These coefficients suggest that students of higher social status who have done well in the past, whose parents hold high aspirations for them and are involved in their children's postsecondary plans, have higher aspirations.

The total variance explained by a linear combination of

the variables gender, SES, prior achievement, students' perceptions of the school, perceptions of teachers, perceptions of parents' aspirations for children, and parental involvement on Black students' standardized achievement is .761. This means that 76% of variance in academic achievement is due to the variability in these factors. The largest contribution to this explained variance comes from previous achievement and family's socioeconomic status.

CHAPTER 5

DISCUSSION

The results of this study indicate that prior achievement, teachers, and SES affect achievement. Furthermore, student aspirations are causally influenced by prior achievement, SES, and parental aspirations. Finally, prior achievement, gender, and SES causally influence student motivation.

Despite the useful qualitative aid provided by Keith & Cool (1992) for interpreting path coefficients and magnitude of effects, it must be remembered that the present study employs a nonexperimental design. As a result the researcher is limited to making a best guess regarding causality and effects. That is, no definitive claims can be made regarding which variables cause another. Only the assertion can be made that given certain statistical and methodological controls, certain effects may be observed. With this frame of reference in mind, conditional or tentative explanations for the differential effects of the independent variables on student achievement are presented below followed by tentative explanations for student motivation and student aspiration.

The Effect of Background Variables on Achievement

The path from SES to achievement (.134), as reported in

Chapter 4, was significant. This is to be expected and is not a surprise finding. Students having higher levels of socioeconomic status often enjoy greater access to learning resources which aid in their higher achievement. But this finding raises another, more pertinent issue. The coefficient from SES to achievement, in the present study, is (1) higher than the path coefficient calculated in some studies and (2) significant where in other studies it was not. For example, Fehrmann, Keith, and Reimers (1987) reported, looking at an ethnically mixed sample of high school seniors, a path coefficient from family background/SES of .008. Their study suggested that family background had little if any direct effect on achievement as measured by grades. Donovan (1984), estimating a path model for low-income Black youth, found the direct effect from parents' education and family income to be .037 and .033 respectively. Her study also suggested that SES had little if any direct effect on achievement. For Donovan's study, grades were the outcome measure as well. In a study where Keith & Benson (1992) examined effects on high school grades across five ethnic groups, the path from family background to achievement was constrained to zero because it was found to be nonsignificant.

While these studies represent a mere smattering of the literature on student achievement, the studies raise the

question of whether SES has differential effects for minority students when the outcome measure is grades as opposed to scores on a standardized test. It appears that when grades are the outcome measure, parents' income and education are less likely to have an impact on student achievement than when standardized test scores are used as the outcome variable. This observation is at least given tangential support by the research of Fehrmann, Keith & Reimers (1987) as well as Keith, Keith, Bickley & Singh (1992) who suggested that grades are more easily affected than test scores by parental factors. The inconsistency in findings regarding the effect of SES underscores the need for more research using different measures of academic achievement in addition to standardized tests.

The Effect of Prior Achievement on Achievement

The path from prior achievement to later achievement (.844) is very large. This overwhelmingly suggests that students who did well in the past will be the students who do well in the future, controlling for gender and SES. That the path indicates a very strong effect of prior achievement on current achievement comes as no surprise as it stands to reason that nothing better predicts success than previous success. However, by comparison, this coefficient is extremely large. Studies finding a significant path from a

prior measure of achievement to a later measure of achievement typically range from .3 to .6 (Cool & Keith, 1991; Keith & Cool, 1988; Keith & Benson, 1992; Keith & Cool, 1992; and Keith, Keith, Bickley & Singh, 1992; Singh et al. 1995). Thus the magnitude of the coefficient in the present study raises questions about reasons for such a large effect of prior achievement.

The large effect of prior achievement seemingly suggests that prior achievement plays a greater determining role in the later achievement of Black high school students than it does for high school students in the general population. If the role of previous academic achievement is much stronger among Black youth, then it seems that patterns of achievement (conversely of low achievement) are determined much earlier for them. If determinants of earlier school achievement are early school experiences, early instructional quality, early parental aspirations, early parental involvement, and early instructional quality, then studies on minority children should focus on earlier years. The question that such a speculation raises is whether there is greater stratification of achievers and nonachievers at an earlier age for minority youth such that later school factors have little effect.

School Influences on Achievement

A significant path was found to exist between students' perceptions of teachers and teaching and their achievement. Although the magnitude of the effect is small (.082), it is important to consider that it represents a net effect over and above the contribution of other variables in the equation. The teacher effect was measured by the items that solicited students' perceptions regarding rapport with teachers, instructional quality, positive feedback for effort, and teachers showing respect for students. A significant teacher effect means that when students perceive teachers as caring about them, giving them praise for their effort, and the quality of instruction is good, they are likely to be higher achievers (Clark, 1991; Cool & Keith, 1991; Keith & Benson, 1992; Keith & Cool, 1992).

The significant teacher effect is extremely important, particularly in light of the fact that it suggests that teachers have a unique impact on students above and beyond the impact of the school environment, students' prior levels of achievement, and students' SES and gender. By interpretation this means that regardless of whether the student is rich or poor, male or female, academically gifted or challenged, teachers can make a difference in their later academic achievement. It also suggests that whether or not students view discipline as fair at their schools or

regardless of what types of relations exist between students of various races, the relationship between the teacher and student may be the only link to the students' academic achievement.

Parental Influences on Achievement

A big surprise from this analysis was the finding that neither parental aspirations nor parental involvement had a significant effect on student achievement. The studies of Keith et al. (1992) and Singh et al. (1995) used the NELS:88 dataset and operationalized parental aspirations in the same way as was done in the present study. They looked at the entire student population and their results were completely different: parental variables were significant.

The present findings should not be interpreted to mean that parents have no influence on the academic achievement of their children, but they do suggest that when other variables such as SES, prior achievement, school and teacher influences are controlled for, parental involvement and aspirations during tenth grade do not affect academic achievement as measured by standardized test scores. There are several tentative explanations for marginal effects of parental variables. First, the very large effect of prior achievement may have implications for the nonsignificant or marginal effects of parental variables. For instance, it

could be argued that having controlled for the variable prior achievement, which clearly explains most of the variability in future achievement, any path to future achievement above .05 from any other variable in the model is not small but rather meaningful and of substantive importance.

It could also be argued that after controlling for prior achievement, other factors in the model are likely not to show much effect on achievement. Thus the low effect from parental variables to student variables is an artifact of regression. It is endemic to path models where temporal sequencing of variables is required that the effects of a downstream variable (Loehlin, 1987) may be attenuated merely by its position in the path diagram. It is only logical that a prior measure of achievement taken in the eighth grade be posited before measures taken at subsequent points in time (i.e., 10th grade), but once the effect of previous achievement is taken into account, other factors have a small amount of variance left to explain.

Finally, it is important to note that the study provides a snapshot of effects operating between the ninth and 10th grades. It does not take into account prior levels of parental aspirations or prior levels of parental involvement, for example. At best, therefore, it can only be said that between the eighth and tenth grades, a time

when students typically begin establishing their independence from family, that parental variables had little or no effect on students' standardized achievement. But this finding is interesting since other similar studies (Keith, et al., 1992; and Singh et al., 1995) have shown that high parental aspirations are related to higher academic achievement, but in this study, parental aspiration were unrelated to academic achievement.

Several other factors may help explain the current findings. That is, in addition to tentative explanations suggested above, perhaps a qualitative assessment of this phenomenon would prove beneficial. The frequency data, summarized in the first section of this chapter, revealed that nearly 16% of students' parents never completed high school, 23% completed high school only, and nearly 45 percent graduated from high school but had less than a 4-year degree. At the same time these data suggest that approximately 82% of mothers and fathers aspired for their children to attend a 4-year college, graduate from college, or complete post graduate education. This suggests that parents, on the average, want their children to obtain more education than they did. Black parents seemingly value higher education whether or not they have personally benefitted from it. It also suggests that because of low levels of education among many parents, coupled with the

fact that 33% reported incomes of less than $10,000, many parents may have expectations for their children above their children's abilities, given their scores on the tests of achievement. Thus even when their children have relatively low scores on standardized achievement tests, Black parents still hold high aspirations for their children. This pattern is true among Black parents who hold college degrees at various levels as well as among those who have less than a college education.

Another possibility is that these parents may not have within their means the avenues to help bolster their childrens' scores on standardized tests despite their high aspirations. It is unlikely that students from families having incomes under $10,000 would be enrolled, for example, in a course to help prepare them to take a standardized test such as the SAT. Therefore the absence of a substantive path coefficient from parental aspirations and involvement may also reflect a different opportunity structure for minority students compared to non-minority students (Johnson, 1992; Kozol, 1991; and Ogbu, 1985).

These findings suggest the presence of a paradox: parents hold high aspirations for their children's post-secondary plans yet, in some instances, seemingly lack the information and perhaps the skills needed to direct their achievement. They also suggest the importance of such

programs as Even Start where not only is the focus on developing skills in poor children and ensuring their school-readiness but attention is focused on developing the skills and abilities of their parents as well.

Even Start is comprised of three components: parents as teachers, parents as learners, and children as learners. The program recognizes that many parents may not have the confidence to participate in certain school-related activities or interact in formal educational settings, thus programs are individualized for parents. This is not to suggest that all Black parents are in need of these types of services. However, given the large percentage of Black parents who hold less than a college degree (i.e., 58% of fathers and 68% of mothers), it may prove beneficial to provide information to them regarding what it takes for their children to pursue postsecondary plans. In the absence of proper information and guidance, Black students most assuredly will remain underrepresented in colleges and universities.

Student Influences on Achievement

A major surprise outcome is that neither students' educational aspirations nor their motivation affect their academic achievement. Again, this does not suggest that achievement is not affected by whether a student aspires to

higher levels of learning, does his or her homework, or whether he or she takes courses in math, science, English and Foreign Language. Rather, because of the temporal sequencing of these variables it may be that the variability in educational aspirations and achievement motivation is no different from the variability of other variables in the model --it contributes nothing new. This finding is supported by Keith & Cool (1992) who examined the impact of motivation and other factors on the achievement of a national sample of high school students. They found motivation to have a nonsignificant direct effect on achievement although the indirect effect was significant. Similar findings were reported by Uguroglu & Walberg (1986) in a cross-sectional study of less affluent students of different races and ethnicities. They found that while highly correlated with achievement measures, motivation inconsistently predicts achievement when analyzed simultaneously with other factors in the model.

It should be noted that the independent contributions of aspiration and motivation may be difficult to detect because motivation, as a construct, is complex and multidimensional and its usual measures may only represent certain aspects or a single dimension of motivation.

These findings suggest that the effects of motivation as measured and student aspiration are inconsistent and

should be studied further in future research, using multiple measures of these constructs.

Background Influences on Student Motivation.

Both gender (β = .084) and SES (β = .079) influence student motivation. The path coefficient from gender to motivation indicated that girls are more "motivated" than boys. Specifically this suggests that girls spend more time on homework and take more courses in math, science, English, and Foreign Language than boys. Similarly, the path from SES to motivation suggests that higher levels of socioeconomic status is causally related to higher levels of motivation among students in the present study.

School Influences on Student Motivation

An interesting finding is that despite the significant influence of students' perceptions of teachers on their achievement, the effect of students' perceptions of teachers did not impact their aspirations nor their motivation when other variables in the model were statistically controlled. This gives rise to two thoughts. First, it might be that Black students have developed a type of resilience factor. As a result teachers seemingly have no impact on affective characteristics of students such as thoughts, feelings, and aspirations (Lee, Winfield & Wilson, 1992; Ogbu, 1985, 1989,

1991; Wilson-Sadberry, Winfield & Royster, 1991; and Winfield, 1991). Related to this is yet another possibility: The process of education for Black students have neither permitted nor facilitated a relationship between Black student and teacher outside of the classroom. Thus students' perceptions that teachers are friendly and supportive may be more a result of teachers not being outwardly unfriendly or the result of teachers being helpful when students seek help as opposed to teachers being proactive in offering help and support.

Again, since these ideas are based on speculation, they need to be examined empirically. Studies on Black students' achievement should further explore these ideas.

Parental Influences on Student Motivation

The effect of parental aspiration (β = -.038) on student motivation is perplexing. It suggests that higher levels of parental aspirations for their children is related to lower levels of motivation among them and vice versa. Although the effect is very small, the direction of this coefficient is opposite from what one might expect. Thus while parents hold high aspirations, they seemingly are unable to translate these aspirations into motivation and achievement orientation for their children. Kozol (1991), Ogbu (1985) Pine & Hilliard (1992) document possible reasons

for their inability to do so. They suggested that the schooling of Black children should not be viewed in isolation from the larger society in which they live. Furthermore, they suggested that a history of poverty may have adversely affected the schooling and motivation of Black children. Thus it seems that many poor families, among whom Blacks are disproportionately represented, may operate with a decreased ability to foster motivation and achievement in their children even when they hold high aspirations for their children's future education. Holding higher aspirations in absence of motivation and achievement orientation will not necessary pave the way for future achievement. Schools could be helpful by providing information, assistance, and encouragement to families regarding ways to increase the motivation of their children toward achievement (Johnson, 1992). For example, schools could initiate a program similar to Even Start whose sole purpose is to educate parents and children regarding the steps to academic success.

Finally, the finding that the effect from parental involvement to student motivation is marginal may also be explained by a qualitative assessment. That is, students are probably less likely to talk to parents about taking the SAT or ACT if parents have not taken these tests themselves. Students may, therefore, be more inclined to talk to them

about going to college in general and not at the level of detail of taking the tests. Kozol (1991) also suggested that parents of poor children may find the process of going to school intimidating if they haven't been exposed to the process themselves.

Thus these findings suggest that parents' hold high aspirations and yet the parental aspirations are somehow unrelated to students' achievement behaviors such as homework time and coursework taken.

Influences of Student Aspirations

The largest significant effect on students' aspirations was from parents' aspirations (β = .250), followed by parental involvement (β = .225). These effects far outweighed those of socioeconomic status (β = .089) and prior achievement (β = .071). This suggests that although parents may not be able to affect increased study time or motivate their children to enroll in academic courses, their impact on childrens' aspirations is profound.

The research of Clark (1991), Pollard (1989), and Wilson & Wilson (1992) consistently reinforces the incidence and prevalence of high aspirations among parents of Black children. In addition, Keith et al (1992) and Singh et al (1995) reported high levels of aspirations among minority youth. Taken together it may be seen that parents of Black

children view education as the only available path of escape from poverty, inequality, and even racism and thus do hold high educational aspirations for their children.

CONCLUSION

The purpose of this study was to test the direct and indirect effects of school learning variables on the academic achievement of Black 10th graders. For this study, prior achievement was found to influence later achievement overwhelmingly. SES produced a moderate effect on achievement whereas students' perceptions of teachers and teaching exerted a small but statistically significant effect. Furthermore, prior achievement, SES, and parental aspirations were found to causally influence student aspirations. Student motivation was also affected by prior levels of achievement, gender, and SES. Findings indicate that despite high educational aspirations of both Black children and their parents, these aspirations often affect neither student achievement as measured by scores on standardized tests nor student motivation.

The major factor that determined the standardized achievement of Black 10th graders was found to be their previous achievement. Although the large effect of previous achievement on later achievement is not a surprising finding and has been reported in similar studies, the magnitude of this effect was larger than in other studies of general populations. There may be some plausible reasons for such a large effect. It seems that patterns of achievement are crystallized during earlier schooling and these same

patterns continue during high school years. This apparent stratification of achievers and nonachievers, which seemingly may occur at a young age for Black children may explain why later school factors seem to have little effect on their achievement.

Another important variable that affected academic achievement of Black students was the socioeconomic status (SES) of the families. SES represented a composite variable measured by father's and mother's education, father's and mother's occupation, and family income. This seems to suggest the possibility of students' economic impoverishment negatively impacting their achievement at the 10th grade level as well as undermining their postsecondary plans. Furthermore, earlier studies have reported smaller or marginal effects of SES on achievement when grades are measures of achievement, while the present study found a larger effect of SES on standardized test scores. It is possible that SES is more strongly related to standardized achievement, measured by test scores, than grades earned in subject areas because parents of higher SES may be more knowledgeable of standardized testing and of the ways to prepare for these tests. In addition, family resources might be used to facilitate greater standardized test achievement. Further research should examine the differential effects of SES on different measures of

achievement other than standardized tests. Such research is important for policy reasons when educational programs and interventions are designed for students whose parents have little more than a high school education and who, despite higher aspirations for their children, may not be familiar with the tests and practices necessary for their children to gain college admission.

Students' perceptions of teachers and teaching were found to significantly impact the academic achievement of students although to a much lesser degree than prior achievement or SES. A significant teacher effect means that when students perceive teachers as caring about them and giving them praise for their effort, and when they feel that the quality of instruction is good, they are more likely to be higher achievers. This finding is important, particularly in light of the fact that it suggests that teachers have a unique impact on students above and beyond the impact of the school environment, students' prior levels of achievement, and students' SES and gender. It indicates that regardless of whether the student is rich or poor, male or female, academically gifted or challenged, teachers can make a difference in their later academic achievement. It also suggests that students' perceptions regarding school discipline and peer relations among students of different

races are less important to school achievement than are perceptions of teachers and teaching.

This study, like all research, raises as many questions as it answers and suggests directions for further research. Some critical areas for research and practice suggested by the study include the following. Additional empirical research is needed to investigate whether patterns of school achievement are determined at an earlier age for Black children. This research would examine the earlier influences on school learning in elementary grades. Secondly, since in the present study school achievement was not affected by parental involvement, it supports the view that effects of parental involvement may be age specific. Earlier research has reported that the effect of parental involvement is stronger in younger years than in adolescent years. In that case, more empirical research on parental involvement and its effect on school achievement should be focused on younger Black children. Another recommendation is to include measures of parental aspiration and involvement taken directly from parents in studies of school achievement. Furthermore, similar models may be developed and examined for other ethnic groups to determine whether there are differences in factors that affect school achievement for different groups. For example, are there significant differences in the magnitude of effects when the

present model is tested on Hispanic, Asian or White students? Another point that should be emphasized is that factors that affect achievement such as aspiration and motivation are multidimensional. Issues of validity and reliability in measurement of such complex constructs are always paramount. Thus while the measures proposed in the present study had high reliabilities and face validity, new studies may conceptualize these constructs using more comprehensive, multiple measures. Finally, this study suggests the need for school personnel to help raise parents' knowledge, awareness, and involvement in their children's education. Better information and knowledge would aid parents in their efforts to help their children select more rigorous, academic coursework in high school years and better advise them with regard to planning for a college education.

It is crucial to identify variables influencing the academic achievement of Black students and the present study is an attempt in that direction. Examining these sources of variation, educators and policy makers will be in a better position to intervene and reverse negative educational trends among Black students and, ultimately, modify service delivery for the improved learning and development of all students.

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Appendices

A. Codebook

B. Figures A1-A5: Antecedent Causes of Prior Achievement, School Environment, Perceptions of Teachers, Parental Aspirations, and Parental Involvement

C. Vita

Appendix A

Codebook for Variables included in the Model

The following conventions were used in naming variables:

A prefix of BY indicates a variable from the base-year (1988) database.
A prefix of F1 indicates a variable from the first follow-up (1990) database.

All variables included in this study were extracted from Student Data Files and are identified as BYST.PUB (i.e., from base year student publication) or F1ST.PUB (i.e., from first-follow-up student publication).

Variable 384: BY2XRTH READING IRT THETA
Module 1: DATA\BYST.PUB Position: # 1/ 1 485-488 2
The base year Reading IRT Theta is a continuous variable. Scores are reported for 1,673 of the 1,766 Black students comprising the sample. Scores ranged from a low of 24.14 to a high of 63.49. Scores for all sampled students ranged from a low of 23.29 to a high of 63.49.

Variable 385 : BY2XMTH MATH IRT THETA
Module 1: DATA\BYST.PUB Position: # 1/ 1 489-492 2
The base year Math IRT Theta is a continuous variable. Scores are reported for 1,677 or the 1,766 Black students comprising the sample. Scores range from a low of 24.89 to a high of 67.23. Scores for all sampled students ranged from a low of 23.34 to a high of 67.23.

Variable 386 : BY2XSTH SCIENCE IRT THETA
Module 1: DATA\BYST.PUB Position: # 1/ 1 493-496 2
The base year Science IRT Theta is a continuous variable. Scores are reported for 1,663 of the 1,766 Black student comprising the sample. Scores range from a low of 23.20 to a high of 66.65. Scores for all sampled students ranged from a low of 22.2 to a high of 69.42.

NOTE: The IRT scores appearing above, which are continuous, were used to establish correlations with other variables. Gains in overall achievement can be computed by subtracting the scores of a prior year from subsequent scores. Theta scores are in t-score metrics, standardized across years.

7 How much do you agree with each of the following statements about your current school and teachers?

F1S7A	Students get along well with teachers.
F1S7D	Discipline is fair.
F1S7E	Students make friends with students of other racial and ethnic groups.
F1S7G	The teaching is good.
F1S7I	When I work hard on schoolwork, my teachers praise my effort.
F1S7J	In class I often feel "put down" by my teachers.

NOTE: Items F1S7A, F1S7D, F1S7E, F1S7G and F1S7I have been rescaled so that the more positive responses receive higher ratings. F1S7J is in its original form.

Variable 411: F1S7A STUDENTS GET ALONG WELL WITH TEACHERS
Module 2: DATA\F1ST.PUB Position: # 1/ 1 8-8

Code	Freq	Percent	Label
1	70	4.0	STRONGLY DISAGREE
2	542	30.7	DISAGREE
3	939	53.2	AGREE
4	49	2.8	STRONGLY AGREE
8	166	9.3	MISSING
	1766	100.0	

Variable 414: F1S7D DISCIPLINE IS FAIR AT SCHOOL
Module 2: DATA\F1ST.PUB Position: # 1/ 1 11-11

Code	Freq	Percent	Label
1	183	10.4	STRONGLY DISAGREE
2	440	24.9	DISAGREE
3	849	48.1	AGREE
4	105	5.9	STRONGLY AGREE
8	189	10.7	MISSING
	1766	100.0	

Variable 415: F1S7E STUDENTS FRIENDLY WITH OTHER RACIAL GROUPS
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 12-12

Code	Freq	Percent	Label
1	44	2.5	STRONGLY DISAGREE
2	132	7.5	DISAGREE
3	942	53.3	AGREE
4	475	26.9	STRONGLY AGREE
8	173	10.7	MISSING
	1766	100.0	

Variable 417: F1S7G THE TEACHING IS GOOD AT SCHOOL
Module 2: DATA\F1ST.PUB Position: # 1/ 1 14-14

Code	Freq	Percent	Label
1	57	3.2	STRONGLY DISAGREE
2	247	14.0	DISAGREE
3	1060	60.0	AGREE
4	228	12.9	STRONGLY AGREE
8	174	9.9	MISSING
	1766	100.0	

Variable 419: F1S7I WHEN R WORKS HARD TEACHERS PRAISE EFFORT
Module 2: DATA\F1ST.PUB Position: # 1/ 1 16-16

Code	Freq	Percent	Label
1	93	5.3	STRONGLY DISAGREE
2	504	28.5	DISAGREE
3	777	44.0	AGREE
4	214	12.1	STRONGLY AGREE
8	178	10.1	MISSING
	1766	100.0	

Variable 420: F1S7J IN CLASS OFTEN FEEL PUT DOWN BY TEACHERS
Module 2: DATA\F1ST.PUB Position: # 1/ 1 17-17

Code	Freq	Percent	Label
1	56	3.2	STRONGLY AGREE
2	199	11.3	AGREE
3	829	46.9	DISAGREE
4	510	28.9	STRONGLY DISAGREE
8	172	9.7	MISSING
	1766	100.0	

Variable 500: F1S22A HOW MUCH COURSEWORK IN GENERAL MATH
Module 2: DATA\F1ST.PUB Position: # 1/ 1 105-105

22. From the beginning of ninth grade to the end of this school year, how much coursework will you have taken in each of the following subjects? Count only courses that meet at least three times (or three periods) a week for at least one half year. Also include summer school classes taken in 1988 or 1989 that counted for one half year or more. (MARK ONE)

F1S22A General Math
F1S22C Algebra I
F1S22D Geometry

Code	Freq	Percent	Label
0	892	50.5	NONE
1	68	03.9	1/2 YEAR
2	576	32.6	1 YEAR OR MORE
	230	13.0	MISSING
	1766	100.0	

Variable 502 : F1S22C HOW MUCH COURSEWORK IN ALGEBRA I
Module 2: DATA\F1ST.PUB Position: # 1/ 1 107-107

Code	Freq	Percent	Label
0	519	29.4	NONE
1	126	7.1	1/2 YEAR
2	899	50.3	1 YEAR OR MORE
	232	13.1	MISSING
	1766	100.0	

Variable 503 : F1S22D HOW MUCH COURSEWORK IN GEOMETRY
Module 2: DATA\F1ST.PUB Position: # 1/ 1 108-108

Code	Freq	Percent	Label
0	860	48.7	NONE
1	86	04.9	1/2 YEAR
2	565	32.0	1 YEAR OR MORE
	255	14.4	MISSING
	1766	100.0	

Variable 510 : F1S23A HOW MUCH COURSEWORK IN GENERAL SCIENCE
Module 2: DATA\F1ST.PUB Position: # 1/ 1 115-115

23. From the beginning of ninth grade to the end of this school year, how much coursework will you have taken in each of the following subjects? Count only courses that meet at

least three times (or three periods) a week for at least one half year. Also include summer school classes taken in 1988 or 1989 that counted for one half year or more. (MARK ONE)

F1S23A General Science
F1S23B Physical Science
F1S23C Biology

Code	Freq	Percent	Label
0	996	56.4	NONE
1	57	3.2	1/2 YEAR
2	565	32.0	1 YEAR OR MORE
	263	14.9	MISSING

Variable 511 : F1S23B HOW MUCH COURSEWORK IN PHYSICAL SCIENCE
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 116-116

Code	Freq	Percent	Label
0	766	50.8	NONE
1	62	3.5	1/2 YEAR
2	679	38.4	1 YEAR OR MORE
	259	14.7	MISSING
	1766	100.0	

Variable 512 : F1S23C HOW MUCH COURSEWORK IN BIOLOGY
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 117-117

Code	Freq	Percent	Label
0	234	13.3	NONE
1	129	7.3	1/2 YEAR
2	1192	67.5	1 YEAR OR MORE
	211	11.9	MISSING
	1766	100.0	

Variable 518 : F1S24A HOW MUCH COURSEWORK IN ENGLISH
Module 2: DATA\F1ST.PUB Position: # 1/ 1 123-123

24. From the beginning of ninth grade to the end of this school year, how much coursework will you have taken in each of the following subjects? Count only courses that meet at least three times (or three periods) a week for at least one half year. Also include summer school courses taken in 1988 or 1989 that counted for one half year or more. (MARK ONE)

F1S24A English (including literature, composition, language arts)
F1S24G Foreign Language

Code	Freq	Percent	Label
0	39	2.2	NONE
1	34	1.9	1/2 YEAR
2	1491	84.4	1 YEAR OR MORE
	202	11.4	MISSING
	1766	100.0	

Variable 524 : F1S24G HOW MUCH COURSEWORK IN FOREIGN LANGUAGE
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 129-129

Code	Freq	Percent	Label
0	661	37.4	NONE
1	91	5.2	1/2 YEAR
2	750	42.5	1 YEAR OR MORE
	264	14.9	MISSING
	1766	100.0	

Variable 605 : F1S36A1 TIME SPENT ON HOMEWORK IN SCHOOL
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 222-223
36. Overall about how much time do you spend on homework EACH WEEK, both in and out of school? (MARK ONE)

Variable 605: F1S36A1 TIME SPENT ON HOMEWORK IN SCHOOL
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 222-223

Code	Freq	Percent	Label
00	228	12.9	NONE
01	708	40.1	1 HOUR OR LESS
02	284	16.1	2-3 HOURS
03	177	10.1	4-6 HOURS
04	59	3.3	7-9 HOURS
05	15	.8	10-12 HOURS
06	8	.5	13-15 HOURS
07	25	1.4	OVER 15 HOURS
98	262	12.6	MISSING
	1766	100.0	

Variable 606: F1S36A2 TIME SPENT ON HOMEWORK OUT OF SCHOOL
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 224-225

Code	Freq	Percent	Label
00	103	5.8	NONE
01	433	24.5	1 HOUR OR LESS
02	507	28.7	2-3 HOURS
03	238	13.5	4-6 HOURS
04	112	6.3	7-9 HOURS
05	78	4.4	10-12 HOURS
06	43	2.4	13-15 HOURS
07	32	1.8	OVER 15 HOURS
98	220	12.6	MISSING
	1766	100.0	

48. How far in school do you think your father and your mother want you to go? (BE SURE TO ANSWER BOTH A AND B BELOW FOR PERSONS WITH WHOM YOU LIVE OR WITH WHOM YOU HAVE REGULAR CONTACT.) (MARK ONE)

Variable 684: F1S48A HOW FAR IN SCHOOL FATHER WANTS R TO GO
Module 2 : DATA\F1ST.PUB Position: # / 33 -33

Code	Freq	Percent	Label
01	13	.7	LESS THAN HS GRAD
02	59	3.3	GRADUATE FROM HS
03	76	4.3	VOCATIONAL AFTER HS
04	59	3.3	ATTEND 2-YR COLLEGE
05	142	8.0	ATTEND 4-YR COLLEGE
06	465	26.3	GRAD FROM COLLEGE
07	291	16.5	POST GRAD ED
	661	37.6	DON'T KNOW, PARENT DOESN'T CARE, DOES NOT APPLY OR MISSING
	1766	100.0	

Variable 684: F1S48B HOW FAR IN SCHOOL MOTHER WANTS R TO GO
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 338-339

Code	Freq	Percent	Label
01	21	1.2	LESS THAN HS GRAD
02	62	3.5	GRADUATE FROM HS
03	80	4.5	VOCATIONAL AFTER HS
04	79	4.5	ATTEND 2-YR COLLEGE
05	169	9.6	ATTEND 4-YR COLLEGE
06	571	32.3	GRAD FROM COLLEGE
07	410	23.2	POST GRAD ED

374	21.2	DON'T KNOW, PARENT DOESN'T
1766	100.0	CARE, DOES NOT APPLY OR MISSING

Variable 685: F1S49 HOW FAR IN SCHOOL R THINKS HE WILL GET
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 340-341

49. As things stand now, how far in school do you think you will get? (MARK ONE)

Code	Freq	Percent	Label
01	30	1.7	LESS THAN H.S. GRAD
02	217	12.3	HS GRADUATION ONLY
03	56	3.2	< 2 YRS TRADE SCHOOL
04	137	7.8	2+ YRS TRADE SCHOOL
05	74	4.2	< 2YRS OF COLLEGE
06	260	14.7	2/MORE YRS OF COLL
07	473	26.8	FINISH COLLEGE
08	213	12.1	MASTER'S DEGREE
09	267	15.1	PH.D., M.D.
98	39	2.2	MISSING
	1766	100.0	

Variable 692: F1S51 DOES R PLAN TO GO TO COLLEGE AFTER H.S.
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 348-348

51. Do you plan to go to college after you graduate from high school? (MARK ONE)

Code	Freq	Percent	Label
1	215	12.2	NO, DON'T PLN COLLEGE
2	931	52.7	YES, RIGHT AFTER H.S
3	197	11.2	YES, AFTER ONE YEAR
4	38	2.2	YES, AFTER OVER A YR
5	150	8.5	DON'T KNOW
8	235	13.3	MISSING
	1766	100.0	

105. In the first half of this school year, how often have you discussed the following with either or both of your parents or guardians ...

F1S105F Plans and preparation for the ACT or SAT tests?
F1S105G Going to college?

Variable 938: F1S105F DISCUSSED PREP FOR THE ACT/SAT TEST
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 637-637

Code	Freq	Percent	Label
1	614	34.8	NEVER
2	545	30.9	SOMETIMES
3	203	11.5	OFTEN
8	404	22.8	MISSING
	1766	100.0	

Variable 939: F1S105G DISCUSSED GOING TO COLLEGE WITH PARENTS
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 638-638

Code	Freq	Percent	Label
1	173	9.8	NEVER
2	531	30.1	SOMETIMES
3	657	37.2	OFTEN
8	405	22.9	MISSING
	1,766	100.0	

Variable 961 : F1PANFLG BASE YEAR & F1 QUESTIONNAIRES AVAILABLE
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 687-687

Indicates the completion (or noncompletion) of a questionnaire in both the BY and F1. If the value of F1PANFLG=1, the sample member completed both a BY and F1 questionnaire; if the value of F1PANFLG=0, the sample member did not complete a questionnaire in both the BY and F1. Only cases where the sample members completed both the BY and F1 questionnaire were retained for the present study.

Variable 971: F1SEX COMPOSITE SEX
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 699-699

F1SEX was taken first from the BY composite variable.

NOTE: F1SEX was recoded for the present study.

Code	Freq	Percent	Label
0	854	48.4	MALE
1	912	51.6	FEMALE
	1766	100.0	

Variable 972: F1RACE COMPOSITE RACE
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 700-700

F1RACE was constructed using the BY composite "RACE", BY parent questionnaire data from BYP10, and school reported data. If the BY composite RACE was coded missing or was blank, the New Student Supplement data were used. If there was no New Student Supplement, the BY parent data were used. If RACE was still missing or blank, either the eighth grade school roster RACE or the tenth grade school reported freshened student RACE was used. Although for BY respondents, no new race data were gathered, some BY "race unknown" cases were resolved in the F1, by virtue of greater use of parent data in constructing the F1 composite.

Race is a constant for the present study since all subjects are Black, not Hispanic (Code 3).

The number of Black students completing surveys in 1988 and 1990 is 1,766.

Variable 974: F1SES SOCIO-ECONOMIC STATUS COMPOSITE
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 702-706 3

F1SES was constructed using parent questionnaire data, when available. The following parent data were used: father's education level, mother's education level, father's occupation, mother's occupation, and family income (BYP30, BYP31, FYP34B, BYP37B and BYP80). Occupational data were recoded using the Duncan SEI scale as used in HS&B. Parent data were used to construct F1SES if at least one component was not missing.

F1SES is a continuous variable with variables ranging from -2.97 to 2.56.

For the present sample, responses ranged from -2.838 to 1.972. F1SES was used to generate correlations. The socio-economic quartile variable, described below, was used to generate descriptive statistics on students.

Variable 1009 : F12XRTH READING IRT THETA
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 787-790 2

The first follow-up Reading IRT Theta score is a continuous variable. Scores are reported for 1,609 of the 1,766 Black students comprising the sample. Scores ranged from a low of 22.27 to a high of 71.86. Scores for all participating students ranged from a low of 22.18 to a high of 71.86 .

Variable 1010 : F12XMTH MATH IRT THETA

Module 2 : DATA\F1ST.PUB Position: # 1/ 1 791-794 2

The first follow-up Math IRT Theta score is a continuous variable. Scores are reported for 1,600 of the 1,766 Black students comprising the sample. Scores ranged from a low of 25.71 to a high of 72.90. Scores for all participating students ranged from a low of 24.87 to a high of 72.90.

Variable 1011 : F12XSTH SCIENCE IRT THETA
Module 2 : DATA\F1ST.PUB Position: # 1/ 1 795-798 2

The first follow-up Science IRT Theta score is a continuous variable. Scores are reported for 1,587 of the 1,766 Black students comprising the sample. Scores ranged from a low of 25.37 to a high of 74.78. Scores for all participating students ranged from a low of 25.18 to a high of 74.92.

Appendix B

Figures A1-A5: Antecedent Causes of Prior Achievement, School Environment, Perceptions of Teachers, Parental Aspirations, and Parental Involvement.

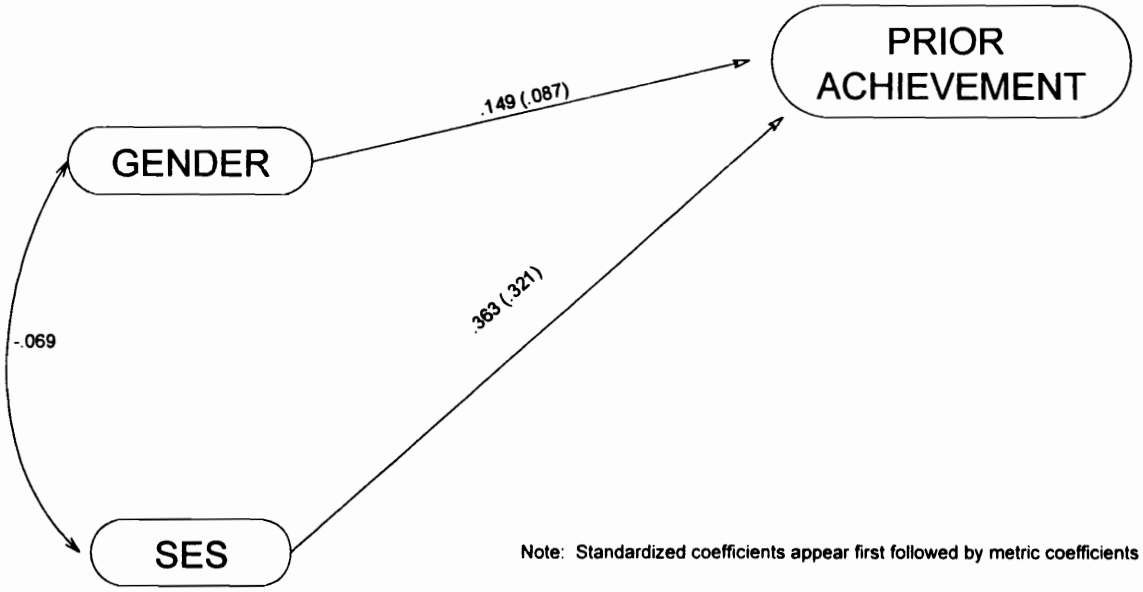

Figure A1: Direct Effects of Background Variables on Prior Achievement of Black 10th Graders

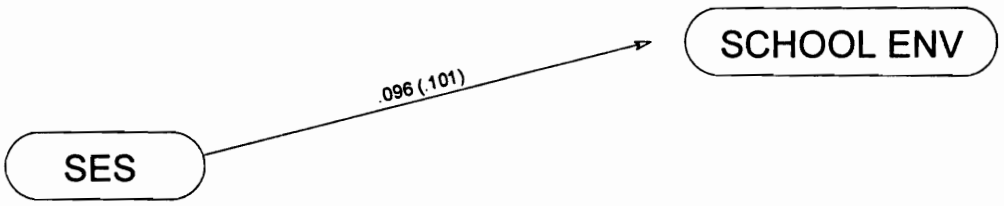

Figure A2: Direct Effect of SES on the School Environment as Perceived by Black 10th Graders

Note: Standardized coefficients appear first followed by metric coefficients in parentheses.

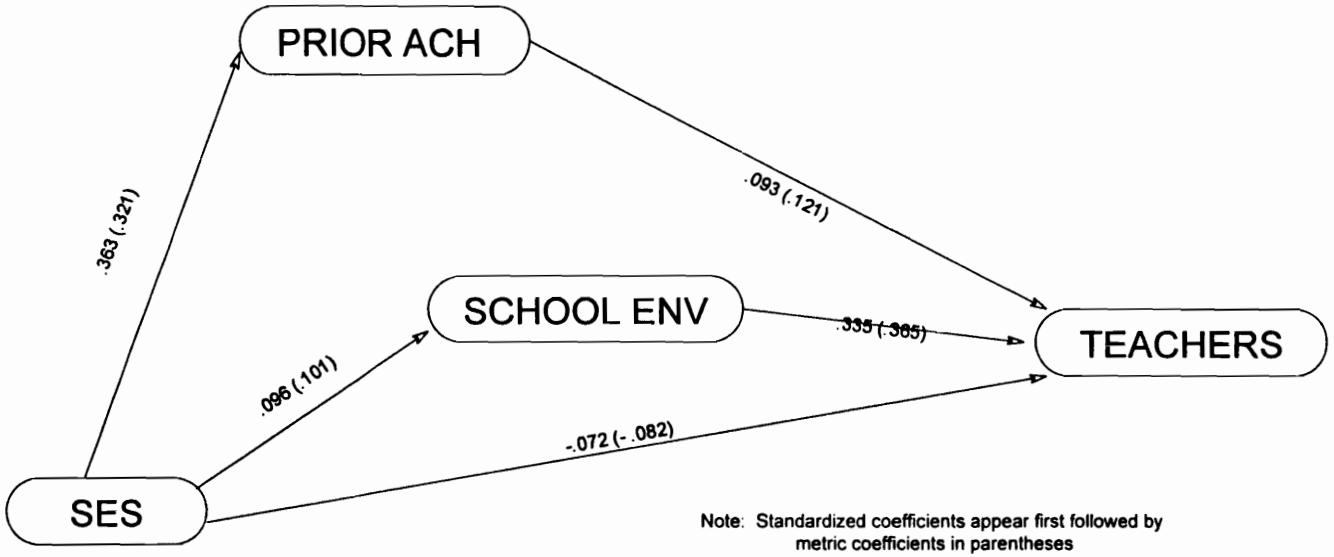

Figure A3: Significant Paths to Black 10th Graders' Perceptions of Teachers and Teaching

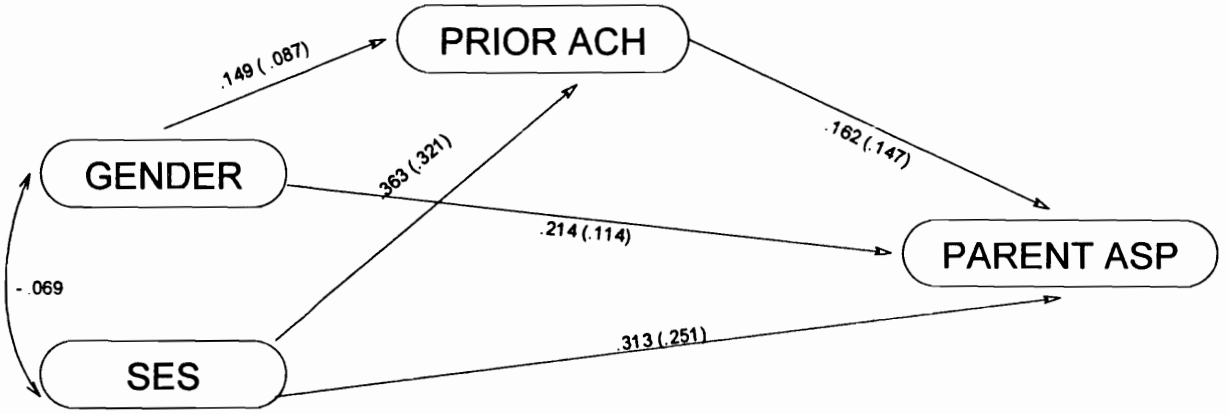

Figure A4: Significant Paths to Black 10th Graders' Perceptions of Parental Aspirations for Them

Note: Standaradized coefficients appear first followed by metric coefficients in parentheses.

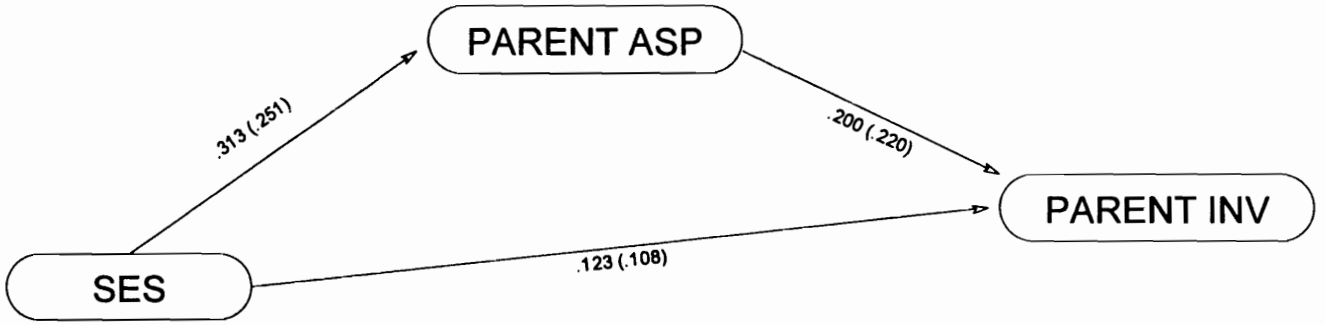

Figure A5 Signficant Paths to Black 10th Graders' Perceptions of Parental Involvement

Note: Standardized coefficients appear first followed by metric coefficients in parentheses.

CANDACE RENEE ADAMS

Ms. Adams was awarded a Bachelor's Degree in Liberal Arts from the University of Maryland/University College in College Park, Maryland in 1976. She was also an undergraduate student at Rutgers University in New Brunswick, New Jersey, enrolled as a double major of Political Science and Sociology from 1971-1974. She obtained a Master's Degree in Curriculum and Instruction with a cognate in Human Development from Radford University, Radford, Virginia in 1992. A disgruntled consumer of research on issues pertaining to the academic achievement of African Americans, Ms. Adams pursued and was awarded the Ph.D in Educational Research and Evaluation from Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, Virginia in 1995.

In addition to her academic degrees, Ms. Adams was awarded a Dissertation Grant by the American Educational Research Association and was named a Commonwealth Fellow by the Commonwealth of Virginia.

Ms. Adams has worked as a research analyst and business development specialist for R & D firms in the Washington, D.C. metropolitan area. Her successes include writing proposals for and receipt of grant and contract awards ranging from $64,000 to $1.5 million. She was named senior officer of two firms and partner of another. While earning her Master's degree Ms. Adams was employed full-time as a grants specialist at Radford University. For the first two years of her doctoral studies at Virginia Tech, she was employed as an instructor providing consultation to graduate students and faculty in research design, analysis, and the use of computer packages including SPSS, LISREL, and pc-driven statistical packages.

Ms. Adams' research interests are in educational outcomes, planning and evaluation, attribution theory, and human development.