Order Number 8801099

Antecedents of academic achievement among elementary school American Indians and their classmates

Edwards, Karl Ormond, Ph.D.

University of Montana, 1987

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark _√_.

1. Glossy photographs or pages _____
2. Colored illustrations, paper or print _____
3. Photographs with dark background _____
4. Illustrations are poor copy _____
5. Pages with black marks, not original copy _____
6. Print shows through as there is text on both sides of page _____
7. Indistinct, broken or small print on several pages _√_
8. Print exceeds margin requirements _____
9. Tightly bound copy with print lost in spine _____
10. Computer printout pages with indistinct print _____
11. Page(s) _______ lacking when material received, and not available from school or author.
12. Page(s) _______ seem to be missing in numbering only as text follows.
13. Two pages numbered _____. Text follows.
14. Curling and wrinkled pages _____
15. Dissertation contains pages with print at a slant, filmed as received _____
16. Other ____________________

UMI

ANTECEDENTS OF ACADEMIC ACHIEVEMENT AMONG ELEMENTARY SCHOOL AMERICAN INDIANS AND THEIR CLASSMATES

By

Karl Ormond Edwards

B.S., University of Utah, 1973

B.A., University of Utah, 1974

M.I.S., University of Montana, 1983

Presented in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

University of Montana

1987

Approved by

Rodney L. Brod

Chair, Board of Examiners

[signature]

Dean, Graduate School

October 1, 1987

Date

Edwards, Karl Ormond, Ph.D., September 1987 Sociology

Antecedents of Academic Achievement Among Elementary School American Indians and Their Classmates (776 pp.)

Director: Rodney L. Brod

The antecedents of academic achievement were the focus of this panel and cross-sectional, existing records study of American Indian elementary students and their classmates. Unlike most studies, this study more complexly operationalized academic achievement as ten separate test scores. Antecedent data on academic achievement, teacher evaluations, personal/familial characteristics, and school environment/learning contexts of Indian (n = 201) and non-Indian (n = 258) students were collected to: (1) describe student characteristics and determine if Indian students' achievement was, as previous studies have reported, below that of their classmates; (2) discover antecedents that accounted for population and Indian academic achievement; (3) determine if predictors of achievement were different for Indians than for the population, or if they varied by grade level; and (4) determine whether predictors were potentially manipulable by the school system.

Descriptive statistics documented that Indian students were statistically and substantively different from non-Indian students in antecedent academic achievement, teacher evaluations, personal/familial characteristics, and school environment/learning contexts. Analyses also demonstrated that the achievement level of Indian students was below that of non-Indian students, both for the aggregate and at individual grade levels.

Antecedents of Indian achievement were different from those that predicted population achievement, accounted for more variance by grade level than for the aggregate, and were more predictive at particular grade levels than others. More of the predictors were potentially manipulable by the school system for both the population and Indian students even though no more manipulable variables entered the regression models than expected by chance alone. Potentially manipulable predictors accounted for significantly more of the explained variance for both the population (65%-97%) and Indian students (80%-100%). However, non-manipulable antecedents, particularly personal/familial factors, were significantly more important to understanding population, rather than Indian, achievement. Conversely, antecedent teacher evaluations were significantly more important to explaining Indian, rather than population, achievement. Panel data showed that the achievement gap between Indian students and their classmates was generally less for third than second grade students, least for fourth grade students, but greatest for fifth and sixth grade students. Non-manipulable antecedents were more important for Indian students at higher grade levels.

This dissertation is dedicated to my wife, Cindy,
and our children, Kristoffer and Ryan.

PREFACE

This research was part of an ongoing effort by the Washoe County School District Title IV Indian Education program to understand, and hopefully facilitate, American Indian student achievement. In 1983 the Title IV program director, Sylvia McCloud, submitted a Chapter I block grant proposal to purchase equipment and hire a researcher to develop a computerized student profile program to help monitor Indian student academic achievement and success. Larger concerns of the district's special services director and curriculum specialist, Jerry Holloway, included more generalized, theoretical understandings of Indian education in the Washoe County School District, along with the more explicit applied goals.

Upon approval of the block grant, attempts to locate a research assistant through the University of Nevada-Reno proved unsuccessful, and the position was advertised in the local paper. I was subsequently hired for the position, with the clear understanding that I would be able to keep copies of all data collected for theoretical analyses in this dissertation. Thus, the project began with two

separate goals that, nonetheless, encompassed related sets of objectives: (1) the theoretical exploration of Indian education in the Washoe County School District; and
(2) the applied program development. The necessity to collect information on both Indian and non-Indian students was explained to the Title IV director and concurrently to Jerry Holloway.

Data collection began in July, 1984, with the recording of the Stanford Achievement Test Scores (along with other types of test scores) on Indian students. Once permission and cooperation to obtain data files from the mainframe were made, data collection began in earnest. Most data were collected between September, 1984, and December, 1984. Copies of the student's permanent records, enrollment forms, and other information were made. Data file structures for use on personal computers were created to establish student profiles per the applied goal; but data was not entered (due to hardware damage) successfully prior to my departure from Reno--although explicit guidelines were left for my replacement.

Shortly after I began working for the district, I submitted a research proposal to the district to conduct research for my dissertation. The research would consist of analyzing characteristics of education, including both Indian and non-Indian student differences, and identifying predictors of academic success. Through the support of Jerry Holloway, and the interests of others in the district, the proposal was wholeheartedly approved. From that point on, data was collected with the theoretical questions in mind; although such issues were obviously cognate to the applied needs, albeit larger in scope.

Data collection on my part ceased in December, 1984, when I returned to Montana, but data collection on American Indian students has remained an ongoing process. With my departure, the theoretical issues became my only goal, while the Title IV program divorced itself of this theoretical goal in favor of the more strict applied goal. However, since the district, and particularly Jerry Holloway, remained interested and supportive of my research, data collection was completed in absentia.

The results of this study, therefore, while intended to be theoretical, will hopefully have some applied effects as well. Moreover, it is my hope that I will be able to conduct further research in the Washoe County School District to obtain both attitudinal and interactional data.

ACKNOWLEDGEMENTS

As with any project of this size, there are numerous individuals who have helped tremendously in making it a reality, and it would be impossible to thank each of them specifically. I would, therefore, like to give my thanks to all the unnamed people who so graciously assisted me throughout this project. Special thanks, however, are due to a few without whose help this dissertation would not be a reality.

First and foremost, I would like to thank my wife and co-worker, Cindy, for her constant support, assistance, and encouragement. Cindy was of inestimable assistance in coding the data and in editing and typing the manuscript. A special thanks is given to my chair, Dr. Rod Brod, for his constant support, invaluable criticisms, enthusiasm, long hours in the terminal room, and for his moral support during the long hours of work.

A very special thanks is also given to Jerry Holloway for his enduring belief in me, his protracted support and material assistance, and for providing me with the opportunity to conduct this research. To Maudeen West and the other Chapter I, Title IV, and special

services staff, a word of thanks is due for all their help in locating resources, teaching me the ropes of the district policies, and in the use of personal computers.

I would also like to thank Dr. John McQuiston for his putting up with my frantic requests and for assistance in collecting data on school and student socioeconomic statuses.

Last, but not least, a special note of thanks is particularly due to my committee and my family for their faith, patience, and encouragement.

CONTENTS

Chapter Page

Chapter | Page

Chapter | Page

Chapter Page

Chapter | Page

TABLES

Table		Page

Table		Page

FIGURES

Figure | Page

Chapter 1

RESEARCH PROBLEM

This research was primarily an inductive comparison of the educational success of elementary Indian students and their classmates. The majority of previous studies on Indian and non-Indian students' academic or educational success have concluded that the primary factors that explained such success were not located within the school systems, but rather that they were embedded within the students themselves, their families, their community, and their culture (e.g., Berry, 1968; Chadwick, 1972; Coleman et al., 1966, 1982; Coombs et al., 1958; Fuchs and Havighurst, 1972; Jencks et al., 1972; Parmee, 1968). Nevertheless, some studies have concluded that school related variables were indeed important in determining academic success for Indian students and their classmates (Brod, 1975, 1976a, 1976b, 1977), for English students (Rutter et al., 1979), and for American students in general (Heyns, 1974, 1978; Mayeske et al., 1972).

In contrast to either of these positions, a recent nationwide evaluation of Indian student academic success concluded that "very few of the [Title IV-A Indian Education] project or student characteristics which were studied served as meaningful predictors of

Indian test scores" (Goldsamt and Jones, 1983:4-40); that is, the researchers failed to significantly explain which factors, school or non-school, associated with academic success.

Most previous research, moreover, has focused upon secondary school students (grades 7-12), which has created a void of any recent comprehensive research on the academic achievement of elementary school students (grades K-6). A number of studies have also indicated this need for more research on elementary student achievement (e.g., Brod, 1979a, 1979b; Development Associates, Inc., 1983; W.C.S.D., 1984). Together, this need for further research and the lack of any cohesive theoretical understanding about the academic achievement of Indian students (McShane, 1983), denoted the need for an inductive and comparative study to identify descriptors and antecedents of both Indian and non-Indian academic achievement.

To inductively and deductively examine the academic achievement of elementary school Indian students and their non-Indian classmates in the Washoe County School District, this study encompassed four objectives. The first objective was to describe and compare characteristics of elementary school Indian and non-Indian students (including academic achievement) in the Washoe County School District. The second objective inductively identified and isolated antecedent factors of standardized achievement test scores, which were then developed into predictive models for explaining elementary school student success in the Washoe County School District. The third objective of the research deductively determined which factors best predicted academic achievement for the Washoe County School District elementary school students. Tests were also made to determine if different factors explained academic achievement for either Indian students or for students at different grade levels, than for the Washoe County School District elementary school total population in general. The fourth and final objective of this study was to empirically assess whether factors found to explain academic achievement for elementary school Indian students and their classmates were within the school system, and therefore potentially manipulable by it, or, as found in most previous research, outside the control of the schools, and not subject to manipulation by the Washoe County School District.

Research Review

In 1928 the Meriam Report documented what was termed the "failure" of Indian schools to provide adequate training and education for Indian children. As a result of this Congressional investigation, the Johnson-O'Malley Act of 1934 was enacted to correct problems found in the education of Indians. Since then, numerous scientific studies and school system evaluations of Indian education have been made, both in the context of Indian/government and public/private schools. In the first of these studies, Peterson (1948) concluded that considerable progress had been made and demonstrated a substantial reduction in the labeling of academic retardation. In 1950 Anderson and his associates did a follow-up study of Peterson's project, and generally supported the findings of Peterson. From these results it was concluded

> that as the cultural and educational backgrounds of Indian children become more like those of white children in public schools, the more closely will the educational achievement of Indian children match that of white children (Beatty, 1953:xvi).

Other studies during this time period also drew favorable conclusions as to Indian academic success. For example, in 1951 Hopkins wrote approvingly of the federal and mission schools on the Tongue River (Northern Cheyenne) Reservation. Similarly, Dale (1955) evaluated the program of practical education on the Pine Ridge Reservation and concluded that the program had definitely achieved its purposes. Except for occasional anomalies such as these studies, the nearly universal conclusion of investigations and evaluations of Indian education has been that the Indian students were failing.

A third follow-up study of Indian education was made by Coombs and his associates in 1958, which has been considered by some researchers (Berry, 1968; Dankworth, 1969; DiSilvestro, 1961; Edington, 1969) the most significant investigation done between the Meriam Report (1928) and the Kennedy Report (1969). While Peterson reported positive trends in Indian education, and Anderson generally verified Peterson's findings, Coombs et al. showed that Indians were not achieving as well as Peterson's study had indicated. The research of Coombs et al. offered substantial evidence that Indian students were not achieving as well in the basic skills subjects as non-Indian students, nor as well as reported in previous studies.

In 1967 a special United States Senate subcommittee was charged to study all matters pertaining to Indian education. This committee was constituted as a result of the growing concerns about Indian education coming from studies, on both national (e.g., Coleman et al., 1966) and Indian (Aurback, 1967; Havighurst, 1957; Wax et al., 1964) education, and the tremendous interest of Congress to reform overall Indian policy (Szasz, 1977). The findings were crystallized in the 1969 Senate report Indian Education: A National Tragedy--A National Challenge, more commonly known as the Kennedy Report (after its primary author, Ted Kennedy) which charged that Indian education had not improved measurably since the Meriam Report four decades earlier. Indeed, the study found that although more Indian students were attending school, the quality of education was inferior to that reported in 1928. The direct result of this new assault on Indian education was the passage of the Indian Education Act, or Title IV of Public Law 92-318, in 1972.

In September of 1980 Congress directed the U.S. Department of Education to evaluate the effectiveness of the Title IV, Part A projects. Pursuant to this Congressional mandate, the U.S. Department of Education contracted Development Associates, Inc., to make the evaluation study. To accomplish the evaluation, Development Associates, Inc., collected information from a stratified random sample of Title IV-A projects. The researchers attempted data triangulation through the use of student achievement tests, anecdotal data from parents, project staff, and others, and by parent, teacher, staff, and tutor ratings of Title IV-A projects and student performances. Dependent variables were measures of student achievement, attendance, and retention. With respect to academic achievement, Development Associates, Inc., concluded that factors typically conceived of as predictive of student achievement were not predictive of Indian student achievement.

> Very few of the [Title IV-A Indian Education] project or student characteristics which were studied served as meaningful predictors of Indian student test scores....It would thus appear either that: (a) the variables which were selected for study in this evaluation are not those which are related to Indian student achievement test performance; (b) the measurement of those variables was imprecise or inaccurate; or (c) there are <u>few project or student variables which are meaningful predictors</u> of Indian student achievement test scores (Goldsamt and Jones, 1983:4-40; emphasis added).

The researchers also made the startling conclusion that attendance and retention were not a problem for Indian students per se.

> It appears that the attendance problem is no greater among Indian students than among the general student population....While local perceptions of the role of Title IV, Part A projects in reducing dropout were positive, the Indian student dropout rate remained relatively constant over the past ten years (Rudes, 1983:13-3).

Lastly, Development Associates, Inc., made the general conclusion that participation in Title IV, Part A programs was not related to the academic achievement of Indian students.

> Most Title IV, Part A project[s] include a formal component to improve the academic performance of Indian students. The Development Associates evaluation did not provide definitive evidence that Part A project[s] have improved Indian student academic performance. <u>Achievement test scores were not found to be strongly related to program participation</u> by students or the extent of academic programing by project[s] (Hopstock, 1983:9-3; emphasis added).

This evaluation project was unique in that it had as one of its objectives, the isolation of predictors of Indian students' academic achievement test scores through statistical analysis techniques. That is, unlike most other studies on Indian education, Development Associates, Inc., had attempted to statistically describe the causes as well as the effects of Indian student achievement. Specifically, Development Associates, Inc., measured the following variables, where asterisks (*) indicate variables also used to test project level differences (1983:4-13):

Contextual Variables
* Technical Assistance Center Geographic Region (5 categories)
* Number of Indian students in project (5 categories)
* Geographic location of project (on or near Reservation, other rural area, urban area, metropolitan area)
* Proportion of Indians to total students in district (4 categories)
* Whether or not Indians in projects represented a single tribe

Program Characteristics
* Cultural Emphasis (yes, no)
* Counseling Emphasis (yes, no)
* Basic Academic Skills Emphasis (yes, no)

Student Characteristics
* Language Spoken at Home: English only, Indian language only, both English and an Indian language, another combination of languages
* Receiving Free or Partially Free Lunch (SES measure)
  Sex
  Grade
* Tutorial Emphasis in Reading: none, remedial, or enrichment
* Tutorial Emphasis in Mathematics: none, remedial, or enrichment

Development Associates, Inc., as indicated above, concluded that no measured variable, including Title IV, Part A program participation, was a significant predictor of academic achievement test scores for Indian students. These findings by Development Associates, Inc., much more than other studies, suggested that the factors explaining Indian education were different than those commonly believed to be predictive of Indian, or any other, student achievement. What other factors, then, have been commonly believed to explain Indian educational success/failure?

While many studies have examined the effects of schooling on Indian students, fewer have studied the causes (Szasz, 1977), and even fewer have tried to develop any theory of Indian education (McShane, 1983). This has probably been because most researchers have relied upon accepted educational theories, which focused upon the student and his family to explain educational success. Yet the conclusions made by Development Associates, Inc., suggested otherwise because they included these factors in their study. Therefore, before examining these general educational theories, a review of other explanations concerning Indian education might be helpful.

In a rare attempt to synthesize the literature on Indian education in an effort to explain the academic achievement of Indian students, Damian McShane (1983) has developed what he calls a transcultural and developmental model of Indian student achievement. McShane categorized the personal, familial, and cultural factors usually offered for explanations into five basic concepts, which he "refers to as D models...disadvantage/deficit/deprivation (Ddd), disorganization/disruption (Dd), dependence (d), difference (D), and developmental change (Dc)" (1983:34). For McShane, the developmental change concept has been the least applied, but most critical, of the five. Factors McShane included under developmental change were: a) academic performance (i.e., the crossover phenomenon; see below for discussion of this); b) the neurosensory system; c) verbal and nonverbal language ability; d) identity, stress, and mental health referral; e) child-rearing, competence, and development; f) motivation orientation; and g) family integrity and stability.

Clearly, McShane has attempted, through his focus upon developmental change, to place added emphasis upon psychological factors.

> There has been no concentrated focus upon the interrelationships among cognition, affect, and behavior. Typically, research has pursued questions with one of these three areas to the exclusion of the effects of the others (1983:43-44).

Despite his preference for psychological explanations, McShane's developmental change perspective of academic achievement incorporated, in limited fashion, the other four concepts, which were more sociocultural in nature:

> Three levels of factors (family, child, teacher) directly or indirectly influence actual academic achievement over time, and two major sorts of environmental components (environment and peers) influence the nature of the context within which important transactions take place.
>
> In addition, underlying dimensions, primarily related to the family level, are identified with the particular "D" model...previous research has suggested may apply (1983:44).

Moreover, McShane's model held that "the first or primary level influence upon variation in American Indian achievement lies within the teacher-student relationship" (1983:44).

McShane's transcultural and developmental model contained several problems, however. First, where is the "transcultural" (whatever he meant by this) part of the model? Second, which does he really see as the focus? Was it the psychological cognitive, affect, and behavior, or the social psychological interactional relationships? What was clear, was that "non-developmental" concepts were not very important, while it appeared that psychological factors were important. Lastly, why did McShane unexpectedly give emphasis to the student-teacher relationship as the most important factor to understanding Indian achievement? That is, when McShane stated that the relationship was the primary influence on Indian achievement, that was his first (and only) discussion of any type of interaction.

Regardless of the internal conflict of what the primary influence was in his model, McShane did include, at one point, an interactive factor (i.e., relationships) as an explanatory variable. Equally important, McShane's model was relatively complex in comparison to the general educational models often used to explain Indian achievement. The model did, nonetheless, place an emphasis upon psychological factors through its focus upon the student's cognitive, affective, and behavioral aspects (i.e., the individual) and his familial influences.

While McShane paid only limited attention to sociocultural factors, most studies that have offered any type of conceptual explanations about Indian student achievement have focused upon sociocultural factors. Indeed, several of the studies already discussed (Coombs et al., 1958; Meriam et al., 1928; U.S. Senate, 1969) drew attention to the sociocultural differences of the Indian student. Berry (1968), in his review of the research on Indian education since the Meriam Report, generally concluded that sociocultural differences were the cause of Indian student failure.

Other studies (e.g., Chadwick, 1972; Dankworth, 1969; Fuchs and Havighurst, 1972; Parmee, 1968) of the same period also made the same conclusions. In particular, cultural deprivation has been seen as the most influential factor.

Overwhelmingly, then, the literature on Indian education has presented a fairly bleak situation, in which the contributing factors were generally seen as being beyond the control or manipulation of the school system. As suggested above, this may indeed be true because most research on Indian achievement, in terms of understanding the patterns of that achievement, has evolved from general education theory. Hence, these conclusions concerning explanations about Indian student achievement derived from some very basic questions applicable to education in general. Do children's experiences at school have any effect on their school success? Does it matter which school they attend? How influential is the family to student success? What features of the school environment account for achievement, attendance, and retention (the three most popular measures of educational success)? How important are individual characteristics?

A review of the relevant literature indicated a fairly widespread acceptance of the theoretical perspective, in response to these questions, that schools have generally made very little difference in a student's achievement (see Bridge, Judd, and Moock, 1979; Mosteller and Moynihan, 1972; and Shea, 1976; for reviews of the literature on this). That is, schools have not exerted much influence on student success, it has not really mattered what school one went to, and the student's individual, familial, and cultural characteristics have best explained student achievement. Clearly, this dominant theory has the same perspective as found in the literature on Indian education, but with no group specification. This perspective has been essentially predicated upon a few very influential studies.

Foremost and earliest among this group of studies was the United State's governmentally instigated report on the Equality of Educational Opportunity, also known as the "Coleman Report", by James Coleman and his associates in 1966. The study conducted a large scale cross-sectional survey of academic achievement in over 4,000 schools, with some 645,000 students of all ethnic (including Indian) and racial origins. The results were interpreted to indicate that educational attainment was essentially independent of the schooling a student received. During this same time period, a number of cross-sectional studies were done in England that resulted in the Plowden Report, Children and Their Primary Schools, in 1967. This study, similar in many regards to the Coleman Report, concluded that schools had limited influence on the development of their students. Moreover, both of these reports determined that home, parental, and other non-manipulable influences beyond the control of the school system far outweighed any manipulable influence of the school system on student success.

Also quite influential upon existing beliefs about the effect of schools on student success was the work of Arthur Jensen. In his monumental report, "How Much Can We Boost IQ and Scholastic

Achievement?" Jensen (1969) reviewed the evidence on the factors that influence IQ and scholastic achievement. Jensen concluded that the most influential factors were biologically determined, which was substantiated by the fact that compensatory education had been tried, and that it apparently had failed.

In 1972 the last influentially condemning study was reported by Christopher Jencks and his associates in Inequality: A Reassessment of the Effect of Family and Schooling in America. Jencks et al. reanalyzed numerous sets of statistical data, including the data from the Coleman et al. study, and drew the startling conclusion that

> equalizing the quality of high schools would reduce cognitive inequality by one per cent or less [and that] additional school expenditures are unlikely to increase achievement, and redistributing resources will not reduce test score inequality (1972:109).

As a result of these studies, it generally has come to be accepted that education does not have any great influence on student success. There has been, however, considerable disagreement as to what actually influenced such success. Jensen (1969) concluded that heredity was the predominate factor, while Jencks et al. (1972) interpreted student success as essentially based on "luck." Coleman et al. (1966) and the Plowden Report (1967), on the other hand, saw the roots of inequality in familial and cultural influences during the pre-school years. Thus, the dominant theoretical position has been that school systems have very little influence over student success.

This dominant theory of educational success, consequently, has been directly transposed to guide research on the academic achievement of Indian students. While the psychological factors stressed by McShane are not explicitly part of these dominant explanations, they certainly can be located within its framework. Although more obvious, so can the sociocultural factors. Thus, because of the apparent adaptability of the dominant model, it can be understood why there has been very little theorizing in Indian education.

Yet there have been a number of recent and less prestigious studies that have countered or refuted this commonly held pessimistic view concerning the influence of school systems on student success. A problem with this theoretical perspective, which has been a problem in Indian education as well, has been that,

> regarding the influence of the social context or environment on individual behavior, reviews of the educational literature have generally not taken this theoretical tradition into account. Instead, they have tended simply to describe empirical results and/or present large scale models of interacting influences on achievement (Stockard and Mayberry, 1987:2).

Similarly, part of the problem has derived from the fact that those studies that have presented evidence demonstrating that school systems did have an effect on student success have not been large, cross-sectional studies, but rather, small, regional, cross-sectional or longitudinal studies. Of these studies, the longitudinal studies have been more generally accepted. Accordingly, one of the few acknowledged challenges to the dominant theoretical position came in 1979, as the result of the longitudinal study of twelve London secondary schools by Michael Rutter and his associates. The researchers utilized a variety of data collection and analysis techniques to investigate why there were differences between schools in terms of various student measures (including academic achievement). They looked at four generally different features: (1) characteristics of students at the time they entered secondary school (intake variables); (2) facets of the process of schooling (i.e., types of social organization and types of environments); (3) student outcomes of these processes (i.e., achievement of educational goals); and (4) ecological factors influential to the school process. From their results, Rutter et al. made these definitive conclusions, which clearly contradicted the dominant theoretical position on the influence of schools:

> First, our investigation clearly showed that secondary schools varied markedly with respect to their pupils' behaviour, attendance, exam success and delinquency. This had been observed before, but the demonstration that these differences remained even after taking into account differences in their intake was new [emphasis in the original]. This suggested that, contrary to many views, secondary schools do have an important influence on their pupils' behaviour and attainments [emphasis added].
> Secondly, we found that these variations in outcomes were systematically and strongly associated with the characteristics of schools as social institutions (1979:205).

The researchers also identified a number of variables that they found to be associated with student success, but more interestingly they concluded that

> the pattern of findings suggested that not only were pupils influenced by the way they were dealt with as individuals, but also there was a group influence resulting from the ethos of the school as a social institution (Rutter et al., 1979:205).

That is, academic achievement was influenced by the quality of social interactions between students and school personnel, and by characteristics or image (or ethos) of the school itself.

Other research has asked how schools can facilitate student achievement by focusing on areas in which schools have more direct control. In reviewing the effects of grouping or contextual variables such as ability, racial, and/or socioeconomic composition of the classroom or school, Stockard and Mayberry (1987) found a number of studies in which such factors had minimal effect on achievement (e.g., Alwin and Otto, 1977; Bridge, Judd and Moock, 1979; Campbell and Alexander, 1965; Nelson, 1972; Wiatrowski et al., 1982). Another important area that studies have focused on, which schools have control over, has been learning climates. In looking at school climates, Stockard and Mayberry (1987) found in their review that valuing academic achievement along with social rewards for students' accomplishments, an emphasis on basic skills, administrative leadership, and an orderly atmosphere all had an effect on student achievement (e.g., Brookover et al., 1979; Purkey and Smith, 1982; Rutter et al., 1979; Wynne, 1980). In general, Stockard and Mayberry (1987) found that the same characteristics important to the school climate were important to the classroom climate as well. However, the teacher's skills, expectations, and attitudes were also important to the classroom environment. School size has also been shown to be an important factor for understanding student achievement. Recent studies, moreover, have found a nonlinear relationship (Stockard and Mayberry, 1987) between school size and achievement, where the negative effect was greater for some social categories of students (Summers and Wolfe, 1977).

Thus, there have been a number of studies that have identified factors that were manipulable by the school system for students in general. In the first real review of this literature, Stockard and Mayberry have proposed a conceptual framework to understand the role of potentially manipulable factors in student achievement:

> We are suggesting that most of the literature on the effect of environmental variables on student achievement can be understood by utilizing two broad-ranging, key variables presented in theoretical examinations of environmental or contextual effects: (1) the nature of a group's norms and values, and (2) the relationships among the group members. We further suggest that the norms and values of the group may be linked to distinctions between instrumental activities, those oriented toward task completion,and expressive activities, those oriented toward promoting socioemotional integration of the group. Finally, the relative balance between these activities and their content are seen as influenced by the nature of group relations (1987:2-3).

In sum, Stockard and Mayberry have proposed a primarily sociological theoretical perspective that has focused upon interaction norms, and values (or ethos), which would be manipulable by school systems.

Very few studies, however, have investigated such manipulable factors to determine if they helped to explain the academic achievement of Indian students. Indeed, the only known studies were done by Rodney Brod (1975, 1976a, 1976b, 1977, 1979b). But, academic acknowledgement of Brod's research has been limited to tribal publications and one reading at the American Association for the Advancement of Science meetings (1976b). Despite this visibility problem, Brod's findings have seriously challenged commonly held ideas about Indian achievement. That is, Brod found that potentially manipulable variables within the school system accounted for over 90% of the explained variance in the student's grade point average in a rural school district enrolling Indian students (1975).

In exploring explanations for his findings, Brod pointed out, as did Rutter et al. (1979), that national (or large cross-sectional) survey data were problematic in that they often (a) did not detect the variability in regional and local patterns, (b) ignored school system factors when teachers, curricula, and facilities were the same, and (c) disregarded the fact that slight gross differences become magnified when statistically controlled (1976b:1). That is, the large-scale studies have helped in identifying gross differences between school systems, but have done little to explain educational processes and effects within particular school systems. This, Mehan (1979) has suggested, has resulted in very few practical policies having been produced. Mehan, in his work on classroom social organization, has also suggested three related methodological problems with large scale correlational studies:

1. These studies have attempted to use an 'input-output' model of schooling. However, indices of input, such as the number of books in the school library or the opinions of teachers, do little to explain variations in output (i.e., educational performance).

2. There is no way of knowing where the presumably missing input variables are to be found. This leads to considerable disagreements of what missing factors are likely to be (e.g., ability grouping or classroom arrangements).

3. "Correlational studies seldom provide similar findings on the same topic...[and] even produce contradictory interpretations of the same data" (Mehan, 1979:7) (Silverman, 1985:8-9).

Consequently, a central issue involved with determining the predictors of Indian and other student's achievement has been a methodological problem. In a more recent study, James Coleman and his associates have rebutted these arguments in another national, cross-sectional survey. In this stuoy, as part of the continuing National Assessment of Educational Progress, Coleman et al. compared public and private high school systems. Based upon their new conclusions, Coleman et al. again argued for the use of large, rather than small, cross-sectional studies:

> despite this evidence that schools do make a difference, not much is known about what characteristics of schools affect achievement....The task of gaining some idea of factors affecting achievement and of the effects of their variations on American education is not a simple one; but large-scale surveys of students involving national samples of schools provide one approach to this task. Their principle virtue is coverage of a large enough set of schools to preclude finding fortuitous differences between schools having high and low achievement, and attributing causal significance to these fortuitous differences (Coleman et al., 1982:10-11; emphasis in the original).

While Coleman et al. have reaffirmed their previous conclusions (Coleman et al., 1966) that ultimately the variables associated with student success reside beyond the school's control, their arguments have also pinpointed a major problem source. That is, while Coleman et al. and others have been interested in determining the predictors of academic achievement for the average American (whomever that may be), other researchers (and Brod in particular) have been more concerned with particular groups or classes of students.

Rutter and his associates also have provided some insight into yet another methodological problem, that of measuring educational achievement or success.

> A careful examination of the various studies shows that when like is compared with like the results of different investigations are pretty much in agreement on the main findings. The apparent clashes in evidence arise largely because the studies have

> gathered different kinds of data or have used different statistical analyses to answer quite different questions (1979:2-3; emphases added).

That is, Rutter et al. have underscored the methodological differences between their use of longitudinal data and the large-scale, cross-sectional data used by Coleman et al. and others, which have been most influential in creating the impression that education has made little difference. But, paramount to this methodological issue has been the overreliance of cross-sectional surveys on a single measure of verbal ability or skill for their dependent variable. Rutter et al., showed that reliance on such a measure tended to underestimate the importance of schooling, as did the choice of subjects used; that is, subjects generally learned at school such as mathematics or science tended to show greater school differences than those subjects more likely learned outside of the school system, such as English or social studies (1979:4).

While Brod, Mehan, and Rutter et al. have provided some insight on the methodological differences of various types of studies, they have not totally clarified the issues concerned with explaining educational success. They have failed, for instance, to discuss the findings of other relevant longitudinal studies such as the 1971 report on Delinquency and Dropout by Delbert S. Elliott and Harwin L. Voss. Results of this longitudinal study reinforced the findings of the more influential cross-sectional surveys, having demonstrated that family factors, which were not manipulable by the school system, were the most important factors in accounting for student failure as measured by delinquency and dropout. Similarly, the arguments against cross-sectional studies made by Rutter et al. failed to account for the findings of small scale or regional cross-sectional studies, such as those by Brod, which have often supported the findings of longitudinal studies, such as their own.

The most important insight to be made from these studies, therefore, was that they have gathered different kinds of data, to answer many different types of questions. This insight has profound implications, given the fact that most of the prestigious studies were certainly attempting to answer a question quite disparate from that of this and a number of other studies. That is, the goal of Coleman et al., Jencks et al., and others has been social equality, where education was the means to the goal, rather than educational equality, where all students would receive equal education. It would seem very probable that those factors involved in explaining educational equality were different from those of social equality.

These methodological differences, therefore, have confused the theoretical understanding of educational influences. Yet, equally germane to these methodological problems has been the operationalization of the dependent variable--student success; that is, how one has defined and measured student success was shown by Rutter et al. to determine the degree and type of educational influence upon such student success.

Measures of Student Success Used in Previous Research

The implicit, if not explicit, goal of formal education for Indian students has remained the elimination of their cultures by assimilation into the dominant culture of American society (McQuiston and Brod, 1984; Whiteman, 1984). New developments, however, have reflected the emergence of alternative or additional goals for the formal education of Indian students as established by Indians themselves (Barlow, 1984; Hertzberg, 1984; Kincheloe and Kincheloe, 1984; Kincheloe and Staley, 1984).[1] Regardless of how the goals have been defined, however, the empirical assessment of how well students have achieved such educational goals (i.e., student success/failure), has been defined in terms of academic achievement. Moreover, the overwhelmingly prevalent measures of academic achievement have been language and mathematical ability.

Other major dependent variable measures of student success have included attendance or absenteeism and tardiness, retention or dropout rates, and delinquency rates. Most studies of Indian students have similarly defined student success, although delinquency has seldom been an important factor. Indian student success also has been defined in terms of student intelligence and overageness. While data on many of these factors will be included in this research, academic achievement was used to assess student success. This was justified in that most other research has included such a definition, which thereby facilitates the applicability of this study, and, secondly, because academic success can be regarded as an appropriate definition of student success, regardless of the educational goals.

In reviewing the literature it was found that several variables have been used to measure academic achievement. The most common type of evidence used by researchers in assessing academic achievement has been the results of standardized achievement test scores. The second most widely used measure has been student class grades. However, grades were often problematic in that different schools used different grading systems, grades tended to be more subjective due to teacher upward grading biases (Brod, 1976a) and school policies, and student grades were often harder to obtain or measure consistently (especially for elementary level students). Other types of evidence that have been used, to a lesser extent, in measuring Indian student academic achievement, have included ratings of students by teachers, parents, special or ancillary program staff personnel, and data on other forms of student accomplishments such as the result of some project participation (e.g., Development Associates, Inc., 1983). The major handicap of these types of measurements has been that they were too subjective, usually used nominal or dichotomous scales, and often resulted in unsystematic evidence.

Despite the prevalent use of standardized achievement test scores, as measures of academic achievement, there were still problems. Foremost was the question of which scores to use? Some or all? Subtest or test? Or should the battery total score be used? Test and battery total scores tended to have a regression effect that averaged out or masked variations among subsumed scores. Tests were not composed of the same subtests, nor was the battery composed of the same tests for all grade levels. At one grade level the reading test may have contained two subtests, while at another grade level there might have been three or four subtests. A battery for one grade level may have been the reading, language, and math tests, while for another grade level they might have included reading, listening, math, and science in the battery total. This problem has been further compounded by the fact that standardized test results have been reported as raw scores, percentiles, stanines, and grade equivalent scores. As pointed out above, the one most prevalently singled out for measuring achievement has been the verbal ability/skills test score. Percentiles tended to be the most common scores used, but researchers have used, on occasion , stanines, grade equivalent scores, and, less often, standardized raw scores. However, many researchers have not explained which test score was used, verbal or otherwise.

These methodologically diverse practices have raised serious questions as to the comparability of research findings from one study to the next, and to the validity and reliability of using a single test measure to determine academic achievement. Although some studies have used single measures other than verbal skill (e.g., DiSilvestro, 1961), and others have used several test/subtest scores to measure achievement (e.g., Quirk, 1965), there has remained considerable variation in the use of raw scores, stanines, percentiles, and grade equivalents (e.g., Anderson et al., 1953; Coombs et al., 1958; Dankworth, 1969; Development Associates, Inc., 1983; Preuss, 1969).

Moreover, the use of standardized achievement test scores to determine academic achievement posed a number of other problems. First, as mentioned above, such tests have not necessarily tested students on what they have been taught. Second, standardized tests have often contained hidden biases against various subpopulations being tested because of wording, format, and underlying assumptions. On a general or national level a variety of different forms of tests have been administered to a number of different grade levels, and at different times of the year. The cultural biases inherent in standardized achievement tests, as well as other assessments of aptitude and achievement, have been documented and will not be discussed.[2] Third, it had to be assumed that the measured skills and knowledge were common to either the goal of assimilation or any other emergent educational goals.[3] It must also be assumed that, although culturally biased, standardized raw scores from a variety of subtests and tests, as well as the battery total, provide the most accurate and most comprehensive measurements of student skill or academic achievement. All of these problems, assumptions, and biases notwithstanding, for purposes of this research, achievement test scores were assumed to provide the most valid, reliable, and relevant information available regarding student academic achievement. That is, while achievement test scores probably did not measure Indian student socialization or education, they did certainly measure their enculturation or assimilation of the required skills for survival in an alien culture. The assumption, therefore, was made that at this point in time, non-assimilative goals for Indian education have remained unrealistic for the school system. Hence, Indian achievement must be measured in terms of Indian students learning the skills measured by standardized tests.

Previous studies on Indian academic achievement have included many types of comparisons: Indians versus whites; full blood Indians versus mixed blood Indians; males versus females; tribe versus tribe; one type of school versus another; English speaking Indians versus non-English speaking Indians; Indian versus local, state, and national norms; acculturated or assimilated Indians versus non-acculturated Indians; reservation Indians versus non-reservation Indians; and Indians at one grade level versus Indians at another grade level. Studies also have used nationally standardized and locally standardized tests as well as tests that are either culture free or culturally biased.

Yet, regardless of the instruments or criteria used, nearly every study has indicated that Indian students have low academic achievement. There were, of course, exceptions. Some studies have indicated that some individual Indian students do exceedingly well (e.g., Graham, 1951; Lee, 1953; Lloyd, 1961; Uhlman, 1953), while a number of studies have reported that Indian students at certain grade levels did better than other students (e.g., Branchard, 1953; Bryde, 1965, 1970; Coombs et al., 1958; Dorn, 1954; Kayser, 1963; Lloyd, 1961; Parmee, 1968; Peters, 1963; Peterson, 1948; Quirk, 1965; Rist, 1961; Safer, 1964; Uhlman, 1953; Wax, 1964; Witherspoon, 1962).

Several studies have also discussed a phenomenon known as the "crossover effect," which occurred when Indian students were doing better at various early grade levels, but did worse at other, higher, grade levels (Berry, 1968; Bryde, 1965, 1970; Chadwick, 1972; Coombs et al., 1958; Fuchs and Havighurst, 1972; Peters, 1963; Quirk, 1969; Saslow and Harrover, 1968). Other research has described a "learning plateau effect" (e.g., Fuchs and Havighurst, 1972; McShane, 1983; Witherspoon, 1962), where Indian students performed at similar levels as their classmates until they reached a certain grade level or "learning plateau." Unfortunately, a few researchers (e.g., McShane, 1983) have concluded that these two patterns of achievement were the same phenomenon, presumably because the "crossover" and "learning plateau" both occurred around the fourth or fifth grade. In particular, both Chadwick (1972) and Berry (1968) cited studies as supporting the crossover effect, when in actuality the references only stated that Indians in certain grade levels did comparatively worse than non-Indians, but from that point on, the gap became increasingly larger.

Estelle Fuchs and Robert J. Havighurst pointed out that most studies that have found a learning plateau or crossover effect, have failed to account for age differences due to the fact that Indian students were being held back:

> When Indian pupils are tested on such subjects as reading and arithmetic, and are compared with other children of the same chronological age, they are likely to average below the national norms from the start of school (1972:126).

The only study to really show any crossover effect was the one reported by John Bryde (1965, 1970), which showed Indian students to be doing better until puberty (around sixth or seventh grade). Fuchs and Havighurst, however, pointed out that Bryde's data were suspect, and, therefore, concluded that

> since a variety of careful research studies have failed to confirm the existence of a 'crossover phenomenon,' we believe that the usual finding concerning the low school achievement of Indian children should be credited" (1972:128).[4]

This conclusion drawn by Fuchs and Havighurst was somewhat supported by Development Associates, Inc., who made a meta-analysis (Glass, 1976, 1978) of all available previous research studies on Indian achievement done during the 1950s, 1960s, 1970s, and 1980s to measure or determine the typical findings. Development Associates, Inc., found that

> the 1970s data show a modest "classic" slope (divergent) downward with increased grade, while the 1960s data show a tendency to <u>converge</u> toward the comparison group <u>mean</u>, from lower elementary to junior high, and then to diverge again. This latter pattern found in the 1960s data appears quite unusual and is different from the traditional picture of Indian student achievement declining across grade levels portrayed in the educational literature (e.g., Havighurst, 1971 [1970]) (Day, 1983:2-13; emphases in the original).

Thus, the meta-analytic review technique, used by Development Associates, Inc., demonstrated, that, at least in the 1960s, there were some very different processes occurring at the early grade levels. In contrast, Development Associates, Inc., also concluded that

> American Indian reading and mathematics achievement, particularly in the upper grades, is as high or higher than it has been at any time in the last thirty years. Nevertheless, these remain well below the national norms, and the academic needs of Indian students have not been met (Day, 1983:2-22).

Moreover, the results of this meta-analysis found that nearly all research that analyzed achievement by grade level corroborated the conclusion that Indian student achievement varied considerably, and more so than established norms, by grade level (regardless of whether or not a plateau or crossover effect was found or not).

In summary, previous research has demonstrated that Indian students were academically, significantly less successful than their classmates, regardless of the educational goals or how student achievement was measured. While some studies have reported a crossover effect, a more likely conclusion was that Indian student success simply varied by grade level. Nonetheless, these results have suggested that Indian achievement varied by grade level. In regards to grade level differences in general, therefore, it should be noted that in their analysis of longitudinal data on high school student aspirations, Driessen and Elliott (1968) found significantly different aspirations for each grade level. Additionally, generalizations in the literature about the education of Indian students have attributed a number of causes to Indian student academic failures. In his review of the literature for the Kennedy Report, Berry discussed the causes under eight sociocultural categories: the intelligence of the Indian student; teachers; parents; cultural deprivation; the cultural barrier; the language barrier; the school; and the Indian student's self-concept (1968:43-98). Clearly the focus of these reputed causes was primarily upon the Indian students themselves; that is, Indian students were failing because of factors generally beyond the control of the school systems. Moreover, it was noted that Berry's categories of sociocultural predictors of Indian achievement were very similar to those in McShane's (1983) proposed model; which helped to reiterate that McShane's model was nothing more than a rearticulation of previous imputed concepts.

Previous Research in the Study Setting

The Washoe County School District, with district offices in Reno, Nevada, encompassed 6,608 square miles in area. The majority of the schools were in the Reno-Sparks area, with the other schools in the district located in communities eight to sixty miles from Reno. All students were enrolled through neighborhood zoning of street grids. The district was composed of sixty public schools: forty-two elementary schools, nine middle schools, and nine high schools. Additionally, there were nine private elementary schools, five private middle schools, and five private high schools in the Reno-Sparks urban area. Pyramid Lake Indian Reservation, located within the school district, also had a tribally operated high school at Nixon, Nevada, that was completely separate from the Washoe County School District.

The Washoe County School District had three Indian groups that were educationally served by the district's Title IV, Part A, Indian Education program. Each group was also served by separately contracted Johnson-O'Malley programs. One group was the Reno-Sparks Indian Colony, which was a small reservation located along the city limits between the cities of Reno and Sparks. It was approximately three blocks wide and about six blocks long. It was federally recognized, and had recently acquired several new facilities which included Indian Health Services. The second group was the federally recognized Pyramid Lake Indian Reservation, with tribal offices located in Nixon, Nevada, forty-five miles east of Reno. The reservation had three primary communities: Wadsworth, Nixon, and Sutcliff. The third group was the (Reno) Nevada Urban Indians, Inc., with offices located in Reno, who represented the Reno-Sparks area urban Indian population. The Pyramid Lake Indian Reservation and Reno-Sparks Indian Colony students primarily attended six schools (that were within their respective school zones), while the urban Indian students were widely scattered throughout the school district.

There have been four previous studies of Indian education in the Washoe County School District area. The earliest study was "An Analysis of the Language Achievement of Indian Children in Washoe County Elementary Schools with Proposals for Improvement," by I. Anthony DiSilvestro in 1961. DiSilvestro compared language achievement and intelligence test scores of Indian children at two of the elementary schools, which were the neighborhood schools for the Reno-Sparks Indian Colony (n = 44) and the Pyramid Lake Indian Reservation (n = 27) communities. DiSilvestro used IQ test scores and determined that there were no significant differences in intelligence between students at the two schools. Utilizing grade equivalent language achievement scores, DiSilvestro then compared third graders at Natchez Elementary School (the Pyramid Lake Indian Reservation community school) with fourth graders at Orvis Ring Elementary (the Reno-Sparks Indian Colony community school), and found that there were significant differences in standardized achievement test scores.

DiSilvestro concluded that increased cultural contact with the dominant (non-Indian) society, which by definition was greater for the Reno-Sparks Indian Colony students, and the physical removal of students from their family home environment to a study hall environment would be the most beneficial steps for improving language skills. In drawing these implications for the Washoe County School District, DiSilvestro assumed that the student's geographical domicile (i.e., reservation or colony) was a valid measure of the student's degree of culture contact and assimilation into the dominant culture. While such an assumption seemed logical, and still has often been interpreted as such, there existed no empirical evidence that Indians living at the Reno-Sparks Indian Colony had quantitatively or qualitatively greater culture contact with more non-Indians.[5] Both the use of grade equivalent scores (rather than standardized scores) and the comparison of third grade with fourth grade students were methodologically inappropriate procedures, and, taken together with his assimilation assumption, has invalidated DiSilvestro's conclusions and implications.

In 1965 Virginia C. Quirk conducted "A Comparative Analysis of Educational Achievement of Indian and Non-Indian Students Enrolled in the Orvis Ring Elementary School and the E. Otis Vaughn Junior High School," which were the elementary and middle schools closest to the Reno-Sparks Indian Colony. Quirk matched fifty Indian and fifty non-Indian students in grades three to eight in terms of the following criteria (to hold these factors constant): age, sex, grade, years in the same school, intelligence test scores, and father's and mother's occupations. She then compared the two samples on the reading (word meaning, paragraph meaning), spelling, language, and math (computation, concepts, applications) sections, along with the composite scores, of the Stanford Achievement Test. Like DiSilvestro, Quirk used grade placement (or equivalent) scores, rather than standardized scores, but she did employ multiple measures of achievement and used both test and subtest scores. Quirk also compared the students in terms of teacher ratings (1-5) of class participation. Quirk found considerable evidence that Indians in the fourth grade outperformed non-Indian students with matched background characteristics. Quirk also found Indian students outperformed their classmates in grades four through eight in spelling achievement; in grades four, six and seven for paragraph meaning and math computation achievement; in grade four in word meaning and math concepts achievement; and in grade seven in language and math applications achievement. With respect to composite means, she found the following differences in mean composite grade placement (equivalent) scores for Indian and non-Indian students (1965:54):

> Grade 3 - [the] non-Indian group [was] higher by .38 [equivalent grade levels]
> Grade 4 - [the] Indian group [was] higher by .42 [equivalent grade levels]
> Grade 5 - [the] non-Indian group [was] higher by .36 [equivalent grade levels]
> Grade 6 - [the] non-Indian group [was] higher by .04 [equivalent grade levels]
> Grade 7 - [the] Indian group [was] higher by .21 [equivalent grade levels]
> Grade 8 - [the] non-Indian group [was] higher by .66 [equivalent grade levels].

However, statistical tests of these, and other, equivalent grade level differences were not significant. That is, Quirk found no significant differences, with respect to academic achievement, between the Indian and non-Indian students in her study . Except for the finding that the academic achievement of Indian students was not significantly different from that of their classmates, Quirk's results were similar to those in other studies, which indicated that Indian students compared best in grade four (holding both age and sex constant), best in the subject of spelling, and that they participated less than did non-Indian students in the classroom.

Unlike the first two studies, which were essentially descriptive, in 1969 Marjorie C. Preuss conducted "An Investigation of Background Factors in American Indian Academic Performance" to determine correlates "of intellectual functioning of the American Indian student" (1969:2). Preuss' subjects (n = 96) were not, however, part of the Washoe County School District, but rather were made up from the senior class at the Stewart Indian Boarding School in Carson City, Nevada, which was about 30 miles south of Reno. The study was discussed here only because the school was in close proximity to the Washoe County School District, many of the subjects had been in the Washoe County School District at one time, and because so few studies have been done that were relevant to Indian student achievement in the Washoe County School District. Her dependent variables were intelligence, as measured by IQ scores, and academic achievement, as indicated by the test battery total scores (Preuss did not indicate whether she used raw, percentile, grade equivalent, or some other standardized score), while the independent, or predictor, variables were dichotomous scores for self-concept (+ or -), number of school years completed (1 to 5 and 6+), and level of deprivation (more or less). Preuss found self-concept to be the only factor that significantly correlated with achievement test scores, while elevated test scores were related to off-reservation residence (part of deprivation score). Preuss appropriately concluded that the variables or measures were methodologically inappropriate for explaining academic achievement.

The last study related to Indian education in the Washoe County School District was performed as part of a U.S. Department of Health, Education, and Welfare grant. Richard T. Dankworth investigated the "Educational Achievement of Indian Students in Public Secondary Schools as Related to Eight Variables, Including Residential Environment," in 1969 under the project direction of James A. Jacobsen. Like Preuss, Dankworth was interested in determining what variables showed a significant relationship or correlation to educational achievement. Unlike most studies (and not just those done in the Washoe County School District) of Indian education, Dankworth was also interested in demonstrating how much of a significant contribution the independent variables made in explaining the variability in the educational achievement of Indian students.

Dankworth's dependent variable was academic achievement as measured by the student's achievement test total or composite score, while the independent variables were: (1) mental ability as measured by IQ scores; (2) level of anxiety as ranked by correct answers; (3) verbal concept choice as ranked by correct or higher level choices; (4) self-concept as measured by the average of three different scores; (5) achievement-motive as scored by the district psychologist; (6) interaction with the dominant culture as categorized by high, moderate, and low interaction with the dominant culture; and (7) residence as categorized by rural reservation, urban colony, and multi-ethnic community. The sample (n = 140) included thirty-nine (7th-12th grade) students from the Pyramid Lake Indian Reservation, fifty-one from the Reno-Sparks Indian Colony, and fifty from multi-ethnic communities. All seven variables were found to correlate with achievement, and when acting together were determined to account for 60.6% of the variability in achievement test battery composite score. Four of the seven variables were found to contribute significantly ($p < .01$) to 59.3% of the variability in achievement: (1) IQ, 48.9%; (2) residence, 4.1%; (3) verbal concept choice, 3.2%; and (4) interaction with the dominant culture, 3.1%. The other three variables, achievement motive, self-concept, and level of anxiety, together accounted for only 1.3% of the variance. More importantly, Dankworth found that the percent of variance explained or predicted by any one variable was different for, or varied among, his three residence groups. In particular, he found that

> partial regression coefficients showed that the effect of residence environment with respect to achievement was negative for rural reservation students and positive for urban colony and multi-ethnic community students (1969:68).

A major fault with these findings was that both IQ and verbal concept choice scores would be expected to correlate strongly with achievement in that they all were measures of similar phenomena, cognition. That is, one was left having to conjecture as to what explained IQ, unless, of course, one looked to other studies, where evidence would have indicated that IQ was also predicted by previous achievement. Thus, knowing that IQ accounted for nearly 50% of the variance in composite achievement test scores was not very explanatory. Moreover, because Dankworth used the composite score, it would be even more probable to correlate with IQ. Additionally, the instrument used for categorizing interaction with the dominant culture both overlapped with other variables and was of questionable validity. It was noted, moreover, that the independent variables all focused upon the student's attributes, thereby implying that achievement was not manipulable by the schools.

In sum, previous investigations related to student success in the Washoe County School District have been of little utility, practically or theoretically, due to methodological deficiencies and theoretically nonproductive independent variables. These studies further established the need for new, up-to-date, knowledge concerned with academic achievement in the Washoe County School District. As a final note, the Title IV-A Indian Education program explicitly wanted to use academic achievement scores (W.C.S.D., 1984).

Summary of Theoretical Perspective

A review of the related research on the education of Indian students provided a broadly dismal portrayal. It also raised questions as to whether schools really have any effect on students, and, if not, questioned what the potential causes or antecedents of student failure were. Literature on these questions in broader educational research generally have concluded that schools do not have any influence on student success, although theoretically relevant exceptions have found contrary evidence that schools do effect student success or failure (methodological exceptions aside). It seemed apparent, then, that there was a need for additional empirical research to help clarify the existing theoretical confusion in both education, in general, and Indian education, in particular.

In empirically studying student success, academic achievement has been the predominant criteria. Moreover, some form of standardized achievement test has been the usual measure of academic achievement. Regardless of the criteria or measures used, however, nearly all research has concluded that Indian students were less successful (Berry, 1968; Coleman et al., 1966; Coombs et al., 1958; Development Associates, Inc., 1983; Havighurst, 1970; Peterson, 1948; U.S. Senate, 1969). Other research, however, has demonstrated that considerable variance existed by grade level, and a few studies have found that Indian students did better than other students at certain grade levels (Berry, 1968; Bryde, 1965, 1970; Chadwick, 1972; Coombs et al., 1958; Day, 1983; Fuchs and Havighurst, 1972; Havighurst, 1970; Peters, 1963;

Quirk, 1965; Saslow and Harrover, 1968; Witherspoon, 1962). Further support that grade level differences might be important was found in a study of student aspirations by grade level, which found considerable variation across the grades (Driessen and Elliott, 1968). The overwhelming conclusion that emerged from the literature on achievement by grade level was, once again, the continued need for additional empirical research.

The four previous studies related to the academic achievement of Indian students in the Washoe County School District (Dankworth, 1969; DiSilvestro, 1961; Quirk, 1965; Preuss, 1969) generally contained methodological or theoretical problems. Although Quirk (1965) drew some important conclusions, she still inferred, despite the fact that her study had no statistically significant results, that Indian students generally became progressively less successful in the school system. Quirk also concluded that the observed differences, although not statistically significant were due to the usual non-school related factors. Moreover, administrators, counselors, and teachers have continued to feel that "Indian students are dropping through the cracks of the school system" (W.C.S.D., 1984), and were unsure of what factors may have been antecedent to, or explanatory of, such failure.

The goal of this research, therefore, was to more fully understand (relative) Indian student academic success. In doing so this study analyzed aggregate data on student and school factors, statistically testing them to determine if Indian student achievement was significantly different than non-Indian achievement. Moreover, the research involved longitudinal (panel) data because most factors included in the study existed prior to the students taking the scholastic achievement tests (the dependent variables) and because grade level cohorts were used. The study also sought evidence for understanding the role of factors potentially manipulable by the school system as well. Thus, the current research investigated factors that have been found important to academic achievement both by large and small scale cross-sectional and by longitudinal studies.

A basic assumption of most studies in this area (and made by this study as well) has been that standardized achievement tests measure some aspect of student achievement and were, therefore, valid indicators of student success. Moreover, this study assumed that such factors were valid to all educational goals, whether such goals included assimilation, socialization, or pluralism. That is, it was assumed that, despite any inherent cultural biases, test scores were valid and reliable measures of how well a student was surviving, or would do, in the dominant school system, within which most Indian students were/are found.

In summary, then, the current research sought to provide empirical evidence in order to answer the following research questions:

1. What student characteristics are related to education?

2. Do Indian students differ from other students?

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

4. Is ethnicity a determinate antecedent predictor of achievement?

5. Are different factors antecedent predictors of achievement for Indian and non-Indian students?

6. Are different factors antecedent predictors of achievement across different grade levels?

7. Is residence (reservation, colony, urban) a determinant of Indian student achievement?

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

9. Do manipulable variables account for more of the total variance than non-manipulable variables?

10. Do more manipulable than non-manipulable variables account for the explained variance?

Solutions to the first two questions established parameters to answer the third question. Answering the third provided a basis for answering questions four through eight. Finally, the evidence from answering these questions formed the foundation for answering the last two questions. Although hypotheses would usually be derived from the data in inductive research, the theoretical perspective of this study, as presented above, has implied certain research hypotheses:

H_1: Standardized achievement test scores for Indian students are significantly lower than scores for non-Indian students in the Washoe County School District.

H_2: Class grades, attendance, and other measures of achievement are significantly different for Indian and non-Indian students in the Washoe County School District.

H_3: Teacher evaluations are different for Indian and non-Indian students in the Washoe County School District.

H_4: Personal and familial background characteristics are significantly different for Indian and non-Indian students in the Washoe County School District.

H_5: School environment and learning context variables are different for Indian and non-Indian students in the Washoe County School District.

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_8: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

H_9: Different antecedents are predictive of standardized achievement test scores at different grade levels in the Washoe County School District.

Most of these hypotheses, however, were non-directional, which allowed for greater inductive understanding.

Chapter 2

METHODOLOGY

The research process for normal or basic science has usually been conceptualized as circular and cumulative (Kuhn, 1970; Ritzer, 1980). This conceptualization has presented basic science as beginning with observations of various phenomena from which generalizations were inductively made to explain as many similar observations as possible. These generalizations were then synthesized into theoretical statements. This theory then guided future research as it generated hypotheses for deductive testing and validation of the theory through further observations, and so forth. The cycle of basic science, therefore, allowed researchers to describe and clarify characteristics of existing knowledge, to discover new phenomena and integrate it into theory, and to validate the truthfulness of existing theory. Normal science not only guided the processes of understanding and development of new scientific knowledge, but it also guided the socialization process for individuals just learning how to do scientific research. Normal science thus became cumulative through both its circular processes and its exemplar process for socializing new "scientists."

While several elaborations of this view helped facilitate comprehension for conducting research (Dooley, 1984; Jones, 1985; Kerlinger, 1986; Reynolds, 1971; Wallace, 1971), they have failed to explicitly incorporate the reality of research into the circular process of normal science. That is, these derivatives have tended to present research as simply that of testing a hypothesis, which was based upon a review of the literature, while implicitly assuming that some deductive link existed to a substantive theory. These models provided examples of hypothesis testing, but then failed to demonstrate how the results related to theory. Again, the assumption appeared to be that researchers should intuitively understand how to relate results to theory. Most studies that have followed these models of research, therefore, have often culminated in elegant results, but were not cumulative (despite the pretense of doing otherwise).

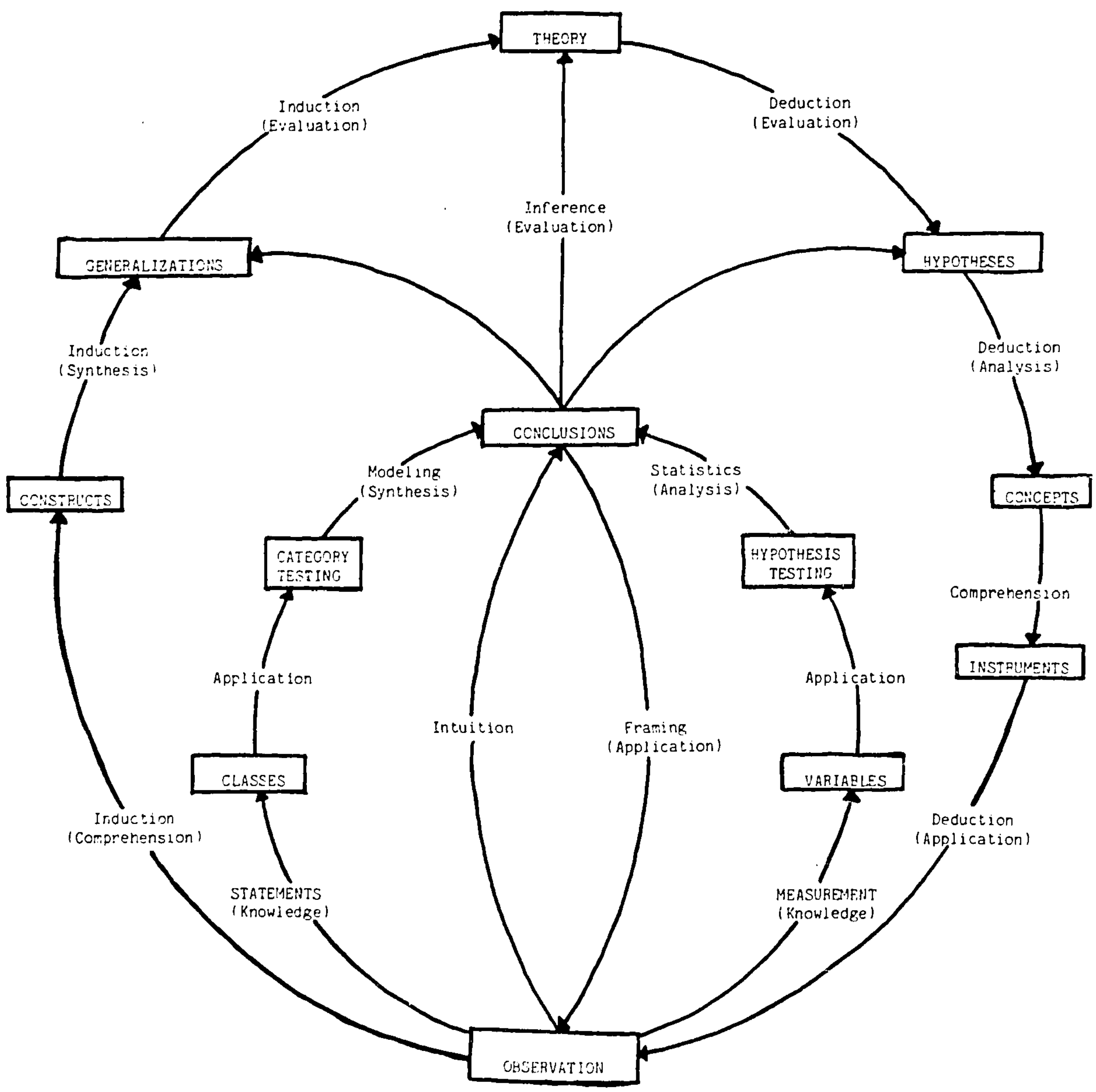
Yet, such models (e.g., Wallace, 1971) also implicitly presented research as noncircular. These views of the research process dictated that if one was doing research he/she should proceed in one of two ways. They could begin with conclusions, derive hypotheses and formulate appropriate variables and instruments, collect data utilizing one of the preferred methods of observation, statistically reduce the data to test the hypotheses, and infer conclusions based upon these statistical results, with the assumption that these inferences somehow related to theoretical understanding. Conversely, he/she could select a topic of interest, perhaps based upon other research results, collect data based upon a predisposed method, organize the data from these observations into classes of data from which patterns, clusters or models would be drawn into conclusions, and, occasionally, could formulate these into generalizations or grounded theory.

These models or views did not reflect, however, the ideal (Kuhn, 1970) processes of normal science, which involved two generalized research procedures. The first ideal process started by deducing hypotheses from existing theory rather than previous research conclusions, and instrumenting the concepts of these hypotheses so that observations could be made instead of employing a predisposed method. Next, these observations were analyzed and compared to the deduced concepts to test the induced hypotheses. These conclusions were then inductively reintegrated into the theory through constructs and generalizations. The second ideal process began by making empirical observations using a variety of known methods, which were induced into abstractly comprehensive constructs. Synthesizing these constructs with other observations, generalizations were evaluatively constructed into a theory, from which hypotheses were deduced and tested with further observations. These observations were then compared to previous constructs to modify the theory.

Much research, therefore, has been both noncumulative (i.e., did not build upon existing theory or develop new theory) and noncircular (i.e., was not both inductive and deductive). This reality of research, however, has not been reflected in the existing models of research. This absence indicated a substantial need to develop a model for conducting scientific research that accurately represented both those processes that were actually followed in research as well as those that should have been involved in normal science. Figure 1 provides an alternative model of the research processes that has attempted to demonstrate the complexity of scientific research. This model has sought to reflect both the reality of what normal science involves (represented by the inner circle), as well as Kuhn's (1970) ideal conceptualization of normal science (indicated by the outer circle). Implicit to this model is the fact that research really involves a number of subjective/political decisions rather than automatic stages. It was conceived that scientific research could involve one of any number of processes and begin at any one of the decision points (represented by rectangular boxes in Figure 1). Unlike other models of normal science, therefore, this model conceptualized the possibility of research beginning at decision points other than theory or observation, which has been particularly true of applied and engineering science, and has involved subjective/political considerations rather than objective and logical procedures.

The present model or view of scientific research provided for the possibility of modifying the usual conceptualization of research to accurately reflect what much of research has actually entailed--beginning research with some predetermined variables, preferred instruments and methods, or subjective opinion (hypothesis)

Figure 1. Processes of Normal Science



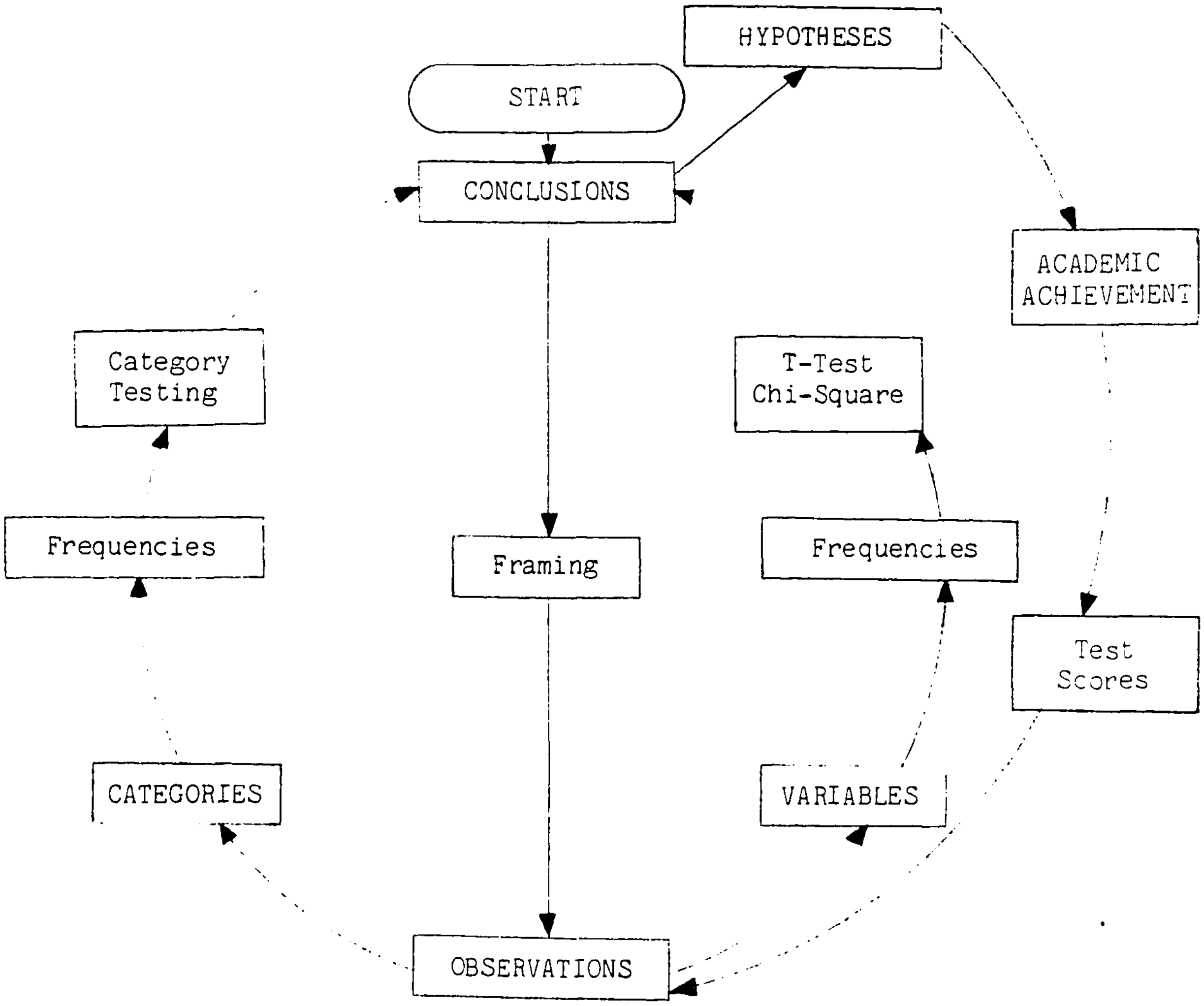
in mind. That is, much research has not even started with conclusions, but rather began at some other stage in the model, and then in post hoc fashion integrated other conclusions to corroborate the results. Ethical issues aside, the model presented in Figure 1 was formulated to imply that research has, does and can begin at any point in the research cycle; although certain decision points are methodologically more appropriate.

Perhaps more fundamental to this view (Figure 1) of science, in contrast to other models of science, was the recognition that conclusions of previous studies, rather than theory or observations (as idealized by Kuhn), were the focus or beginning point of most research in what has been referred to as normal science. That is, conclusions can form the foundation for either: (1) inductive, deductive, empirical, and/or theoretical research; or (2) the end of a research project. Furthermore, this model has implicated that normal science should not involve just stages of research, but rather it should involve a combination of research processes interconnected by numerous individual decisions. That is, normal science would be processual, with individual researchers making subjective, albeit not explicit, decisions as to when to begin and end their own particular project.

This research project, as alluded to in the previous chapter, was what this study would refer to as processual. Thus, the research was composed of cycles based upon subjective decisions to continue on, beginning with the initial decision to begin with the conclusions of previous studies on Indian education. The first cycle of this research, as found in Figure 2, involved two distinct sets of processes. The first set began by framing the literature to identify factors on which there existed available data within the Washoe County School District, but that had not been previously studied in conjunction with Indian education. For instance, factors such as preschool attendance, tribal status with the federal government, and participation in the gifted student program had not been considered before. Such data were collected without any other considerations other than to determine if differences existed between Indian and non-Indian elementary students; or in the case of characteristics applicable to Indian students only, to describe such characteristics. Following observation or data collection, the data were coded into categories or variables for analyses, and conclusions were drawn from these findings. The second set of processes in the first cycle of this research project involved synthesizing hypotheses about the characteristics of Indian education and deductively defining concepts that were empirically measurable. These concepts were operationally defined into specific instruments of observation. Data collection consisted of making observations and coding data into specific variables, which were then descriptively and comparatively analyzed. Conclusions were made simultaneously with the findings from the first set of procedures.

Thus, the first cycle of research involved two sets of processes, one essentially inductive or exploratory and the other deductive. The

Figure 2. Processes of the First Research Cycle

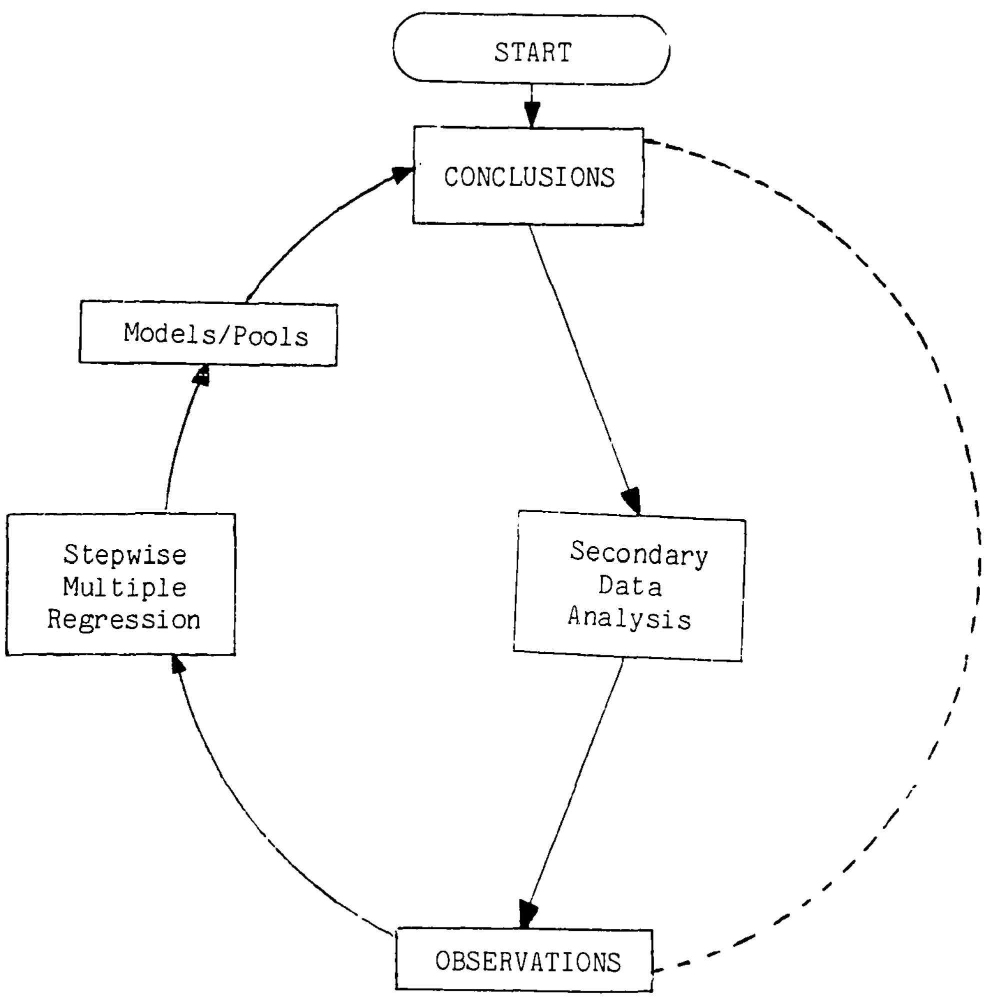


results of this cycle are reported in Chapter 3. It is noted from Figure 2 that in actuality the research cycle could have begun at any one of the decision points or stages. Arbitrary hypotheses could have been intuitively stated rather than synthetically formulated. Knowledge of the existence of data could have precipitated the collection of such information (which described the beginning point of the applied processes for the Washoe County School District), or a researcher could have gone to the various schools and just start collecting information.

Rather than ending the research after this cycle, the processual decision was made to continue into a second cycle. As seen in Figure 3, the conclusions from the first cycle became the first stage of the second cycle. During this cycle the previous conclusions provided a framework for data observation. Through secondary data analysis procedures and stepwise multiple regression analyses, explanatory models of elementary student education in the Washoe County School District were inductively developed. These processes inductively led to conclusions concerning academic achievement, and suggested the necessity for a third cycle of study.

The processual nature of this study drew upon the conclusions of the first two cycles to begin the third cycle of research. That is, the conclusions of the first two cycles corroborated hypotheses previously derived from the literature regarding which factors explained academic achievement in the Washoe County School District. Like the first research cycle, the third research cycle involved two

Figure 3. Processes of the Second Research Cycle



distinct sets of processes; but, unlike the first cycle, these two sets were done consecutively rather than simultaneously. Figure 4 indicates that the conclusions concerning observed differences between Indian and non-Indian students that were found in the first research cycle, along with those factors found to predict academic achievement in the Washoe County School District in the second research cycle, led to the decision to test other hypotheses, (the first set of processes), which were derived during the first two cycles, about Indian education. These hypotheses were operationalized through secondary data analysis procedures and tested using both stepwise and forced entry multiple regression techniques. The results of these analyses provided input for framing further observations in the second set of processes, which entailed making "new" observations of the data for inductive analyses to draw conclusions on the remaining hypotheses. Conclusions concerning the results of these last two sets of processes were then made.

Figure 5 shows the processes that were followed, and should have been followed, during the fourth research cycle, which began with the conclusions of the previous research cycles. That is, the fourth research cycle included the rearticulation of the research conclusions and the synthesis of these conclusions with those of other studies into generalizations about Indian education. While it had been hoped to then further inductively refine these generalizations into a theory of Indian education, the decision was made to not complete this last

Figure 4. Processes of the Third Research Cycle

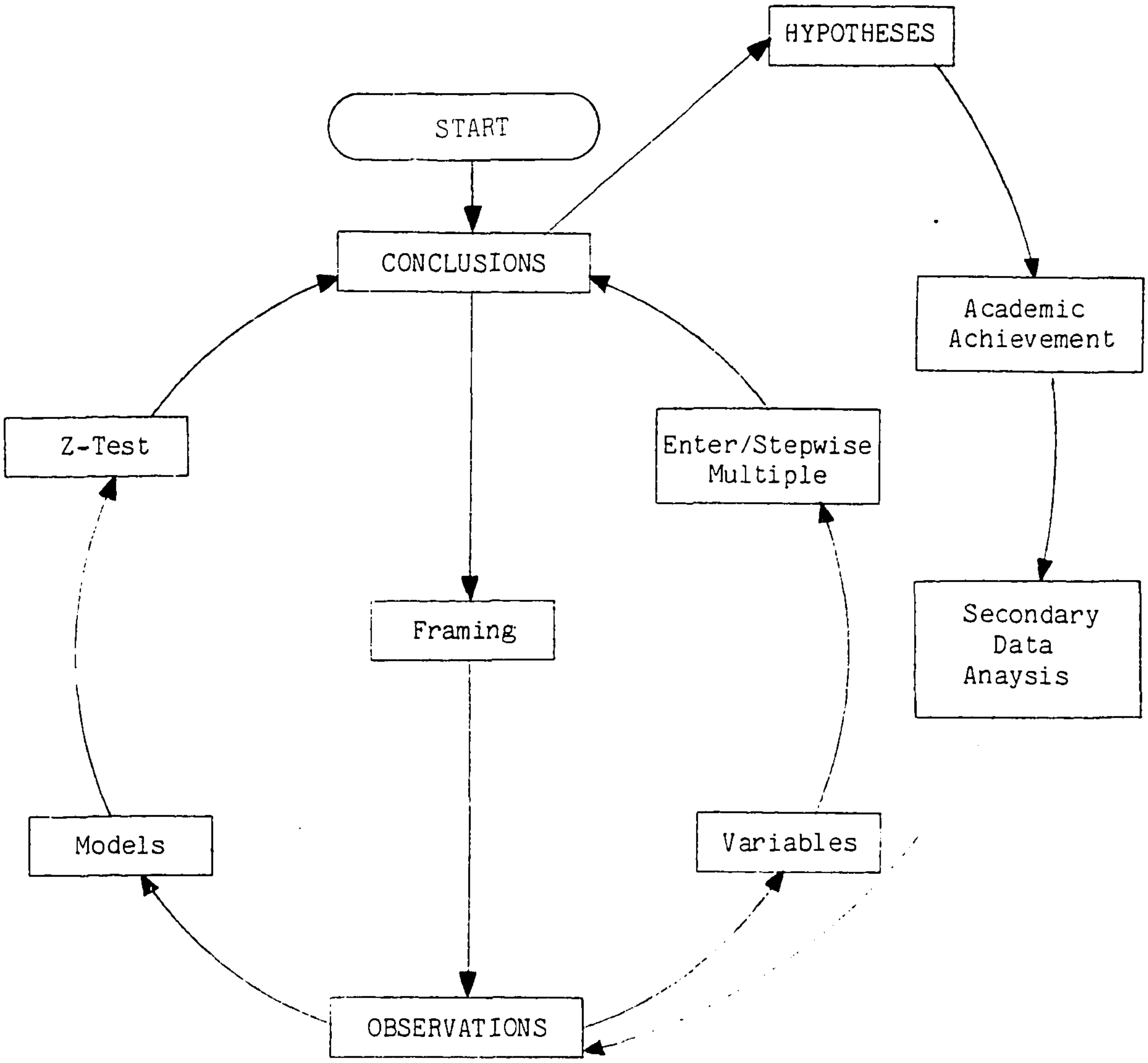
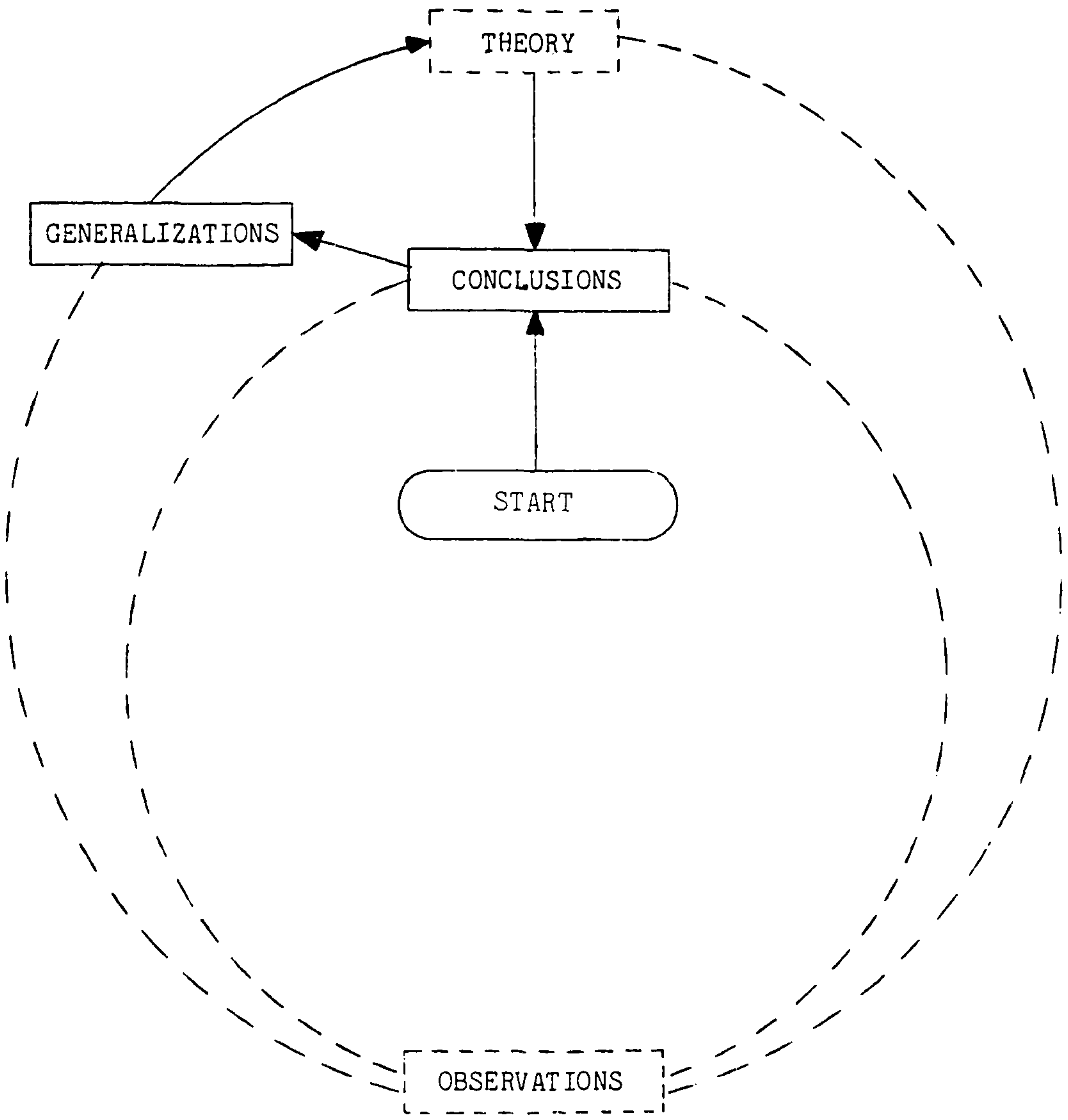


Figure 5. Processes of the Fourth Research Cycle



process because too many gaps existed to be able to formulate such a theory.

Fundamental to these cycles of research processes, however, were the decision making points, at which the research project could have terminated: (1) when making the observations; (2) following the initial analysis processes; (3) upon making conclusions that other questions were inappropriate; (4) upon re-instrumenting the data and developing explanatory models; (5) after deriving any one of the conclusions; or (6) after a provisional theory was developed.

Research Design

This research project was conducted in conjunction with a Washoe County School District Block Grant to collect information on Indian students, and to develop student profiles based upon this data, for the Title IV-A Indian Education program.[6] Although the ultimate use of the data may have been for applied needs, the current research retained basic theoretical research as its sole purpose throughout the project. Data were collected by the researcher while in the official capacity of Research Assistant with the school district.

The project began on July 1, 1984, by first setting up a detailed research design, including an extension of theoretically relevant goals and objectives from those in the project's original grant. Between September, 1984, and January, 1985, data sources were identified and letters of information sent to school principals and appropriate departments, after which the data were collected, collated, verified and copied. Data coding for the study was done separately from that for the school district. This was done for several reasons. First, the district Title IV program did not want numeric data, but rather verbal data, and secondly, they did not want all the data. Hence, separate code books were made. Actual coding for the study was done by the researcher's assistant and verified by both the researcher and the assistant. Coding for the district was done simultaneously with the data entry. Data were entered onto a personal computer by employees of the school district (January, 1985, to July, 1985), while the researcher employed a professional data entry person to enter and verify the data on a mainframe computer (May, 1985). The researcher did all data editing, updating, and final verification, which occurred between June, 1985, and September, 1985. Data analysis was periodically conducted using the mainframe's SPSS^{X} program between October, 1985, and November, 1986, as time and resources allowed.

The study employed a variation of the cross-sectional correlational survey design, but included temporal data. As the cross-sectional data were based upon existing information, a chronological or temporal order to the data was achieved through this extensive cross-sectional information as it occurred over time. In this respect the research also employed a type of longitudinal design. Data were not, however, collected on all variables at two points in time, particularly for the dependent variables. It would seem best, therefore, to classify the research design of this study as semi-longitudinal; that is, it was not truly longitudinal, but it did have temporality built into it and contained some longitudinal data. Moreover, because the data were collected on students in various grades, a panel design was also used for certain comparisons.

Research Procedures

Following the identification and delineation of the research questions from analyses of previous studies' conclusions, the first set of processes involved identifying the research population and samples. Once the research samples were identified, data collection methods and procedures were implemented. This was followed by data analyses that resulted in conclusions from which the second research cycle of the study began. In the second cycle, secondary data analysis procedures and regression analyses were used to develop models for predicting academic achievement. Data were once again reorganized using secondary data analysis techniques in the third research cycle, and these observations were analyzed using regression analyses procedures. Following this, a second set of processes involved framing the regression results and conducting hypothesis testing to draw conclusions from the regression results. The fourth research cycle included inductive synthesization procedures.

Sampling Methods

A number of different sampling techniques and procedures were utilized during the various cycles of the data collection. This was done to best identify the most representative samples of both Indian and non-Indian students. As discussed below, both practical and theoretical justifications were employed in identifying the research samples.

Techniques. The research population consisted of the 30,269 students listed by the Washoe County School District as enrolled in one of the sixty (60) schools in April, 1984, when academic achievement tests were administered. Student distributions for the entire district, Indian students, and non-Indian students are presented in Table 1 (see Appendix A for distributions by school). While the American Indian population comprised 2.35% of the student population, the total minority population was nearly 14%.[7]

A synthesis of the literature indicated that no comprehensive study of elementary school Indian students had ever been conducted in either the Washoe County School District; nor had any been done recently elsewhere. This research gap identified a need to focus upon this particular group of students. Further impetus to limit this study to elementary school students was provided by both data limitations and theoretical assumptions. That is, academic achievement tests were not administered to secondary school students (grades 9-12), and the data on middle school students (grades 7 and 8) proved to be extremely difficult to collect as much of it was missing. Theoretically, it was assumed that the critical learning period was during the elementary school years, which would make those grades most relevant to understanding any observed differences in Indian education. Moreover, it was the expressed interest of the

Table 1. Washoe County School District
Student Population

Population	N	%
Elementary School Population, District	15,909[a]	--
Elementary School Population, Indian Students	456	2.87
Elementary School Population, Non-Indian Students	15,453	97.14
Middle School Population, District	5,277[b]	--
Middle School Population, Indian Students	98	1.87
Middle School Population, Non-Indian Students	5,179	98.14
High School Population, District	9,083[c]	--
High School Population, Indian Students	156	1.72
High School Population, Non-Indian Students	8,927	98.28
Total Student Population, District	30,269[d]	--
Total Student Population, Indian Students	710	2.35
Total Student Population, Non-Indian Students	29,559	97.65

[a]--Includes 7th and 8th grade students from an elementary school located on the Pyramid Lake Indian Reservation, which is K through 8th grade.
[b]--Includes 6th grade students at one of the middle schools.
[c]--Includes alternative high school students and 7th and 8th grade students at one of the high schools.
[d]--Does not include homebound students.

Washoe County School District to have the research focus upon the elementary school students. It was for these reasons, therefore, that this study limited the study population to the 15,909 elementary school students.

To obtain comparability and generalizability, several different techniques of sampling were necessary. First of all, due to the small number of Indian students in the population, proportionate random sampling would have been difficult to use. Thus, purposive sampling was used to collect data on all identifiable Indian students. Identification was initially based on Title IV Indian Education records, and then verified at individual schools by interviewing school personnel. Such procedures demonstrated some inherent difficulties in self-reporting systems. A number of students identified as Indian were actually non-Indians, and they were eliminated from the population. A number of known Indian students (i.e., eligible for Title IV assistance, which meant they were at least one-eighth Indian) were self-identified as belonging to other racial ethnic groups (e.g., Hispanics). For consistency such students were not included in this study as Indian students.[8] Additionally, eleven Indian students were included in the study that were identified only through individual school records. These discrepancies between district and school records are indicated in Table A-1 of Appendix A. Data were collected on all Indian students from only forty of the forty-two elementary schools (n = 488), because two of the schools had no Indian students enrolled.

In order to ensure comparability between Indian and non-Indian groups, it was decided that the sampling would have to have similar case representation for each school and grade level.[9] Hence, proportional stratified random sampling was employed to identify non-Indian students to be included in the study.[10] Sampling was done using district student lists. Substitute samples were also taken to allow for the tremendous transiency in the school district (which will be discussed in greater detail below). While the original non-Indian sample consisted of 1,004 (3.4%) kindergarten through twelfth grade students,[11] only the 544 elementary students were used in this study.

Table 2 lists the samples for Indian and non-Indian elementary students by school, while Table A-1 in Appendix A indicates the sample figures for all sixty elementary, middle, and high schools. At school number 28 There were only 22 non-Indian students enrolled and was, therefore, deliberately oversampled, which added nineteen students to the sample size. Additionally, data on the seventh and eighth grade students at this elementary school were collected, because it had kindergarten to eighth grade students. The actual number of students, therefore, for whom data were collected was 1,032 (or 488 Indian and 544 non-Indian students). These sampling techniques and procedures ensured a high degree of similarity among all students within grade levels and schools with regards to teachers, physical facilities, and curricula. Holding these factors constant provided a control to isolate other school or nonschool system factors that might account for hypothesized underachievement, if such were to be found.

Table 2. Original Indian and Non-Indian Elementary School Student Samples by School Number

School Number	Number of Indian Students	Number of Non-Indian Students	School Number	Number of Indian Students	Number of Non-Indian Students
1	1	12	22	2	13
2	3	15	23	1	15
3	57	13	24	6	7
4	0	10	25	11	14
5	11	15	26	15	13
6	13	13	27	11	15
7	5	22	28	116[a]	22[a]
8	6	19	29	6	11
9	7	14	30	6	12
10	22	16	31[b]	0	0
11	2	13	32	10	13
12	4	12	33	47	18
13	2	13	34	10	10
14	3	9	35	13	6
15	8	15	36	11	14
16	0	5	37	17	22
17	6	14	38	17	17
18	4	15	39	4	14
19	2	2	40	3	4
20	5	17	41	4	11
21	12	18	42	5	11
			Totals	488	544

[a]--The sample at this school includes 7th and 8th grade students.
[b]--This school has only special education students and therefore was not sampled.

Sampling procedures during data analysis. Ultimately the 1,032 Indian and non-Indian students in the samples were reduced first to 669 students (Indian sample = 286; non-Indian sample = 383), and then down to 459 students (Indian sample = 201; non-Indian sample = 258) for the data analyses. These drops in the sample size were caused by a number of factors. First of all, it was found that seventeen of the selected cases were duplicate listings and that ten students had never really enrolled in the Washoe County School District. Secondly, twenty-one of the cases collected had been from grades seven and eight. These two factors reduced the sample size to 984 elementary students. Next, it was decided to eliminate all students involved in special education (n = 92) and English as a Second Language (n = 2) programs because the district did not require these students to take the academic achievement tests, which were used as the dependent variables.[12] It was also necessary to remove all kindergarten (n = 164) and pre-kindergarten (n = 3) students too, as they did not take the student achievement tests. These eliminations reduced the sample size to 723 first through sixth grade students.

As noted above, transiency was a very large problem in the Washoe County School District. While initial sampling techniques and procedures were used to account for this problem, the selection of students who moved out of the district during the 1983-84 school year still existed. That is, even after the sampling had been completed and data collection begun, fifty-four (n = 54) students included in the sample had since moved. Indeed, during the initial sampling procedures, eighty (n = 80) students selected as part of the original 544 non-Indian students had already transferred, which required that replacement students be selected.

While these figures seemed quite large, examination of the Washoe County School District's transiency report sustained these figures. Table 3 presents the transiency rates over the last six school years for the forty-two elementary schools in this study; (see Appendix A-2 for middle and high school rates). As can be seen, the transiency rate varied tremendously from a low of 21% for school number 2 during the academic year under study (1983-84), to highs of 114% for school number 27 during 1983-84 and 162% for school number 24 during 1980-81. Indeed the mean transiency rate for the Washoe County School District elementary schools ranged from a low of 53% during the 1983-84 and 1982-83 school years, which were the years included in this study, to a high of 73% for the 1979-80 school year. In summary, while the transiency problem during the data gathering stage would seem to have been quite extensive, it was, in fact, relatively low.

Obviously, with over half the elementary school students moving out of or into the schools under study, it was not unlikely that a number of students would have moved during the course of the study period. While many of these problems were alleviated during the initial sampling replacement procedures, others were not accounted for until the very end of the data collection procedures. This was due to the fact that, although these students had moved out of the district, their new schools had not requested their records until after data

Table 3: Washoe County School District Transiency[a] Report
For Elementary Schools 1978 - 1984

SCHOOL NUMBER	1983-84 (%)	1982-83 (%)	1981-82 (%)	1980-81 (%)	1979-80 (%)	1978-79 (%)	SCHOOL NUMBER	1983-84 (%)	1982-83 (%)	1981-82 (%)	1980-81 (%)	1979-80 (%)	1978-79 (%)
1	59	58	76	89	87	77	22	26	46	36	N/A	N/A	N/A
2	21	23	27	46	34	27	23	44	64	50	72	70	64
3	69	57	56	79	77	74	24	110	74	54	162	121	139
4	31	38	51	48	55	47	25	30	35	40	38	45	44
5	79	62	89	99	85	81	26	81	72	94	66	52	66
6	59	59	58	66	47	72	27	114	92	135	N/A	N/A	N/A
7	23	39	39	N/A	N/A	N/A	28	42	45	72	44	44	45
8	35	43	N/A	N/A	N/A	N/A	29	66	69	69	N/A	N/A	N/A
9	28	46	60	41	43	50	30	39	43	50	60	59	54
10	85	76	114	122	96	97	31	26	34	21	35	35	40
11	25	41	32	N/A	N/A	N/A	32	31	45	52	49	61	52
12	55	41	59	75	58	51	33	54	37	44	40	51	42
13	39	40	49	35	43	45	34	59	63	94	63	55	68
14	45	42	44	N/A	N/A	N/A	35	95	70	88	89	84	89
15	26	27	23	29	32	30	36	82	73	74	63	88	58
16	47	64	75	51	50	42	37	100	78	83	92	97	84
17	62	59	75	30	40	89	38	67	84	102	124	117	116
18	57	45	48	48	52	66	39	34	35	40	36	43	38
19	60	43	46	46	64	58	40	49	65	44	100	141	126
20	28	34	34	28	32	38	41	73	54	45	67	78	46
21	49	39	56	68	65	69	42	46	46	51	56	75	30
							Means	53	53	61	64	73	61

[a]--Transiency = (Total E's - Sept. Enroll.) + R's + W's/Sept. Enroll.

collection had begun. As such, these cases required considerable tracing to substantiate that they were indeed transients.[13] While not all cases were corroborated as having moved, most of the transients (n = 54) were verified and thereby eliminated from the data analyses.

This reduction brought the sample size down to 669 students (286 Indian students and 383 non-Indian students) for data analysis purposes. Justification for further reducing the sample size was made because the study sought to identify antecedent predictors of achievement test scores, and it was assumed that the best predictors would be 1982-83 school year class grades. Therefore, only those students who were in the Washoe County School District during both the 1982-83 and 1983-84 school years were used for data analyses. One hundred and thirty-three (n = 133) of the 669 students had been in the first grade in 1983-84, which meant that they had no grades for the 1982-83 academic year, because they had been in kindergarten, and could not be included in the analyses. The transient rate again affected the study sample, as seventy-seven (n = 77) students were not enrolled in the school district during 1982-83 (although enrolled in 1983-84). These two factors reduced the research sample, as shown in Table 4, to 459 students (201 Indian students and 258 non-Indian students) for data analysis purposes.

Data Collection Methods

Data were collected on location in the field, except where noted below. A variety of techniques and procedures were employed during the first cycle to collect existing data on the district, the schools,

Table 4. Reduced Indian and Non-Indian Student Samples by School Number

	Number of Students					Number of Students			
	Indians		Non-Indians			Indians		Non-Indians	
School Number	Original Sample	Reduced Sample	Original Sample	Reduced Sample	School Number	Original Sample	Reduced Sample	Original Sample	Reduced Sample
1	1	0	12	8	22	2	2	13	11
2	3	2	15	10	23	1	0	15	5
3	57	33	13	7	24	6	1	7	3
4	0	0	10	7	25	11	2	14	9
5	11	5	15	4	26	15	3	13	3
6	13	6	13	7	27	11	1	15	7
7	5	1	22	5	28	116[a]	44	22[a]	6
8	6	0	19	4	29	6	4	11	6
9	7	1	14	3	30	6	1	12	3
10	22	8	16	5	31[b]	0	0	0	0
11	2	0	13	3	32	10	5	13	8
12	4	0	12	5	33	47	24	18	7
13	2	2	13	11	34	10	2	10	4
14	3	0	9	1	35	13	8	6	4
15	8	4	15	11	36	11	3	14	6
16	0	0	5	1	37	17	9	22	11
17	6	2	14	11	38	17	8	17	6
18	4	3	15	11	39	4	2	14	10
19	2	2	2	1	40	3	0	4	0
20	5	1	17	9	41	4	2	11	5
21	12	7	10	11	42	5	3	11	9
					Totals	498	201	544	258

[a]--The sample at this school included 7th and 8th grade students.

[b]--This school had only special education students and therefore was not sampled.

and the students. The secondary data analysis method was then used to reorganize these observations in the other research cycles. One advantage to using the existing records method was that all measures were nonreactive in relation to this research project. It was recognized that many of the measures when initially made were indeed reactive, but this would be true of most existing records. Another advantage to using existing records was that they could be more readily used with both primary and secondary data collection procedures and analyses.

Techniques. The existing records method of research was used through all phases of the research project. As such, this study relied upon demographic and performance records, available to, or found within, the Washoe County School District, as indicators or observations of student characteristics and achievement. This was not meant to imply that attitudinal data were not conceived to be theoretically relevant, but rather that such information was beyond the possible scope of the current research project. Data were collected on factors considered both manipulable and non-manipulable by the school system. That is, factors such as sex, residence, parent's occupation, and days not enrolled were generally considered beyond the control or manipulation of the school district. Conversely, previous student achievements or grades, patterns of teacher evaluation, and the learning contexts or environments of classrooms and schools were taken to be potentially manipulable or subject to change by the school system.

Data were collected using a variety of procedures.[14] Data for the dependent variables were collected using forms developed by the researcher for the district to record the raw, grade equivalent, and percentile scores of all subtests taken by each student. Similar procedures were used for recording data on preschool programs (Indian students only), the Title IV program (Indian students only), the gifted student program, the English as a Second Language (ESL) program, and the federal lunch program. A second procedure involved making xerox copies of permanent records, enrollment forms, and report cards. Xeroxing was also used to make copies of the district's 1983-84 reports concerning student-teacher ratios, employment figures, and data on each school's library resources (which were provided in annual reports). Information on school facilities was collected by reading through records and making field notes of key factors. A xerox copy of an older report was also made. A final procedure involved mapping techniques. The 1980 United States census map was overlayed onto the Washoe County School District grid system to identify median family incomes by student to generate measures of personal socioeconomic status, and to determine the median family income by school (school socioeconomic status).[15]

The data set was reorganized using secondary data analysis procedures after it was initially analyzed and the results were synthesized into subsequent deductive research hypotheses. This second technique of data collection was used during both the second and third cycles of the project. Specific procedures involved the recoding of factors and the computation or creation of new variables for subsequent analyses of the data. Additionally, cases were weighted appropriate to their sample referent for use in inferential statistical population estimates.[16]

Operationalization. The factors used in this study were operationalized according to the coding system ruies outlined in Appendix B: Coding Manual. The variable category content and coding system (Appendix B) indicates the numerical values that were assigned to various scores, along with the data file column numbers each bit of information was stored in, for each factor. Generally these numerical codes were straightforward, but the nominal data occasionally utilized specific lists of category codes ("Coding Supplement" in Appendix B).

All raw Stanford Achievement Test (SAT) scores were converted to standardized z-scores utilizing national means and variances. This was done because the means and standard deviations of each subtest and test across grade levels and between classrooms or schools were not exactly the same. To compare test scores on each of these different distributions the scores had to be converted to comparable standard z-scores, which explained how many standard deviations a student scored above or below the mean, for all raw SAT subtest and test total scores:

$$z\text{-score} = \frac{\text{Raw Score} - \text{Mean}}{\text{Standard Deviation}}$$

As a standardized score, the z-score has been designed to have a mean value of 0.00, which has been defined as "normal," and has tended to range from a high of +3.00 (or the 99th percentile) to a low of -3.00 (or the 1st percentile). Negative numbers indicated scores below the mean, while positive scores were above the mean. Thus, standard z-scores were more powerful statistically because they were derived from the properties of the normal probability curve and they preserved the absolute differences between scores, which allowed for the calculation of averages and correlations that were then directly comparable. Moreover, by using national means and standard deviations, the scores could also have been compared to scores from other parts of the country that were nationally standardized.

Subject grades were also converted to a standard coding system for comparability, because two different grading systems were employed by teachers in the Washoe County School District: (1) the traditional grades of A, B, C, D, and F (with pluses and minuses); and (2) the less conventional, but frequently used, system of outstanding (O), satisfactory (S), and improvement needed (I) (also with pluses and minuses). In order to standardize the grading systems, several assumptions were made concerning the latter grading system. First of all, it was assumed that satisfactory (S) was the same as the letter grade C (or doing average work). Secondly, it was assumed that outstanding (O) was the same as the letter grade A (or doing superior work), and that improvement needed (I) meant the same as the letter grade F (failing). The third assumption concerned the use of pluses and minuses in conjunction with the grades O, S, and I. It seemed reasonable to assume that O- meant the same thing as B+; that S+ meant the same thing as B-; and so forth. As a result, grades were standardized using the system provided in Table 5.

As the Washoe County School District does not calculate grade point averages (GPAs) for elementary school students, such variables had to be created, which was done by computing the mean grade for the arithmetic, language, reading, science/health, and social studies grades. Additionally, a cumulative grade point average (variable) was calculated on the bases of the 1982-83 and 1983-84 grades.

Tables 6, 7, 8, and 9 list the specific items of information collected and used in this study. Table 6 identifies the manipulable and non-manipulable factors of student achievement; Table 7 contains the manipulable and non-manipulable measures of teacher evaluation patterns; Table 8 presents the manipulable and non-manipulable personal and parental background characteristics; and Table 9 lists the manipulable and non-manipulable school environment and learning context categories.

Dependent variables. The dependent variables were measured by the 82 Stanford Achievement Test, Form E, which had different battery versions for each grade level:

Grade Level	Version
1	Primary 1
2	Primary 2
3	Primary 3
4	Intermediate 1
5	Intermediate 1
6	Intermediate 2

Table 5. Grade Standardization System

System 1[a]	System 2[b]	Standardized Score[c]
A+, A	O, O+	4.00
A-		3.60
B+	O-	3.40
B		3.00
B-	S+	2.60
C+		2.40
C	S	2.00
C-		1.60
D+	S-	1.40
D		1.00
D-	I+	0.60
F+		0.40
F, F-	I, I-	0.00

[a]--System 1 refers to traditional letter grading: A = superior; B = Above Average; C = Average; D = Passing, Below Average; F = Failing.

[b]--System 2 refers to less traditional grading: O = Outstanding; S = Satisfactory; I = Improvement Needed.

[c]--Values are those used by many colleges and high schools.

Table 6. Student Achievements

Manipulable	Non-Manipulable
Arithmetic Grade*	Achievement Test Scores
Handwriting Grade*	Days Not Enrolled
Language Grade*	
Reading Grade*	
Science/Health Grade*	
Social Studies Grade*	
Spelling Grade*	
Art Grade*	
Music Grade*	
Achievement Test Form	
Days Present*	
Days Absent*	
GPA*	
Times Tardy*	
English Grades*	
Math Grades*	
Reading Grades*	
Spelling Grades*	
Science/Health Grades*	
Social Studies Grades*	
Handwriting Grades*	
Art Grades*	
Music Grades*	

*--Also occur simultaneously with or after achievement tests.

Table 7. Patterns of Teacher Evaluations

Manipulable	Non-Manipulable
Upward Grading Averaging Bias*	Teacher Code
Special Education Code	
Citizenship Grade*	
(Was Student Retained)	
(Number of Times Retained)	
U.G.A.B. of Citizenship Grade*	
Work Habits*	
Social Habits*	
Courses Needing Improvement*	
Gifted Program	
English as a Second Language Program	

*--Also occur simultaneously with or after achievement tests.

Table 8. Personal and Parental Background Characteristics

Manipulable	Non-Manipulable
	Personal
Emergency Contact Person	Sex
Emergency Contact Phone Number	Residence
506 Form	Birthdate
	Birthplace
	Previous W.C.S.D. Attendance
	Racial Ethnic Group
	Last School Attended
	Transfers (Total)*
	Transfers (1983-84)*
	Months in District
	Who is Native American
	Nationality
	National Status
	Attended Preschool
	Type of Preschool
	Number of Years in Preschool
	Telephone Number
	Parental
	Personal Median Family Income
	Free/Reduced Fare Meal
	Father Living
	Father's Status
	Father's Occupation
	Father's Employment Location
	Mother Living
	Mother's Status
	Mother's Occupation
	Mother's Employment Location
	Parents Absent
	Parents Employed
	Father's Birthplace
	Mother's Birthplace

*--Also occur simultaneously with or after achievement tests.

Table 9. School Environment and Learning Context Characteristics

Manipulable	Non-Manipulable
	Grade Level
School	
Grid	
Enrollment of School*	
School's Library Characteristics*	
Number of Students by Grade*	
Number of Teachers by Grade*	
Number of Aides/Assistants by Grade*	
Special Education Students by Grade*	
ESL Students by Grade*	
Number of Library Resource Teachers*	
Number of Federal Employees*	
Number of Counselors*	
Total Staff*	
	Age of School*
Number of Improvements in School*	
Number of Classrooms in School*	
Total Square Footage of School*	
School's Site Acreage Size*	
Total Cost of School Construction*	

*--Also occur simultaneously with or after achievement tests.

The specific subtests and tests for each battery are shown in Table 10. As can be seen from the table, not all subtests and tests were given to all grade levels.

Two particularly ambiguous domains were science and mathematics. Separate subtests for math computation and application were given at all grade levels except first grade, where a combined subtest included both computation and application. Methodologically and theoretically it was impossible to determine how to handle these subtests correctly, consequently the decision was made to exclude these subtests. In reference to the science domain, the subtest given to first and second grade students was labeled environment rather than science, which was the label given to the test given to the other grade levels. These two subtests were technically different strands of the science domain, but were methodologically and theoretically assumed to have been measuring similar types of achievement (i.e., science). In this case, therefore, the subtests labeled environment and science were treated as the same domain for purposes of for both data collection and analysis.

Three other subtests (word reading, reading, language) and one test total (total language) were not used as dependent variables because they were not given to all grade levels being studied; nor were any parallel tests given. This was an interesting observation because a number of previous studies have purportedly utilized the language total test scores (i.e., verbal scores). The using information test was not included in this study for several reasons:

Table 10. Stanford Student Academic Achievement Subtests, Tests, and Battery Versions

	Battery Version			
Domain	Primary 1	Primary 2	Primary 3	Intermediate 1 & 2
READING	Word Study Skills	Word Study Skills	Word Study Skills	Word Study Skills
	Word Reading	Word Reading		
	Reading Comprehension	Reading Comprehension	Reading Comprehension	Reading Comprehension
	Reading	Reading		
	Total Reading	Total Reading	Total Reading	Total Reading
LISTENING	Vocabulary	Vocabulary	Vocabulary	Vocabulary
	Listening Comprehension	Listening Comprehension	Listening Comprehension	Listening Comprehension
	Total Listening	Total Listening	Total Listening	Total Listening
LANGUAGE	Spelling	Spelling	Spelling	Spelling
			Language	Language
			Total Language	Total Language
MATHEMATICS	Concepts of Number	Concepts of Number	Concept of Number	Concept of Number
		Math Computation	Math Computation	Math Computation
		Math Application	Math Application	Application
	Computation & Application			
	Total Math	Total Math	Total Math	Total Math
SCIENCE & SOCIAL SCIENCE (ENVIRONMENT)	Environment	Environment		
			Social Science	Social Science
			Science	Science
USING INFORMATION			Using Information	Using Information

(1) the test was only available for grades three through six; and (2) the test was not given to all students in those grades. As a result, ten dependent variables were used in this study:

Subtest Name	Test Name	Variable Name	Domain
Word Study Skills		ZSKLS	Reading
Reading Comprehension		ZREAD	Reading
	Total Reading	ZREADT	Reading
Vocabulary		ZVOC	Listening
Listening Comprehension		ZLIST	Listening
	Total Listening	ZAUDIT	Listening
Spelling		ZSPELL	Language
Concepts of Numbers		ZMATH	Mathematics
	Total Math	ZMATHT	Mathematics
Environment		ZSCIENCE	Science
Science		ZSCIENCE	Science

Indians and non-Indians.[17] Since there was tremendous variance in the definitions for the terms Indian and non-Indian, clarification on how these were used is necessary. Conceptually the terms were interpreted to be broad sociocultural ideas similar in nature to European and non-European. Specifically this meant that the terms were not used in this study as biological constructs. They were used instead as overgeneralized ethnic realities. How does one define overgeneralized ethnic realities like European or Indian?

First of all, unlike most other appellations, a distinction between American Indians and India Indians was necessary. As such, this study assumed Indians meant American Indians. Secondly, and again unlike other terms like European, the term Indian has had a multitude of legal definitions that often contradict each other. More importantly, these legal definitions have usually combined both ethnic and biological meanings, thus converting the term into a racial appellation. Indeed, for most people Indian has been a racial rather than ethnic term, while European has been an ethnic identification.

European has been used to refer to someone who belonged to one of the many unique or confederated cultures in Europe. Simply replacing European with Indian, the term (American) Indian would then be used to refer to someone who belonged to one of the many unique or confederated cultures in America. Indian was, therefore, conceptually defined in this study as a referring to students who belonged to one of the more than one hundred different cultures historically and contemporaneously found in America. Non-Indian was similarly defined as referring to all students in this study who did not belong to one of the identified Indian cultures.

Indian and non-Indian were operationally defined as follows. In filling out their school enrollment forms all students had to self-identify themselves into one of five "racial ethnic group" categories used by the Washoe County School District: (1) American Indian-Alaskan Native; (2) Asian or Pacific Islander; (3) Black not Hispanic; (4) White not Hispanic; or (5) Hispanic. As mentioned above, this type of measurement was not very reliable because students often fit into more than one category. Despite this problem, all students were coded into the category they had identified, unless it was demonstrated that the data were incorrect. All students self-identified as Indian were verified before being coded as such.

Thus, for purposes of this study all students self-identified as American Indian/Alaskan Native were operationally defined as Indian. All other students were operationally defined as non-Indians.[18]

Data Analysis Methods

Each research cycle involved different data analysis techniques and procedures, although those methods employed in the first cycles were prerequisites for subsequent cycles.

Controlling for school enrollment differences. Due to a number of circumstances, schools and the corresponding student enrollments were considerably different enough that statistical differences would be expected through such differences alone. All school factors, therefore, were divided by that school's enrollment to obtain per student ratios for purposes of data analyses. For example, the number of classrooms or library books per student enrolled were used for the data analysis procedures, rather than just the (raw) number of classrooms or library books in the school attended by the student. Thus, controlling for enrollment size eliminated the chance of artificial differences between Indian and non-Indian students simply because they attended different sized schools.

Techniques and processual sets of data analysis. Data analysis was performed using the SPSS^X (Statistical Package for the Social Sciences Mainframe version) software on the University of Montana computer system. Four sets of procedures were employed during the project. The first set of procedures (see Figure 2) involved the following techniques to identify and describe patterns about the research samples:

Frequencies: descriptive tables of values and the corresponding number of cases and percentages for those values for each variable or factor.

Histograms: descriptive, graphic representation of the frequencies involved with each variable.

Univariate Statistics: descriptive statistical calculations of the mean, median, mode, standard deviation,variance, skewedness, kurtosis, sum, range, maximum, and minimum.

The second set of procedures involved the following techniques to test the initial research hypotheses that differences between Indian and non-Indian students existed:

Cross-tabulations: to compare joint distribution of Indian and non-Indian samples with the nominal and ordinal or categorical data. Chi-square (X^2) tests of association (along with other bivariate statistics) indicated the significance of observed distributions. This determined if observed distributions were due to chance or dependent upon whether students were Indian or non-Indian (i.e., ethnicity), and hence statistically significant. On a number of the school environment and learning context variables the data were markedly skewed. As such these interval data could not be tested using the t-test, as discussed below. Instead, the Median Test for a difference between two medians, which is essentially a simple chi-square, was made for these factors.

T-Tests: to compare sample means of interval or variable data by calculating students' t and testing the significance of the difference between the means. This determined if Indian and non-Indian differences were statistically significant.

Upon completing these two sets of data analysis procedures, conclusions concerning the results were made. As part of the second research cycle in this study (see Figure 3), a third set of data analysis procedures was employed, following secondary data analysis or reorganization procedures, to inductively identify classes of predictive factors of academic achievement test scores, so as to develop a model or models for further hypothesis testing:

Correlations: to test the association or relationship between two variables. Both simple and partial correlations (the relationship between two factors holding other relevant variables constant) were made.

Stepwise Regressions: to test the effects of variables on the dependent variable, isolating and simultaneously analyzing the strongest group of factors that independently predict the dependent variable. The stepwise function causes the most powerful predictor to be selected first.

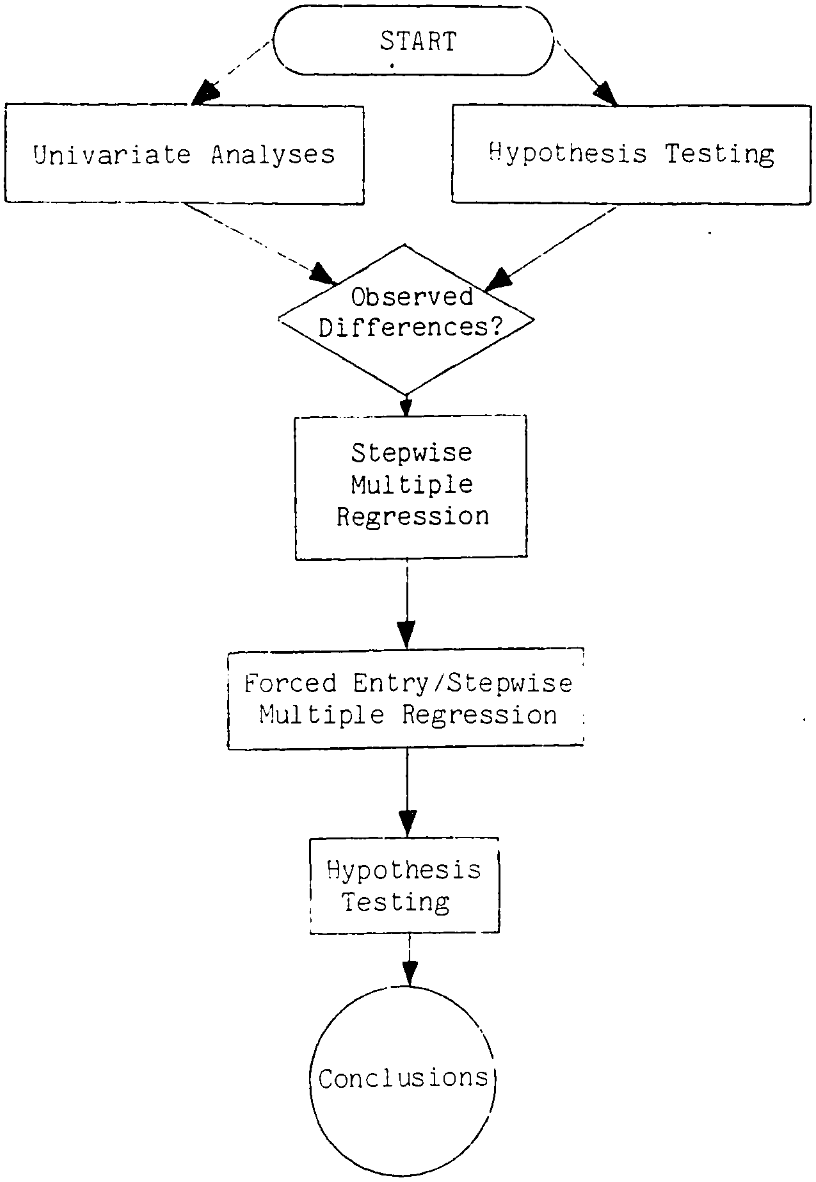
The fourth set of data analysis procedures was employed during the third research cycle (see Figure 4). The purpose of these analyses was to test hypotheses concerning differences in predictor models for Indian students, for each grade level in the population, and at each grade level for Indian students. Additionally, analyses were made to determine statistical differences between the population and Indian students both in terms of manipulable and non-manipulable factors, and in terms of the four types of factors (see Tables 6 through 9). The following techniques were employed during this phase of the research project:

Stepwise and Forced Entry Regressions: to test to see what variables from the predictor pool, when forced into the operation, were found to be significant predictors for achievement test scores. Analyses were done for the district, for Indian students, for the district by each grade level, and for Indian students by each grade level.

Binomial Test, Fisher's Exact Test, *t*-test and Chi- Square: to test explanatory accountability and percentages of predictors explaining population and Indian academic achievement.

Figures 2, 3, 4, and 5 include the analytic processes of this research project as discussed here, while Figure 6 presents the sequential flow of the data analysis techniques encompassed in this study.

Figure 6. Flow of Data Analysis



CHAPTER 3

COMPARATIVE CHARACTERISTICS OF ACADEMIC ACHIEVEMENT IN THE WASHOE COUNTY SCHOOL DISTRICT

The objectives of this study were to: (1) describe characteristics of elementary education in the population and to determine if Indian students were academically less successful than non-Indian students; (2) discover antecedent factors that accounted for observed variance in academic success; (3) compare Indian student and grade level models with population models of academic achievement; and (4) assess whether such antecedent predictors were manipulable by the school system. As indicated in Chapter 2, this study began with a synthesis of the literature, posing a number of questions and hypotheses about Indian and non-Indian education in the Washoe County School District. Since answers to some questions relied upon answers to other proceeding questions, the research was conducted through four cumulative cycles.

Each of the four cycles of research in this study concerned one of the objectives. That is, the first cycle of research, which consisted of two simultaneous sets of processes, provided empirical evidence concerning the first objective. The conclusions of these two sets of research processes in the first cycle provided the beginning stage for the second cycle of research that focused on the objective of developing a predictive model (or models) of academic success in the Washoe County School District. These inductively created models of academic achievement, in turn, became the first stage of the third cycle of the research processes to test for differences between the population and Indian students and at each grade level in the predictor models, along with assessing whether such predictive factors were manipulable by the Washoe County School District. The fourth cycle of research was to build upon the conclusions of the previous three research cycles, as well as other research, to synthesize a theory about Indian education (or education in general).

The results of the first cycle of this research project are reported in this chapter, while the results of the other research cycles will be presented in succeeding chapters. Specifically, this chapter was concerned with the following research questions:

1. What student characteristics are related to education?
2. Do Indian students differ from other students?

This chapter also dealt with the following research hypotheses, which were synthesized from the literature, and that were concerned with these two research questions:

H_1: Standardized achievement test scores for Indian students are significantly lower than test scores for non-Indian students in the Washoe County School District.

H_2: Class grades, attendance, and other measures of previous achievement are significantly different for Indian and non-Indian students in the Washoe County School District.

H_3: Teacher evaluations are different for Indian and non-Indian students in the Washoe County School District.

H_4: Personal and familial background characteristics are significantly different for Indian and non-Indian students in the Washoe County School District.

H_5: School environment and learning context variables are different for Indian and non-Indian students in the Washoe County School District.

Data Analysis Processes

Data collection was accomplished as discussed in Chapter 2, after which the data were coded by an assistant using the code book found in Appendix B, and then entered onto the mainframe computer by a professional data entry person. All data entries were verified by both the data entry person and the researcher. All subsequent editing was done by the researcher. Data were initially entered into two separate files, one for information on individual students and the other for data on each of the schools. There were ninety-eight variables for which data were entered in the student file and ninety variables in the school file. Systems files for conducting statistical analyses were set up using the Statistical Packages for the Social Sciences software (SPSS^X). As part of these systems files, thirty-nine new variables were created for the student data systems file, and four new variables for the school data systems file.

Computer commands were also included in the student data systems file to exclude cases. Specifically, all preschool, kindergarten, and seventh and eighth grade students were left out of the systems file. Additionally, students identified as either special education or

English as a Second Language (ESL), and those who had moved into/out of the district after the administration of the Stanford Achievement Exams, were eliminated from the student data systems file.

Once these two systems files had been established, a merged systems file was created by matching the school data appropriate to each case in the student data file, which resulted in a combined file consisting of 230 variables and 669 cases.[19] Of the 230 variables, 81 variables were not used for the following reasons:

1. 59 variables had been recoded/computed into new variables;
2. 8 variables were used for administrative purposes only;
3. 4 variables were used to exclude or control for specific characteristics (i.e., special education, ESL, moved into/out of the district, did not previously attend);
4. 7 variables had too many cases with missing data to be appropriately used; and
5. 3 variables had no variance (i.e., all elementary schools were found to have <u>no</u> microfilms, microfiches, or newspaper subscriptions).

This left a combined systems file of 149 variables, which are listed in Appendix C.[20]

Procedure files were set up for data analyses of the combined systems file. As part of the procedure files, a command was included to select only those students who had class grades for both the 1982-83 and 1983-84 school years, which reduced the data file case size to the delimited study sample of 459 students. Another command categorized the students into two groups, Indian and non-Indian.

Three separate procedure files were used during this cycle of the study. The first procedure file utilized the frequencies package of

SPSS^X. This analysis used the combined systems file and calculated frequency distributions for each of the selected variables along with univariate statistics and histograms of the data distributions. A summary of the univariate statistics (mean, mode, median, range, and sample size) for both the overall sample and Indian students only is presented in Appendix D. The frequencies procedure file was utilized four times, once each for the weighted population, the total sample, Indian students only, and non-Indian students only.

The other two procedure files were used to test the research hypotheses of this research cycle. One file employed the crosstabulations package and the other used the t-test package of SPSS^X. Selection of which file or statistic to use was based upon standard criteria. The t-test required that the data be randomly sampled, involve interval or ratio scale measurements, be taken from a normally distributed population, and have approximately equal variances. The chi-square test, which was part of the crosstabulations package, was used whenever a measure did not meet these criteria. Of the 139 independent variables used in this study (see Appendix D), 112 involved interval data, 24 had nominal data, and 3 had ordinal data. In the case of these latter variables the Median Test chi-square statistic was employed to test whether it was probable that the two groups, Indians and non-Indians, were drawn from populations with the same median. The Median Test chi-square was calculated by hand by using the population median as the point at which to divide the Indian and non-Indian student distribution frequencies on the involved variables into two groups, one less than or equal to the population median and the other greater than the population median. These frequencies were then entered into crosstabulation tables and the chi-square was computed (Isaac and Michael, 1985:179).

The inferential t-test statistic was used to determine whether differences between the means could have been expected by chance. Phrased differently, the t-test answered the question of whether the samples could have been drawn from a population in which the means for the two groups were identical. The chi-square test, also an inferential statistic, was used with the crosstabulation tables to determine if the observed relationships in the table were statistically significant. That is, chi-square answered the question of whether it was likely that the sample was drawn from a population in which the variables were related or if the differences exist simply because of chance alone. The Median Test chi-square statistic was used to test the difference between the two medians. Both statistics actually tested the null hypothesis rather than the alternative hypothesis. The null hypothesis for the t-test stated that there was no difference between the means of the two groups; and the null hypothesis for the chi-square test stated that there was no difference between the distributions obtained from the two groups on each item. Rejection of these null hypotheses was based upon the predetermined level of significance or the accepted level of alpha error (i.e., $p < .05$), and would have indicated that the alternative hypotheses were probably true and not due to random chance or sampling errors. The results of these hypothesis tests are reported below as they relate to the dependent variables and the independent background, achievement, evaluation, and school environment and learning context variables.

Comparison of Student Achievement Test Scores

The Stanford Achievement Tests (SATs) were administered to students at all schools in the district during the week of April 2, 1984. Scores were reported on official SAT forms along with local and national norms, and were accessible to teachers by early June (before school ended for the summer). Copies of these forms were made and data were then entered onto collection inventories or forms. Scores were reported in three formats: raw scores, grade equivalent scores, and percentiles. Generally speaking, teachers relied upon the grade equivalent scores, although some referred to the percentiles, but the norms were seldom used, if even looked at. There was no district policy concerning who was or was not to take the exams; indeed there was little consistency at either the school or classroom level. Hence it was important to first determine how many of the students in the study had taken part or all of the exams. Table 11 provides the frequencies and percentages of Indian and non-Indian students who did or did not take the SATs. Out of the 459 students, only 2.8% (n = 13) did not take part or all of the tests. Although more Indian than non-Indian students took the SATs, these differences were not found to be statistically significant.

Table 11. Differences Between Indians and Non-Indians Taking the Stanford Achievement Tests (SAT)

Took Exams (SAT)	Indian Students	Non-Indian Students	Sample Totals
Yes	197 (98.0%)	249 (96.5%)	446 (97.2%)
No	4 (2.0%)	9 (3.5%)	13 (2.8%)
Totals	201 (100.0%)	258 (100.0%)	459 (100.0%)

$\chi^2 = .458$ p = n.s.

Indian and Non-Indian Differences

As discussed in Chapter 2 the dependent variables were limited to ten subtests and tests, which were comparable across battery versions or grade levels. The mean scores for Indian students, their non-Indian classmates, and the total weighted sample or population for each of the ten measurements of academic achievement are presented in Table 12. Statistical comparisons between Indian and non-Indian students' standardized (z-score) SAT scores are also presented in the table. Tests for mean differences (t-ratio) indicated that Indian students were achieving significantly lower than non-Indian students in all ten dependent variables of academic achievement.

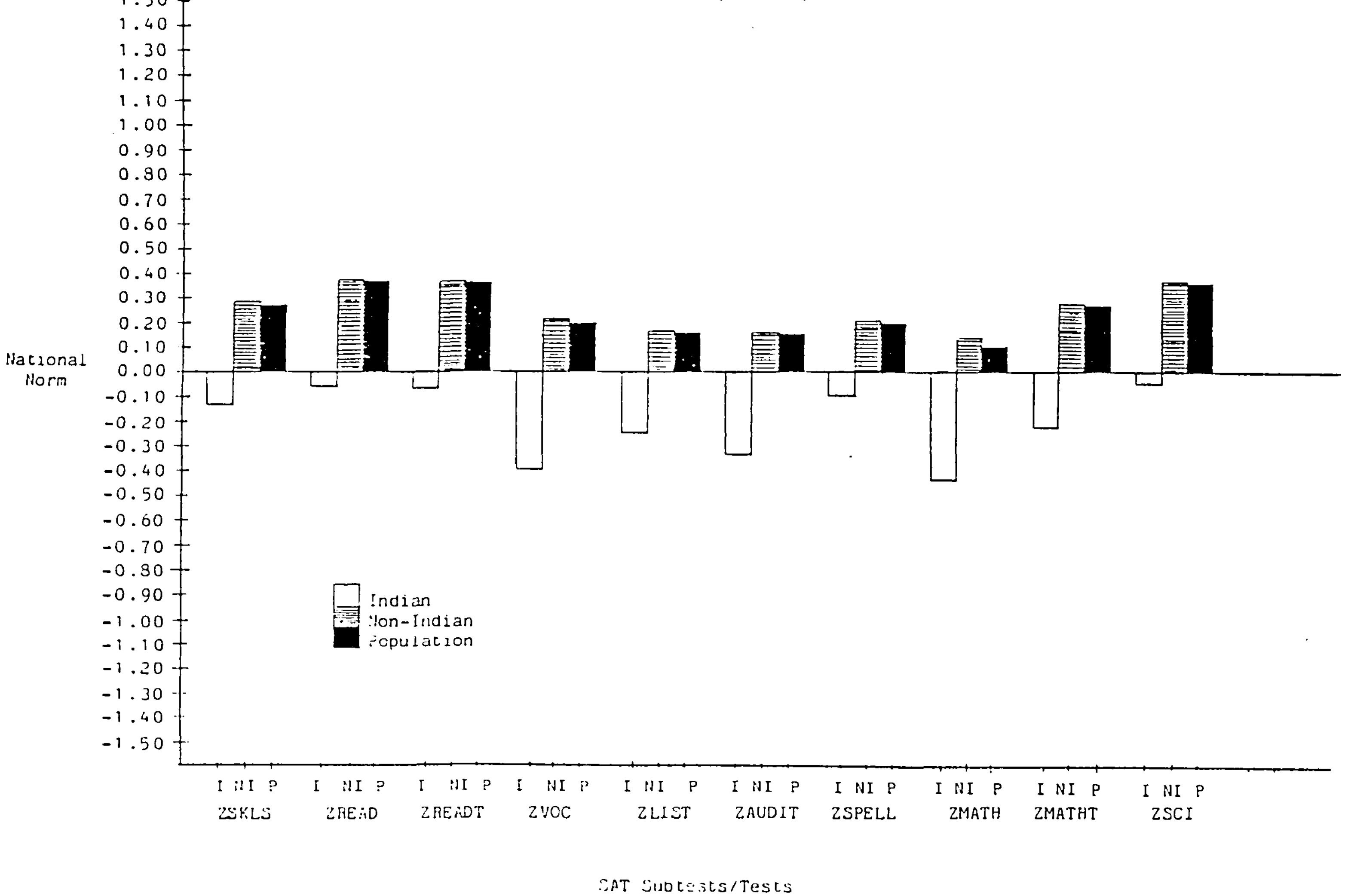
For ease of interpretation, Figure 7 shows the mean test scores on each of the dependent variables for the population (or weighted sample), Indian students, and non-Indian students. Indian students' mean scores were all consistently below the norm, while those of their classmates were consistently above it. The population mean scores, as would be expected, were all very close to the mean scores for the non-Indian students. The greatest difference between Indian and non-Indian students was unquestionably for the vocabulary knowledge subtest. Indian students were over a third of a deviation below the national norm and over one-half of a deviation below non-Indians and the Washoe County School District mean. The results also indicated that Indian and non-Indian academic achievement differences were smallest for the spelling test. Equally important, it was found that while Indian students' test scores were consistently below the

Table 12. Mean Comparisons of Indian and Non-Indian Students For Standardized (Z-Score) Achievement Test (SAT) Scores

Variable Name	Indian Mean	Non-Indian Mean	Population Mean	t-ratio
Word Study Skills	-.12	.29	.28	4.89***
Reading Comprehension	-.06	.38	.37	5.93***
Reading Test Total	-.08	.37	.36	6.23***
Vocabulary Knowledge	-.39	.22	.20	7.29***
Listening Comprehension	-.24	.17	.16	4.92***
Auditory Test Total	-.33	.16	.15	5.58***
Spelling	-.09	.21	.20	3.44***
Math Concepts	-.43	.13	.11	6.54***
Math Test Total	-.22	.28	.27	5.94***
Science Knowledge	-.05	.37	.36	5.42***

***--p<.001

Figure 7. Mean SAT Scores for Indian Students (I), Non-Indian Students (NI), and Population (P)



national norm, in the test score differences for reading, spelling, and science such differences were negligible.

Indian students did best in science, spelling, reading comprehension, and the reading test total, and were weakest in math concepts, vocabulary, and auditory test total. Interestingly, non-Indian students also did their best in reading comprehension, science, and the reading test total, while scoring lowest in math concepts, auditory test total, and listening comprehension. While both Indian and non-Indian students did poorly in math concepts, Indian students clearly did even more poorly than their classmates. Among the tested areas Indian students were closest to their peers in spelling, with only a .30 z-score difference; but this was still significantly lower than their classmates.

These results from the tests for mean differences between Indian and non-Indian students provided evidence for the rejection of the null hypothesis, and the acceptance of the alternative hypothesis,

> H_1: Standardized achievement test scores for Indian students are significantly lower than test scores for non-Indian students in the Washoe County School District.

Moreover, Indian students' test scores were consistently below the national norm, but demonstrated a relatively consistent pattern with their classmates. That is, both Indian and non-Indian students tended to do poorly or well on the same subtest/test areas, although the non-Indian students were consistently higher than the Indian students.

Academic Achievement Comparisons by Grade Level

A major conclusion of the literature review in Chapter 1 was that Indian students had better achievement at certain grade levels than others. In 1965 Quirk found no statistical differences between Indian and non-Indian students by grade level in the Washoe County School District, but she did find that Indian students were doing better than non-Indian students in the fourth and seventh grades. Quirk nonetheless concluded that Indian achievement in the Washoe County School District became progressively worse through the grades. It would be interesting and theoretically relevant to compare academic achievement test scores for Indian and non-Indian students by grade level. Such analyses must include a reminder that these were panel and not true longitudinal data.

Table 13 presents the results of the mean comparisons of Indian and non-Indian SAT scores by grade level, while Figures 8 to 17 facilitate interpretation by graphically displaying the mean scores for Indian and non-Indian students by grade level for each of the ten dependent measures of academic achievement. It was observed from these analyses that Indian students were achieving consistently lower than non-Indian students, and, generally, significantly more so at the upper grade levels. From the figures and Table 13 several relatively consistent patterns were observed. First of all, Indian students' achievement scores across the grades tended to follow trends similar to non-Indian students' scores. Secondly, the gap between Indian and non-Indian students remained fairly constant until the 6th grade when

Table 13. Mean Comparisons of Indian and Non-Indian Stanford Achievement Test (SAT) Scores by Grade Level

Dependent Variable	Grade Level	Indian Mean	Non-Indian Mean	t-value
Word Study Skills	2	-.03	.16	.91
	3	-.37	.15	2.57**
	4	-.17	.40	2.90**
	5	-.18	.26	2.56**
	6	.15	.55	2.80**
Reading Comprehension	2	.01	.31	1.79
	3	.08	.44	2.30*
	4	-.01	.26	1.38
	5	-.23	.27	2.96**
	6	-.06	.65	4.72***
Reading Test Total	2	.02	.26	1.44
	3	-.10	.38	3.02**
	4	-.06	.37	2.28*
	5	-.23	.28	3.08**
	6	.02	.64	4.52***
Vocabulary Knowledge	2	-.54	.10	3.11**
	3	-.23	.26	2.54**
	4	-.37	.14	2.54**
	5	-.44	.21	3.89***
	6	-.35	.47	4.48***
Listening Comprehension	2	-.43	-.06	1.67
	3	-.05	.15	1.10
	4	-.18	.25	2.15*
	5	-.29	.19	2.91**
	6	-.26	.51	4.64***
Auditory Test Total	2	-.50	.08	2.61**
	3	-.15	.22	1.99*
	4	-.29	.20	2.41*
	5	-.38	.15	2.95**
	6	-.34	.24	2.45*

*--$p < .05$ **--$p < .01$ ***--$p < .001$

Table 13. (continued)

Dependent Variable	Grade Level	Indian Mean	Non-Indian Mean	t-value
Spelling	2	-.04	.08	.55
	3	-.09	.24	1.92
	4	.08	.21	.57
	5	-.25	.07	1.69
	6	-.15	.51	3.87***
Math Concepts	2	-.45	-.12	1.55
	3	-.30	.11	2.22*
	4	-.45	.08	2.42*
	5	-.51	.15	4.35***
	6	-.46	.56	4.81***
Math Test Total	2	-.33	-.01	1.45
	3	-.02	.36	2.36*
	4	-.11	.35	2.25*
	5	-.34	.27	3.54***
	6	-.32	.58	4.62***
Science Knowledge	2	-.42	-.05	1.80
	3	-.16	.42	3.50***
	4	.18	.42	1.45
	5	-.06	.51	3.43***
	6	.05	.70	4.09***

*--p<.05 **--p<.01 ***--p<.001

Figure 8. Mean Word Study Skills Scores
by Grade Level

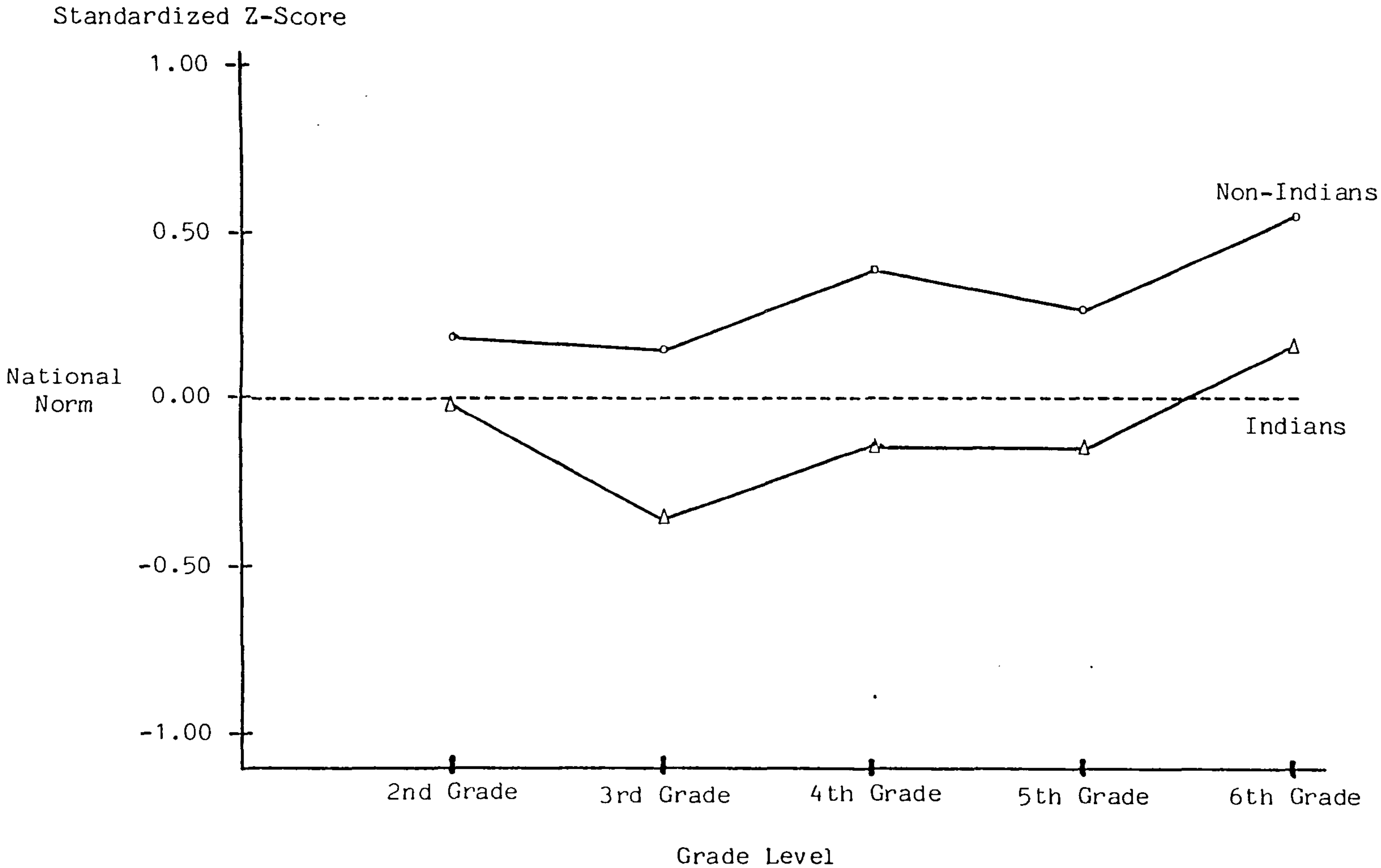


Figure 9. Mean Reading Comprehension Scores by Grade Level

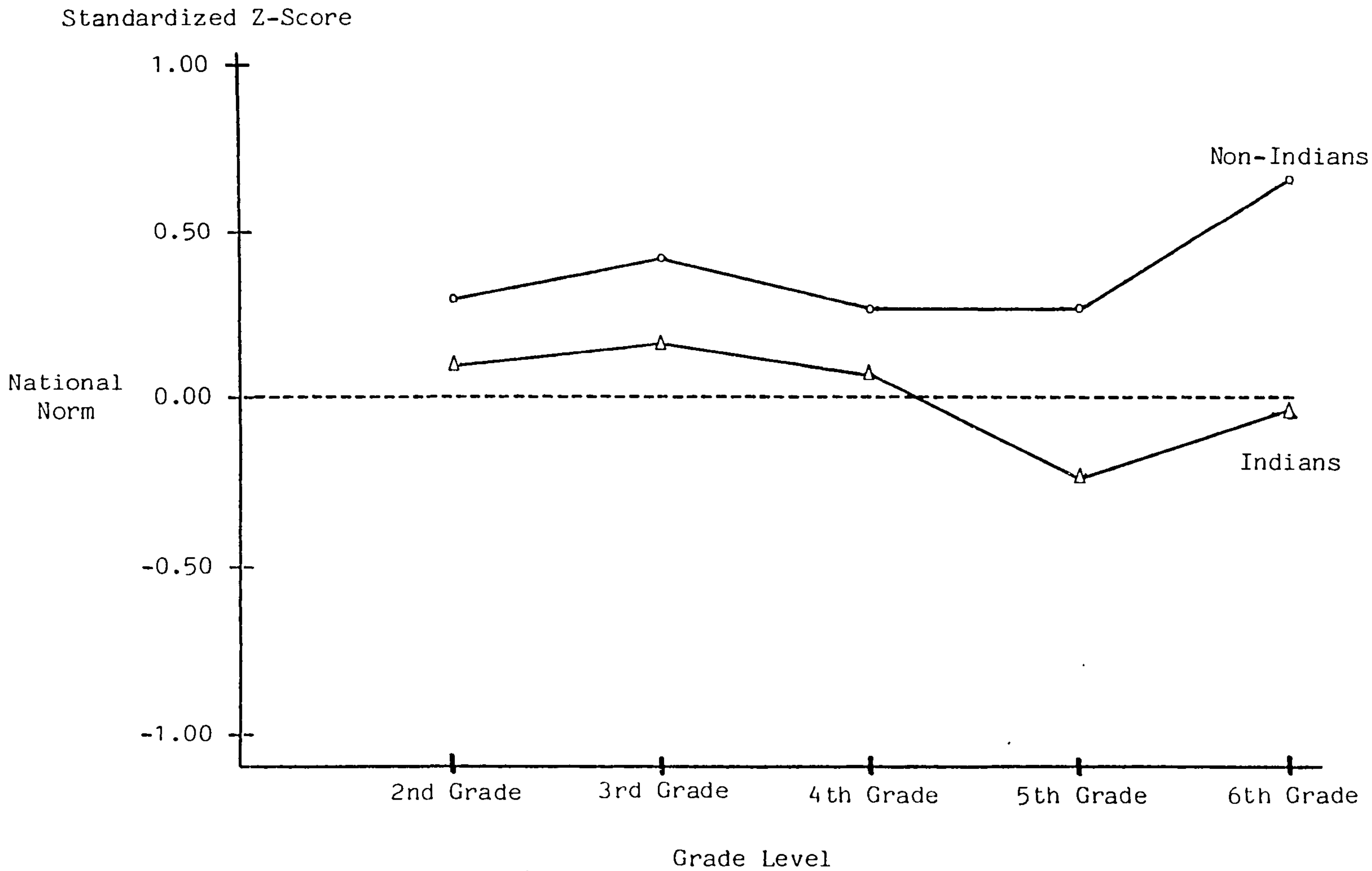


Figure 10. Reading Test Total Scores by Grade Level

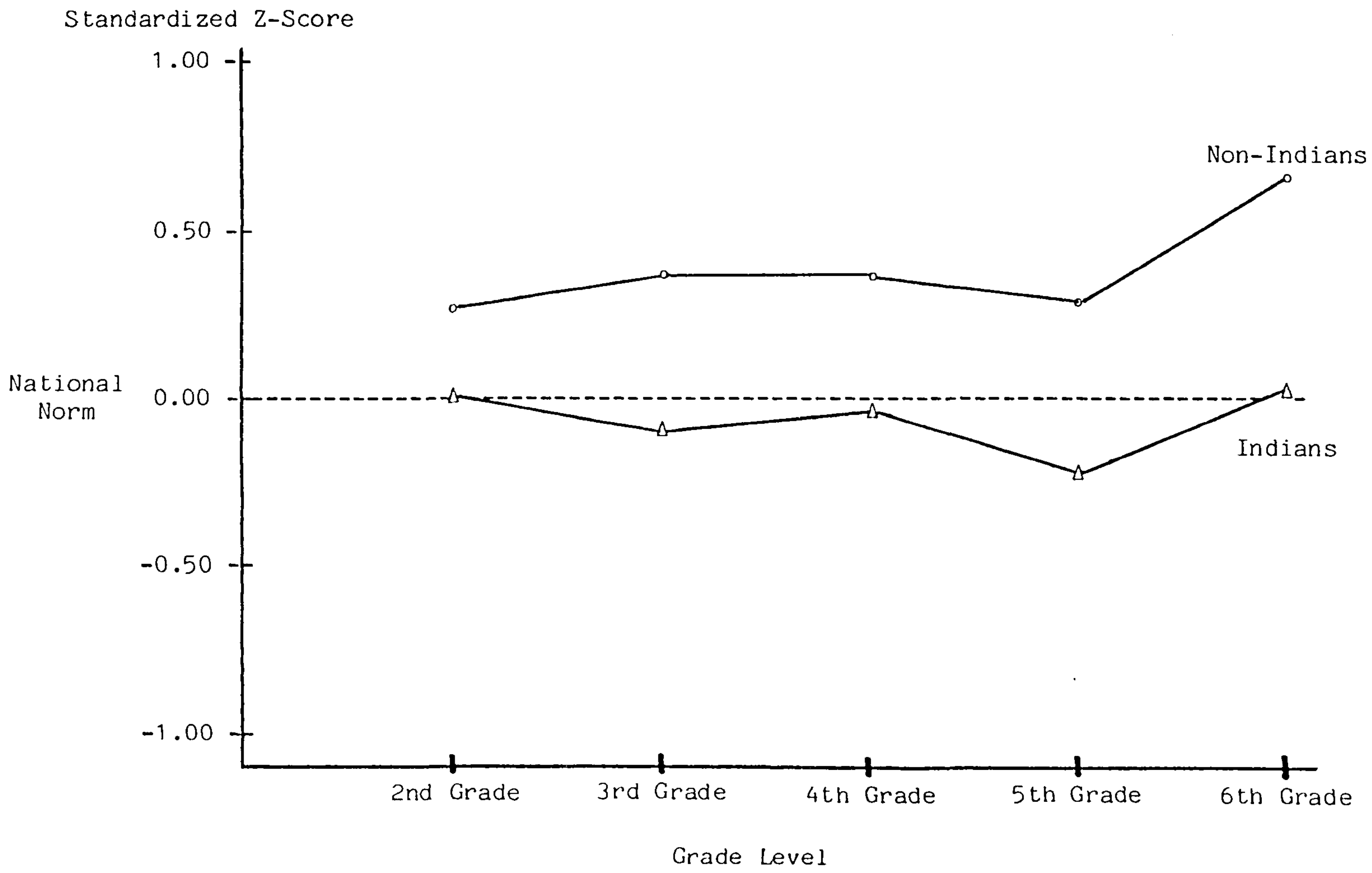


Figure 11. Mean Vocabulary Scores
by Grade Level

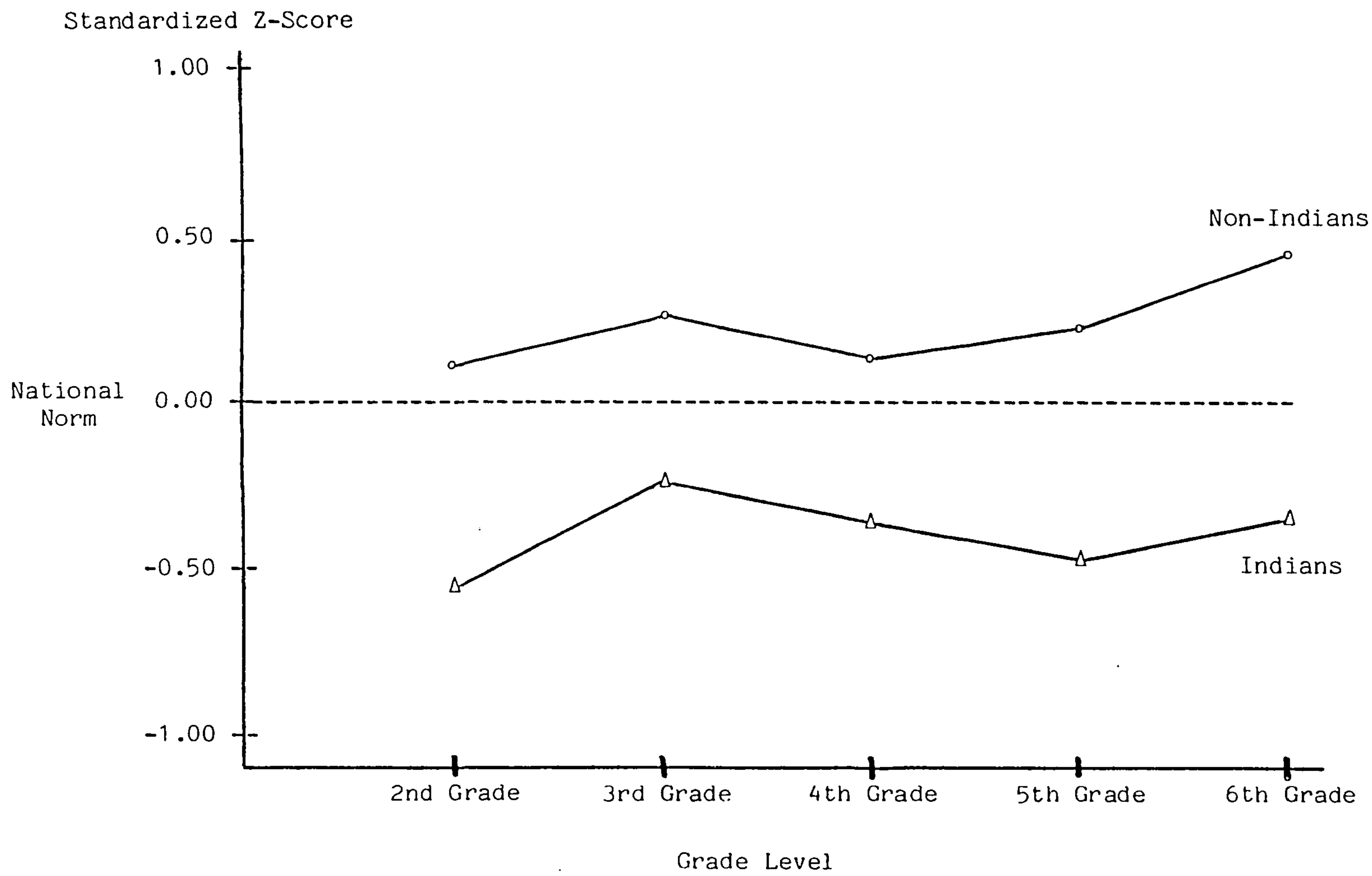


Figure 12. Mean Listening Comprehension Scores by Grade Level

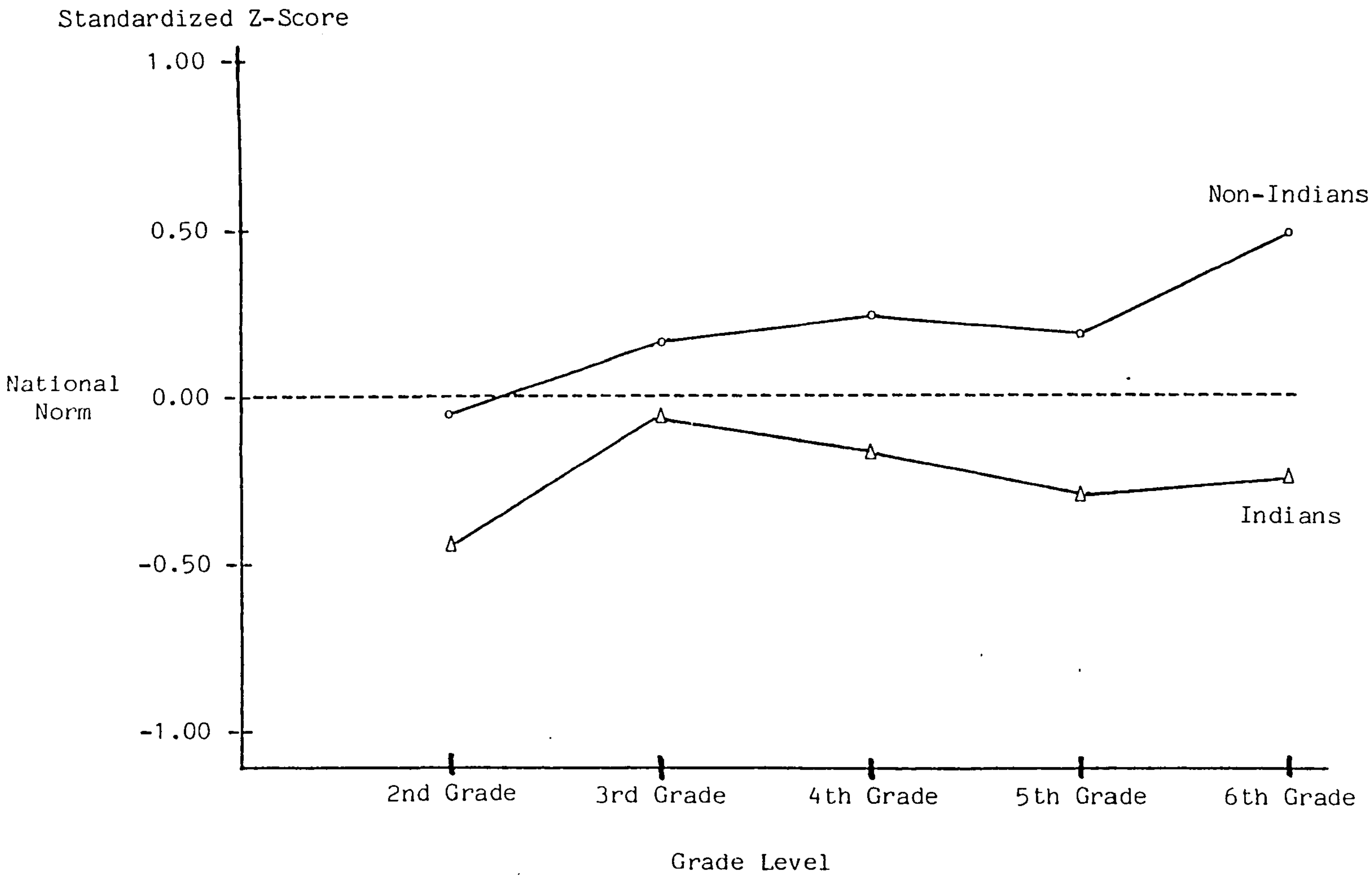


Figure 13. Mean Auditory Test Total Scores by Grade Level

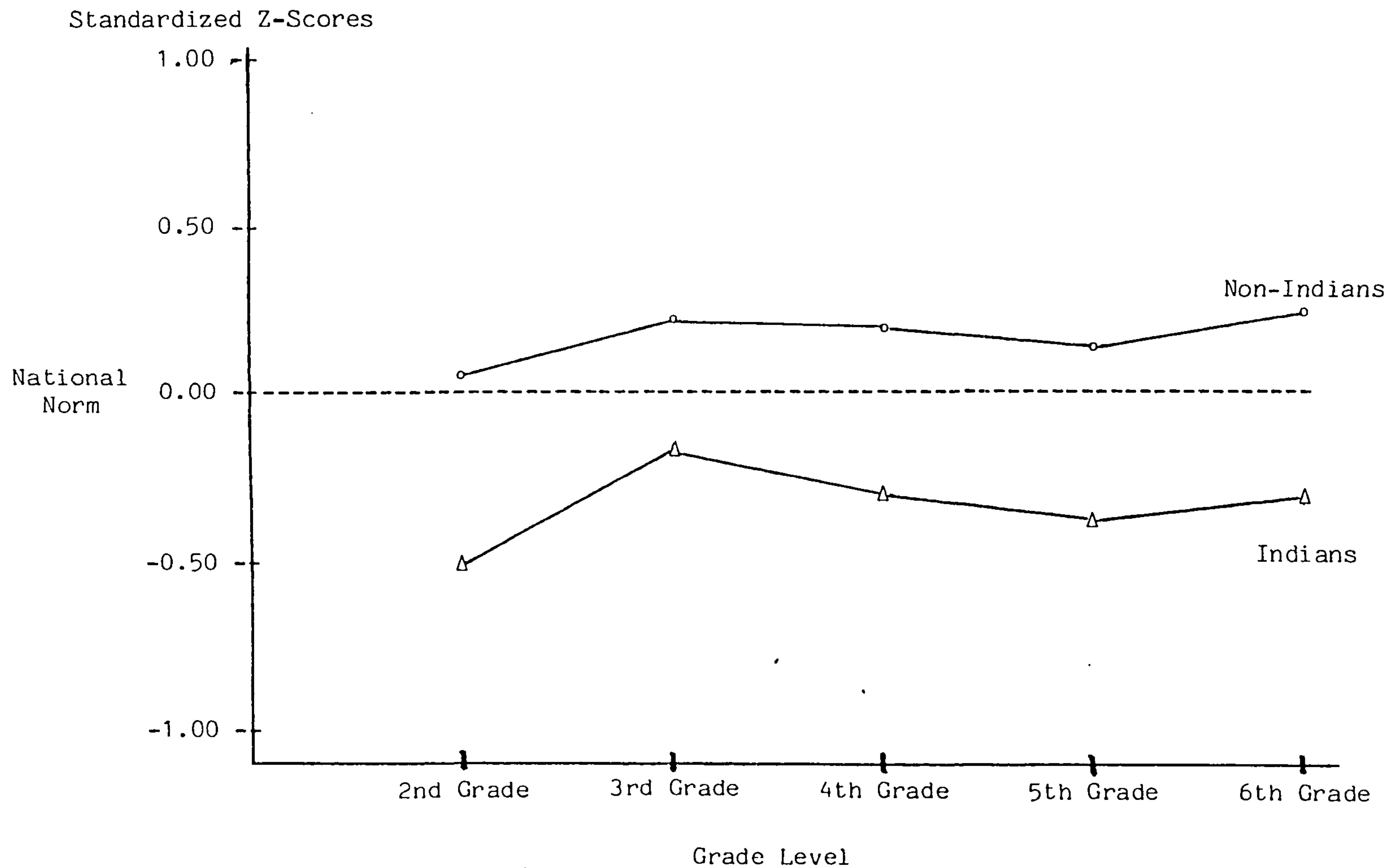


Figure 14. Mean Spelling Scores
by Grade Level

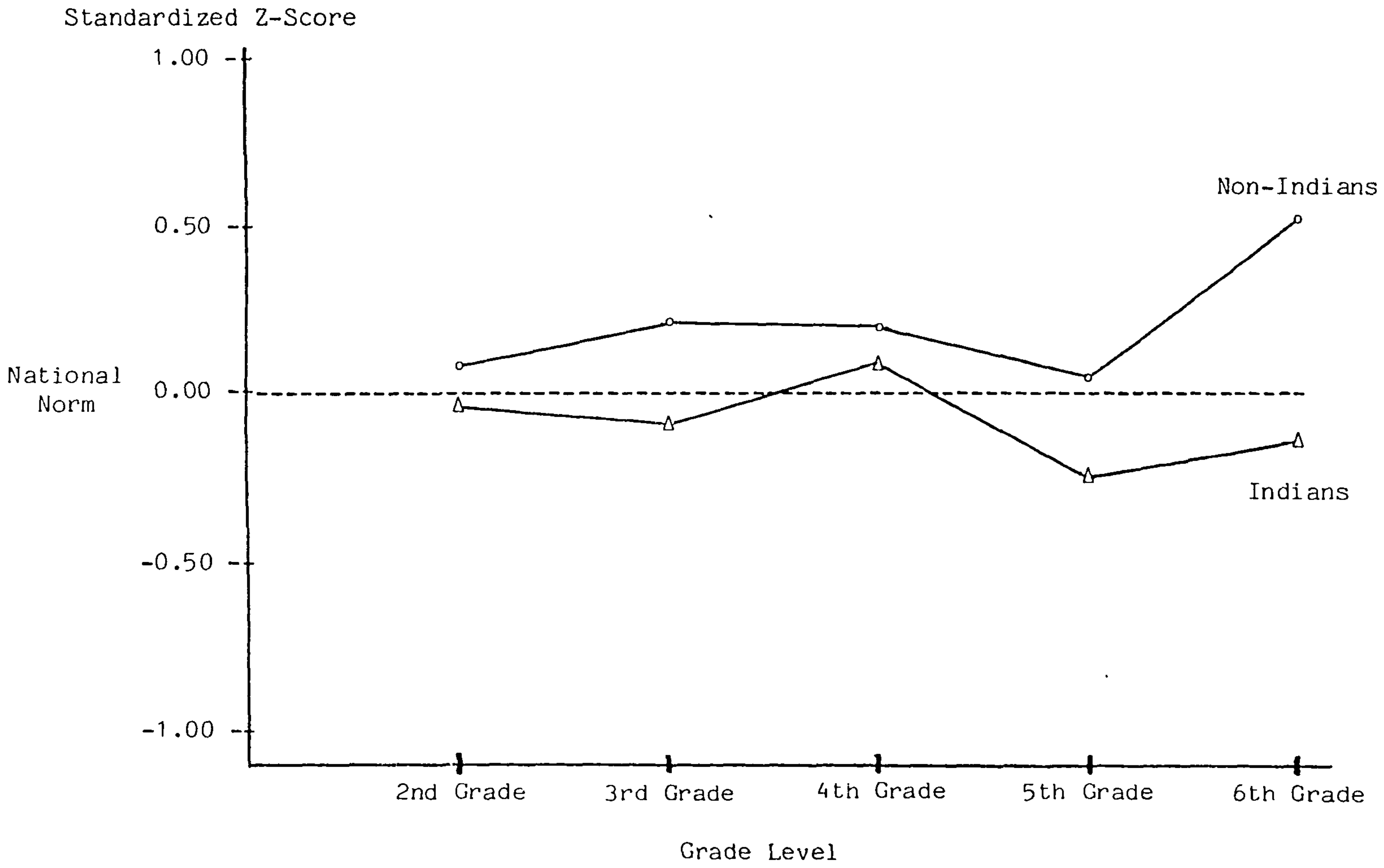


Figure 15. Mean Math Concepts Scores
by Grade Level

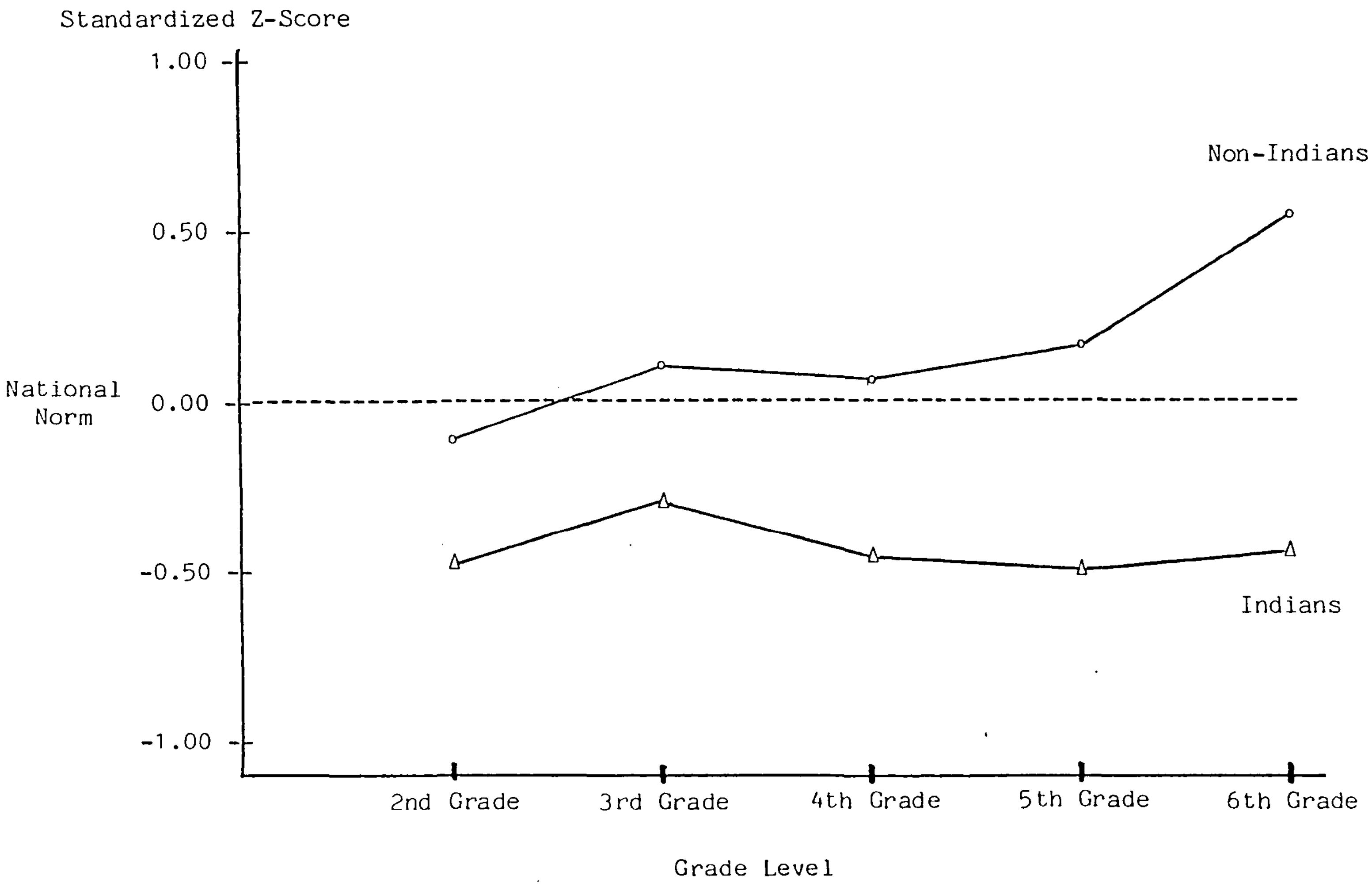


Figure 16. Mean Math Test Total Scores by Grade Level

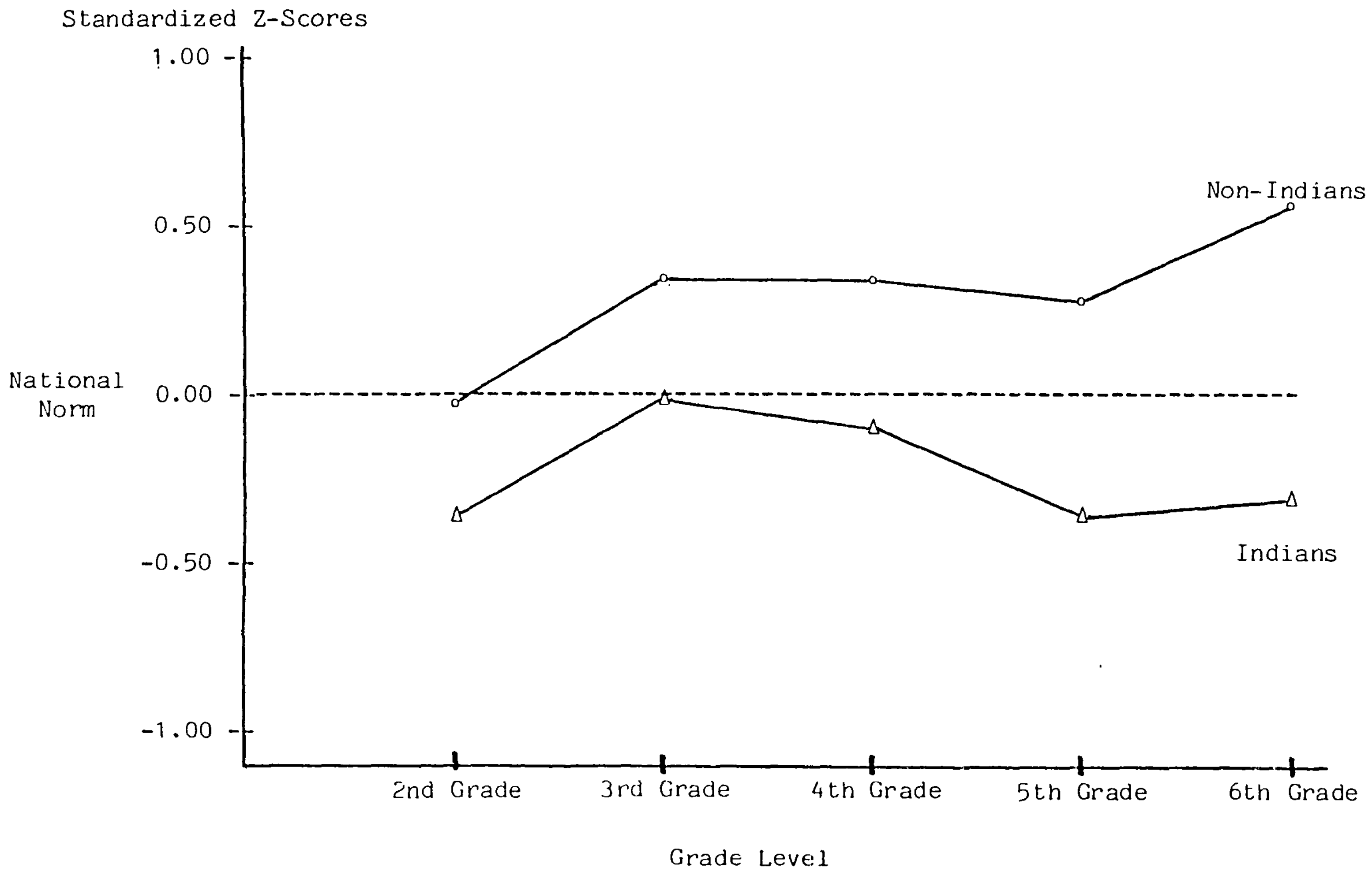
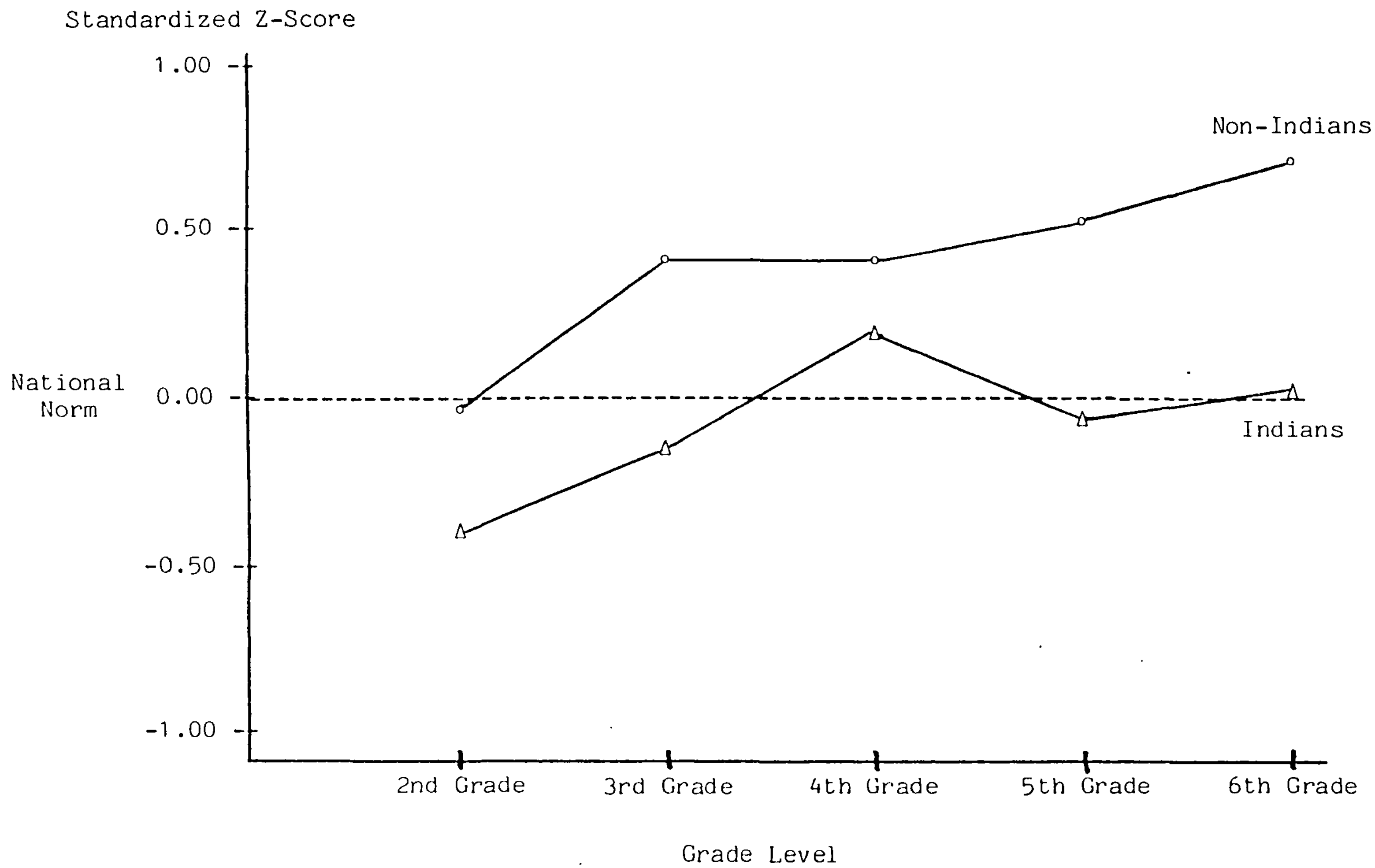


Figure 17. Mean Science Scores
by Grade Level



non-Indian achievement dramatically increased. It was noted that, except for the auditory test total scores, non-Indian sixth grade students were consistently achieving at least one-half a standard score (z >.50) above the national norms. Sixth grade Indian students' test scores were not, however, as consistent over test areas. For example, the mean word study skills score of z = .15 was slightly above the national norm and the reading test total mean of z = .02 was essentially at the national norm, but the math concepts mean of z = -.46 was considerably below the national norm. A third important pattern was that across the tests, and for both Indian and non-Indian students, the fifth grade somehow precipitated lower academic achievement.

In looking at just Indian students by grade level it was found that the third grade was usually the level at which they performed best. Interestingly, in spelling and science, which have often been found to be Indian students' strongest areas, Indian students did best at the fourth grade level instead. The results indicated that Indian students' spelling achievement dropped off after the fourth grade and was statistically significantly worse than non-Indian students' spelling achievement. This was particularly unexpected because most previous research had indicated that spelling was the one area Indian students did consistently well in. Indeed, the data analyses of the aggregate data in this study also suggested that Indian and non-Indian achievement in spelling were essentially equal. These results suggested that this was not totally accurate and that overall Indian students' spelling achievement was probably being misrepresented by their success in the 3rd and 4th grades.

Perhaps the most disturbing area of Indian student achievement found across grade levels was for reading comprehension. That is, reading comprehension was the only test area that really exhibited a negative learning regression line. Yet, even in this achievement area, Indian students were essentially achieving par with other students in the nation. Generally speaking, teachers appeared to have been doing their job for both Indian and non-Indian students, although some clearly were not. This result must be tempered, however, by the results discussed above and the statistical tests that demonstrated Indian students were academically significantly less successful than their non-Indian classmates. The results of this study also seemed to corroborate other research conclusions that Indian students were achieving fairly consistently until about the fourth grade, but that between the fourth and fifth grade Indian students appeared to almost give up rather than "plateau out."

Educational Characteristics of the Washoe County School District

In addition to data on academic achievement test scores, data were collected on a large number of other educational characteristics in the Washoe County School District. In a number of cases the data were simply collected because they existed rather than because they were of theoretical or applied importance, while other factors were included because of their probable differences between Indian and non-Indian students. The results of the descriptive data analyses for the Washoe County School District population in general, Indian students only, and non-Indian students only are presented below, along with the results of the hypothesis testing analyses. The results of the hypothesis testing procedures were further analyzed for their validating support of the remaining research hypotheses concerning Indian and non-Indian differences.

Student Achievement/Evaluation Characteristics

The most common measures of student achievement other than academic achievement tests have been grade point averages (GPAs), previous grades in specific subject areas, and the number of days absent (absenteeism). Univariate statistics (mean, mode, median, range, variance, and sample size) for each of these variables are presented in Appendix D for the Indian and non-Indian students.

Indian and non-Indian comparisons. The means for all Indian students, non-Indian students, and the combined total sample are presented, with the *t*-ratio value of Indian and non-Indian student differences, in Table 14. In looking at the means in Table 14, and other descriptive statistics from Appendix D, several patterns and changes that occurred between the 1982-83 and 1983-84 school years were observed.

Descriptive statistics indicated that, comparatively, the Indian mean GPA rose two hundredths of a grade point (+.02) between the 1982-83 and 1983-84 school years, while the non-Indian mean GPA

Table 14. Mean Comparisons of Indian and Non-Indian Students For Student Achievement and Teacher Evaluation Characteristics

Variable Name	Indian Mean	Non-Indian Mean	t-ratio
Accumulated GPA	2.40	2.76	6.11***
1983 Grade Point Average	2.39	2.74	5.62***
1984 Grade Point Average	2.41	2.78	5.62***
1983 Arithmetic Grade	2.63	3.01	4.87***
1983 Language Grade	2.52	2.88	4.66***
1983 Reading Grade	2.49	2.87	4.63***
1983 Science/Health Grade	2.21	2.48	3.79***
1983 Social Studies Grade	2.13	2.46	4.37***
1983 Spelling Grade	2.88	3.10	2.63**
1984 Arithmetic Grade	2.55	2.94	5.33***
1984 Language Grade	2.49	2.90	5.09***
1984 Reading Grade	2.42	2.87	5.70***
1984 Science/Health Grade	2.27	2.61	4.51***
1984 Social Studies Grade	2.30	2.55	3.16**
1984 Spelling Grade	2.92	3.22	3.82***
Number of Days Present (1982-83)	163.59	163.38	-0.10
Number of Days Present (1983-84)	166.89	169.90	2.71**
Number of Days Absent (1982-83)	11.51	9.27	-2.84**
Number of Days Absent (1983-84)	11.88	9.65	-2.54*
Number of Days Not Enrolled (1982-83)	3.02	5.00	1.16
Number of Days Not Enrolled (1983-84)	1.43	0.32	-1.47
1983 Citizenship Grade[a]	3.00	3.16	2.02*
1984 Citizenship Grade[a]	2.99	3.24	2.96**

*--p<.05 **--p<.01 ***--p<.001

[a]--Teacher Evaluations Characteristic.

increased three hundredths of a grade point (+.03). It was also observed that arithmetic and spelling were consistently the two areas that all students, both Indian and non-Indian, did best in. The arithmetic grades, however, dropped about seven hundredths of a grade point (-.07) between the two school years for both groups. In contrast, spelling grades increased differentially for the two groups. That is, the mean non-Indian spelling grade increased three times as much as the Indian mean spelling grade. It was noted, however, that the standard deviations or variances (see Appendix D) for grades were relatively large; that is, the standard deviation was more than one quarter (.25) of a full grade. The descriptive statistics also showed that the number of days present increased for both groups, but increased the fewest number of days for Indians. Conversely, the number of days not enrolled decreased, with Indian students having the smallest decrease.

In looking at other patterns in the results, a very clear pattern occurred in which Indian students' mean grades were consistently two-tenths of a grade point (.2) lower than non-Indian students' mean grades. It was found as well that all mean grades were above the 2.00 average for class grades. Interestingly, the lowest mean class grades were consistently in science/health and social studies for both groups. As with achievement factors, teacher assigned grades evaluating citizenship were lower for Indian students. All factors considered, it would seem that the patterns of student achievement, and changes in those patterns, were remarkably similar for both Indian and non-Indian students, with the single distinction that Indian student achievement was lower than non-Indian student achievement.

Statistical comparisons were made between Indian and non-Indian students on the twenty-one student achievement variables and two of the teacher evaluation variables to determine if these observed differences were statistically significant. Statistical tests of these observed differences in the means, or _t_-ratios, indicated (Table 14) that Indian students were significantly different from non-Indian students in eighteen of the twenty-one student achievement measures and in both of the teacher evaluation characteristics. Although it was found that Indian students were enrolled in the Washoe County School District for more days than non-Indian students during 1982-83, Indian students were also enrolled fewer days in 1983-84. Mean comparisons of Indians and non-Indians demonstrated that these differences were not, however, statistically significant. That is, Indians and non-Indians were enrolled in school for a statistically similar number of days.

Although not statistically important, the result of the _t_-test for the number of days present in 1982-83 was substantively significant because Indian and non-Indian students' class attendance frequencies were _not_ significantly different. Indeed, not only was their attendance essentially the same, Indian students were present slightly more often than other students, a unique result in comparison to other research studies. This result became even more significant in light of the _t_-test for days absent in 1982-83, which proved to be statistically significant. That is, the results demonstrated that Indians were absent significantly more often than other students, yet they were present more days than non-Indian students! This situation was the result of the fact that Indian students were also enrolled more days than non-Indians. Hence, when both days absent and days not enrolled were considered in combination, it became clear that non-Indian students were in the classroom fewer days in 1982-83 than Indian students.

These results had both practical and methodological implications with regards to absenteeism policies and research. First, it should be noted that the data implicated recordkeeping errors on the part of the school teachers. The number of days present, number of days absent, and the number of days not enrolled, when added together should have totaled 180 days. However, the mean figures for neither group added up correctly. Second, this result highlighted a methodological problem for studying absenteeism in that each measure was found to present a different image of the situation. One solution to this problem would be to convert the frequency counts into percentages, so that rather than coding the number of days absent (e.g., 11.9), the percentage of days absent (e.g., 6.6%) would be entered.

This methodological issue also raised practical concerns because absentee policies have usually been based upon examination of the number of days absent. Much previous research has concluded that Indian students were absent more, and thus that they were in the classroom less. This was interpreted to mean that Indian students were learning less than students who were less absent and presumably present more. Yet the results here have suggested the possible fallacy of such assumptions and conclusions, because Indian students in the Washoe County School District were both present and absent more than non-Indians. Indeed, if this study had taken the same assumption that attendance was positively correlated with achievement, then Indian students should have done academically better than other students because they were, at the time, attending class more than their classmates.

In looking at teacher evaluations of students in both Tables 14 and 15 it was found that Indian students were statistically significantly differently evaluated on two of five variables (40%) in comparison to the eighteen of twenty-five statistically significant factors (86%) for student achievement factors. Indian students' mean citizenship grades were two-tenths of a grade point (.2) below their non-Indian classmates (Table 14). In looking at other types of teacher evaluations[21] in Table 15 it was found that teacher evaluations of Indian and non-Indian students were not statistically significantly different. The failure to find a significantly large enough chi-square value may have been due to the number of cases involved in the variables for both groups. Only 14% of the students in the Washoe County School District total sample had been retained one or more times, with 3% having been retained for the 1983-84 school

Table 15. Differences Between Indian and Non-Indian Students in Teacher Evaluations

Variable/Value		Indians	Non-Indians	Total
Gifted Program				
Nonparticipant	f	195	241	436
	%	(97.0)	(93.4)	(95.0)
Participant	f	6	17	23
	%	(3.0)	(6.6)	(5.0)
Total		201	258	459
		$\chi^2 = 2.37$	p = n.s.	
Was Student Retained in 1984?				
No	f	196	248	444
	%	(97.5)	(96.1)	(96.7)
Yes	f	5	10	15
	%	(2.5)	(3.9)	(3.3)
Total		201	258	459
		$\chi^2 = 0.69$	p = n.s.	
Total Number of Times Retained				
None	f	168	227	395
	%	(83.6)	(88.0)	(86.1)
Once	f	32	29	61
	%	(15.9)	(11.2)	(13.3)
Twice	f	1	2	3
	%	(.5)	(.8)	(.7)
Total		201	258	459
		$\chi^2 = 2.25$	p = n.s.	

year. Moreover, only 5% of the elementary students had participated in the gifted program.

Despite the fact that differences were not statistically significant, and that the percentage of cases different from the mode were generally small for two of the variables, there were several substantively significant results concerned with teacher evaluations in Table 15. First of all, it was shown that non-Indian students were twice as likely to be participants in the gifted student program. Secondly, 4.4% more of the Indian students than non-Indian students had been retained at least once since entering school. In other words, 12.0% of the non-Indian students in comparison to 16.4% of the Indian students attending elementary school in the Washoe County School District had been retained at least one grade. This meant Indian students were substantively significantly more likely than non-Indian students to be retained a year. That is, one out of every six Indian students had been retained a grade in elementary school in the Washoe County School District. While this figure was not statistically different from that for non-Indians, practically speaking, this was a substantively higher rate of grade retention.

Indian and non-Indian comparisons by grade level. A major conclusion of the literature review in Chapter 1, and of the empirical results from this study in regards to standardized achievement test scores, was that Indian students had higher levels of achievement at certain grade levels than others. Brod (1976b); Brod and Brod (1981); Bryde (1965, 1970); Coombs et al. (1958); Havighurst (1957, 1970), and a host of other researchers have found that Indian students did better at certain grade levels than at others; indeed such conclusions have provided the foundation for the "crossover" or "plateau" effect discussed in Chapter 1. It would be interesting and theoretically relevant, therefore, to compare teacher assigned class evaluations or subject grades for Indian and non-Indian students by grade level as well. Once again, it must be remembered that these were cross-sectional panel data and not true longitudinal data.

As can be seen from Table 16 and Figures 18, 19, and 20, similar patterns were found for class grades as for academic achievement test scores by grade level (Table 13). It was noted that Indian students' mean grade point average and 1984 grade point average were statistically significantly lower than their classmates in the second grade, but not in the third grade. This was probably due to the fact that in 1984, second grade Indian students had significantly lower grades than their classmates in science/health and social studies, while third grade Indian students had higher grades than non-Indian students in the same two subjects and spelling. That is, second grade Indian students apparently had low grades in two subjects that significantly affected their overall grade point averages, while third grade Indian students did better than, or about the same as, their classmates in both 1982-83 and 1983-84. In the fourth grade, however, differences between Indian and non-Indian students in teacher assigned grades for 1983-84 exhibited both the "crossover" effect and a dramatic increase. Hence, Indian students seemed to be lower

Table 16. Mean Comparisons of Indian and Non-Indian Subject Grades by Grade Level

Variable	Grade Level	Indian Mean	Non-Indian Mean	t-value
Mean Grade Point Average	2	2.48	2.66	2.22*
	3	2.63	2.65	0.19
	4	2.42	2.88	3.50***
	5	2.32	2.84	3.80***
	6	2.20	2.89	3.80***
1983 Grade Point Average	2	2.55	2.70	1.60
	3	2.65	2.66	0.10
	4	2.37	2.82	3.43***
	5	2.32	2.79	3.38***
	6	2.16	2.88	3.63***
1983 Math Grade	2	3.02	3.22	1.28
	3	2.93	3.04	0.74
	4	2.70	3.17	2.91**
	5	2.41	2.83	2.76**
	6	2.22	2.85	3.03**
1983 Language Grade	2	2.65	2.90	1.45
	3	2.90	2.82	-0.49
	4	2.52	3.16	3.85***
	5	2.31	2.74	2.65**
	6	2.35	3.00	3.18**
1983 Reading Grade	2	2.74	2.96	1.26
	3	2.90	2.92	0.18
	4	2.44	3.00	2.93**
	5	2.23	2.75	3.22**
	6	2.32	2.86	2.61**
1983 Science/ Health Grade	2	2.14	2.21	0.54
	3	2.27	2.24	-0.24
	4	2.11	2.41	1.67
	5	2.39	2.88	3.25**
	6	2.07	2.88	3.67***

*--p<.05 **--p<.01 ***--p<.001

Table 16. (continued)

Variable	Grade Level	Indian Mean	Non-Indian Mean	t-value
1983 Social Studies Grade	2	2.19	2.20	0.06
	3	2.24	2.27	0.20
	4	2.08	2.36	1.69
	5	2.26	2.76	3.19**
	6	1.87	2.82	3.90***
1983 Spelling Grade	2	2.72	3.01	1.49
	3	3.24	3.17	-0.45
	4	3.09	3.22	0.73
	5	2.79	3.02	1.39
	6	2.62	3.25	2.72**
1984 Grade Point Average	2	2.42	2.62	2.18*
	3	2.61	2.64	0.22
	4	2.48	2.94	3.11**
	5	2.31	2.90	3.68***
	6	2.23	2.89	3.52***
1984 Math Grade	2	2.78	2.95	1.16
	3	2.60	2.94	2.19*
	4	2.53	2.91	2.10*
	5	2.56	2.98	2.66**
	6	2.25	2.87	3.04**
1984 Language Grade	2	2.71	2.90	1.13
	3	2.63	2.77	0.85
	4	2.58	3.05	2.77**
	5	2.38	2.90	3.00**
	6	2.22	2.97	3.53***
1984 Reading Grade	2	2.66	2.82	1.04
	3	2.76	2.76	0.00
	4	2.42	2.95	2.94**
	5	2.24	2.90	3.87**
	6	2.10	2.91	4.13***

*--p<.05 **--p<.01 ***--p<.001

Table 16. (continued)

Variable	Grade Level	Indian Mean	Non-Indian Mean	t-value
1984 Science/ Health Grade	2	2.00	2.22	2.74**
	3	2.51	2.43	-0.53
	4	2.46	2.94	3.46***
	5	2.12	2.82	3.65***
	6	2.29	2.92	3.12**
1984 Social Studies Grade	2	1.97	2.22	3.18**
	3	2.54	2.29	-1.33
	4	2.40	2.84	2.53**
	5	2.27	2.86	3.19**
	6	2.29	2.78	2.31*
1984 Spelling Grade	2	3.01	3.20	1.22
	3	3.12	3.10	-0.09
	4	2.94	3.27	1.71
	5	2.94	3.32	2.26*
	6	2.60	3.20	2.81**

*--p<.05 **--p<.01 ***--p<.001

Figure 18. Mean (1983) Reading Grades
by Grade Level

Figure 19. Mean (1983) Math Grades
by Grade Level

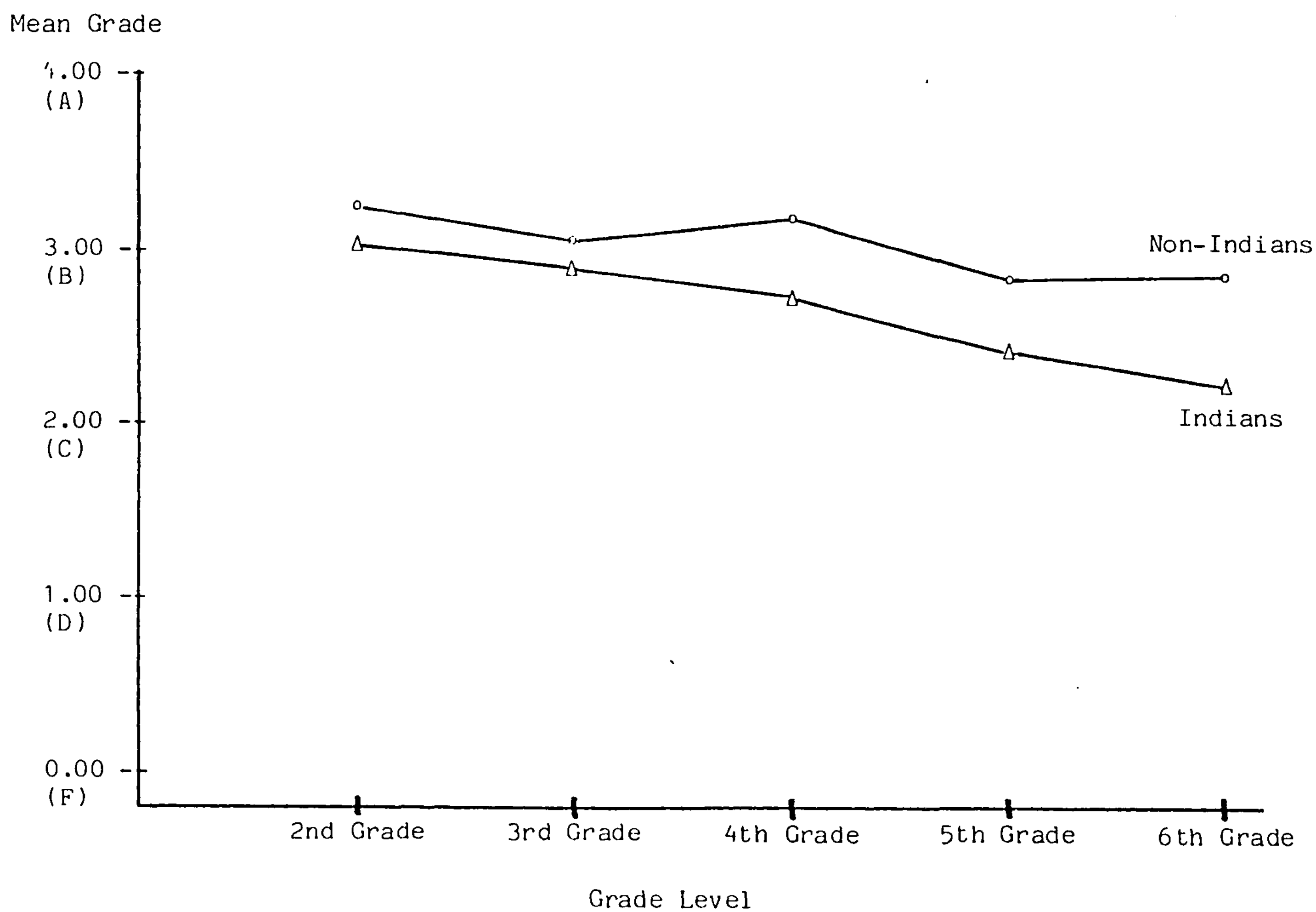
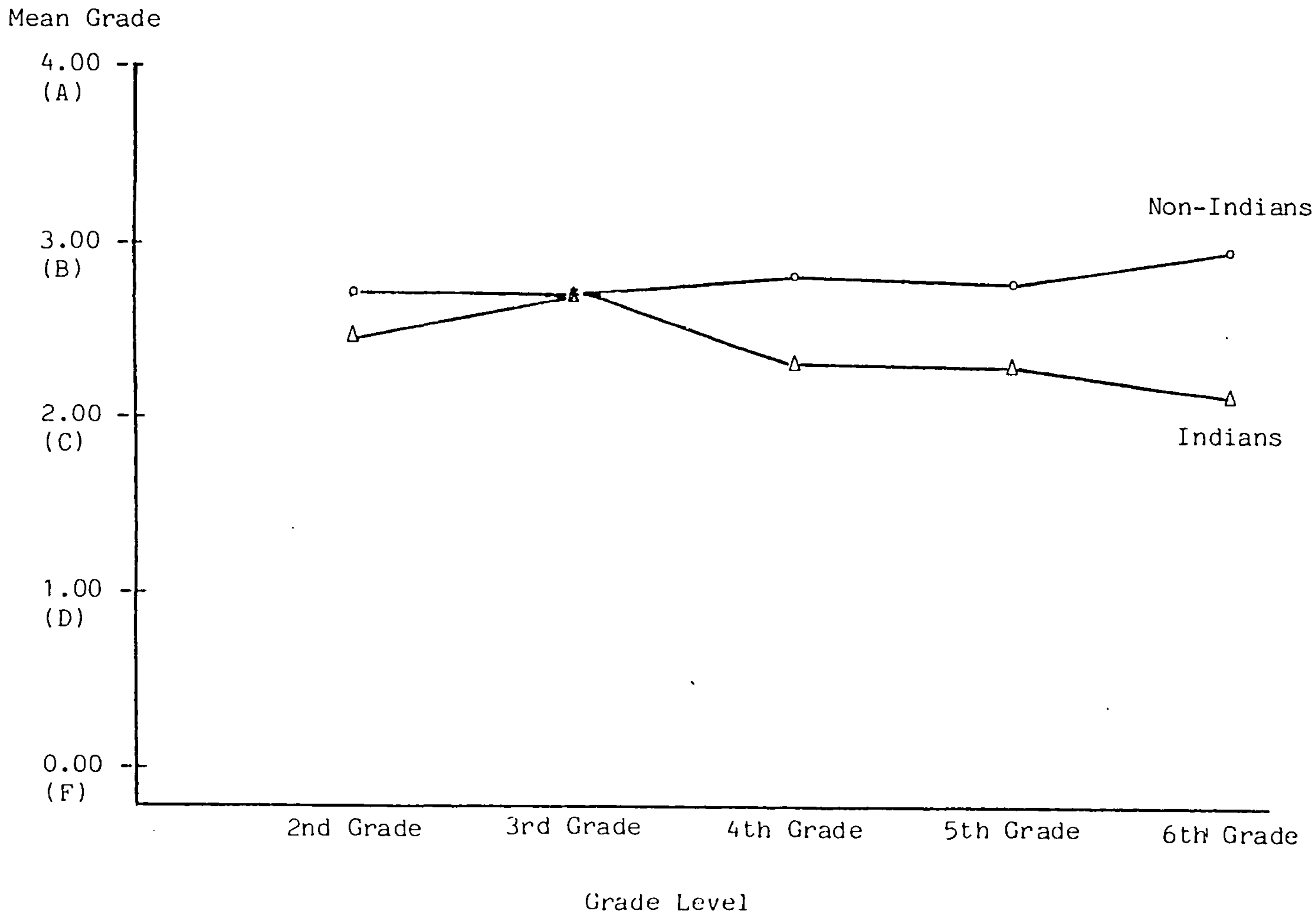


Figure 20. Mean 1983 Grade Point Averages by Grade Level



achievers in class. While not as statistically significant, the same pattern was observed for class grades in 1982-83.

Non-Indian students' grades were found to generally increase by grade level, which indirectly reflected the anticipated accumulation of knowledge by students, while grades for Indian students generally declined. Thus, the patterns of teacher awarded grades of student academic achievement did not parallel those patterns found for standardized achievement test scores. Moreover, it was noted that of all the average grades listed in Table 16, only two were below average (i.e., <2.00). Both of these below average grades were for Indian students only: the 1982-83 social studies grade (1.87) for sixth graders; and the 1983-84 social studies grade (1.97) for second graders. Both substantively and in terms of absolute standards, Indian students were found to be doing quite well; conversely, when compared to their classmates Indian students in the Washoe County School District were doing relatively poor.

Background Characteristics

Most variables concerning the students' personal and familial background characteristics were, by their nature, nominal measurements. That is, their information could only have been nominally categorized. Often occupational data can be coded as ordinal data using one of the occupational scales available to researchers, but such scales were not feasible with the imprecise data available to this study. For example, if the parent worked at one of the hospitals, then that hospital was listed on the student's enrollment form for employment (as well as employer) rather than a specific occupation such as doctor, nurse, pharmacist, or custodian. Consequently, data were coded into general occupational fields (e.g., medical profession) that were meaningless in terms of status ranking. As a result, occupational codes were recoded as working or not working.

In regards to ethnic (i.e., not racial) distributions it was noted that there were 258 non-Indian and 201 Indian students in this study. Thus, 56% of the study sample were non-Indians and 44% of the students were Indians. While descriptive and comparative hypothesis testing statistics were based upon these figures, the more sophisticated data analysis techniques were weighted so that the research sample was more representative of the Washoe County School District ethnic distributions of 97% non-Indian and 3% Indian elementary school students.

Socioeconomic status characteristics. Analysis of previous research had indicated that socioeconomic status (SES) was a tremendously important factor in educational achievement and, as such, was indirectly included in this study. That is, this study contained no direct aggregate measure of socioeconomic status. A number of indicators often included in the measurement of SES were, however, included. Two different measures of family income were made along with three scales of parental employment.

The first scale of socioeconomic status (SES), which was statistically the most powerful measure because it was the only interval scale measurement, was the median family income reported in

Table 17. Data for this variable were collected by matching the population 1980 U.S. census areas with the district's community grid system. The median income for the census area in which the student resided was taken as the student's family income. It was observed (Table 17) that the median family income had a large range ($23,892), going from a low of $12,083 to a high of $35,975. The average income, $22,520, was $4,400 more than the modal income. In comparing Indian and non-Indian family incomes it was found that Indian students' family incomes were statistically significantly ($p < .001$) less than their classmates' family incomes. Dramatically, it was found (Table 17) that the mean Indian student's family income was $4,021, or nearly a full standard deviation, less than the mean non-Indian student's family income. The modal income differences were even greater, as the Indian student's modal family income was $6,284 less than the non-Indian student's modal family income. Figure 21 graphically presents the students' family income frequencies, which visually demonstrates the skewedness of Indian students' family incomes, along with the significant differences already discussed. It is further noted in Figure 21 that the non-Indian students' family incomes were much more normally distributed.

The second measure of socioeconomic status was based upon the student's participation in the federally operated free or reduced fare lunch program. Discussions with district personnel indicated that many eligible families were not participating in this program for a number of reasons, foremost being the "red tape" involved. Table 18,

Table 17. Student's Family Income[a]

Value $	Indians f	Non-Indians f	Total f	Value $	Indians f	Non-Indians f	Total f
12,083	--	1	1	21,534	--	1	1
15,818	2	1	3	21,689	12	12	24
15,930	--	1	1	21,729	1	10	11
17,138	5	3	8	23,925	--	3	3
17,222	1	1	2	24,384	8	25	33
17,377	2	1	3	24,678	8	12	20
17,413	11	6	17	25,658	5	16	21
17,679	--	2	2	26,329	--	2	2
18,087	8	4	12	26,434	1	10	11
18,100	61	11	72	26,528	3	16	19
19,050	1	2	3	26,677	3	11	14
19,451	2	5	7	27,355	3	10	13
19,556	--	1	1	27,569	1	7	8
19,614	13	12	25	27,708	--	5	5
19,830	1	4	5	28,295	1	6	7
19,834	5	11	16	30,021	1	7	8
19,896	--	2	2	31,455	--	1	1
20,000	--	1	1	32,899	--	7	7
20,662	37	1	38	35,975	1	12	13
				Missing	4	15	19
				Total	201	258	459

	Mean	Median	Mode	Standard Deviation
Indians	$ 20,298.61	$ 19,614.00	$ 18,100.00	$ 3,110.12
Non-Indians	$ 24,320.23	$ 24,678.00	$ 24,384.00	$ 4,749.67
Total	$ 22,519.64	$ 21,611.50	$ 18,100.00	$ 4,556.63

t-ratio = 10.67 $p < .001$

[a]--Figures based upon residential median census incomes.

Table 18. Differences Between Indian and Non-Indian Students in Background Socioeconomic Status Characteristics

Variable/Value		Indians	Non-Indians	Total
Student in Lunch Program?				
Not in Program	f	120	217	337
	%	(59.7)	(84.1)	(73.4)
Reduced Lunch Fare	f	29	17	46
	%	(14.4)	(6.6)	(10.0)
Free Lunch	f	52	24	76
	%	(25.9)	(9.3)	(16.6)
Total		201	258	459
		$X^2 = 34.82$	$p < .001$	
Number of Parents Employed[a]				
Both Employed	f	70	139	209
	%	(34.8)	(53.9)	(45.5)
Father Only Employed	f	48	82	130
	%	(23.9)	(31.8)	(28.3)
Mother Only Employed	f	42	27	69
	%	(20.9)	(10.5)	(15.0)
Both Unemployed	f	41	10	51
	%	(20.4)	(3.9)	(11.1)
Total		201	258	459
		$X^2 = 47.43$	$p < .001$	

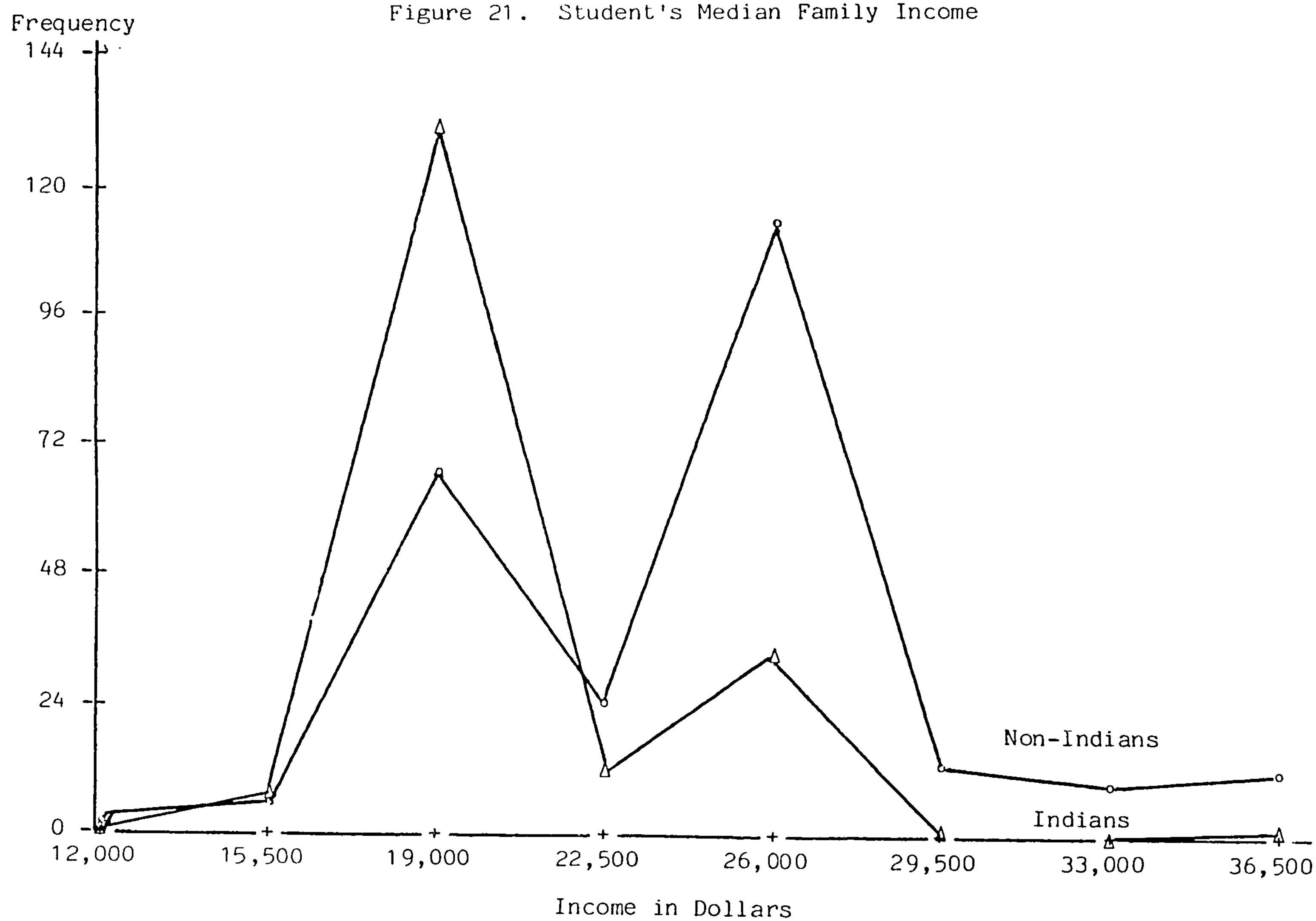
[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

Table 18. (continued)

Variable/Value		Indians	Non-Indians	Total
Which Parents are Employed?[b]				
Both/Father	f	118	221	339
	%	(58.7)	(85.7)	(73.9)
Mother/Neither	f	83	37	120
	%	(41.3)	(14.3)	(26.1)
Total		201	258	459
		$\chi^2 = 42.51$	$p < .001$	
Father's Employment Status[b]				
Working	f	116	221	337
	%	(74.4)	(92.5)	(85.3)
Not Working	f	40	18	58
	%	(25.6)	(7.5)	(14.7)
Total		156	239	395
		$\chi^2 = 24.70$	$p < .001$	
Mother's Employment Status[b]				
Working	f	110	166	276
	%	(57.6)	(65.6)	(62.2)
Not Working	f	81	87	168
	%	(42.4)	(34.4)	(37.8)
Total		191	253	444
		$\chi^2 = 2.99$	p = n.s.	

[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

Figure 21. Student's Median Family Income



which presents the results for this variable along with the three variables concerned with parental employment, indicates that Indian students were statistically significantly ($p < .001$) more than twice as likely to have participated in the federal lunch program, and to have had only his/her mother employed or neither parent employed.

In presenting the data on parental employment, both crosstabulation tables using the original data codes and the dichotomous recodings which were used for regression analyses, have been included in Table 18. It should be noted that only the recodings of father's and mother's occupations into working or not working dichotomous variables were included in the results, because the original data codes were too ambiguous. Although Indian students were not statistically more likely to have a mother working, the differences were substantively significant. When the results of this variable, mother's employment status, were compared with the results of the variable on the number of parents employed, as originally coded, these results were even more substantively significant. That is, it was observed that Indian students were twice as likely as non-Indian students to live in a home where the mother was the only parent employed.

In terms of socioeconomic status, however, one of the most significant implications of the results presented in Table 18 was that Indian students were more than five times as likely to live in a family in which both parents were unemployed. Unfortunately, when the variable was recoded into a dichotomous measure this fact became hidden by the fact that Indian students' mothers were more likely to be working. Regardless of this masking effect, the results of the recoding corroborated the statistically significant differences between Indian and non-Indian students in terms of parental employment. That is, most measures on parental employment clearly demarked the substantively and statistically lower socioeconomic status of Indian students' families.

Moreover, only 28% of the students in this study, and less than one-fourth (23.9%) of the Indian students, lived in what would be considered traditional families where only the father worked. Conversely, 21% of the Indian students came from families in which the mother was the only parent working. The high cost of living in the Reno area probably accounted for the relatively high rate of families with both parents employed, which was 45.5% in the total sample and 53.9% among non-Indian families.

Home environment characteristics. Those variables most commonly accepted as the best predictors of how well a student will do in school have been those concerned with the family's home environment. Factors such as whether the student's parents were alive, present in the home, and whether the parent's status to the student was natural or otherwise, have been the most often cited factors in the literature for explaining achievement success differences. Most research on Indian student education also concluded that residency, as defined by proximity to non-Indians and isolation from other Indians, has had a strong relationship with academic achievement. The underlying assumptions of this conclusion have been that increased contact between the two cultures would have a type of osmosis or, more preferably, purging effect, and that assimilation was (and has remained) the primary goal of education.

Associated with home environment characteristics, but also a socioeconomic measure of sorts, was whether the school office had a telephone number listed for the student. Brod (1975, 1976a) had found that such a factor helped explain variances found in terms of Indian achievement. Thus, a primary interest of this study was to investigate similar factors to determine whether they were significantly different for Indian students than for their classmates, and eventually to determine if such factors helped explain academic achievement differences.

Table 19 presents the frequency distribution and chi-square hypothesis test of distributional differences for each of the seven variables measured under home environment characteristics. The results concerning the number of parents present in the home, the father's and mother's statuses to the student, and the student's residential area were given twice, the first providing the data distributions as originally collected and the second indicating characteristics after the variables were dichotomously recoded. The results indicated that Indian students were statistically significantly more likely than non-Indian students to come from home environments that had a father or both parents absent, had a father

Table 19. Differences Between Indian and Non-Indian Students in Background Home Environment Characteristics

Variable/Value		Indians	Non-Indians	Total
Are Parents Absent?[a]				
Both Present	f	122	206	328
	%	(60.7)	(80.2)	(71.6)
Father Absent	f	68	42	110
	%	(33.8)	(16.3)	(24.0)
Mother Absent	f	6	8	14
	%	(3.0)	(3.1)	(3.1)
Both Absent	f	5	1	6
	%	(2.5)	(.4)	(1.3)
Total		201	257	458
		$\chi^2 = 24.12$	$p < .001$	
Parent(s) Absent From Home?[b]				
Both Home	f	122	206	328
	%	(60.7)	(80.2)	(71.6)
One/Both Absent	f	79	51	130
	%	(39.3)	(19.8)	(28.4)
Total		201	257	458
		$\chi^2 = 21.03$	$p < .001$	
Is Father Living?				
Living	f	154	243	407
	%	(95.7)	(99.6)	(98.1)
Deceased	f	7	1	8
	%	(4.3)	(.4)	(1.9)
Total		161	244	415
		$\chi^2 = 7.22$	$p < .01$	

[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

Table 19. (continued)

Variable/Value		Indians	Non-Indians	Total
Is Mother Living?				
Living	f	200	257	457
	%	(99.5)	(100.0)	(99.8)
Deceased	f	1	0	1
	%	(.5)	(0.0)	(.2)
Total		201	257	458
		χ^2 = 1.28	p = n.s.	
Father's Status to Student[a]				
Natural	f	133	201	334
	%	(78.7)	(83.8)	(81.7)
Step	f	23	33	56
	%	(13.6)	(13.8)	(13.7)
Guardian	f	6	5	11
	%	(3.6)	(2.1)	(2.7)
Deceased	f	7	1	8
	%	(4.1)	(.4)	(2.0)
Total		169	240	409
		χ^2 = 8.14	$p < .05$	
Father's Status[b]				
Natural	f	133	201	334
	%	(78.7)	(83.8)	(81.7)
Other	f	36	39	75
	%	(21.3)	(16.2)	(18.3)
Total		169	240	409
		χ^2 = 0.27	p = n.s.	

[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

Table 19. (continued)

Variable/Value		Indians	Non-Indians	Total
Mother's Status to Student[a]				
Natural	f	188	239	427
	%	(96.9)	(96.0)	(96.4)
Step	f	0	6	6
	%	(0.0)	(2.4)	(1.4)
Guardian	f	5	4	9
	%	(2.6)	(1.6)	(1.4)
Deceased	f	1	0	1
	%	(.5)	(0.0)	(0.2)
Total		194	249	443
		$\chi^2 = 6.47$	p = n.s.	
Mother's Status[b]				
Natural	f	188	239	427
	%	(96.9)	(96.0)	(96.4)
Other	f	6	10	16
	%	(3.1)	(4.0)	(3.6)
Total		194	249	443
		$\chi^2 = 0.27$	p = n.s.	
Student's Telephone Number Listed?				
Yes	f	150	243	393
	%	(74.6)	(94.2)	(85.6)
No	f	51	15	66
	%	(25.4)	(5.8)	(14.4)
Total		201	258	459
		$\chi^2 = 33.54$	$p < .001$	

[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

Table 19. (continued)

Variable/Value		Indians	Non-Indians	Total
Student's Residential Area[a]				
Urban	f	58	168	226
	%	(28.9)	(65.1)	(49.2)
Colony	f	38	0	38
	%	(18.9)	(0.0)	(8.3)
Rural	f	45	84	129
	%	(22.4)	(32.6)	(28.1)
Reservation	f	60	6	66
	%	(29.9)	(2.3)	(14.4)
Total		201	258	459
		χ^2 = 142.63	$p < .001$	
Student's Residence[b]				
Urban/Colony	f	96	168	264
	%	(47.8)	(65.1)	(57.5)
Rural/Reservation	f	105	90	195
	%	(52.2)	(34.9)	(42.5)
Total		201	258	459
		χ^2 = 13.93	$p < .001$	

[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

who was deceased, were in a rural or reservation area, and did not have a home telephone listed with the school.

Specifically, it was found that Indian students were twice as likely to be living in a home environment where the father or both parents were absent. It was also four times as likely that an Indian student's father was deceased, although over 95% of all students' parents were still living. Of the seven cases of students whose fathers were deceased, only one was a non-Indian student's father, and the only incident of a deceased mother was for an Indian student. Thus, Indian students' families accounted for most of the variance in these two variables. It was found that eighteen percent (18.3%) of all the students' fathers in the study were not the student's natural father, and when regrouped into just "natural" and "other status" categories, differences between Indian and non-Indian students were found, although they were not statistically significant. Presumably the observed statistically significant differences found in the original distribution were due to the statistically significant differences in the father's mortality for Indian students.

Substantively, however, it was found (Table 19) that Indian students were slightly less likely to have a natural father, and slightly more likely to have a father who was their legal guardian. The fact that twice as much of the data (16% vs. 7%) for Indian students as for non-Indian students were missing on father's status was intriguing to note, because such missing data may have been due to the father's greater probability of being absent. In looking at the results for mother's status, Indian and non-Indian students were not statistically significantly different, although Indian students were more likely to have a legal guardian and non-Indian students were more likely to have a stepmother. It should be remembered that many of these distributional differences, particularly as originally coded, were comprised of small numbers of student cases, and in the case of father's status 11% of the data were missing. Hence, these conclusions should be tentatively interpreted.

As would be expected, the results (Table 19) indicate that statistically more Indian students than non-Indian students lived on the colony and reservation; or in rural locations when the data were recoded. Conversely, nearly two-thirds (65.1%) of the non-Indian students lived in urban residential areas.[22] The Indian student population was also found to be more equally divided into each of the residential categories than the non-Indian student sample. Again, this was expected since very few non-Indians were able to live on the reservation or colony, while all Indian families could have lived in the urban and rural areas.

Although the telephone has become an assumed part of the American household, Table 19 demonstrates that 14% of the students' families in the Washoe County School District total sample apparently had no phone, or at least one was not listed with the school. Fully one-fourth (25.4%) of the Indian students, or five times as many as their classmates, did not have a phone listed at the school office. This statistically important difference may have been due to a number of causes, including economic burden or sociocultural factors, but the effect was that Indian students' parents were less accessible by school personnel and may have portrayed Indian parents to school employees as not caring about their children enough to list a home phone.[23]

Not too surprisingly, many characteristics of the home environment of Indian students were statistically significantly different from those of their non-Indian classmates. Specifically, they were statistically different in terms of parents' absence or presence, father's mortality, residential location, and having a telephone listed at the student's school, or 57% of the measured factors. Although not statistically different in regards to the other variables, Indian students were substantively different in terms of father's and mother's statuses.

School related background factors. Student characteristics concerning student mobility and enrollment, as well as parental access for emergencies and school problems, have often been viewed as causually associated with poor student achievement. Several antecedent and concurrent measures of such school related background factors of students are reported in Table 20. In looking at the results, several interesting patterns emerged concerning school related background factors. First, in the Washoe County School District the only characteristic for which Indian students were statistically different from non-Indian students was the listing of an emergency phone number at the school office. Given the fact that

Table 20. Differences Between Indian and Non-Indian Students in School Attendance Background Characteristics

Variable/Value		Indians	Non-Indians	Total
Change of Schools?				
No	f	111	144	255
	%	(55.2)	(55.8)	(55.6)
Yes	f	90	114	204
	%	(44.8)	(44.2)	(44.4)
Total		201	258	459
		X^2 = 0.02	p = n.s.	
Emergency Contact Phone Number Listed?				
Yes	f	164	230	394
	%	(81.6)	(89.1)	(85.8)
No	f	37	28	65
	%	(18.4)	(10.9)	(14.2)
Total		201	258	459
		X^2 = 4.70	$p < .05$	
Emergency Contact Person Listed?				
Yes	f	186	233	419
	%	(92.5)	(90.3)	(91.3)
No	f	15	25	40
	%	(7.5)	(9.7)	(8.7)
Total		201	258	459
		X^2 = 0.45	p = n.s.	

Table 20. (continued)

Variable/Value	Indians f	Indians Cum %	Non-Indians f	Non-Indians Cum %	Total f	Total Cum %
Number of Continuous Months in District (1982-83)						
2 Months	1	.5	3	1.2	4	.9
3 Months	---	.5	4	2.8	4	1.8
4 Months	---	.5	4	4.3	4	2.7
5 Months	2	1.5	1	4.7	3	3.3
6 Months	5	4.0	3	5.9	8	5.1
7 Months	2	5.1	2	6.7	4	6.0
8 Months	2	6.1	2	7.5	4	6.9
9 Months	186	100.0	235	100.0	421	100.0
Total	198		254		452	
Mean	8.82		8.67		8.73	
	t-ratio = -1.50				p = n.s.	
Number of Continuous Months in District (1983-84)						
3 Months	1	.5	---	0.0	1	.2
4 Months	---	.5	---	0.0	0	.2
5 Months	1	1.0	---	0.0	1	.4
6 Months	1	1.5	---	0.0	1	.7
7 Months	1	2.0	1	.5	2	1.1
8 Months	1	2.5	1	1.0	2	1.5
9 Months	196	100.0	256	100.0	452	100.0
Total	198		254		459	
Mean	8.92		8.99		8.96	
	t-ratio = 1.66			p = n.s.		

non-Indian students tended to be more transient than Indian students, the result indicating that fewer Indian students (6.1%) than non-Indian students (7.5%) were in the district less than nine continuous months during the 1983-84 school year was not too surprising either. Contrary to most previous results and assumptions, it was interesting to find that Indian students did not statistically significantly change schools more frequently than did non-Indian students, nor were they significantly different from their classmates in terms of continuous months in the school district. The observed increase in the percentage of students in the total sample for nine continuous months during the 1983-84 school year was probably artificially caused by limiting the study groups to only those students having class grades for both the 1982-83 and 1983-84 school years.

When considered in retrospect of the results discussed thus far, the finding that statistically significantly more Indian than non-Indian students did not have emergency telephone numbers listed at the school was not too surprising. That is, not only did Indian families tend not to have home telephone numbers listed, because they probably did not have phones, they did not have emergency phone numbers listed either. This was most likely because Indian students' parents were more likely not to be employed, and it was more probable that their neighbors did not have phones as well. It needs to be pointed out that it was district policy to have such a number listed at the school, particularly for medical emergencies. In contrast to emergency phone number listings, a larger, but statistically nonsignificant, number of Indian students had an emergency contact person listed. Unfortunately, it would take much more sustained effort to get in touch with an emergency contact person than to call someone by phone.

Individual background characteristics. Two sociologically, anthropologically, and educationally important variables frequently used for comparisons have been age and sex. Table 21 lists the frequencies of age distributions for Indian and non-Indian students. The *t*-test results indicated that Indian students were statistically significantly older than non-Indian students. Not only was the mean age greater for Indian students, but the standard deviation was larger too. Two important considerations must be made, however. First, as will be discussed below, the Indian sample contained slightly larger grade level percentages of the study group at the upper grade levels. Secondly, it was found (Table 21) that the median age for Indian students was seven months older than for the non-Indian students, which substantiated the conclusion that the observed age differences were due to sampling bias. On the other hand, if one considered the probable age range for the grade levels involved, students' ages should have ranged from a low of 84 months (or 7 years old at the end of first grade) to a high of 144 months (or 12 years old at the end of the sixth grade). Yet 14% of the Indian students were overage, in contrast to 8% of their classmates. These figures were not much different from the percentages of students retained. Accordingly, it

Table 21. Student's Age (in Months) at Time of Testing

Value Months	Indians f	Non-Indians f	Value Months	Indians f	Non-Indians f
81	0	1	126	3	3
90	1	0	127	4	3
91	3	2	128	4	5
92	1	5	129	5	3
93	5	3	130	4	7
94	2	2	131	3	5
95	4	4	132	4	2
96	0	4	133	3	4
97	2	3	134	2	2
98	3	9	135	2	5
99	0	7	136	3	4
100	2	4	137	3	3
101	2	6	138	7	5
102	4	6	139	7	1
103	4	9	140	6	7
104	3	3	141	3	4
105	1	3	142	3	4
106	3	0	143	2	1
107	4	10	144	2	8
108	2	7	145	2	4
109	3	4	146	3	2
110	5	4	147	5	5
111	1	4	148	1	2
112	2	3	149	3	3
113	6	6	150	5	0
114	3	6	151	1	2
115	3	7	152	1	0
116	3	1	154	1	0
117	5	3	156	3	0
118	3	7	157	1	0
119	3	2	158	0	1
120	5	9	159	0	1
121	2	9	160	0	1
122	3	0	161	1	0
123	5	3	162	1	0
124	2	3	164	1	0
125	2	1	Total	201	258

	Mean	Median	Standard Deviation
Indians	124	125	18.1
Non-Indians	119	118	17.4

t-ratio = -2.97 $p < .01$

would seem that the age differences between Indian and non-Indian students, contrary to what Fuchs and Havighurst (1972) have suggested, were not substantively significant.

The second commonly important variable, sex, is presented in Table 22, along with a third individual characteristic, place of birth. As can be seen from the results, there were slightly more females than males in both the Indian and non-Indian groups. While Indian male students comprised the smallest percentage, and Indian females the largest percentage, the distributional differences were not statistically significant. In terms of place of birth, statistically more Indian students were born in all categories of in-state measures, while nearly half the non-Indian students were born out of state. Overall, just over half (51.6%) of the total students sampled were born in Reno, and almost two-thirds (60.8%) were born somewhere in Nevada.

Indian characteristics. In addition to the factors discussed above, data for seven variables were collected on Indian students only. The results in Table 23 indicate that the 201 Indian students in this study sample represented 46 self-identified ethnic or politically autonomous tribes or nations.[24] Table 24 provides information on the other six variables. Practically speaking, the most interesting result was that the Washoe County School District's Title IV Indian Education program had federal 506 Forms on only two-thirds (69.7%) of the Indian students. About one-third (30.8%) of the Indian students were involved in one of the Head Start preschool

Table 22. Differences Between Indian and Non-Indian Students in Personal Background Characteristics

Variable/Value		Indians	Non-Indians	Total
Student's Sex				
Male	f	87	125	212
	%	(43.3)	(48.4)	(46.2)
Female	f	114	133	247
	%	(56.7)	(51.6)	(53.8)
Total		201	258	459
		$\chi^2 = 1.01$	p = n.s.	
Student's Birthplace[a]				
Reno-Sparks	f	110	127	237
	%	(54.7)	(49.2)	(51.6)
Schurz, Nevada	f	25	3	28
	%	(12.4)	(1.2)	(6.1)
Elsewhere in Nevada	f	4	10	14
	%	(2.0)	(3.9)	(3.1)
Out-of-State	f	59	105	164
	%	(29.4)	(40.7)	(35.7)
Outside the US	f	2	13	15
	%	(1.0)	(5.0)	(3.3)
Unknown	f	1	0	1
	%	(.4)	(0.0)	(.2)
Total		201	258	459
		$\chi^2 = 36.53$	$p < .001$	

a--Crosstabulations using original values.
b--Crosstabulations using dichotomous recodings.

Table 22. (continued)

Variable/Value		Indians	Non-Indians	Total
Student's Place of Birth[b]				
Nevada	f	139	140	279
	%	(69.2)	(54.3)	(60.8)
Outside of Nevada	f	62	118	180
	%	(30.8)	(45.7)	(39.2)
Total		201	257	458

$\chi^2 = 10.51 \quad p < .01$

[a]--Crosstabulations using original values.
[b]--Crosstabulations using dichotomous recodings.

Table 23. Indian Student's National/Tribal Affiliations

Nation/Tribe	f	Nation/Tribe	f
None Given	61	Klamath	1
Washoe of California	2	Ft. Peck Sioux	2
Washoe/Paiute	3	Duckwater Shoshone	1
Haulapi/Paiute	1	Hopi/Paiute	2
Pyramid Lake Paiute	57	Acoma (Pueblo)	2
Cherokee of Oklahoma	1	Cherokee/Wyandot	1
Oglala Sioux	1	Turtle Mountain Chippewa	1
Northern Paiute	8	Ft. Hall Shoshone/Bannock	2
Paiute	8	Navajo/Shoshone	1
Navajo	1	Washoe/Pima/Maricopa	1
Nez Perce/Paiute	1	Paiute/Sioux	1
Cheyenne	1	Summit Lake Paiute	2
Western Shoshone/Te-Moak	5	Northern Cheyenne	1
Chippewa/Cree	1	Potawatomi	3
Fallon Paiute/Shoshone	1	Klamath/Paiute	2
Paiute/Shoshone	6	Paiute/Apache	1
Shoshone	2	Shoshone/Maida	1
Rosebud Sioux	1	Athabaskan/Alaskan Native	2
Yomba/Shoshone	1	Duck Valley Shoshone/Paiute	1
Western Nevada Shoshone	1	Kiowa	1
Chumash	1	Apache	1
Ft. Bidwell Paiute	2	Taos (Pueblo)	1
Walker River Paiute	3	Paiute/Chippewa-Cree	1
		Total	201

Table 24. Special Background Characteristics of Indian Students

Variable/Value	Frequency	Percent
Is there a 506 Form for Student?		
Yes	140	69.7
No	61	30.3
Total	201	100.0
What is the Nations/Tribes Status?		
Federally Recognized	126	62.7
Eskimo-Alaskan Native	2	1.0
Not Federally Recognized	1	0.5
Federally Terminated	3	1.5
State Recognized	1	0.5
Both Federally and State Recognized	3	1.5
Other	62	30.8
Not Applicable	3	1.5
Total	201	100.0
Who is Indian Eligibility Based On?[a]		
Mother	25	12.4
Father	17	8.5
Both Mother and Father	9	4.5
Student Themself	72	35.0
Grandmother	8	4.0
Grandfather	1	.5
Grandparents	3	1.5
Student and Parents	62	30.8
Not Applicable	4	2.0
Total	201	100.0

[a]--Frequencies using original values.
[b]--Frequencies using recoded values.

Table 24. (continued)

Variable/Value	Frequency	Percent
Who is Indian Eligibility Based On?[b]		
Both Student and Parents	134	66.7
Other	63	31.3
Missing	4	2.0
Total	201	100.0
Did Student Attend Preschool?		
Yes	62	30.8
Unknown	139	69.2
Total	201	100.0
What Type of Preschool?[a]		
Colony Headstart	32	15.9
Reservation Headstart	29	14.4
Other	1	.5
Missing Data	139	69.2
Total	201	100.0
Did Student Attend Colony Headstart?[b]		
No	169	84.1
Yes	32	15.9
Total	201	100.0

[a]--Frequencies using original values.
[b]--Frequencies using recoded values.

Table 24. (continued)

Variable/Value	Frequency	Percent
Did Student Attend Reservation Headstart?[b]		
No	172	85.6
Yes	29	14.4
Total	201	100.0
Number of Years in Preschool		
One	29	14.4
Two	32	15.9
Three	1	.5
Missing Data	139	69.2
Total	201	100.0

a--Frequencies using original values.
b--Frequencies using recoded values.

programs. These data, however, were not very valid since they were based primarily on Head Start files. That is, the information was not self-disclosed and was most likely under- representative of Indian students' preschool activities. For instance, it was known that many of the non-reservation/non-colony Indians participated in the Reno Head Start program; however, access to those records was denied.

Summary. Most variables concerning the personal and familial background characteristics were, by their nature, nominal measurements. That is, their information could only have been categorized. Four of the twenty-one background characteristics measured were interval scale variables and tested using the t-test statistic. These results indicated that Indian students came from significantly lower socioeconomic (or income) families and were slightly older than their classmates, but that there were no statistical differences in terms of the number of months students were enrolled for either 1982-83 or 1983-84.

Crosstabulations of the other seventeen background variables were made by ethnicity, and the chi-square statistic was used to determine if Indian and non-Indian differences were statistically significant. These results generally indicated that Indian students were not significantly different from non-Indian students on nine (or 45%) of the variables: number of males and females in the sample; mother's status to the student; father's status to the student; whether the student's mother was living; whether the student's mother was working; whether the student had had a change of schools; whether an emergency contact person was listed at the school; and the number of continuous months in the Washoe County School District for both the 1982-83 and 1983-84 school years. In contrast, they were significantly different on eleven (55%) of the twenty variables: median family income; participation in the federal lunch program; the number of parents employed; whether the student's father was employed; the number of parents absent from the home; whether the student's father was living; whether a home telephone number was listed with the school's office; the student's residence; whether an emergency telephone number was listed with the school office; the student's age; and the student s birthplace.

School Environment and Learning Context Characteristics

Although many researchers have studied the influences of the student's school environment and learning context characteristics, most have supported the conclusions made by Coleman et al. (1966) that such factors were not predictive of educational success, despite measurable differences that existed between ethnic and other groups. Such empirical results, however, would seem theoretically ridiculous. In other words, the logical deduction from the conclusion drawn by Coleman et al. would be that the school system has no effect (or at least no intended effect) on students. Conversely, as Stockard and Mayberry (1987) have shown, numerous studies have shown that schools do make a difference. Therefore, analyses of school environment and learning context characteristics were made so as to eventually analyze their ability to explain educational success.

Unlike Coleman et al., Rutter and his associates (1979) found that a number of school environment and learning context variables were important in explaining school success, and concluded that a school's ethos was one of the most important factors. Contributing causes included the school's median family income, the school's physical facilities, the teachers and staff, and some esprit de corps that resulted from the interaction of these and other more attitudinal characteristics. That is, some schools developed a good reputation and others a bad reputation, which could have been conceptualized in part by a school's socioeconomic status, and this reputation led to self-fulfilling prophesies on the part of the students, teachers, staff, and community.

School socioeconomic status characteristics. One measure of the school's ethos has been the school's socioeconomic status (SES). As such, this study measured the school's SES by calculating the school's median family income. Such a measure was derived by summing each student's median family income and dividing by the number of students in the study group from that school.

Table 25 and Figure 22 present the frequency distributions and statistics concerning the school's median family income. It was found that the distribution for schools attended by Indian students were more positively skewed, while the distribution of school's median income of non-Indian students approached a normal distribution. Other statistical results (Table 25) also demonstrated this. The *t*-test of means indicated that Indian students attended schools with mean family

Table 25. School's Median Family Income

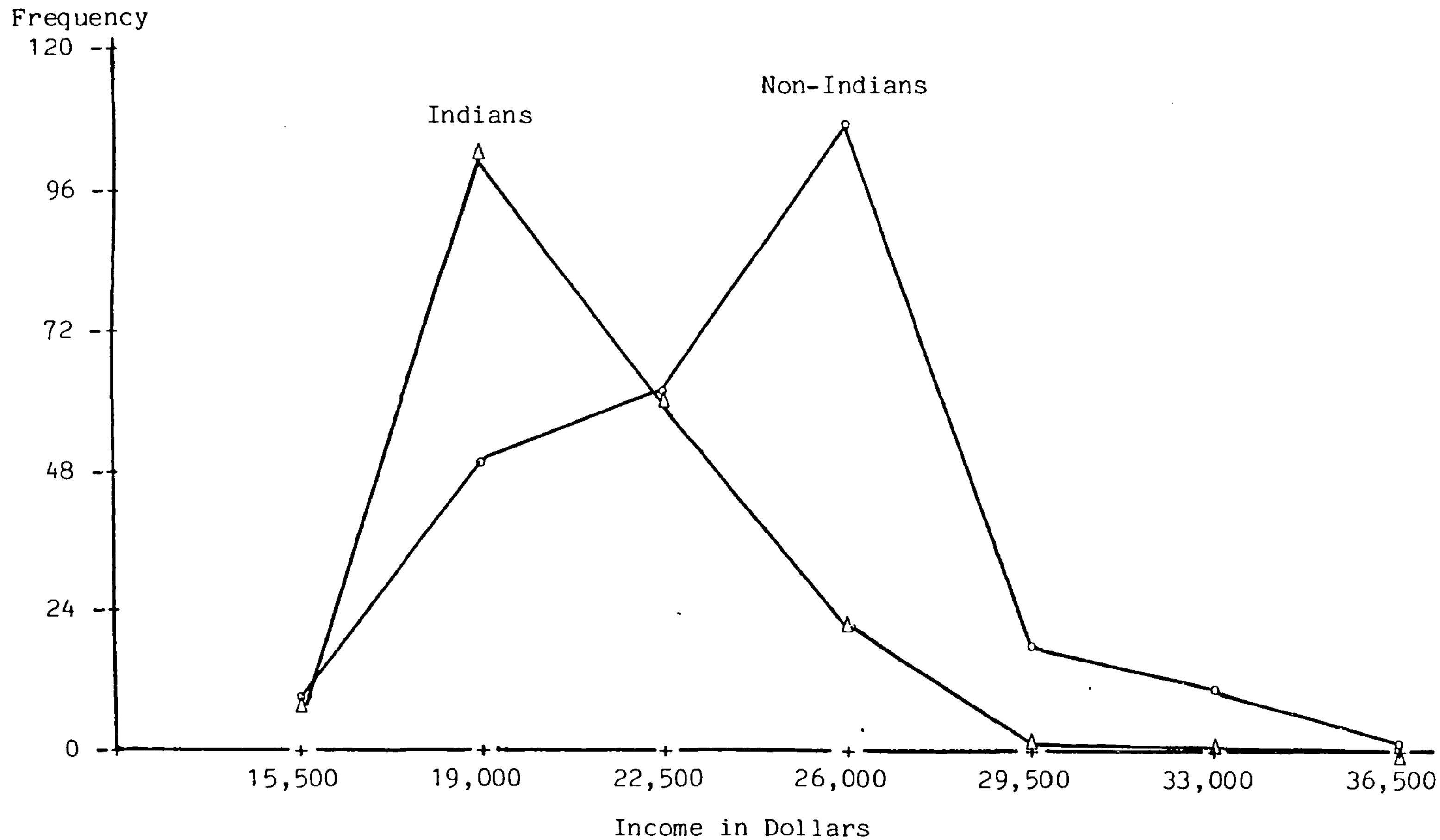
Value $	Indians f	Non-Indians f	Value $	Indians f	Non-Indians f
16,320	1	3	24,105	0	5
17,138	5	4	24,288	1	7
17,180	3	3	24,384	2	11
17,377	2	1	24,678	2	9
17,413	8	4	24,934	1	9
18,050	8	5	25,658	5	8
18,100	44	6	25,748	3	9
18,934	2	5	26,238	0	7
19,290	2	4	26,367	2	11
19,614	9	11	26,434	0	8
19,834	3	6	26,528	2	10
20,630	24	7	26,677	3	11
20,936	33	7	27,611	1	3
21,689	12	12	27,708	1	5
22,053	1	3	28,295	0	3
22,993	7	11	29,382	2	11
23,210	4	11	30,021	0	4
23,393	6	7	32,310	2	10
23,549	0	5	32,899	0	1
			35,975	0	1
			Total	201	258

	Mean	Median	Mode	Standard Deviation
Indians	$ 20,700.33	$ 20,630.00	$ 18,100.00	$ 2,576.20
Non-Indians	$ 24,016.77	$ 24,384.00	$ 21,689.00	$ 3,831.92

t-ratio = 10.44 $p < .001$

a--Figures based upon residential median census incomes.

Figure 22. School's Median Family Income



incomes ($20,700) statistically significantly below schools attended by non-Indian students ($24,017). The median differences were even greater. One-half of the Indian students attended schools with median family incomes of $20,630 or less, while over one-half of the non-Indian students attended schools with median family incomes over $24,384.

Another characteristic that often affected the status of a particular school has been the school's enrollment size. Table 26 indicates the study group's enrollments by school,[25] for those schools still represented in the study. In analyzing these results, the discussion concerning sampling in Chapter 2 must be recalled. First, the Indian sample had been a deliberate 100% sampling of the Indian student population, while only a 3% stratified sample of the non-Indian population was made. Second, the transiency rate in the Washoe County School District was unusually high in most schools for all students. Third, while the district elementary school Indian population was about 3%, most of the Indian students attended one of only several schools. To demonstrate, in School Number 28 the Indian population accounted for 85% (see Appendix A, Table A-1) of the total school enrollment, while in School Number 3 and School Number 33, Indian students made up 13% and 7%, respectively, of the student body. As a result, these three schools alone accounted for 45% of the total elementary school Indian population. Additionally, the decision was made to restrict this study to students who attended school in the Washoe County School District during both the 1982-83 and 1983-84

Table 26. School Enrollments

Enrollment Size	Indians f	Non-Indians f	Enrollment Size	Indians f	Non-Indians f
57	2	1	414	5	4
134	44	6	415	6	7
148	0	1	425	2	9
188	8	4	426	4	11
200	1	3	430	5	14
278	0	7	434	33	7
283	2	4	437	3	11
285	0	1	438	0	5
315	4	6	449	2	10
333	2	5	460	1	7
335	3	9	476	8	5
350	1	11	493	1	9
363	0	5	528	8	6
376	2	11	539	7	11
380	5	8	558	24	7
381	0	3	583	0	4
387	2	11	600	9	11
406	4	9	660	1	5
410	2	10	Total	201	258

	Mean	Median	Mode	Standard Deviation
Indians	375	430	134	160
Non-Indians	415	425	430	104

t-ratio = 3.08 $p < .01$

school years. It was not surprising, therefore, that apparently sizable differences in the school enrollment frequency distribution (Table 26) were found, and that they indicated that considerably more Indian students than non-Indian students were sampled at School Number 3, School Number 28, and School Number 33.

The results of the descriptive analyses indicated that Indian students attended schools that had mean enrollments of 375 students. The modal frequencies and standard deviation indicated, on the other hand, that most Indian students did not attend schools with mean enrollments, but rather attended either much smaller schools (i.e., enrollment of 134 students) or much larger schools (i.e., enrollments of 434 and 588 students). At the same time, the median enrollment size was practically the same for both Indian (median = 430) and non-Indian (median = 425) students. These results, then, indicated that Indian students primarily attended one of only a few schools, which covered the spectrum from very low enrollment (School Number 28), to near average enrollment (School Number 3), to quite a large enrollment (School Number 33). In contrast, the distribution for non-Indian student enrollment sizes was much more normally distributed, with a mean enrollment size of 415 students. A test of mean differences (Table 26) further suggested that Indian students attended schools with significantly smaller average enrollments than non-Indian students. A major implication of these results was that further analyses of school environment and learning context characteristics in the Washoe County School District would have to control for enrollment size.

Theoretically, as well as realistically, the age, number of improvements made, size, and total cost of constructing the school's facilities should have all influenced the school's socioeconomic status or ethos. The results (Table 27) demonstrated that Indian students did not attend schools that were statistically significantly newer or older than those attended by non-Indian students. The mean age for schools in the Washoe County School District was twenty-three years. Although the standard deviation was greater for non-Indian students, this simply showed that they were more likely than Indian students to attend the oldest (72 years old) and the newest (three to four years old) schools.

Although initial analyses of other school characteristics (see Appendix A for descriptive statistics) indicated that there were no statistical differences between Indian and non-Indian students in terms of other school environment and learning context characteristics at the schools they attended, when such factors were controlled for by enrollment, statistically significant differences were found. That is, the results (Table 28) demonstrated that Indian students attended schools that had had statistically significantly more improvements made, had more classrooms and total square footage, and had larger school sites per student than non-Indian students. Although not statistically greater, the schools attended by Indian students also had higher total construction costs per student. It was noted,

Table 27. Age of School (in Years)

Years	Indians f	Non-Indians f	Years	Indians f	Non-Indians f
3	0	4	27	18	24
4	9	36	28	33	7
12	44	6	29	7	25
18	0	1	30	0	8
19	5	16	33	8	6
20	19	48	34	0	1
21	24	7	35	2	4
22	5	4	36	2	12
23	1	3	49	3	3
24	6	7	60	8	4
25	0	5	72	1	7
26	6	20	Total	201	258

	Mean	Median	Mode	Standard Deviation
Indians	23.4	21.0	12.0	11.6
Non-Indians	23.8	24.0	20.0	13.3

t-ratio = 0.35 p = n.s.

Table 28: Mean Comparisons of Indian and Non-Indian Students For School Environment and Learning Context Characteristics Per Student

Variable Name[a]	Indian Mean	Non-Indian Mean	t-ratio
Number of School Improvements	0.0130	0.0108	-3.78***
Number of Classrooms in School	0.0534	0.0466	-4.66***
Total Square Footage of School	89.6575	80.0615	-3.98***
School Site Acreage Size	0.0331	0.0181	-5.90***
Total Cost of School Construction	1583.88	1438.87	-1.43

*--p<.05 **--p<.01 ***--p<.001

[a]--Due to the large differences in school enrollment, variables were controlled by dividing measures by the school's enrollment to obtain per student values.

however, that most of the mean differences were not necessarily substantively large.

In looking at the number of improvements made to school facilities, which included things like building additions, carpeting, and facility repairs or upgrading, it was found that 13 improvements per 1000 students (or .013 improvements per student) had been made at schools attended by Indian students and approximately 11 improvements per 1000 students (or .011) had been made at schools most often attended by non-Indian students. Although the schools exhibited considerable variance in the number of improvements made (0-9), such improvements were apparently appropriate to the school's enrollment size as much as anything else.

While the observed number of classrooms per student was substantively similar, with one room for every twenty students (or .05 classrooms per student), the total square footage per student was substantively different. On the average, the square footage of schools attended by Indian students (89.66 square feet) was more than 8.5 square feet per student larger than schools attended by non-Indian students (80.06 square feet). Hence, the results (Table 28) indicated that Indian students attended significantly larger schools, particularly when comparing total square footage per student.

The results also demonstrated (Table 28) that Indian students attended schools with substantively larger school sites per student. On the average, schools most often attended by Indian students had a little more than three acres per 100 students (or .0331 acres per student), while those schools most likely attended by non-Indian students had less than two acres per 100 students (or .0181 acres per student). That is, schools attended by Indian students were on the average one acre larger per hundred students than schools most likely attended by non-Indian students. These substantively and statistically significant differences in school site acreage between Indian and non-Indian students were further amplified by other descriptive results. That is, it was observed (Appendix D) that the modal school site for schools most likely attended by Indian students was 12.5 acres, in comparison to 10 acres for schools most likely attended by non-Indian students.

The last school characteristic for which data were collected was the total cost of school construction. The range for this variable was tremendously large, with the lowest total cost ($39,743) almost 1.9 million dollars below the highest expenditure ($1,933,400). The school's age, enrollment size, number of classrooms and improvements, and total square footage were all factors that influenced the total cost of construction. A simple comparison of the mean cost per student indicated substantive differences between Indian and non-Indian students (Table 28). It was found that, on the average, $145 per student more had been spent on school construction costs at schools most likely attended by Indian students than at schools attended by non-Indian students. However, the _t_-test results (Table 28) indicated that this observed difference in total school costs per student was not statistically significant.

In summary, the results found that Indian students attended schools with significantly lower median family incomes and school enrollments, but similarly aged schools. This considerable variation in school enrollment sizes made it necessary to control for enrollment size in further analyses of school environment and learning context characteristics. Once school enrollment was controlled, it was found that Indian students were statistically significantly more likely to attend schools with more improvements made, more classrooms, greater square footage, and larger school sites per student than for schools attended by their classmates.

Library characteristics. No other known studies have made as many multiple measurements of library characteristics as the current research. Data were analyzed on thirty-one different variables concerning the school's library environment and learning context. All of these data consisted of interval data, but many of them also had distributions with very large variances which made initial analyses difficult. However, once these variables were controlled for by the school's enrollment size, distributions and variances became stabilized and *t*-tests could then be used to test for Indian and non-Indian student differences.

Table 29 shows the mean values per student for both Indian and non-Indian students, and the results of the *t*-tests of the mean differences. The *t*-test results found that the two groups of students were statistically significantly different on twenty-five of the thirty-one (81%) library school environment and learning context

Table 29: Mean Comparisons of Indian and Non-Indian Students For Library School Environment and Learning Context Characteristics Per Student

Variable Name[a]	Indian Mean	Non-Indian Mean	t-ratio
Number of Encyclopedia Sets in Classrooms	0.0177	0.0173	-.36
Number of Encyclopedia Sets in Library	0.0183	0.0124	-3.88***
Number of Encyclopedia Sets Missing Volumes	0.0064	0.0049	-2.07*
Total Number of Encyclopedia Sets in 1983	0.0132	0.0176	4.71***
Total Number of Encyclopedia Sets in 1984	0.0158	0.0202	4.10***
Percentage of Books Added (1983-84)	0.0154	0.0133	-1.65
Percentage of Books Discarded (1983-84)	0.0089	0.0092	.23
Percentage of Books Lost (1983-84)	0.0018	0.0014	-4.27***
Total Library Books in 1983	19.6968	15.8621	-5.55***
Number of Minutes Library is Open Before School	0.0156	0.0320	4.66***
Number of Minutes Library is Open During Lunch	0.0793	0.0490	-4.96***
Number of Minutes Library is Open After School	0.0434	0.0355	-1.90
Number of Filmstrips	2.2099	1.7495	-8.42***
Number of Audio Tapes	1.4242	1.2457	-3.00**
Number of Audio Recordings	0.4803	0.3370	-5.08***

*--p<.05 **--p<.01 ***--p<.001

a--Due to the large differences in school enrollment, variables were controlled by dividing measures by the school's enrollment to obtain per student values.

Table 29: (continued)

Variable Name[a]	Indian Mean	Non-Indian Mean	t-ratio
Number of Video Tapes	0.0013	0.0004	-4.14***
Number of Software Programs	0.0296	0.0372	.84
Number of Slides	0.7414	0.6282	-2.59**
Number of Transparencies	0.4295	0.5153	1.27
Number of Instructional Kits	0.1650	0.1408	-2.19*
Number of Film Loops	0.0484	0.0315	-2.98**
Number of Globes	0.0058	0.0099	3.16**
Number of Models	0.0325	0.0162	-7.66***
Number of Audio Visual Materials	5.5322	4.6963	-5.04***
Number of Magazine Subscriptions	0.0250	0.0178	-5.13***
Number of Certified Librarians	0.0000	0.0001	2.53**
Number of Paid Library Aides	0.0002	0.0000	-3.68***
Number of Library Assistants	0.0034	0.0024	-5.71***
Average Daily Number of Student Library Aides	0.0022	0.0039	3.81***
Weekly Average Circulation	1.6901	1.5226	-3.07**
Weekly Average Student Use	1.2695	0.8762	-3.54***

*--p<.05 **--p<.01 ***--p<.001

a--Due to the large differences in school enrollment, variables were controlled by dividing measures by the school's enrollment to obtain per student values.

characteristics per student. Of these, nineteen (76%) had negative *t*-ratios, which meant that Indian students had a statistical advantage in those factors. In looking at the six variables for which Indian and non-Indian students were not statistically different, Indian students also tended to have the advantage on three of the factors: number of encyclopedia sets in classrooms, percentage of books added, and the number of minutes the library was open after school; and non-Indian students had the advantage on the other three variables: percentage of books discarded, number of software programs, and number of transparencies.

The results (Table 29) indicated that Indian students tended to attend schools that had statistically significantly more of the following library characteristics per student than schools typically attended by non-Indian students:

1) Number of encyclopedia sets in the library
2) Number of encyclopedia sets missing volumes
3) Percentage of books lost in 1983-84
4) Total library books in 1982-83
5) Number of minutes the library was open during lunch
6) Number of filmstrips
7) Number of audio tapes
8) Number of audio recordings
9) Number of video tapes
10) Number of slides
11) Number of instructional kits
12) Number of film loops
13) Number of models
14) Number of audio/visual materials
15) Number of magazine subscriptions
16) Number of paid library aides
17) Number of library assistants
18) Weekly average circulation of library books
19) Weekly average student use of library

In contrast, schools more likely attended by non-Indian students had statistically significantly more of the following library characteristics:

1) Total number of encyclopedia sets in 1982-83
2) Total number of encyclopedia sets in 1983-84
3) Number of minutes the library was open before school
4) Number of globes
5) Number of certified librarians
6) Average daily number of student library aides

However, some of these differences were not necessarily substantively large. For example, it was not too important to know that schools most likely attended by Indian students had nine more video tapes for every 10,000 students (or .0009 per student more) or twelve more slides for every 100 students (or .12 per student more) than schools more often attended by non-Indian students.

The observations that Indian students tended to go to schools with more books per student and with a library that was open longer per student over the lunch hour, and that schools most often attended by non-Indian students were open longer (per student) before school, were the most substantively interesting results. More specifically, it was found that Indian students attended schools that had nearly four more library books per student, and that the libraries at these schools were open three minutes per student more during the lunch hour than at other schools. In contrast, the libraries of schools less likely to be attended by Indian students were open two minutes per student longer before school began. Accordingly, nearly one-half of the non-Indian students, in comparison to less than one-fourth of the Indian students, attended schools with libraries open before school.

In contrast, over three-fourths of the schools attended by Indian students were open during lunch, but less than one-half of the schools non-Indian students were likely to attend were open over the lunch period when students would have been less likely to use the library.[26] It was also noted that the weekly average circulation of books and the student use of the library were substantially greater at schools most likely attended by Indian students. This, however, was to be expected in light of the results that indicated there were more books in the library and that it was open longer over the lunch hour.

Some other interesting results concerned library personnel. Although it was found (Table 29) that the mean number of personnel was zero for both Indian and non-Indian students, the t-ratios were statistically significant. Examination of frequency data helped to clarify this situation. First, it was found that Indian students did not go to schools that had certified librarians, which was statistically significantly ($x^2 = 4.67$, $p < .05$) less than for non-Indian students, although only 3% of the non-Indian students attended schools with certified librarians. Conversely, Indian students were significantly more likely to attend schools with paid aides and other library assistants. Overall, most school libraries did not have paid aides (i.e., 93%) but very few students attended a school with no type of library assistant (6%). Again the low frequencies probably caused these results. Lastly, with respect to student library aides, frequency counts indicated that significantly more (45%) of the non-Indian students than Indian students (32%) went to schools with one or more student aides. While it was found that only 10% of the Indian students, in comparison to 23% of the non-Indian students, went to schools with three or more student aides, this may have been because they were also more likely to go to smaller schools. It was also interesting that libraries at schools most likely attended by Indian students had significantly more books checked out per week, although the mean differences were not substantively large (i.e., only 17 more books per hundred students).

Student and faculty characteristics. Table 30 presents the results of the mean comparisons for student and faculty differences, while Table 31 presents the results for special faculty and staff comparisons. The results concerning numbers of students and teachers (Table 30) indicated that seven of the sixteen (44%) comparisons were statistically significant, and that non-Indian students attended schools with more students and teachers, both by grade level and for the school in general (which was already known). The greatest differences were in the number of students by grade level. That is, non-Indian students were significantly more likely to attend schools with more first, second, third, and fourth grade students. Not surprisingly, these schools also had significantly more first and third grade teachers. Interestingly, the student teacher ratios at all schools were nearly equal, yet schools most likely attended by non-Indian students had statistically more students, but not significantly more teachers.

Table 30: Mean Comparisons of Indian and Non-Indian Students For Student and Faculty School Environment and Learning Context Characteristics

Variable Name	Indian Mean	Non-Indian Mean	t-ratio
Number of Students in Kindergarten	52.75	53.78	0.56
Number of Students in First Grade	62.54	69.16	2.51**
Number of Students in Second Grade	53.42	59.89	2.85**
Number of Students in Third Grade	51.44	58.40	3.76***
Number of Students in Fourth Grade	52.05	57.44	2.69**
Number of Students in Fifth Grade	55.15	58.18	1.46
Number of Students in Sixth Grade	57.45	60.89	1.39
Total Number of Students	389.17	418.20	2.15*
Number of Kindergarten Teachers	1.07	1.07	0.02
Number of First Grade Teachers	2.51	2.72	2.31*
Number of Second Grade Teachers	2.23	2.33	1.22
Number of Third Grade Teachers	1.85	2.12	4.57***
Number of Fourth Grade Teachers	2.09	2.15	0.93
Number of Fifth Grade Teachers	2.11	2.18	1.03
Number of Sixth Grade Teachers	2.18	2.26	0.90
Total Number of Teachers	14.26	14.85	1.42

*--p<.05 **--p<.01 ***--p<.001

Table 31: Mean Comparisons of Indian and Non-Indian Students For Student and Faculty School Environment and Learning Context Characteristics Per Student

Variable Name[a]	Indian Mean	Non-Indian Mean	t-ratio
Number of Kindergarten Aides/Assistants	0.0002	0.0005	1.66
Number of First Grade Aides/Assistants	0.0006	0.0006	0.18
Number of Second Grade Aides/Assistants	0.0013	0.0010	-1.42
Number of Third Grade Aides/Assistants	0.0002	0.0004	0.93
Number of Fourth Grade Aides/Assistants	0.0002	0.0002	0.24
Number of Fifth Grade Aides/Assistants	0.0002	0.0003	1.39
Total Number of Aides/Assistants	0.0005	0.0006	1.16
Number of Special Education Students, Kindergarten	0.0034	0.0139	2.69**
Number of Special Education Students, First Grade	0.0546	0.0344	-5.01***
Number of Special Education Students, Second Grade	0.0958	0.0556	-8.13***
Number of Special Education Students, Third Grade	0.0911	0.0780	-2.75**
Number of Special Education Students, Fourth Grade	0.1024	0.0994	-0.51
Number of Special Education Students, Fifth Grade	0.0681	0.0811	2.29*
Total Number of Special Education Students	0.0660	0.0616	-1.39

*--p<.05 **--p<.01 ***--p<.001

[a]--Due to the large differences in school enrollment, variables were controlled by dividing measures by the school's enrollment to obtain per student values.

Table 31: (continued)

Variable Name[a]	Indian Mean	Non-Indian Mean	t-ratio
Number of ESL Students, Kindergarten	0.0020	0.0038	0.83
Number of ESL Students, First Grade	0.0156	0.0164	0.18
Number of ESL Students, Second Grade	0.0134	0.0171	1.03
Number of ESL Students, Third Grade	0.0092	0.0135	1.64
Number of ESL Students, Fourth Grade	0.0090	0.0114	0.85
Number of ESL Students, Fifth Grade	0.0092	0.0125	1.24
Total Number of ESL Students	0.0095	0.0121	1.00
Number of Library/ Resource Teachers	0.0041	0.0042	1.33
Number of Federal Employees	0.0019	0.0007	-7.44***
Number of Counselors	0.0018	0.0011	-6.49***
Total Staff	0.0563	0.0493	-7.49***

*--p<.05 **--p<.01 ***--p<.001

a--Due to the large differences in school enrollment, variables were controlled by dividing measures by the school's enrollment to obtain per student values.

In regards to student and faculty characteristics (Table 31) concerning aides/assistants, special education teachers and students, English as a second language teachers and students, library/resource teachers, federal employees, counselors, and total staff, Indian and non-Indian students attended schools that were statistically significantly different in only eight of twenty-five factors (32%). Although it was the Washoe County School District's policy to consolidate special education students by grade level throughout the district, the fact that Indian students tended to go to schools that had statistically more special education students in the first, second, third, and fifth grades was unexpected. This implied one of two things: there were significantly more Indian students in special education or the district was selectively consolidating special education students at those schools most likely attended by Indian students.

Despite descriptive analyses (Table 31) that indicated large differences in the number of resource teachers and federal employees for Indian and non-Indian students (Appendix D), when these differences were held constant by the school's enrollment size, the substantive, although not statistical, differences per student did <u>not</u> exist. That is, the differences in federal employees and counselors, while statistically significant, were realistically meaningless: both groups had fewer than one per hundred students. In contrast, the results concerning total staff were substantively and statistically significant, with Indian students attending schools with one more additional staff person per one hundred students. The results (Table 31) concerned with counselors in the Washoe County School District, which indicated that there were nearly two counselors for every 1000 students (or .0019 per students) at schools most likely attended by Indian students and only one for every 1000 students (or .0011 per student) at schools attended more often by non-Indian students, were somewhat surprising, since it was commonly believed by personnel in the district that the opposite was true. However, these figures were substantively meaningless, as no school had a thousand students.

Table 32 presents the observed student frequencies in the study sample by grade level. Statistical analyses indicated that significant ethnic distributional differences did not exist by grade level in the study sample, although statistical differences for the total sample had been (Table 31) found. Thus, no fewer Indian students than expected were included in the various grade level samples of this study, although simple percentage differences did occur. This meant that the samples were comparable, despite the large transiency problem. Nonetheless, these results (i.e., the observed differences in actual numbers) underscored the necessity to weight the non-Indian sample so that advanced data analyses were not biased by these sampling differences.

One final note, it was observed (Table 32) that about one percent of the sample had been retained a grade level. Because the sample was restricted to students who had been in the district, and received grades, for two consecutive years, all kindergarten and first grade

Table 32. Sample Differences Between Indian and Non-Indian Students by Grade Level

Variable/Value		Indians	Non-Indians	Total
Grade Level				
1st Grade	f	2	4	6
	%	(1.0)	(1.5)	(1.3)
2nd Grade	f	32	61	93
	%	(15.9)	(23.6)	(20.3)
3rd Grade	f	37	59	96
	%	(18.4)	(22.9)	(20.9)
4th Grade	f	41	43	84
	%	(20.4)	(16.7)	(18.3)
5th Grade	f	50	52	102
	%	(24.9)	(20.1)	(22.2)
6th Grade	f	39	39	78
	%	(19.4)	(15.1)	(17.0)
Total		201	258	459

χ^2 = 7.88 p = n.s.

students should have been eliminated from the study. The six first graders in this study, therefore, represented students in the first grade both years--that is, these students had been retained. Although only one percent of each group was retained, it has been noted that one-third of the retained students in the sample were in fact Indian students.

Summary. Data on eighty-one school environment and learning context variables were analyzed. The results of these analyses indicated that Indian students tended to go to schools that were significantly different from schools most often attended by non-Indian students. In regards to school facilities, Indian students were more likely to attend schools that had significantly lower median family incomes (which were also more positively skewed), lower enrollments, more improvements per student, more rooms per student, more square footage per student, and larger school yards per student. Because of the tremendous variances in school sizes, it was controlled for on most of the school environment and learning context variables. When controlled for by enrollment, the results were much different. For example, analyses without controlling for enrollment found that Indian students attended schools with significantly less square footage, rather than significantly more square footage (per student) when school size was controlled. The libraries at those schools Indian students were most likely to attend were also different in that they had per student significantly more encyclopedia sets in their libraries, more encyclopedia sets missing volumes, larger percentages of books lost in the 1983-84 school year, more total books, more films, audio recordings, video tapes, slides, instructional kits, film loops, instructional models, total audio visual materials, more library aides and assistants, greater library circulation and student use, and longer hours of operation over the lunch hour. Conversely, these same schools had per student significantly fewer total sets of encyclopedia sets during both years of study, fewer globes, no certified librarians, fewer student library aides, and shorter hours for the library to be open before school. With regard to school staff and student body structure, the schools most often attended by Indian students had per student significantly more special education students in the first, second and third grades, more federal employees, more counselors, and more total staff; although not all of these were substantively different. Overall, then, schools most likely attended by Indian students statistically significantly differed from schools most likely attended by non-Indian students on forty-six of the eighty-one (57%) variables. Of these, the schools attended by Indian students had the statistical advantage on twenty-eight (61%) of the forty-six statistically significant differences. In contrast, the schools were not statistically significant on thirty-five (43%) of the eighty-one variables, but these schools attended by Indian students had the advantage on only seven (20%) of thirty-five nonsignificant differences. These results, therefore, suggested that statistically significant differences between schools most likely attended by Indian students and those most likely attended by non-Indian students did exist and that Indian students tended to enjoy an advantage on a per student basis (although not on a per school basis).

Conclusions

The results of the data analyses from the first cycle of the research project presented in this chapter have provided both descriptive and comparative characteristics of academic achievement in the Washoe County School District for Indian students and their classmates. Data were inductively collected on a variety of factors, some of which had not been previously studied in conjunction with educational achievement, and deductively gathered on variables that were identified as potentially important to achievement in the literature. All data, regardless of the data collection procedures, were analyzed with univariate and bivariate descriptive and comparative statistics.

Student Characteristics of Education

Discussion concerning the type and degree of relationship between student characteristics will be discussed in Chapter 4, as these results were methodologically important to the advanced data analyses of the second research cycle discussed in that chapter. That is, although such a discussion would certainly, at this point, more adequately answer the first research question concerning what student characteristics are related to education, it will be both theoretically and editorially more parsimonious to present the correlates of education in Chapter 4. Doing so eliminates the presentation of redundant correlates; that is, reporting two variables that correlate with academic achievement test scores, but also correlate with each other. Hence, the discussion in Chapter 4 will be limited to those variables that were theoretically and/or empirically correlated with test scores.

The results presented in this chapter have provided initial evidence of which characteristics may or may not be related to educational achievement in the Washoe County School District. These results have indicated those variables for which there was very little or no variance among students in the sample, and presumably within the district population.

Indian and Non-Indian Differences

In regards to academic achievement, the empirical evidence showed that Indian students were achieving at statistically significantly lower levels than their classmates. They were, however, relatively successful in comparison to national norms. The largest significant differences in the ten measured areas of achievement tended to be found at individual grade levels, although such differences were minimal at the third and fourth grade levels. As such, these results supported the acceptance of the first research hypothesis:

> H_1: Standardized achievement test scores for Indian students are significantly lower than test scores for non-Indian students in the Washoe County School District.

Analyses of class grades and other characteristics of prior achievement found that Indian students were statistically significantly less successful than their classmates in all measured areas except the number of days present during the 1982-83 school year and the number of days not enrolled for both the 1982-83 and 1983-84 school years. That is, during both years analyzed, Indian students achieved significantly lower grade point averages and class grades in arithmetic, language, reading, science/health, social studies, and spelling. Indian students were absent statistically significantly more days than non-Indian students both years, but were present more days in 1982-83 and were slightly more likely to have taken the standardized achievement tests in 1984; that is, they were present those days to take them. Since eighteen of the twenty-one (86%) measured prior achievement characteristics were statistically different for Indian students than their classmates, the second research hypothesis is accepted:

> H_2: Class grades, attendance, and other measures of previous achievement are significantly different for Indians and non-Indians in the Washoe County School District.

With respect to teacher evaluations, Indian students were statistically significantly different only in terms of citizenship grades for both 1982-83 and 1983-84. However, Indian students were substantively different from their classmates in terms of their participation in the gifted student program and having been retained one or more times. That is, non-Indian students were more than twice as likely to participate in the gifted student program while, in contrast, Indian students were more likely to have been retained one or more grades. While not as strong of evidence existed concerning the third research hypothesis as for the first two hypotheses (i.e., only 40% of the differences were significant), the results still tended to confirm the third research hypothesis (particularly with regard to citizenship grades):

> H_3: Teacher evaluations are different for Indian and non-Indian students in the Washoe County School District.

In analyzing personal and familial background characteristics of students in the Washoe County School District, it was found that Indian students were statistically significantly different from non-Indian students in terms of socioeconomic status (as measured by both median family income and participation in the federal lunch program), home environment, school-related, and personal background measurements. Specifically, Indian students' families had significantly lower family incomes, were more likely to participate in the federal lunch program, and were more likely to have a father or both parents unemployed. Indian students' home environments were significantly more likely to have one or both parents absent, and were also more likely to have a father who was a stepfather, guardian, or deceased. Indian students were more likely to have a rural residence, to not have a telephone number listed at their school, to have been born in-state (Nevada), and to have been older than their classmates. In contrast, Indian students were significantly different from non-Indians on only one (or 20%) of the measures of school-related background characteristics. Only the variable concerning the listing of an emergency phone number at the school office was significant, with Indian students being twice as likely <u>not</u> to have one listed. Overall, 60% of the observed differences were statistically significant, which provided for the acceptance of the fourth research hypothesis:

> H_4: Personal and familial background characteristics are significantly different for Indian and non-Indian students in the Washoe County School District.

The last set of variables analyzed were school environment and learning context characteristics. These results demonstrated that Indian students were statistically significantly different in regards to most of the school's socioeconomic status measurements, which included the school's median family income, enrollment, age, improvements, size, and total cost of construction and subsequent improvements; that is, six of eight, or 75%, of the variables had significant statistical comparisons. Indian students were more likely to attend schools that had a significantly lower median family income and student enrollment, but that had per student significantly more square footage, more rooms, more improvements, and more school acreage.

The schools most likely attended by Indian students were per student significantly more likely to have libraries that were open less before school but open more during lunch, had no certified librarians but more paid aides and nonpaid assistants, greater student use and circulation, fewer student aides, more encyclopedias in the library but fewer in the school overall, more encyclopedias missing volumes, and generally more audio/visual materials.

Indian and non-Indian students were not, generally, statistically significantly different with respect to student and faculty characteristics. Indian students were, however, found to be significantly more likely to attend schools with fewer students in the first, second, third, and fourth grades, along with having smaller total enrollments, per student. These schools also had per student more special education students in first, second and third grades (but fewer in kindergarten and fifth grade) and fewer classroom teachers in the first and third grades. The schools most likely attended by Indian students also had per student statistically more federal employees, counselors, and total staff. Since forty-six of the eighty-five (57%) school environment and learning context variables were statistically significant the results tended to also verify the fifth research hypothesis:

> H_5: School environment and learning context variables are different for Indian and non-Indian students in the Washoe County School District.

In sum, it was concluded that Indian students were significantly different from non-Indian students in the Washoe County School District with respect to previous class achievements, teacher evaluations, personal and familial background characteristics, and school environment and learning context factors. More importantly, Indian students' academic achievement in the Washoe County School District was statistically and substantively significantly lower than that of their non-Indian classmates. Taken together, these results suggested that there existed unintended, latent, structural discrimination in relationship to Indian student success in the Washoe County School District.[27] Overall, Indian students were significantly different from their classmates in 61% of the measured antecedent variables of the standardized achievement tests. These conclusions suggested the hypothesis that these antecedents were likely to be correlated with test scores and were probably predictors of academic achievement. Moreover, these conclusions inductively corroborated the synthesis of the literature discussed in Chapter 1, which deductively led to the sixth and seventh research hypotheses:

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_7: Ethnicity is an antecedent predictor of SAT scores in the Washoe County School District.

Implications

The first cycle of this study, then, provided both inductive descriptions and deductive test results in response to the first two research questions:

1. What student characteristics are related to education?
2. Do Indian students differ from other students?

Two sets of research processes (see Figure 2) were followed in finding empirical evidence to answer these questions. The first set of processes involved framing the literature to identify potential factors not previously studied and observing the existing records of the Washoe County School District to further identify potential characteristics related to education. Data were then collected and descriptively analyzed, which provided initial responses to the first question (Note: Correlates of Academic Achievement will be discussed in Chapter 4). The second set of procedures led to the deduction of the first five hypotheses concerning the second research question, as well as the remaining three research hypotheses. As discussed above, the empirical evidence of this study has supported these hypotheses, which in turn provided a tentative answer to the second research question. More importantly, knowing what characteristics seemed to be related to education and that Indian students differed from non-Indian students on most of these characteristics, has provided the parameters and empirical support to continue on with the second cycle (Figure 3) of this study and explore answers to the third and fourth research questions. Thus, while the primary focus of this cycle of research was to inductively draw generalizations from empirical observations concerning the following two questions, a parallel deductive test (signified by the dotted line in Figure 3) of the sixth and seventh research hypotheses was also made as supportive evidence for the research questions:

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

4. Is ethnicity a determinate antecedent predictor of achievement?

In sum, the results of this first cycle of research have verified the need for further research, as was predicted in Chapter 1. That is, in Chapter 1 it was suggested that answers to the first two questions would pose parameters or implications for further analyses to answer the third, fourth and preceding research questions. Thus, Chapter 4 will first discuss the results of the simple correlations between theoretically and/or methodologically relevant independent variables and the dependent academic achievement test variables, and then analyze those correlates to determine which variables were antecedent predictors of achievement test scores and whether ethnicity and/or grade level were predictive of academic achievement. The first process will more definitively answer the first research question and the second will answer the third and fourth research questions.

CHAPTER 4

FORMULATION OF ACADEMIC ACHIEVEMENT MODELS

This study began with a synthesis of previous research that led to the formulation of two initially distinct sets of research processes; (see Figure 2 for flow of both sets of those research processes). The first set involved the inductive processes of framing the literature to identify factors that had not previously been studied. This provided a set of factors, some of which had previously been studied and others had not, on which data were then collected and inductively or descriptively analyzed, as reported on in Chapter 3. The results of these exploratory observations demonstrated tremendous variation among most variables. The results suggested a number of conclusions, from which it was determined that additional research was desired. That is, how and to what degree were these variables related to achievement? What variables were predictors of achievement? And, more specifically, was ethnicity a predictor of achievement? The second set of processes (in the first research cycle) involved synthesizing the conclusions of previous research on academic achievement and deriving hypotheses that were then tested with the data from the Washoe County School District. This process dictated a set of factors on which data were collected, simultaneously with data collection of the first set of processes, and deductively analyzed as reported in Chapter 3. The results of these analyses found considerable differences between Indian and non-Indian students in regards to both academic achievement and other student characteristics. Again, this suggested that further research would be fruitful, and that the deduced hypotheses that ethnicity and grade level were predictors of achievement were theoretically and empirically relevant.

Methodological Clarification

The results of these two distinct sets of research procedures have resulted in both substantively and statistically significant conclusions concerning elementary education in the Washoe County School District, which included measurable differences between Indian students and their classmates in academic achievement. Since these descriptive results were of minimal utility by themselves, and because they corroborated the conclusions found in other similar studies, continued research was both implicated and justified. The next research cycle once again involved the existing records method. While the results reported up to this point had been analytically based upon data collected using the original data analysis techniques associated with the existing records method, the results of this second study cycle were based upon data collected using secondary data analysis techniques to re-instrument and then further analyze the data.

Data Collection Procedures

The procedures of the second cycle of this study sought to find answers to the following research questions:

1. What student characteristics are related to education?

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

4. Is ethnicity a determinate antecedent predictor of achievement?

Additionally, the procedures attempted to verify or refute the following research hypotheses, which were formed on the bases of the literature review of previous studies:

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

The first step involved theoretically clarifying the concepts antecedent and predictors. Antecedent was defined in this study as anything occurring prior to the administration of the standardized achievement tests on April 2, 1984. Hence, all factors that occurred prior to these exams were defined as being antecedents of them. Predictors were defined as those factors that explained some part of the observed variances in achievement test scores when other endogenous variables were held constant. Antecedent predictors, therefore, were defined as those variables that chronologically occurred prior to, and that partially explained the variance in, the standardized achievement test scores.

Following this step of theoretically establishing the context of the research cycle, all the variables in the existing systems data file were categorized as follows:

1. Dependent Variables (SAT scores)
2. Independent Variables
    a. Antecedent Independent Variables
        1) Previous Student Achievements (e.g., reading grade for 1982-83)
        2) Previous Teacher Evaluations (e.g., participated in the gifted student program during 1982-83)
        3) Personal and Familial Background Characteristics (e.g., student's age; father's status)
        4) School Environment and Learning Context Characteristics (e.g., school's age; number of books in the library for 1982-83)
    b. Postcedent Independent Variables
        1) Student Achievements (e.g., reading grade for 1983-84)
        2) Teacher Evaluations (e.g., citizenship grade for 1983-84)
        3) School Environment and Learning Context Characteristics (e.g., the number of books in the library for 1983-84)
3. Control Variables (e.g., moved into/out of the district)

A new systems file was then created, consisting of the dependent and antecedent independent variables. Postcedent independent variables were not used because they occurred either simultaneously with or after the administration of the achievement tests. Nominal scale data were also recoded into binary (or "dummy") variables.

Data Analysis Procedures

Once the data had been collected, that is, re-instrumented into a new systems file, the next process of the second cycle involved analyzing the data for relationships between variables so as to establish preliminary models of academic achievement. Simple correlations were computed between all variables in the systems file, which were then systematically reviewed in both theoretical and methodological contexts. Specifically, variables with large correlation coefficients were first identified, along with those variables that were conceptualized to be theoretically relevant to the study. That is, factors that were considered potential predictors of achievement, as a result of reviewing previous studies. Secondly, it was theoretically desired to retain some measure from each of the four types of antecedent variables (listed above) for the analyses.

This set of variables was then theoretically and methodologically reevaluated. That is, variables were theoretically evaluated to determine if certain variables were measuring (equally) the same thing. For example, total teachers was theoretically as well as methodologically the same thing as total teachers for each of the sub-category variables; that is, first grade teachers, second grade teachers, and so forth. Similarly, total staff should theoretically include total teachers, aides, English as a Second Language teachers, special education teachers, federal employees, counselors, and administrators. Methodologically, intercorrelations were evaluated to determine those measures that would duplicate explanation of the variance among all variables. It was found that the intercorrelations among various subject area grades were substantial enough to warrant limiting further analyses to just one measure of the "teacher-evaluated student achievement" factors.

Based upon these initial data analyses, thirty-one antecedent variables were selected for further study in conjunction with the more sophisticated and statistically powerful techniques of multiple regression in an attempt to answer the third and fourth research questions:

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

4. Is ethnicity a determinant antecedent predictor of achievement?

And to test the sixth and seventh research hypotheses:

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

It was methodologically and theoretically determined that the grade point average for 1983 was the best correlate of the math and science dependent variables (Math Concepts, Math Test Total, and Science Knowledge), while the reading grade for 1983 was found to account for greater variance in the other dependent variables (Word Study Skills, Reading Comprehension, Reading Test Total, Vocabulary Knowledge, Listening Comprehension, Auditory Test Total, and Spelling). Because the 1983 reading grade and 1983 grade point average were not used together in predicting each of the dependent measures of academic success, due to their very high intercorrelation, a total of thirty antecedent variables were used for the stepwise multiple regression analyses (with means substitution for missing data) to statistically isolate the strongest factors from these antecedent variables. As a result of these analyses, two general predictor models were created.

Correlates of Academic Achievement

Before proceeding to the results of the more rigorous stepwise multiple regression data analysis techniques, the analyses of the simple correlations for the thirty-one independent variables, or potential predictors, with each of the ten dependent variables need to be discussed. All correlation coefficients were based upon the weighted sample. That is, correlation analyses were made after the non-Indian student data had been properly weighted for greater representation of that group's characteristics as would be expected in the elementary school population. Of the possible thirty-one correlation coefficients for each dependent variable, the results reported in Table E-1 (Appendix E; see Appendix B for variable name translations) indicated that:

1) twenty-four (77%) of the potential predictors were statistically correlated to reading word study skills;

2) twenty-three (74%) of the potential predictors were statistically correlated to reading comprehension;

3) twenty-seven (87%) of the potential predictors were statistically correlated to reading test total;

4) twenty-four (77%) of the potential predictors were statistically correlated to vocabulary knowledge;

5) twenty-three (74%) of the potential predictors were statistically correlated to listening comprehension;

6) nineteen (61%) of the potential predictors were statistically correlated to auditory test total;

7) twenty-four (77%) of the potential predictors were statistically correlated to spelling;

8) twenty-five (81%) of the potential predictors were statistically correlated to math concepts;

9) twenty-four (77%) of the potential predictors were statistically correlated to math test total; and

10) twenty-six (84%) of the potential predictors were statistically correlated to science knowledge.

Overall, 239 of the 310 correlation coefficients (77%) were statistically correlated to the respective dependent variables, whereas only sixteen significant correlations would have been expected by chance alone.

Previous Academic Achievement

Three measures of previous academic achievement variables were included, although the two previous grade variables (1983 reading grade and 1983 grade point average) were used independently in the regression analyses. As would be expected, the correlations between previous grades and achievement test scores were all positive and statistically significant. It was surprising, however, that the degree or strength of those relationships were only moderate (i.e., between r = .38 and r = .55); that is, it was expected that previous grades would have been much more strongly correlated with academic achievement test scores. The coefficients (Table E-1) also indicated that the 1983 grade point average correlated more with the math and science variables, while the 1983 reading grade correlated better than grade point average with reading, auditory, and spelling test scores.

Although most previous research has suggested, and most school districts have presumed, that absenteeism was strongly related to academic achievement, the simple correlation results for this data have not supported this generalization. Indeed, it was found that absenteeism was positively, not inversely, associated with all measures of achievement except math test total (r = -.01). Moreover, the strongest correlation, which was between absenteeism and vocabulary knowledge, was only _r_ = .10; conversely, science had a coefficient of zero and math test total had a coefficient of only _r_ = -.01. As a result, twenty-two of the thirty (73%) correlation coefficients between previous achievement and academic achievement test scores were statistically significant.

Student Evaluations

There were also three measures of previous teacher's evaluations of students that had been retained for further analyses. All thirty correlation coefficients were statistically significant, albeit none indicated very strong relationships. Both previous (1983) citizenship grades and participation in the gifted program were positively associated with test scores. That is, students with high previous citizenship grades scored higher on later achievement test scores, and participation in the gifted program was related to higher academic achievement test scores.

A fairly common policy within school districts, including the Washoe County School District, has been to retain students at a particular grade level to increase their competency at that grade in hopes that they could better handle the curricula of the next grade level. The presumption being that the teacher's evaluation to retain the student would increase academic achievement through repetition of the curriculum. It was beyond the scope of this study to evaluate the success of retaining students to increase their academic achievement. Hence, analyses were not made by first controlling for 1983 achievement scores. However, simple correlations were made between retention and 1984 achievement scores. These results indicated (Table E-1, Appendix E) that an inverse or negative relationship existed between retention and achievement test scores. Thus, in the Washoe County School District, retention was found to be related to lower achievement.

Background Characteristics

Eleven of the thirty-one variables were concerned with personal and familial background characteristics of students. As suggested in Chapter 1, such characteristics were not expected to be very related to student academic achievement, despite the fact that the dominant theory suggested that they were. In fact, only 70 of the 110 (64%) correlation coefficients were found to be statistically significant. Moreover, the strongest relationship, which was between the student's age (in months) at the time of the test and science knowledge, was only $r = .24$. Indeed, five of the eleven variables were found to account for most of these significant relationships:

1) whether an emergency telephone number was listed with the school office was positively related with all dependent variables except spelling;

2) whether a student participated in the federal lunch program was negatively related to all dependent variables except spelling and word study skills;

3) whether the student was ethnically identified as Indian was negatively associated with all dependent variables except spelling;

4) whether a home telephone number was listed with the school office was positively related to all ten dependent variables; and

5) the change of schools a student had made was positively associated with all dependent variables except word study skills.

Of these five, ethnicity and participation in the federal lunch program (as a type of measure of socioeconomic status) were sociologically the most interesting. (It should be noted that the positive correlations between a change in schools and achievement test scores meant that those students who had remained at the same school for both the 1982-83 and 1983-84 school years had higher test scores). That is, these two factors have often been sociologically viewed as predictors of achievement. It was observed that both ethnicity and participation in the federal lunch program correlated strongest with the student's vocabulary knowledge subtest scores, which suggested a possible intercorrelation between the two independent measures. The coefficient for the relationship between ethnicity and participation in the lunch program, although not very strong ($r = .11$, $p < .01$), was positive; (see Chapter 5 for further discussion of the intercorrelations between predictors).

Other correlation coefficients for personal and familial background characteristic factors, while not necessarily statistically significant or strong, have suggested the following relationships:

1) generally, the older students (in months) had higher achievement test scores, particularly for math and science;

2) the availability of an emergency telephone number was associated with higher test scores;

3) having either both parents or just the father employed was associated with higher achievement, while having just the mother employed or both parents unemployed was related to lower achievement;

4) having a natural father was associated with higher reading, spelling, math, and science achievement, but lower language scores, while having a stepfather, legal guardian, or no father was related to lower reading, spelling, math, and science achievement, but higher language achievement;

5) lower family income, as measured by participation in the federal lunch program, was associated with lower achievement (i.e., as participation increased, grades dropped; or vice versa);

6) having one or both parents absent from the family home was associated with lower achievement test scores;

7) being self-identified as Indian was associated with lower test scores;

8) residing in the Reno-Sparks area and in the Reno-Sparks Indian Colony was associated with higher achievement, while living outside the Reno-Sparks area and on the Pyramid Lake Indian reservation was associated with lower achievement test scores; and,

9) being female was associated with higher word study skills, reading comprehension, reading test total, listening comprehension, spelling, and math test total test scores, while being male was associated with higher vocabulary, auditory test total, math concepts, and science test scores.

School Environment and Learning Contexts

A logical deduction from analyzing observed differences in student academic achievement between schools has been that the schools also differed in terms of their school environment and learning contexts. However, as discussed in Chapter 1, most well known studies (e.g., Coleman et al., 1966; Jencks et al., 1972) have concluded that most school environment and learning context factors, which would be potentially manipulable by the school system, were not predictive of academic achievement. Conversely, it was also pointed out in Chapter 1 that other studies (e.g., Brod, 1976b; Rutter et al., 1979) have shown that manipulable school environment and learning context variables were indeed predictive of student academic achievement. The bivariate results of this study have tended to support the latter claim, as 117 of the 140 (84%) correlation coefficients (Table E-2, Appendix E) for school environment and learning context variables were statistically significant. Of the fourteen school environment and learning context variables retained for further analyses in this study, seven were statistically significantly associated with all ten dependent variables:

1) school's median income was positively correlated with achievement;

2) school acreage per student was inversely correlated with achievement;

3) library circulation per student was inversely correlated with achievement;

4) the number of encyclopedia sets in the school per student was positively correlated with achievement;

5) the number of magazine subscriptions (in the school's library) per student was inversely correlated to achievement;

6) the number of second grade special education students in the school per student was inversely correlated to achievement; and,

7) the number of total staff in the school per student was inversely correlated to achievement.

Although such coefficients were statistically and substantively significant, they were not all that strong (i.e., no coefficient was larger than $\underline{r}$ = .30).

Thus, larger school average median family incomes and more encyclopedia sets in the school in 1983 were consistently significantly (positively) associated with higher 1984 academic achievement test scores. This meant that either (1) school's average median family income and the number of encyclopedia sets in the school were a function of student academic achievement, or (2) 1984 academic achievement test scores were a function of the school's median family income and the number of encyclopedia sets. It will be recalled that it was suggested in Chapter 3 that these school variables may be reflecting a type of school ethos (Rutter et al., 1979). Thus, these results have indirectly suggested that achievement was a function of school ethos or vice versa.

In contrast, five of the school environment and learning context variables consistently were significantly inversely related with 1984 academic achievement test scores. This meant that lower student academic achievement test scores, in the Washoe County School District, were associated with: 1) larger school grounds or acreage per student; 2) more library books being checked out per student; 3) more magazine subscriptions per student; 4) more second grade special education students in the school per student; and 5) larger staffs per student. Again, achievement could have been a function of these factors, or these quantitative school resource factors may have been a function of achievement. That is, lower achievement test scores in particular schools may have led to the school system increasing the number of resources available at those schools in hopes of increasing achievement (or larger amounts of these school resources may have resulted in lower achievement).

Consequently, despite the fact that the coefficients were generally not very large, these results strongly suggested that the quantity of some resources did not make up for the quality of those resources. Thus, the schools with larger staffs, more magazine subscriptions, and more books being circulated may also have had more inefficient staffs and more inappropriate types of books and magazines. Moreover, the strongest correlations between achievement and school environment and learning context factors were the negative coefficients for school acreage and achievement test scores. Several of these factors were also inferred (in Chapter 3) to be measures of a school ethos, but these bivariate results have suggested that the school's ethos may not necessarily be a function of quantity as much as of quality. Hence, these results have suggested that larger playgrounds and the inclusion of larger numbers of special education students in the school per student may have been associated with a school ethos of play and underachievement rather than work and achievement.

Summary

Thirty-one independent variables, which occurred prior to the administration of the standardized achievement tests (dependent variables), were initially selected based upon their theoretical and methodological relevance. Overall, 239 of the 310 correlation coefficients (77%) were statistically significant, while 22 of 30 correlation coefficients (73%) for previous academic achievement variables, all 30 correlation coefficients (100%) for previous teacher evaluation variables, 70 of 110 correlation coefficients (64%) for personal and familial characteristic variables and 117 of 140 correlation coefficients (84%) for school environment and learning context variables were statistically significant. Thus, in terms of significant associations with 1984 academic achievement, previous teacher evaluations, and school environment and learning context variables were most often related.

As expected, measures of previous academic achievement were positively related to 1984 academic achievement. Although previous grades had the strongest correlations, none were very strong (i.e., r <.75). Moreover, while all correlation coefficients between previous teacher evaluation variables and achievement test scores were significant, all of the associations were relatively weak (i.e., r <.30). However, as expected, citizenship grades and participation in the gifted program were positively associated and retention was inversely related to achievement test scores. In contrast, the largest coefficient between personal and familial background characteristic factors was r = .24 (between student's age in months and science achievement). Some of the relationships between school environment and learning context variables and achievement test scores often suggested weak to moderate associations (i.e., r >.20), particularly for school acreage. Yet a number of the relationships were inverse relationships, from which it was inferred that quantity did not substitute for quality. Nonetheless, while these bivariate results appeared to have been substantively, as well as statistically, significant, it must be remembered that these results were based upon simple, zero-order correlations.

On the whole, the results from the bivariate simple correlation analyses have provided a definitive answer to the first research question: What student characteristics are related to education? Specifically, all factors listed in Table E-1 (Appendix E) were found to have been associated with student education in the Washoe County School District. In general, previous grades, previous citizenship grades, participation in the gifted program, the availability of an emergency telephone number, the listing of a home telephone number, the degree to which students remained at the same school, grade level, the school's median family income, and the number of encyclopedia sets in the school per student were positively associated with 1984 academic achievement in the Washoe County School District. In comparison, participation in the federal lunch program, ethnicity, residence, school acreage, library circulation per student, number of magazine subscriptions per student, the percentage of books added and lost per student, the number of second grade special education students in the school per student, and the number of staff in the school per student were all inversely related to 1984 academic achievement. Thus, these results further suggested the need for employing more rigorous data analysis techniques, to more clearly define the nature of these relationships.

Predicting Academic Achievement

The purpose of this research cycle, once again, was to identify what student characteristics and other factors were related to, and predictive of, academic achievement in the Washoe County School District. In particular, this research cycle sought to verify or refute the hypothesis that ethnicity and grade level were antecedent predictors of standardized achievement test scores.

Stepwise Multiple Regression Procedures

In order to identify which antecedent variables were predictive of, and thus related to, the dependent variables, sophisticated multiple regression procedures were employed to analyze the data. This technique of statistical data analysis made a number of important assumptions about the data, two of which must be made explicit.

First of all, multiple linear regression analysis assumed that, to some degree, a linear relationship existed between the variables so that for any case the value of the dependent variable could have been predicted given the value of the independent variables. The second assumption was that each dependent variable was a function of one or more independent (predictor) variables and thus could have been expressed as a generalized mathematical equation that was predictive for most or all cases involved.

The result of this type of data analysis was an equation for predicting the dependent variable from the independent variables, which mathematically described the relationship of the variables as a function:

$$\text{Dependent Variable} = \text{Independent Variable}_1 + \text{Independent Variable}_2 + \ldots \text{Independent Variable}_n$$

or

$$Y = a + b_1X_1 + b_2X_2 + \ldots b_nX_n.$$

The multiple regression technique could have been accomplished using a number of different procedures. The most basic procedure, sometimes referred to as simple multiple regression analysis, would have involved entering each independent variable that qualified into an analytical equation at one time. It would have selected the variables with a probability-of-*F* value that was less than the study criterion probability (p) value for inclusion (PIN-value). Thus, all variables that met the tolerance tests for inclusion would have been entered into the equation.

The resulting equation would have included an *a* coefficient, which was a constant or intercept value, and *b* coefficients, which were measures of the amount and direction of change in the dependent (Y) variable for each unit of change in the independent variable (X); in other words, the partial regression coefficient (*b*) was the slope of the regression line. Alternatively, the regression coefficients could have been reported as beta (*B*) coefficients, which would have been standardized partial regression (*b*) coefficients that were based upon the partial correlations of the variables. The beta coefficient, as discussed below, has been particularly useful in calculating the amount of variance in the dependent variable that was explained or was predictable by the independent variable.

Ultimately, the end result of multiple regression analyses was to determine how much each independent predictor variable contributed to the joint prediction, or multiple R^2, of the dependent variable. Such information, however, was not provided in the results of the SPSS^X procedures, which gave only the total table variance in the dependent variable (multiple R^2) accounted for by the predictors. That is, the multiple R^2 result from the SPSS^X procedure did not explain how much of the variance was explained, or was predictable, by any one of the independent variables entering into the regression equation model. To determine the relative contribution each predictor variable made to the total explained variance, therefore, the simple zero-order correlation coefficient (r) between the predictor and dependent variable was multiplied by the beta (B) coefficient of the predictor variable (Williams, 1986:157). This coefficient of determination (R^2), accounted for by the individual independent predictor variable, holding other predictors constant. Accordingly, the results of the multiple regression analyses provided both an equation for predicting the dependent variable (or a predictor model) and a means for assessing the amount of variance explained by each predictor variable.

In contrast, the stepwise multiple regression technique involved a series of procedures that both entered and eliminated variables one step at a time. Variables were selected or eliminated in the order of and on their ability to contribute to the overall variance (R^2) or prediction. Thus, if the predictability of a variable already in the equation was diminished by the inclusion of another variable, the previously entered variable might be eliminated in the next step. The stepwise procedure thereby constructed a more powerful equation than the simple (simultaneous) multiple regression technique, because only the best predictors were entered and retained in the equation.

More specifically, stepwise multiple regression proceeded by first examining the equation to determine if any variables should have been removed from the equation. This was done by comparing the probability of *F* values for each variable in the equation with an established criterion probability for removal value (POUT). If the probability of *F* for any variable in the equation was larger than the criterion POUT-value it was eliminated from the equation. Once no other variables could be removed from the equation, all remaining predictors were examined for inclusion in the equation. The variable that passed the tolerance test with the smallest probability of *F* was entered into the equation if that value was smaller than the criterion probability for entry (PIN-value). Tolerance was the proportion of the variable's variance not accounted for by other independent variables already in the equation. Once a variable was entered, all variables in the equation were reanalyzed for possible removal. This process continued until no more variables could be removed or entered. In this way, the most powerful predictors were entered into the equation, and reported in descending order.. The criterion levels used in this study were as follows:

1) the probability of F-to-enter (PIN) value was 0.05;
2) the probability of F-to-remove (POUT) value was 0.10; and
3) tolerance was set at 0.50.

Following these procedures, the data analyses resulted in models for each dependent variable that included both the statistics for constructing a predictive regression equation and for calculating the relative contributions of each predictor variable to the total variance. Consequently, these models provided evidence respective to the research questions and hypotheses for this research cycle.

Models of Academic Achievement

The resultant models for the prediction/explanation of academic achievement, as measured by standardized achievement test scores, are reported in Table F-1 (Appendix F). Each model included: (1) the predictors of that dependent variable; (2) the simple correlation between each predictor and the dependent variable; (3) the regression coefficient (B), the standardized beta coefficient (BETA), its level of significance, and the standard error of beta (SE BETA); (4) the percent of table (or total) variance accounted for by each predictor; and (5) the multiple R, R^2, and adjusted R^2 values, along with the standard error of the coefficient of determination (R^2).

Word study skills achievement. Taken together, five of the thirty independent variables (the grade point average variable was not used) included in the stepwise multiple regression accounted for approximately 23% (R^2 = .227) of the variance in the first dependent variable, the word study skills subtest. As expected, previous achievement, as measured by the 1983 reading grade, accounted for the greatest amount of variance; but it only accounted for 13.8% of the variance in word study skills. This meant that previous reading grades did not measure much of the same domain as this standardized reading achievement subtest and, therefore, was a poorer predictor than expected. The predictors and their (rounded) relative contribution to the total explained variance in reading word study skill achievement were:

1.	1983 reading grade	13.8%
2.	Acreage per student	4.6%
3.	Student's sex	1.6%
4.	Student's grade level	1.4%
5.	Emergency telephone number listed	1.3%

These results demonstrated that word study skills achievement for students in the Washoe County School District was primarily a function of factors not included in this study. That is, over three-fourths (77%) of the variance in word study skills achievement was left unexplained by the thirty variables included in this cycle of the present research. More importantly, these results have suggested that factors such as family income, family environment, and previous student achievement had very little direct effect on reading word study skills.

Reading comprehension achievement. Six of the thirty independent variables included in the stepwise multiple regression analysis of the reading comprehension subtest measurement of achievement in the Washoe County School District accounted for about 30% (R^2 = .302) of the variance. Again, previous reading grades made the largest relative contribution to explaining the variance (20.7%), but was still much less than was expected. As with reading word study skills, the next best predictor was the school site acreage per student variable (5.1%). The other predictors of reading comprehension achievement test scores were, however, different from those in the previous model. The predictors and their (rounded) relative contribution to the total explained variance in reading comprehension achievement included:

1.	1983 reading grade	20.7%
2.	Acreage per student	5.1%
3.	Number of minutes per student that the library was open after school	1.2%
4.	Participation in the gifted program	2.0%
5.	Cost of school construction per student	-.4%
6.	Change of schools	1.6%

These results indicated that, like word study skills, reading comprehension achievement for students in the Washoe County School District was primarily a function of factors not included in this study. Over two-thirds (70%) of the variance in reading comprehension subtest scores was left unaccounted for by the model.

An interesting predictor was the cost of school construction per student variable, which actually suppressed R^2 through its negative relative contribution to the explained variance. What the suppressor variable actually did was increase the relative predictiveness of the other predictors in the model, rather than reduce the explained variance. That is, the other predictors would have explained even less of the total variance, thus lowering R^2, if the suppressor had not been included in the regression analysis. In this particular model the suppressor effect was very minimal (-.4%), and it might have been indicative of the power of skewedness rather than association, as the cost of school construction per student was positively skewed.

Reading test total achievement. Of the thirty independent variables included in the stepwise multiple regression analysis, eight were found to help predict the reading test total score variance. Unlike the first two models, this model was able to explain a moderate proportion of the dependent variable's variance. That is, the eight predictors together accounted for 38% (R^2 = .380) of the variance in the reading test total scores. While this still meant that 62% of the variance remained unaccounted for, the model did explain over a third of the variance.

Once again, the two best predictors were previous reading grades (26.0%) and the number of acres per student (6.6%). The predictors of reading test total achievement, along with the (rounded) relative contribution of each predictor to the total explained variance, were:

1.	1983 reading grade	26.0%
2.	Acreage per student	6.6%
3.	Number of minutes per student that the library was open after school	1.2%
4.	Student's sex	1.8%
5.	Emergency telephone number listed	2.0%
6.	Student's grade level	.8%
7.	Father's status to student	.9%
8.	1983 citizenship grade	-1.4%

Vocabulary knowledge achievement. Six independent variables were found to have contributed together to explain 31% (R^2 = .307) of the observed variance in the vocabulary knowledge subtest scores. As expected, previous grades was the best predictor, but much less so than expected. The second best predictor was, however, quite different from the previously discussed models. Instead of acreage per student, the next best predictor of vocabulary knowledge was participation in the federal lunch program, a familial economic measure. The predictors and their (rounded) relative contribution to the total explained variance in vocabulary knowledge achievement were:

1.	1983 reading grade	20.2%
2.	Participation in lunch program	3.7%
3.	Change of schools	2.0%
4.	Emergency telephone number listed	1.8%
5.	Student's grade level	.9%
6.	Participation in the gifted program	2.1%

As with previous models, these results indicated that the best predictors of vocabulary academic achievement were factors not included in these multiple regression analyses. Hence, 69%, or over two-thirds, of the variance in vocabulary knowledge test scores, for students in the Washoe County School District, was left unexplained by the model.

Listening comprehension achievement. A total of seven independent variables accounted for 28% (R^2 = .282) of the total variance in listening comprehension subtest scores. While the previous grades variable was the best predictor, both grade level and change in schools were the next best predictors in this regression model. Moreover, several independent variables that had not entered any of the previous models were found to be predictive of listening comprehension. The predictors of listening comprehension achievement, and the (rounded) relative contribution of each predictor, included:

1.	1983 reading grade	16.7%
2.	Student's grade level	3.4%
3.	Change of schools	3.1%
4.	Number of magazine subscriptions per student	1.5%
5.	Participation in the lunch program	2.0%
6.	Number of parents absent from home	-.0%
7.	Home telephone number listed	1.6%

Again, the regression model left 72%, or nearly three-fourths, of the variance in listening comprehension unexplained. In regards to the suppressor variable, the negative contribution was not caused by association because the simple correlation between listening comprehension and the variable concerning the number of parents absent from the home was essentially zero.

Auditory test total achievement. Unlike the reading test total model, which accounted for a larger amount of the variance than either of the subtest models, the auditory test total regression model explained less variance than either subtest. Taken together, the five predictor variables of the auditory test total model accounted for only 23% (R^2 = .231) of the observed variance in scores. This meant that over three-fourths of the variance remained to be explained by variables outside those thirty variables included in the regression analyses. The predictors of auditory test total achievement, and their (rounded) relative contribution to the explained variance, were:

1.	1983 reading grade	15.3%
2.	Emergency telephone number listed	2.3%
3.	Participation in lunch program	1.9%
4.	Participation in the gifted program	2.1%
5.	Change of schools	1.5%

Spelling achievement. Taken together, seven of the thirty independent variables were able to account for 38% (R^2 = .384) of the variance in the spelling test variable. While this was the greatest amount of variance explained in any of the ten dependent measures, the model still left 62% of the variance unexplained. The predictors for the spelling achievement model, along with their (rounded) relative contribution to the total explained variance, were:

1.	1983 reading grades	24.8%
2.	Student's residence	3.9%
3.	Student's sex	2.8%
4.	Acreage per student	2.7%
5.	Encyclopedia sets per student	2.1%
6.	Percentage of books lost per student	2.0%
7.	Number of parents employed	-.0%

Math concepts achievement. Thirty independent variables (the 1983 grade point average variable was used in place of the 1983 reading grade variable) were used in the stepwise multiple regression analysis of the math concepts dependent variable. Taken together, six of these variables were found to predict or explain 30% (R^2 = .304) of the observed variance in the math concepts subtest scores. As with previously discussed models, the best predictor of math concepts scores was previous grades. Although the 1983 grade point average was used in this analysis, the results indicated that previous grades were still predictive of only one-fourth of the variance in math concepts subtest scores.

The predictors of math concepts achievement, along with the (rounded) relative contribution of each variable to the total explained variance, were:

1.	1983 grade point average	26.6%
2.	Participation in the gifted program	2.5%
3.	Student's grade level	1.7%
4.	Percentage of books lost per student	1.5%
5.	1983 citizenship grade	-1.3%
6.	Home telephone number listed	1.4%

As with other models, these results demonstrated that math concept achievement for students in the Washoe County School District was primarily a function of factors not included in this study. That is, seventy percent of the variance in math concepts achievement was left unexplained by the thirty variables included in this cycle of the present research.

Math test total achievement. Similar to the reading test total analyses, multiple regression analysis of the thirty independent variables for their ability to predict math test total scores, resulted in greater predictability of the test scores than the subtest scores. Four independent variables, taken together, accounted for 33% (R^2 = .328) of the observed variance in the dependent variable. The 1983 grade point average variable was once again the best predictor. This time, however, previous grades were found to account for well over one-fourth of the variance (29.6%). While this is still considerably less than expected, it was the largest contribution to any dependent variable by previous grades.

The predictors of math test total achievement, along with the (rounded) relative contribution of each variable to the total explained variance, were:

1.	1983 grade point average	29.6%
2.	Participation in the gifted program	3.1%
3.	Percentage of books lost per student	1.6%
4.	1983 citizenship grade	-1.5%

These results indicated that two-thirds of the variance in math test total scores was left unaccounted for. More importantly, it was found that inclusion of the 1983 citizenship grade in the analyses increased the accountability of the other predictors (i.e., it was a suppressor variable).

<u>Science knowledge achievement</u>. Six of the thirty independent variables analyzed were found to help predict 30% (R^2 = .297) of the variance in science knowledge test scores. While the best predictor was previous grades, it made a relatively small contribution. The next best predictors were the student's age at the time of the test and, again, acreage per student. The predictors, along with their (rounded) relative contributions to the explained variance, for science knowledge achievement were:

1.	1983 grade point average	17.2%
2.	Age in months at the time of test	4.7%
3.	Acreage per student	4.2%
4.	Number of minutes per student that the library was open after school	1.1%
5.	Student's sex	.7%
6.	Participation in the gifted program	1.7%

As with all the other models, the results of the stepwise multiple regression analyses showed that 70% of the observed variance in science knowledge was predictive by factors not included among the thirty variables used in this study.

Summary. Stepwise multiple regression analyses were made for each of the ten dependent measures of academic achievement using thirty independent variables. Although none of the variables involved, including previous grades, had strong correlations with the dependent variables, the variables were theoretically representative of factors that would affect educational achievement. That is, the thirty variables included measures of the student's previous achievements, personal and familial background, previous teacher's evaluations, and school environment and learning contexts. Moreover, many of the traditionally accepted sociocultural factors, such as ethnicity, family cohesiveness, family and school socioeconomic status, material resources for teaching, and faculty/staff, were among the potential independent variables.

Despite this scope of the independent variables, between 62% and 77% of the variance in academic achievement, as measured by standardized achievement test scores, was found to have been a function of variables not included in the analyses. In other words, all of these proposed predictors have explained only between 23% and 38% of the variance in standardized achievement test scores for students in the Washoe County School District. This apparently limited predictive power of the regression models for academic achievement may have been due to the unusually low predictability of previous achievement as measured by class grades. That is, 1983 reading grades/grade point averages only explained between 14% and 30% (with an average of 21%) of the variance in the dependent variables. That only an average of one-fifth of the variance in academic achievement was explained by previous achievement was a surprising result. The implication of this result was that either previous grades or the standardized achievement tests (but most likely previous grades) were not valid and reliable measures of academic achievement in the Washoe County School District.

Developing General Models of Academic Achievement

Regardless of the amount of variance explained by the predictors, this knowledge of which predictors did enter the equations was of theoretical interest to this study. That is, this study sought empirical evidence to determine what student characteristics and other variables were related to, and predictive of, academic achievement in the Washoe County School District. Hence, identification of those variables that had been found to be predictors of the various measures of academic achievement was equally important to that of explaining or accounting for the variance. Moreover, it was hypothesized that ethnicity and grade level would be predictors of academic achievement. The next stage of this research cycle, therefore, was to examine the regression models to refute or verify this hypothesis.

Ethnicity and Achievement

Analysis of the stepwise multiple regression results (Table F-1, Appendix F) documented that ethnicity treated as a variable was not a predictor of academic achievement test scores for any of the dependent variable regression models. Despite the observed significant differences between Indian and non-Indian students with regards to the various factors in the study and the statistically significant correlations, the fact that some students were ethnically or culturally identified as Indian or non-Indian was not a predictor of academic achievement, as measured by test scores, in the Washoe County School District.

Consequently, the results of this study refuted the seventh research hypothesis:

> H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

More importantly, these results provided a definitive answer to the fourth research question: Is ethnicity a determinate antecedent predictor of achievement? Clearly, the results of this study established that ethnicity was not a predictor of achievement in the Washoe County School District. The next step, therefore, was to evaluate the empirical results concerning the research hypothesis that grade level was an antecedent predictor of standardized achievement test scores in the Washoe County School District.

Grade Level and Achievement

In evaluating the regression results in Table F-1 (Appendix F), the ability of a variable to predict academic achievement was assessable in two different ways. One way was to determine the mean amounts of variance explained, while another was to find which variables most frequently appeared as predictors. Either way, grade level was not the next best predictor. In terms of average amounts of explained variance, acreage per student had explained the next largest amount of variance. That is, the acreage variable accounted for an average of 4.65% of the variance in achievement test scores. The next best predictors were participation in the federal lunch program (2.52%) and participation in the gifted student program (2.25%). Indeed, grade level was one of the poorer predictors, accounting for an average of only 1.64% of the variance. Grade level was, however, the third best predictor in terms of occurrence.

The best predictor, of course, was the 1983 reading grade/grade point average variable, which accounted for an average of 21% of the variance and entered all ten models. The second most frequently occurring predictor was participation in the gifted program, having entered into six of the ten equations. In particular, participation in the gifted program was predictive of all three math and science dependent variables. Grade level was the next most frequent predictor and appeared in five of the 10 regression equations. Hence, the results of this study suggested that grade level was a moderate predictor of achievement in the Washoe County School District. As such, these results provided support for the six research hypotheses:

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

This result led to the decision to reanalyze the dependent variables with stepwise multiple regression techniques, after removing grade level from the list of independent variables. Removal of the grade level variable would presumably have allowed other factors to enter into the equation thereby making the models more rigorous. This process of removing a predictor hinged upon the conceptualization that that variable might potentially have become a control measure for further analyses.

Accordingly, grade level was removed from consideration on the presumption that further analyses would include grade level by grade level analyses for each dependent variable. The results of this second set of stepwise multiple regression analyses, without grade level, are reported in Table F-2 (Appendix F).

Of more interest, however, was how the multiple regression results without grade level compared with those when the variable was included. Table 33 presents the results for both sets of stepwise multiple regression results for comparative analyses. As can be seen, the removal of the grade level variable from the analyses had no effect on the five equations for which grade level had not been a predictor. In regards to the explained variance ($\underline{R}^2$), the removal of the grade level predictor slightly increased the explanatory power of the vocabulary (+.5%) and math comprehension (+.1%) models, while it decreased the accountability of the word study skills (-.4%), reading test total (-.7%), and listening comprehension (-.8%) models. In conclusion, in no case did removal of grade level from the analyses

Table 33. Comparison of Regression Models

Models With Grade Level		Models Without Grade Level	
Predictor	% of Table Variance	Predictor	% of Table Variance
	Word Study Skills		
1983 Reading Grade (m)	13.81	1983 Reading Grade (m)	14.07
Acreage Per Student (m)	4.60	Acreage Per Student (m)	4.63
Sex (n)	1.59	Sex (n)	1.65
Grade Level (n)	1.36		
		Age in Months at Time of Test (n)	.55
Emergency Telephone (n)	1.31	Emergency Telephone (n)	1.36
Total	22.67	Total	22.26
	Reading Comprehension		
1983 Reading Grade (m)	20.68	1983 Reading Grade (m)	20.68
Acreage Per Student (m)	5.08	Acreage Per Student (m)	5.08
Library Open After School Per Student (m)	1.16	Library Open After School Per Student (m)	1.16
Gifted Student Program (m)	2.00	Gifted Student Program (m)	2.00
Cost of School Per Student (m)	-.35	Cost of School Per Student (m)	-.35
Change of Schools (n)	1.61	Change of Schools (n)	1.61
Total	30.18	Total	30.18

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 33. (Continued)

Models With Grade Level		Models Without Grade Level	
Predictor	% of Table Variance	Predictor	% of Table Variance
	Reading Test Total		
1983 Reading Grade (m)	26.04	1983 Reading Grade (m)	26.18
Acreage Per Student (m)	6.63	Acreage Per Student (m)	6.68
Library Open After School Per Student (m)	1.23	Library Open After School Per Student (m)	1.21
Sex (n)	1.81	Sex (n)	1.86
Emergency Telephone (n)	1.99	Emergency Telephone (n)	1.96
Grade Level (n)	.82		
Father's Status (n)	.93	Father's Status (n)	.96
1983 Citizenship Grade (m)	-1.44	1983 Citizenship Grade (m)	-1.56
Total	38.01	Total	37.29
	Vocabulary Knowledge		
1983 Reading Grade (m)	20.23	1983 Reading Grade (m)	20.31
Free & Reduced Lunch (n)	3.67	Free & Reduced Lunch (n)	3.47
Change of Schools (n)	2.03	Change of Schools (n)	1.76
Emergency Telephone (n)	1.78	Emergency Telephone (n)	1.66
Grade Level (n)	.90		
Gifted Program (m)	2.09	Gifted Program (m)	1.96
		Number of Days Absent in 1982-1983 (m)	.83
		Magazine Subscriptions Per Student (m)	1.19
Total	30.70	Total	31.18

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 33. (Continued)

Models With Grade Level: Predictor	% of Table Variance	Models Without Grade Level: Predictor	% of Table Variance
Listening Comprehension			
1983 Reading Grade (m)	16.71	1983 Reading Grade (m)	17.43
Grade Level (n)	3.44		
Change of Schools (n)	3.08	Change of Schools (n)	3.00
		Age in Months at Time of Test (n)	1.29
Magazine Subscriptions Per Student (m)	1.49	Magazine Subscriptions Per Student (m)	1.31
Free & Reduced Lunch (n)	1.95	Free & Reduced Lunch (n)	1.93
Number of Parents Absent (n)	-.05	Number of Parents Absent (n)	-.05
Home Phone Listed (n)	1.60	Home Phone Listed (n)	1.68
		Student's Residence (n)	.88
Total	28.22	Total	27.47
Auditory Test Total			
1983 Reading Grade (m)	15.28	1983 Reading Grade (m)	15.28
Emergency Telephone (n)	2.28	Emergency Telephone (n)	2.28
Free & Reduced Lunch (n)	1.94	Free & Reduced Lunch (n)	1.94
Gifted Program (m)	2.08	Gifted Program (m)	2.08
Change of Schools (n)	1.47	Change of Schools (n)	1.47
Total	23.05	Total	23.05

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 33. (Continued)

Models With Grade Level		Models Without Grade Level	
Predictor	% of Table Variance	Predictor	% of Table Variance
	Spelling		
1983 Reading Grade (m)	24.82	1983 Reading Grade (m)	24.82
Student's Residence (n)	3.93	Student's Residence (n)	3.93
Sex (n)	2.79	Sex (n)	2.79
Acreage Per Student (m)	2.71	Acreage Per Student (m)	2.71
Encyclopedia Sets Per Student (m)	2.13	Encyclopedia Sets Per Student (m)	2.13
Percentage of Books Lost Per Student (m)	2.00	Percentage of Books Lost Per Student (m)	2.00
Number of Parents Employed (n)	-.03	Number of Parents Employed (n)	-.03
Total	38.35	Total	38.35
	Math Concepts		
1983 Grade Point Average (m)	24.64	1983 Grade Point Average (m)	24.87
Gifted Program (m)	2.54	Gifted Program (m)	2.66
Grade Level (n)	1.68		
		Age in Months at Time of the Test (n)	1.41
Percentage of Books Lost Per Student (m)	1.48	Percentage of Books Lost Per Student (m)	1.52
1983 Citizenship Grade (m)	-1.34	1983 Citizenship Grade (m)	-1.37
Home Phone Listed (n)	1.40	Home Phone Listed (n)	1.43
Total	30.40	Total	30.52

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 33. (Continued)

Models With Grade Level: Predictor	% of Table Variance	Models Without Grade Level: Predictor	% of Table Variance
Math Test Total			
1983 Grade Point Average (m)	29.60	1983 Grade Point Average (m)	29.60
Gifted Program (m)	3.09	Gifted Program (m)	3.09
Percentage of Books Lost Per Student (m)	1.67	Percentage of Books Lost Per Student (m)	1.67
1983 Citizenship Grade (m)	-1.54	1983 Citizenship Grade (m)	-1.37
Total	32.82	Total	32.82
Science Knowledge			
1983 Grade Point Average (m)	17.22	1983 Grade Point Average (m)	17.22
Age in Months at Time of Test (n)	4.68	Age in Months at Time of Test (n)	4.68
Acreage Per Student (m)	4.25	Acreage Per Student (m)	4.25
Library Open After School Per Student (m)	1.13	Library Open After School Per Student (m)	1.13
Sex (n)	.68	Sex (n)	.68
Gifted Program (m)	1.70	Gifted Program (m)	1.70
Total	29.66	Total	29.66

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

adversely affect the predictive power of the regression models.

In examining changes in the predictors themselves, it was observed (Table 33) that several different predictors entered into the models for vocabulary knowledge and listening comprehension, while the student's age at the time of the tests essentially replaced grade level in the word study skills and math concepts predictor models. That the student's age variable replaced grade level was expected due to the strong intercorrelation between these two independent predictors ($\underline{r}$ = .94), while the entry of the other variables was unpredicted. The number of days absent (.8%) and the number of magazine subscriptions per student (1.2%) took the place of grade level in the vocabulary knowledge model, and in the process increased the explanatory ability of the model just slightly (.5%). On the other hand, the student's age at the time of the standardized achievement tests (1.3%) and the student's residence (.9%) slightly decreased the explanatory power (.8%) of the listening comprehension model when those two variables took the place of grade level. More importantly, the results added to the pool of independent variables that acted as predictors of academic achievement.

General Models of Academic Achievement

The objectives for this stage of the second research cycle of this study was to present empirical evidence concerning the third research question:

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

In answering this question, a general model (or models) was delineated, which could be used for further study as well. The results of the second set of stepwise multiple regression analyses provided the best regression equations or models, but without the explanatory power of the grade level variable. Thus, by pooling the predictors from each model together, a generalized model for explaining academic achievement was created. Such a model thereby provided a definitive answer to the research question. However, due to the fact that different previous grade variables have been used in the multiple regression analyses for the math concepts, math test total, and science knowledge dependent variables, two different general models were constructed. These general models of academic achievement are presented in Table 34. The first general model was designated the "Reading Model," because it included the predictors from the regression equations for word study skills, reading comprehension, reading test total, vocabulary knowledge, listening comprehension, auditory test total, and spelling. The second, or "Math," model encompassed the predictors from the math concepts, math test total, and science knowledge multiple regression equations.

General reading model of achievement. As presented in Table 34, the general reading model was composed of predictors pertaining to student's previous academic achievement, teacher's evaluations, student and familial background characteristics, and school environment and learning contexts factors. Eleven of the twenty-one (52%) antecedent predictors were factors that would be potentially

Table 34. General Models of Academic Achievement in the Washoe County School District

General Reading Model	General Math Model
A. Academic Achievement	A. Academic Achievement
1. Number of Days Absent in 1982-1983 (m)	
2. 1983 Reading Grade (m)	1. 1983 Grade Point Average (m)
B. Student Evaluations	B. Student Evaluations
1. 1983 Citizenship Grade (m)	1. 1983 Citizenship Grade (m)
2. Gifted Program (m)	2. Gifted Program (m)
C. Background Characteristics	C. Background Characteristics
1. Age in Months at Time of Test (n)	1. Age in Months at Time of Test (n)
2. Change in Schools (n)	
3. Emergency Telephone (m)	
4. Father's Status (n)	
5. Free & Reduced Lunch (n)	
6. Home Phone Listed (n)	2. Home Phone Listed (n)
7. Number of Parents Absent (n)	
8. Number of Parents Employed (n)	
9. Sex (n)	3. Sex (n)
10. Student's Residence (n)	
D. School Environment and Learning Contexts	D. School Environment and Learning Contexts
1. Acreage Per Student (m)	1. Acreage Per Student (m)
2. Cost of School Per Student (m)	
3. Encyclopedia Sets Per Student (m)	
4. Grade Level (n)	2. Grade Level (n)
5. Library Open After School Per Student (m)	3. Library Open After School Per Student (m)
6. Magazine Subscriptions Per Student (m)	
7. Percentage of Books Lost Per Student (m)	4. Percentage of Books Lost Per Student (m)

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

manipulable (or changeable) by the school district, while ten (48%) were non-manipulable, or beyond the influence of the school system.

In comparing this list of predictors (or the general reading model) for reading, auditory and spelling achievement with the original list of thirty independent variables, some interesting results were found. Of the three independent variables of academic achievement, both variables included in the multiple regression analyses of the reading oriented models, the 1983 reading grade and the number of days absent in 1982-83, were found to be predictors. (The third variable, 1983 grade point average, was used only with the three dependent variables found in the general math model of achievement as discussed below).

The number of times a student was retained was not found to be a predictor of academic achievement. The other two student evaluation variables, however, were found to be predictors of achievement. Indeed, participation in the gifted program, as discussed above, was the third best predictor in terms of explained variance and the second best predictor in terms of the number of different regression equations that included it (i.e., entered six of the equations). In contrast, the other teacher evaluation, 1983 citizenship grade, was found to be a suppressor of explained variance. That is, when the 1983 citizenship grade variable entered into an equation, it contributed negatively to the explained variance. This meant that if this teacher evaluation factor was not in the model, the other variables would have been less predictive.

Ironically, the only antecedent background characteristic variable included in the stepwise multiple regression analyses that did not prove to be a predictor of academic achievement was ethnicity, which had been hypothesized to be a very good predictor of academic achievement in the Washoe County School District. The other ten personal and familial antecedents were predictors of one or more of the dependent variables. Of these, participation in the federal lunch program, the change of schools, the listing of an emergency telephone number, and the student's sex seemed to be the better predictors in terms of either frequency of appearance in equations or average amount of explained variance.

Only seven of the fourteen school environment and learning context variables were found to be predictors of reading oriented academic achievement in the Washoe County School District. Despite this, the acreage per student variable was found to be the second best predictor in terms of the amount of variance it explained, and second, with grade level, in frequency of appearance. Grade level, along with the percentage of books lost and the number of minutes per student that the library was open after school were the other fairly good predictors from the school environment and learning context category.

General math model of achievement. It was found (Table 34) that, except for the 1983 grade point variable that took the place of the 1983 reading grade variable, all predictors in the general math model of achievement were also in the general reading model. The real differences between the two general models were in regards to the number of predictors involved and the percentage of predictors that would be potentially manipulable by the Washoe County School District. There were half as many predictors in the general math model of achievement, and six of the ten (60%) predictors were manipulable variables.

In comparison to those variables included in the regression analyses, the 1983 grade point average variable was the only previous academic achievement predictor; (the general reading model also included the number of days absent in 1983). As with the general reading model, two of the three antecedent student evaluation variables, the 1983 citizenship grade and participation in the gifted program, were found to be predictors of math oriented achievement. Once again, the 1983 citizenship grade variable was a suppressor variable. The general math model was dramatically different from the general reading model in terms of background characteristic predictors. Only three of the eleven antecedent variables entered as predictors of math or science achievement, suggesting that student and familial background characteristics had less influence on math and science. With respect to school environment and learning contexts antecedent variables, four of the fourteen were found to be predictors of one or more of the three dependent variables in the general math model. On the whole, previous achievement and student evaluations had been found to be more predictive of math oriented achievement than were personal, familial or school factors.

Summary. Evaluation of the stepwise multiple regression equations was accomplished by pooling the predictors from each of the ten separate regression equations into two general models of academic achievement. The first, which had a total of twenty-one predictors and was applicable for word study skills, reading comprehension, reading test total, vocabulary knowledge, listening comprehension, auditory test total, and spelling achievement, was the general reading model. The second model was the general math model, which was for the math concepts, math test total, and science knowledge achievement dependent variables, and it included ten predictors.

The results of these analyses, then, provided an answer to the research question,

> 3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

Specifically, the following manipulable and non-manipulable variables were found to have been antecedent predictors of academic achievement (in the Washoe County School District):

1. Manipulable Antecedent Predictors:
    a. The number of days a student was absent the previous year (1982-83);
    b. Previous class grades (1983 reading grade; 1983 grade point average);
    c. 1983 citizenship grade;
    d. Participation in the gifted student program;
    e. Having an emergency telephone number listed at the school office;
    f. Having a home (or other) telephone number at which parents could be contacted for nonemergency matters;
    g. The acreage of the school campus per student;
    h. The cost of school construction per student;
    i. The number of encyclopedia sets in school per student;
    j. The student's grade level;
    k. The number of minutes the school library is open after school per student;

l. The number of magazine subscriptions per student; and
m. The percentage of books lost per student.

2. Non-manipulable Antecedent Predictors:
   a. The student's age in months at the time of the standardized achievement test (April 2, 1984);
   b. The father's status (e.g., natural, step) to the student;
   c. Participation in the federal lunch program;
   d. The number of parents absent from the home;
   e. The number of parents employed;
   f. The student's sex;
   g. The student's residence (e.g., urban, rural), and
   h. Whether the student has had a few change in schools.

Conclusions

The present chapter presented the results of the second research cycle in this study. The goal of the second research cycle was to provide empirical evidence for the following research questions and hypotheses:

1. What student characteristics are related to education?

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

4. Is ethnicity a determinate antecedent predictor of achievement?

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

Data analyses were made to provide such empirical evidence to answer or validate these questions and hypotheses. Bivariate (simple) correlations were made first, which helped to answer the first research question concerning what student characteristics were related to education. Stepwise multiple regression analyses were then made to answer the other two research questions and hypotheses. These results demonstrated, in addition to which variables were predictors, that ethnicity was not an antecedent predictor of academic achievement, but that grade level was.

The results demonstrated that previous class grades or achievement were predictive of academic achievement tests, but that they contributed no more than 30% of the explained variance (with an average of only 21%) when statistically evaluated with those variables included in the analyses. Moreover, the results showed that out of the thirty antecedent independent variables, twenty-one were predictors of achievement, but that these twenty-one variables, in different combinations, could contribute no more than 38% of the variance in any one of the dependent variables. This meant that between 62% and 88% (with an average of 71%) of the variance in the dependent variables was not explained by variables included in this study. That is, standardized achievement test scores in the Washoe County School District were primarily a function of factors outside of this study.

In contrast, the study did identify two pools of predictors that were then conceptualized as general models of academic achievement. Moreover, that certain variables were identified as predictors was an important contribution to the current theoretical understanding of academic achievement. Moreover, the results answered several research questions concerning academic achievement.

An implication of these results was that academic achievement, as measured by standardized achievement tests, was not very predictable by previous achievement or evaluations, personal or familial characteristics, or school environment and learning context factors; at least as they were measured in this study. The current study, however, did not measure attitudinal (teacher, student, or family) data, nor was it able to evaluate individual teacher performances as predictors of achievement.

Conversely, this study did identify a number of variables that were potentially manipulable by the school district that did have some, albeit small, contribution to how well students did on achievement tests. In particular, the school district could standardize grading procedures. Brod (1975; 1976b) has shown that grades were more the result of nonacademic, than academic, achievements, and such was clearly the case in this study as well. Second, a fairly clear result of these analyses was that previous participation in the gifted program benefitted or enhanced student academic achievement as measured by standardized achievement tests even when holding constant previous achievement (1983 grades). Unfortunately, this was quite problematic because the Washoe County School District used standardized achievement test scores to initially identify students for the gifted program. A third variable that could be potentially changed by the school system was the acreage per student, which was inversely related to academic achievement. While the cost of land would probably inhibit equalizing school sites, awareness that larger tracts of land per student seem to encourage less academic achievement could lead to policies that might counterbalance this. Implications for the other manipulable variables would be similar to these just discussed.

Lastly, it should be noted that the results of these stepwise multiple regression results may be somewhat problematic in that larger numbers of independent variables in multiple regression could have decreased the standard error of the estimate. That is, each time a variable was added to the equation, a degree of freedom was lost from the residual sum of the squares and one was gained for the regression sum of the squares. This may have caused the standard error to increase when the decrease in the residual sum of squares was very slight, yet not have been sufficient to make up for the loss of a degree of freedom. This would have caused the $\underline{F}$ value for the test of the overall regression equation to decrease because the regression sum of squares did not increase as fast as the degrees of freedom for the regression.

Hence, including such a large number of variables has seldom been a good deductive or theory testing strategy. At the same time, the goal of this research cycle was not that of theory testing, but rather that of theory or model building. As such, this exploratory research cycle had deliberately used a larger set of predictors. The result was the establishment of smaller pools of independent variables for predicting academic achievement in the population. In other words, an explicit objective of this research cycle was to establish a more concise pool of predictors, which could then be tested for building more explanatory, empirically based models.

This research cycle, then, has eliminated variables that showed little relationship to, or too much co-linearity with predictors of, standardized academic achievement tests. As shall be seen in Chapter 5, achievement variables tested with the smaller, general models of antecedent predictors derived from this research cycle, accounted for somewhat larger amounts of the variance in standardized achievement tests. This was exactly what should have happened, given that a reasonably good pool of predictors had previously been inductively identified.

Chapter 5

MODELS OF ACADEMIC ACHIEVEMENT

The study up to this point has been essentially exploratory in nature: univariate descriptive and bivariate correlation analyses of student educational characteristics and multivariate regression analyses to identify predictors of academic achievement in the Washoe County School District. Parallel deductive tests of research hypotheses have also established that Indian elementary student academic achievement was statistically lower than that of their non-Indian classmates, and that grade level was a moderate predictor of academic achievement.

Theoretical Clarification

The results of the first two research cycles of this study have provided empirical evidence for answering the following research questions posed in Chapter 1:

1. What student characteristics are related to education?
2. Do Indian students differ from other students?

3. What variables--both manipulable and non-manipulable by the school system--are antecedent predictors of achievement?

4. Is ethnicity a determinant antecedent predictor of achievement?

That is, exploratory data analyses have identified and discussed student and school characteristics that were related to education and demonstrated that Indian students' achievement did significantly differ from their classmates', but that ethnicity was not among the identified predictors of academic achievement in the Washoe County School District.

Moreover, the results of the first two research cycles have provided empirical evidence for testing the following research hypotheses which were originally suggested upon the basis of a review of the literature:

H_1: Standardized achievement test scores for Indian students are significantly lower than the scores for non-Indian students in the Washoe County School District.

H_2: Class grades, attendance, and other measures of achievement are significantly different for Indian and non-Indian students in the Washoe County School District.

H_3: Teacher evaluations are different for Indian and non-Indian students in the Washoe County School District.

H_4: Personal and familial background characteristics are significantly different for Indian and non-Indian students in the Washoe County School District.

H_5: School environment and learning context variables are different for Indian and non-Indian students in the Washoe County School District.

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

Data analysis results verified the first six hypotheses, but refuted the seventh hypothesis that ethnicity was a predictor of academic achievement.

The results thus far have established parameters for seeking answers to the remaining research questions and (implied) hypotheses. That is, the empirical results to this point have demonstrated the need for building upon those already discussed. Just as analyses discussed in Chapter 3, with regards to the first two research questions and the first five hypotheses, provided an emergent basis for the analyses in Chapter 4, so did the results from Chapter 4 concerning the sixth hypothesis and the third and fourth research questions suggest the appropriateness of further analyses on the remaining research questions:

5. Are different factors antecedent predictors of achievement for Indian and non-Indian students?

6. Are different factors antecedent predictors of achievement across different grade levels?

7. Is residence (reservation, colony, urban) a determinant of Indian student achievement?

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

9. Do manipulable variables account for more of the total variance than non-manipulable variables?

10. Do more manipulable than non-manipulable variables account for the explained variance?

As discussed in Chapter 1, previous studies have suggested a number of hypotheses, two of which deal with the questions above. That is, because numerous other studies have found such dramatic differences between Indian and non-Indian achievement, it was impossible not to draw certain hypotheses. It was the intent of this study, however, to only test these hypotheses if the other results from this research also suggested such hypotheses. Therefore, because the results have indeed suggested the same conclusions, the last two previously deduced research hypotheses will be tested:

H_8: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

H_9: Different antecedents are predictive of standardized achievement test scores at different grade levels in the Washoe County School District.

In addition to these two previously suggested hypotheses, which have been corroborated by the results discussed in previous chapters, the results of the first two research cycles have suggested the following hypotheses as well:

H_{10}: Residence is not a determinant predictor of Indian students' achievement in the Washoe County School District.

H_{11}: The models of academic achievement are more predictive at certain grade levels than others in the Washoe County School District.

H_{12}: Manipulable variables account for more total observed and explained variance in standardized achievement test scores than non-manipulable variables in the Washoe County School District.

H_{13}: More manipulable than non-manipulable variables account for the variances in standardized achievement test scores in the Washoe County School District.

These hypotheses were based upon the conclusions that:

1. Residence entered only one time as a predictor of achievement.

2. Grade level was a predictor of academic achievement.

3. The best (i.e., accounted for the most variance) predictors of each dependent variable were those that were potentially manipulable by the Washoe County School District.

4. More manipulable than non-manipulable variables entered into the original stepwise multiple regression equations.

In order to test these hypotheses and answer these research questions, a third cycle of research was done.

Methodological Clarifications

The third research cycle sought to answer and test the questions and hypotheses listed above. As in the second research cycle of this study, secondary data analysis techniques were used to collect or re-instrument the data for further statistical analyses. Like the first research cycle, there were two sets of processes in the third cycle. The first set (Figure 4) dealt with deductively testing the general models of academic achievement for the population and Indian students (Chapters 5 and 6), and for the population and Indian students by grade level (Chapter 7). The second set of processes (Figure 4) were concerned with inductively evaluating these results in terms of their manipulability and the types of factors that were predictive. Thus, the two sets of processes were sequential rather than parallel, as they had been in the first research cycle.

Data Collection Procedures

The first step was to create two new systems files that consisted only of those variables previously identified as predictors for the general reading and math models of academic achievement (see Chapter

4). The first systems file included the twenty-one variables listed under the general reading model in Table 34, while the second systems file was composed of the ten predictors presented in Table 34 under the general math model. Otherwise all previous modifications and recodings remained intact. Thus, the two new systems files were the same as the ones used in the second research cycle, except that they contained only those variables necessary to continue the study. Following this, the procedure files were set up to analyze the newly created systems files.

In the second set of processes, the data results were recategorized using secondary data analysis techniques in terms of whether the variables were manipulable/non-manipulable, or whether they were achievement, evaluation, personal/familial, or school factors. All data collection, or recategorization, was done by hand.

Data Analysis Procedures

The first stage of the data analyses of the first set of processes in the third research cycle of this study was to construct correlation matrices for the predictors in each of the general models. Correlation coefficients were then evaluated to determine if there existed any large intercorrelations that did not make theoretical sense.

Following the evaluation of the intercorrelation coefficients, further multiple regression analyses were made. Because this study sought to determine what the most useful models of achievement were, the decision was made to make the analyses in the third research cycle employing more rigorous procedures; yet it was also desired to retain the step-by-step information obtained from stepwise multiple regression. It was decided, therefore, to sequentially use two different regression procedures during the second and subsequent stages of the analyses in the third research cycle. The stepwise procedure was performed first, and then the forced entry multiple regression procedure was used. While the first procedure produced the statistically most rigorous model, the second procedure forced all other eligible variables into the equation.

The second stage of the first set of analyses in the third research cycle, therefore, was to construct predictor models of academic achievement for the (weighted) population and Indian students, and then to compare the Indian models with the population models (that were, in a sense, criterion models for comparative purposes). Thus, three groups of analyses were performed during this stage of the first set of processes. The first group of analyses were performed on the total weighted population sample, the second on just the Indian students, and the third also on Indian students, but with the additional variables applicable to Indian students only. In order to perform the last group of analyses, two additional systems files had to be created. This was done by simply copying the first two systems files, and adding the variables that were applicable to Indian students only.

The third stage of the first set of analyses in the third research cycle was to construct and compare predictor models of academic achievement by grade levels for the weighted population and Indian students. Four groups of analyses were made during this stage of the first cycle. The first group of analyses were performed exactly as in the second stage, using stepwise and forced entry multiple regression in sequence, except that grade level was removed from the list of independent variables. These models were then compared with the models that included grade level as a predictor to determine structural and explanatory changes caused by the removal of grade level. Similarly, the second group of analyses were made on just the Indian students, again without grade level, and compared with the Indian models produced in the second stage of this set of analyses. The third and fourth groups of analyses, then, constructed models of achievement for each grade level for the (weighted) population and Indian students respectively. Rather than constructing new systems files for each group of analyses and for each grade level, the existing (reading and math oriented) systems files were simply modified by deleting the grade level variable from the predictor list and using the select procedure of $SPSS^X$. The entire command file was then copied four times so that the analyses for each grade level could be performed within the same procedural file and during the same computer run.

The second set of procedures in the third research cycle was accomplished through two stages. The first stage framed the results of the first set of procedures in terms of the variables themselves. Three groups of analyses were then made. The first group compared the population and Indian reading and math oriented predictor pools. The second group of analyses compared predictors to determine whether more manipulable or non-manipulable variables helped to predict various dimensions of academic achievement. The third group compared types of antecedent predictors to ascertain whether one type (e.g., background characteristics) predicted achievement better than the others. The second stage encompassed exactly the same analyses, except in terms of explained variance rather than antecedent variables. The tests of significance for these analyses involved the use of several statistics, including the binomial test of proportions, chi-square, and the t-test.

Discussion of Research Results

Owing to the vastness and complexity of the research results from the third research cycle, they will be reported in several distinct chapters. The actual findings from the first two stages in the first cycle, which created achievement models, will be reported in this chapter (Chapter 5), while these results will then be compared and discussed in Chapter 6. Chapter 7 will report the results from the analyses made for the population and Indian students by grade level in the third stage, and Chapter 8 will compare these results. The results of the second set of analyses in this (third) research cycle will be discussed in Chapter 9. Additionally, Chapter 9 will discuss the conclusions of the third research cycle.

Intercorrelations Among Predictor Variables

Before discussing the results of the multiple regression analyses, the interrelationships between the predictors of each general model need to be discussed.

General Reading Model

Table E-2 (Appendix E) shows the intercorrelations among the twenty-one predictors (from the general reading model) of word study skills, reading comprehension, reading test total, vocabulary knowledge, listening comprehension, auditory test total, and spelling achievement test scores. Inspection of the results indicated that 105 of the 210 (50%) correlation coefficients were statistically significant. With the exception of the correlations listed below, the coefficients indicated low to moderate relationships between the predictors:

1. Acreage per student and
   a. Cost of school construction per student (r = .51);
   b. Number of magazine subscriptions per student (r = .49);
   c. Percentage of books lost per student (r = .51);
   d. Student's residence (r = .42);

2. Number of parents absent from the home and
   a. Number of parents employed (r = .47);

3. Student's age in months at the time of the test and
   a. Student's grade level (r = .94).

Of these rather high associations, the relationship between age and grade level was most expected and understandable because students were generally assigned to a specific grade level according to their chronological age.

While the other fairly large correlations were not expected, they were not incomprehensible. First, with regards to the variables associated with school acreage per student, it would seem that schools in the Washoe County School District with more acreage also tended to be more rural, cost more to construct per student, have more magazine subscriptions per student, and lose more books per student. It must be recalled, however, that the three school variables were previously (Chapter 3) interpreted as possibly measuring some common factor like school ethos. These relatively large correlations seem to have further suggested this as well, although the percentage of books lost per student factor would be difficult to include. It may be that books being lost more frequently was a result of a negative school ethos, or that the more there was of something the more that got lost. Second, in the case of number of parents absent and number of parents employed, it may be that the variables indirectly measured the economic or social conditions of the Washoe County School District.

General Math Model

Table E-3 (Appendix E) presents the intercorrelations among the ten predictors (from the general math model) of math concepts, math test total, and science knowledge achievement test scores. Inspection of the results indicated that twenty-one of forty-five (47%) correlation coefficients were statistically significant. Most of the coefficients, however, indicated low to moderate associations, with the exceptions of the following predictor relationships:

1. Acreage per student and
    a. Percentage of books lost per student (r = .51);

2. Student's age in months at time of test and
    a. Student's grade level (r = .94).

Both of these relatively high correlations also were found in the general reading model intercorrelations, and have been discussed above.

Student Achievement in the Washoe County School District

Sophisticated multiple regression procedures were employed to test the utility of the general models of academic achievement established during the second research cycle (Chapter 4). Following the establishment of population regression equation estimates for the Washoe County School District population (weighted sample), models of achievement were made for Indian students only in order to answer the fifth research question:

5. Are different factors antecedent predictors of achievement for Indian and non-Indian students?

Or, more specifically, the models would test the eighth hypothesis:

H_8: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

Variables applicable to Indian students only were then added to answer the eighth research question:

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

In order to test the research hypotheses and answer the research questions of this research cycle, population regression equations of academic achievement in the Washoe County School District were necessary. This was accomplished by making stepwise and forced entry multiple regression analyses of each dependent variable using the predictors from the appropriate general model. Once again, using both procedures allowed for results that showed how the independent variables would enter in stepwise fashion, but ultimately provided an equation with all eligible variables forced into the equation at once. That is, the forced entry procedure entered all variables that satisfied the tolerance criterion. Variables were analytically entered by the $SPSS^X$ procedure one at a time in order of decreasing tolerance, but were ultimately treated as a single block for computation of statistics. This resulted in all variables meeting or exceeding the tolerance criterion being simultaneously forced into the equation (or model). While this often reduced the significance level of the F-test for a number of entering variables and the equation itself, it also provided more comprehensive and useful models by holding all independent variables constant.

Table 35 presents the (weighted) population predictor models of academic achievement, as measured by standardized achievement tests, for the Washoe County School District, and includes only those factors that entered into the equation at or beyond the .15 level along with each variable's relative contribution to the total observed (table) variance of the dependent variable involved. Table G-1 (Appendix G) presents the technical results of the stepwise and forced entry multiple regression analyses, giving the simple correlation between

Table 35. Population Predictor Models of Academic Achievement

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Word Study Skills		Reading Comprehension	
1983 Reading Grade (m)	14.3	1983 Reading Grade (m)	21.8
Acreage Per Student (m)	4.9	Acreage Per Student (m)	4.4
Sex (n)	1.8	Library Open After School Per Student (m)	1.0
Grade Level (n)	1.2	Gifted Program (m)	1.5
Emergency Telephone (m)	1.4	Cost of School Per Student (m)	-.3
Father's Status (n)	.6	Change of Schools (n)	1.5
1983 Citizenship Grade (m)	-.9	Sex (n)	.8
Other[a]	1.6	Emergency Telephone (m)	1.1
Total	24.8	Free & Reduced Lunch (n)	1.1
		1983 Citizenship Grade (m)	-1.3
		Other[a]	.7
		Total	32.4
Reading Test Total		Vocabulary Knowledge	
1983 Reading Grade (m)	25.7	1983 Reading Grade (m)	20.7
Acreage Per Student (m)	5.1	Free & Reduced Lunch (n)	3.0
Library Open After School Per Student (m)	.9	Change of Schools (n)	1.5
Sex (n)	1.8	Emergency Telephone (m)	1.4
Emergency Telephone (m)	1.9	Grade Level (n)	.7
Grade Level (n)	.7	Gifted Program (m)	1.6
Father's Status (n)	.9	Library Open After School Per Student (m)	.7
1983 Citizenship Grade (m)	-1.6	Magazine Subscriptions Per Student (m)	.9
Other[a]	3.7	Number of Days Absent in 1982-83 (m)	.9
Total	39.2	Home Phone Listed (n)	1.6
		Other[a]	.9
		Total	34.0

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 35. (continued)

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Listening Comprehension		Auditory Test Total	
1983 Reading Grade (m)	16.7	1983 Reading Grade (m)	16.5
Grade Level (n)	3.0	Emergency Telephone (m)	2.0
Change of Schools (n)	2.8	Free & Reduced Lunch (n)	1.7
Magazine Subscriptions Per Student (m)	1.4	Gifted Program (m)	1.5
Free & Reduced Lunch (n)	2.0	Change of Schools (n)	1.6
Number of Parents Absent (n)	-.0	Student's Residence (n)	.6
Home Phone Listed (n)	1.6	Father's Status (n)	.3
Library Open After School Per Student (m)	.1	Number of Days Absent in 1982-83 (m)	.6
Emergency Telephone (m)	1.2	Number of Parents Absent (n)	-.2
Student's Residence (n)	.9	Home Phone Listed (n)	1.3
Other[a]	1.0	Other[a]	.4
Total	30.7	Total	26.3
Spelling		Math Concepts	
1983 Reading Grade (m)	24.7	1983 Grade Point Average (m)	23.9
Student's Residence (n)	3.8	Gifted Program (m)	2.6
Sex (n)	2.8	Grade Level (n)	1.8
Acreage Per Student (m)	2.9	Percentage of Books Lost Per Student (m)	1.4
Encyclopedia Sets Per Student (m)	2.0	1983 Citizenship Grade (m)	-1.2
Percentage of Books Lost Per Student (m)	2.1	Home Phone Listed (n)	1.3
Number of Parents Employed (n)	-.0	Library Open After School Per Student (m)	.6
Other[a]	1.3	Other[a]	.8
Total	39.6	Total	31.2

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 35. (continued)

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Math Test Total		Science Knowledge	
1983 Grade Point Average (m)	25.3	1983 Grade Point Average (m)	17.8
Gifted Program (m)	3.1	Age in Months at Time of Test (n)	4.6
Percentage of Books Lost Per Student (m)	1.6	Acreage Per Student (m)	4.5
1983 Citizenship Grade (m)	-1.5	Library Open After School Per Student (m)	1.1
Age in Months at Time of Test (n)	.9	Sex (n)	.6
Library Open After School Per Student (m)	.6	Gifted Program (m)	1.6
Other[a]	1.2	Other[a]	-.3
Total	34.2	Total	29.8

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

the predictor and respective dependent variable, the B value, the standardized Beta value, the level of statistical significance of the Beta value, the standard error (SE) of the Beta value, and the percent of table variance (or variance accounted for by the independent variable) for each antecedent. This latter value was obtained by multiplying the simple correlation by the standardized Beta value (Williams, 1986:157). The multiple R, R^2, adjusted R^2, and standard error are also presented for each equation in Table G-1.

As previously mentioned, each model in Table 35 (and subsequent tables showing similar results) reports those manipulable (m) and non-manipulable (n) antecedent predictors that were statistically significant (F-test) at or beyond the .15 level. Since a more rigorous technique of data analysis was employed for the population models, a significance level of $p < .15$ was selected rather than the traditionally accepted level of .05. Moreover, because this research was meant to be an exploratory study the larger probability level was accepted in order to obtain models of achievement that were as comprehensive as possible. Thus, all variables entering into the equations that were statistically significant at or beyond the .15 level were listed as predictors in the model. Levels of significance (i.e., for $p < .05$), for the predictors, however, were indicated only in Table G-1. All variables that entered the equations as a result of the forced entry procedure, but were not statistically significant at or beyond the .15 level, were reported in Table 35 (and subsequent tables) and Table G-1 (and other regression tables in the appendices) as "Other." Hence, not all reported predictors in the population models of achievement entered with the same degree of significance as those in the original stepwise regression (only) models (Table F-1, Appendix F), in which all entering predictors were statistically significant at or beyond the .05 level. That is, because the forced entry procedure was used to force "other" variables into the equation, all levels of significance were increased. Again, the purpose for this was to obtain academic achievement models with the greatest (yet somewhat statistically rigorous) scope of predictors possible.

Table 36 compares (see Appendix G for a model by model discussion of these comparisons) the population models with the original stepwise equations (Table F-1, Appendix F), which were exploratorily developed using the larger set of (thirty-one) independent variables (see Chapter 3). Only slightly more variance in the dependent variables was explained by the new population models. That is, the explained variance ($\underline{R}^2$) increased only between .1% and 3.3%, with an average increase of .9% across the ten models. A primary interest in these analyses for setting up population models, however, was to find the structurally most explanatory models. As expected the stepwise and forced entry multiple regression analyses produced new population models that generally included one to five more predictors of academic achievement test scores, although there were no structural changes in the reading test total, spelling, and science knowledge models.

Accounting For the Variance

As expected, previous grades (either the 1983 reading grade or the

Table 36. Comparison of Original and Population Regression Models

Original Stepwise Models		Population Stepwise/Forced Entry Models	
Predictor	% of Table Variance	Predictor	% of Table Variance
	Word Study Skills		
1983 Reading Grade (m)	13.81	1983 Reading Grade (m)	14.32
Acreage Per Student (m)	4.60	Acreage Per Student (m)	4.89
Sex (n)	1.59	Sex (n)	1.76
Grade Level (n)	1.36	Grade Level (n)	1.17
Emergency Telephone (m)	1.31	Emergency Telephone (m)	1.44
		Father's Status (n)	.56
		1983 Citizenship Grade (m)	-.92
	.	Other[a]	1.62
Total	22.67	Total	24.84
	Reading Comprehension		
1983 Reading Grade (m)	20.68	1983 Reading Grade (m)	21.85
Acreage Per Student (m)	5.08	Acreage Per Student (m)	4.38
Library Open After School Per Student (m)	1.16	Library Open After School Per Student (m)	.97
Gifted Student Program (m)	2.00	Gifted Student Program (m)	1.52
Cost of School Per Student (m)	-.35	Cost of School Per Student (m)	-.29
Change of Schools (n)	1.61	Change of Schools (n)	1.52
		Sex (n)	.77
		Emergency Telephone (m)	1.14
		Free & Reduced Lunch (n)	1.14
		1983 Citizenship Grade (m)	-1.26
	.	Other[a]	.68
Total	30.18	Total	32.42

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 36. (Continued)

Original Stepwise Models		Population Stepwise/Forced Entry Models	
Predictor	% of Table Variance	Predictor	% of Table Variance
Reading Test Total			
1983 Reading Grade (m)	26.04	1983 Reading Grade (m)	25.74
Acreage Per Student (m)	6.63	Acreage Per Student (m)	5.08
Library Open After School Per Student (m)	1.23	Library Open After School Per Student (m)	.94
Sex (n)	1.81	Sex (n)	1.80
Emergency Telephone (m)	1.99	Emergency Telephone (m)	1.87
Grade Level (n)	.82	Grade Level (n)	.73
Father's Status (n)	.93	Father's Status (n)	.90
1983 Citizenship Grade (m)	-1.44	1983 Citizenship Grade (m)	-1.57
	.	Other[a]	3.69
Total	38.01	Total	39.18
Vocabulary Knowledge			
1983 Reading Grade (m)	20.23	1983 Reading Grade (m)	20.70
Free & Reduced Lunch (n)	3.67	Free & Reduced Lunch (n)	2.97
Change of Schools (n)	2.03	Change of Schools (n)	1.50
Emergency Telephone (m)	1.78	Emergency Telephone (m)	1.45
Grade Level (n)	.90	Grade Level (n)	.69
Gifted Program (m)	2.09	Gifted Program (m)	1.63
		Library Open After School Per Student (m)	.74
		Magazine Subscriptions Per Student (m)	.92
		Number of Days Absent in 1982-1983 (m)	.90
		Home Phone Listed (n)	1.59
	.	Other[a]	.93
Total	30.70	Total	34.92

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 36. (Continued)

Original Stepwise Models		Population Stepwise/Forced Entry Models	
Predictor	% of Table Variance	Predictor	% of Table Variance
	Listening Comprehension		
1983 Reading Grade (m)	16.71	1983 Reading Grade (m)	16.67
Grade Level (n)	3.44	Grade Level (n)	3.04
Change of Schools (n)	3.08	Change of Schools (n)	2.76
Magazine Subscriptions Per Student (m)	1.49	Magazine Subscriptions Per Student (m)	1.43
Free & Reduced Lunch (n)	1.95	Free & Reduced Lunch (n)	2.03
Number of Parents Absent (n)	-.05	Number of Parents Absent (n)	-.04
Home Phone Listed (n)	1.60	Home Phone Listed (n)	1.55
		Library Open After School Per Student (m)	.09
		Emergency Telephone (m)	1.24
		Student's Residence (n)	.91
	.	Other[a]	1.04
Total	28.22	Total	30.72
	Auditory Test Total		
1983 Reading Grade (m)	15.28	1983 Reading Grade (m)	14.46
Emergency Telephone (m)	2.28	Emergency Telephone (m)	2.03
Free & Reduced Lunch (n)	1.94	Free & Reduced Lunch (n)	1.71
Gifted Program (m)	2.08	Gifted Program (m)	1.48
Change of Schools (n)	1.47	Change of Schools (n)	1.55
		Student's Residence (n)	.59
		Father's Status (n)	.32
		Number of Days Absent in 1982-1983 (m)	.62
		Number of Parents Absent (n)	-.19
		Home Phone Listed (n)	1.33
	.	Other[a]	.39
Total	23.05	Total	26.29

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 36. (Continued)

Original Stepwise Models: Predictor	% of Table Variance	Population Stepwise/Forced Entry Models: Predictor	% of Table Variance
		Spelling	
1983 Reading Grade (m)	24.82	1983 Reading Grade (m)	24.72
Student's Residence (n)	3.93	Student s Residence (n)	3.84
Sex (n)	2.79	Sex (n)	2.82
Acreage Per Student (m)	2.71	Acreage Per Student (m)	2.91
Encyclopedia Sets Per Student (m)	2.13	Encyclopedia Sets Per Student (m)	1.98
Percentage of Books Lost Per Student (m)	2.00	Percentage of Books Lost Per Student (m)	2.13
Number of Parents Employed (n)	-.03	Number of Parents Employed (n)	-.04
	.	Other[a]	1.25
Total	38.35	Total	39.61
		Math Concepts	
1983 Grade Point Average (m)	24.64	1983 Grade Point Average (m)	23.86
Gifted Program (m)	2.54	Gifted Program (m)	2.59
Grade Level (n)	1.68	Grade Level (n)	1.75
Percentage of Books Lost Per Student (m)	1.48	Percentage of Books Lost Per Student (m)	1.41
1983 Citizenship Grade (m)	-1.34	1983 Citizenship Grade (m)	-1.19
Home Phone Listed (n)	1.40	Home Phone Listed (n)	1.34
		Library Open After School Per Student (m)	.65
	.	Other[a]	.75
Total	30.40	Total	31.16

a--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 36. (Continued)

Original Stepwise Models		Population Stepwise/Forced Entry Models	
Predictor	% of Table Variance	Predictor	% of Table Variance
Math Test Total			
1983 Grade Point Average (m)	29.60	1983 Grade Point Average (m)	28.26
Gifted Program (m)	3.09	Gifted Program (m)	3.07
Percentage of Books Lost Per Student (m)	1.67	Percentage of Books Lost Per Student (m)	1.65
1983 Citizenship Grade (m)	-1.54	1983 Citizenship Grade (m)	-1.49
		Age in Months at Time of Test (n)	.89
		Library Open After School Per Student (m)	.61
	.	Other[a]	1.21
Total	32.82	Total	34.20
Science Knowledge			
1983 Grade Point Average (m)	17.22	1983 Grade Point Average (m)	17.80
Age in Months at Time of Test (n)	4.68	Age in Months at Time of Test (n)	4.61
Acreage Per Student (m)	4.25	Acreage Per Student (m)	4.47
Library Open After School Per Student (m)	1.13	Library Open After School Per Student (m)	1.07
Sex (n)	.68	Sex (n)	.60
Gifted Program (m)	1.70	Gifted Program (m)	1.62
	.	Other[a]	-.33
Total	29.66	Total	29.84

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is _not_ manipulable by the school district.

1983 grade point average) accounted for the greatest amount of variance in the population models, ranging from a low of 14% in the word study skills model to a high of 26% in the reading test total model. These results continued to emphasize that the degree of predictability of previous grades--or any other variable--was highly dependent upon which measure of achievement was being used. As further anticipated, the new population models generally involved a greater number of variables, which was what was desired. In order to identify which other variables were consistent predictors, the variables were crosstabulated with the dependent variables in Table 37. In looking at the other variables involved, the results (Table 37) indicated that the number of minutes the library was open after school per student was structurally the second best predictor, entering into four of the seven reading equations and all three of the math equations; or seven of the ten models. The emergency telephone listing and participation in the gifted program variables were the next best predictors, entering into six of the models. The emergency telephone variable, which was not part of the predictor pool for the math models (see Table 34 in Chapter 4), entered into all possible reading oriented equations except spelling. The participation in the gifted program variable entered into all three math models and three of the seven reading models. Acreage per student, student's sex, grade level, and 1983 citizenship grade each entered into five equations. With regards to the amount of explained variance (see Table 35), the best predictor after previous grades was acreage per

Table 37. Step of Entry for Predictor by Academic Achievement Model for Student Population

Predictors	Models: Word Study Skills	Reading Comprehension	Reading Test Total	Vocabulary Knowledge	Listening Comprehension
<u>Academic Achievement</u>					
1983 Reading Grade (m)	1	1	1	1	1
1983 Grade Point Average (m)					
Number of Days Absent in 1982-1983 (m)				9	
<u>Student Evaluations</u>					
1983 Citizenship Grade (m)	7	10	8		
Gifted Program (m)		4		6	
<u>Background Characteristics</u>					
Age in Months at Time of Test (n)					
Change of Schools (n)		6		3	3
Emergency Telephone (m)	5	8	5	4	9
Father's Status (n)	6		7		
Free & Reduced Lunch (n)		9		2	5
Home Phone Listed (n)				10	7
Number of Parents Absent (n)					6
Number of Parents Employed (n)					
Sex (n)	3	7	4		
Student's Residence (n)					10
<u>School Environment and Learning Contexts</u>					
Acreage Per Student (m)	2	2	2		
Cost of School Per Student (m)		5			
Encyclopedia Sets Per Student (m)					
Grade Level (n)	4		6	5	2
Library Open After School Per Student (m)		3	3	7	8
Magazine Subscriptions Per Student (m)				8	4
Percentage of Books Lost Per Student (m)					

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 37. (Continued)

Predictors	Models: Auditory Test Total	Spelling	Math Concepts	Math Test Total	Science Knowledge
Academic Achievement					
1983 Reading Grade (m)	1	1			
1983 Grade Point Average (m)			1	1	1
Number of Days Absent in 1982-1983 (m)	8				
Student Evaluations					
1983 Citizenship Grade (m)			5	4	
Gifted Program (m)	4		2	2	6
Background Characteristics					
Age in Months at Time of Test (n)				5	2
Change of Schools (n)	5				
Emergency Telephone (m)	2				
Father's Status (n)	7				
Free & Reduced Lunch (n)	3				
Home Phone Listed (n)	10		6		
Number of Parents Absent (n)	9				
Number of Parents Employed (n)		7			
Sex (n)		3			5
Student's Residence (n)	6	2			
School Environment and Learning Contexts					
Acreage Per Student (m)		4			3
Cost of School Per Student (m)					
Encyclopedia Sets Per Student (m)		5			
Grade Level (n)			3		
Library Open After School Per Student (m)			7	6	4
Magazine Subscriptions Per Student (m)					
Percentage of Books Lost Per Student (m)		6	4	3	

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

student. Following acreage, the next best predictors were student's age, grade level, and participation in the gifted student program.

In considering just the seven reading oriented models, the second best structural predictor was, again, the emergency telephone listing variable. The next best predictors were acreage, student's sex, grade level, number of minutes that the library was open after school per student, the student's change of schools, and participation in the federal lunch program, each of which entered into four equations.

In comparison, when considering just the three math oriented models, it was found that two of the variables, the number of minutes that the library was open after school per student and participation in the gifted program, entered into all three of the models. The percentage of books lost per student, 1983 citizenship grade, and student's age all entered into two of the three math models. Structurally, then, the best predictors for the math oriented models after previous grades were library hours and participation in the gifted student program.

<u>Suppressor Variables</u>

In looking back at Table 35 and Table 36, it was observed that a number of the predictors in the models acted as suppressor variables. Again, this meant that the inclusion of the suppressor variable increased the explanatory power of the other variables in the model by negatively contributing to the total explained variance. Of particular interest here, was the finding that by forcing all possible variables into the equation that did not enter in the stepwise regression analysis, the amount of explained variance (multiple $\underline{R}^2$) was slightly increased in one model. That is, all variables entering into the equation during forced entry multiple regression analysis, but not having statistical significance (reported as "Other"), contributed negatively or suppressed the amount of explained variance (-3%) in the population science models. However, because the percentage was so small, it was probably due more to statistical artifact than anything else.

It was also found (Table 35) that the 1983 citizenship grade variable was a consistent and, relatively speaking, strong suppressor. Again, this meant that inclusion of this variable enhanced the model's predictability. Other suppressors were cost of school per student, number of parents absent, and number of parents employed. While these other three variables consistently acted as suppressors when they entered, their contribution was much less, and more likely due to chance, or statistical error than to real suppression effects.

Manipulable and Non-Manipulable Variables

A primary interest of this research was to identify factors that would be potentially manipulable by the school system, so that they could alter test score variance and, thereby, improve student achievement. Thus, the multiple regression analyses were further evaluated for manipulability by the school system. In looking at the variables that entered most often, it was found that many antecedent predictors of academic achievement, as measured by standardized achievement test scores, were indeed potentially manipulable by the Washoe County School District.

Table 38 presents the percentages of manipulable and non-manipulable variables for each dependent variable (test) for both the original and the population models of academic achievement in the Washoe County School District. In comparing the original and population models it was found that they differed by between 0% and 20% in terms of the percentages of manipulable/non-manipulable variables in the models. Across the ten models, however, the population models averaged 5% fewer manipulable predictors than the original models. In contrast, there was only a 1% average difference for the seven reading models, but a 9% average difference for the three math models of academic achievement.

Looking at specific models (Table 38), comparisons indicated that there were no differences between the original and population reading test total, spelling, and science knowledge models of achievement with respect to the percentages of manipulable and non-manipulable variables entering the respective models. It was also found through comparisons (Table 38) that for four of the other seven models, the population model included a smaller percentage of potentially manipulable variables than the original model.

The greatest difference (20%) was for the auditory test total model, which had 60% manipulable variables in the original model, but only 40% in the population model. That is, the smaller set of antecedent predictors and the forced entry procedures resulted in a

Table 38. Comparison of Percentages of Manipulable and Non-Manipulable Variables for the Original and Population Models

Dependent Variables	Original Models				Population Models			
	Manipulable		Non-Manipulable		Manipulable		Non-Manipulable	
	f	%	f	%	f	%	f	%
				Reading Oriented Models				
Word Study Skills	3/5	60	2/5	40	4/7	57	3/7	43
Reading Comprehension	5/6	83	1/6	17	7/10	70	3/10	30
Reading Test Total	5/8	62	3/8	38	5/8	62	3/8	40
Vocabulary Knowledge	3/6	50	3/6	50	6/10	60	4/10	40
Listening Comprehension	2/7	29	5/7	71	4/10	40	6/10	60
Auditory Test Total	3/5	60	2/5	40	4/10	40	6/10	60
Spelling	4/7	57	3/7	43	4/7	57	3/7	43
Average	4/7	57	3/7	43	5/9	56	4/9	44
				Math Oriented Models				
Math Concepts	4/6	67	2/6	33	5/7	71	2/7	29
Math Test Total	4/4	100	0/4	0	5/6	83	1/6	17
Science Knowledge	4/6	67	2/6	33	4/6	67	2/6	33
Average	4/5	80	1/5	20	5/7	71	2/7	29
				All Ten Models				
Average	4/6	67	2/6	33	5/8	62	3/8	38

model of auditory test total achievement that was substantively less potentially manipulable by the school system than when the larger set of independent variables was used (Chapter 4). Previous results (Table 36) have indicated that there were five more (or twice as many) variables in the auditory test total population model than in the original, and that four of these were not potentially manipulable by the school system. The second largest difference (17%) was between the two math test total models. This was probably due to statistical probability or a regression effect that reduced the percentage of potentially manipulable factors from 100% to 82%. That is, because the number of variables involved was small and involved no non-manipulable antecedents in the original math test total model, the inclusion of just one non-manipulable predictor in the population model had a large effect on the percentage differences. The next largest difference (13%) also involved fewer potentially manipulable variables in the population reading comprehension model, where half of the additional four variables in the population model were non-manipulable. The last of the four comparisons that showed a smaller percentage (3%) of manipulable variables in the population model was for word study skills. Again this difference was attributable to statistical procedures.

In looking at the three models where the population model had a larger percentage of manipulable variables than the original, it was found that the differences were somewhat less. The largest differences were for listening comprehension (11%) and vocabulary knowledge (10%), and the least for math concepts (4%). Also, listening comprehension was the only one of the original models (Table 38) where there were fewer manipulable than non-manipulable variables, while listening comprehension and auditory test total both had fewer manipulable than non-manipulable factors in the population (or criterion) models. Thus, despite these observed differences between specific models, the population models generally were more stable (i.e., exhibited less differences in the percentages of potentially manipulable variables: 40%-83% versus 29%-100%) and, on the average, were quite similar to the original models.

Summary

Stepwise and forced entry multiple regression analyses were made for each of the ten dependent variables (or standardized achievement tests) to establish population models of student academic achievement in the Washoe County School District. Since more variables were entered, it was expected that these procedures would produce structurally expanded predictor models and explain slightly more of the dependent variable variance (multiple $\underline{R}^2$), although three of the models were not altered. An unanticipated result was that the forced entry of the other predictors suppressed, or negatively affected, the total variance, thereby enhancing the overall contribution of the other predictors, in the science model. With respect to the composition of the models in regards to factors potentially manipulable by the school district, the expanded population models were not altered to any significant degree by the inclusion of the additional predictors.

Indian Achievement in the Washoe County School District

Once the stepwise and forced entry multiple regression analyses were completed for the Washoe County School District (weighted) population, similar analyses were made for Indian students only. Methodologically, the systems file was modified by simply adding a select procedure so that Indian students only (n = 201) were analyzed. These analyses resulted in ten models of academic achievement for Indian students in the Washoe County School District, which are technically reported in Table H-1 (Appendix H), and summarized in Table 39 (for a model by model discussion of the structural characteristics, see Appendix H as well).

Accounting For the Variance

As found in analyses for the weighted population (or criterion models), previous grades (either the 1983 reading grade or the 1983 grade point average) accounted for the greatest amount of the variance in the Indian student models of achievement (Table 39), ranging from a low of 15% in the listening comprehension model to a high of 37% in the reading test total model. Once again, while previous grades were expected to be the best predictors, it was also anticipated that such previous measures of achievement would account for a much larger percentage of the variance than found in these analyses. As with the population models, these results corroborated

Table 39. Predictor Models of Indian Academic Achievement

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Word Study Skills		Reading Comprehension	
1983 Reading Grade (m)	18.7	1983 Reading Grade (m)	31.5
Father's Status (n)	4.4	Encyclopedia Sets	
Grade Level (n)	1.3	Per Student (m)	3.0
Magazine Subscriptions		Gifted Program (m)	2.3
Per Student (m)	4.1	Other[a]	.5
Emergency Telephone (m)	.2	Total	32.3
Other[a]	4.1		
Total	32.7		
Reading Test Total		Vocabulary Knowledge	
1983 Reading Grade (m)	37.2	1983 Reading Grade (m)	20.6
Magazine Subscriptions		Grade Level (n)	.4
Per Student (m)	3.2	Encyclopedia Sets	
Grade Level (n)	-.2	Per Student (m)	1.9
Emergency Telephone (m)	.2	Other[a]	4.3
Father's Status (n)	1.0	Total	27.2
Gifted Program (m)	2.6		
Other[a]	2.7		
Total	46.8		
Listening Comprehension		Auditory Test Total	
1983 Reading Grade (m)	14.8	1983 Reading Grade (m)	21.2
Percentage of Books		Percentage of Books	
Lost Per Student (m)	2.8	Lost Per Student (m)	2.4
Father's Status (n)	1.3	Gifted Program (m)	3.2
Encyclopedia Sets		Encyclopedia Sets	
Per Student (m)	2.3	Per Student (m)	2.4
Student's Residence (n)	1.6	Grade Level (n)	.0
Other[a]	1.9	Other[a]	1.4
Total	24.6	Total;	30.5

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is _not_ manipulable by the school district.

Table 39. (continued)

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Spelling		Math Concepts	
1983 Reading Grade (m)	21.0	1983 Grade Point Average (m)	30.6
Number of Days Absent in 1982-83 (m)	4.2	Percentage of Books Lost Per Student (m)	3.3
Father's Status (n)	1.6	Sex (n)	.7
Gifted Program (m)	3.6	Gifted Program (m)	2.6
Number of Parents Absent (n)	2.4	Other[a]	.3
Emergency Telephone (m)	.4	Total	37.6
Free & Reduced Lunch (n)	2.0		
Student's Residence (n)	.1		
Number of Parents Employed (n)	-.6		
Other[a]	1.9		
Total	36.5		
Math Test Total		Science Knowledge	
1983 Grade Point Average (m)	32.8	1983 Grade Point Average (m)	16.8
Percentage of Books Lost Per Student (m)	3.5	Percentage of Books Lost Per Student (m)	5.8
Gifted Program (m)	2.8	Grade Level (n)	2.7
Other[a]	-.3	Gifted Program (m)	4.0
Total	38.7	1983 Citizenship Grade (m)	-1.6
		Other[a]	.7
		Total	28.4

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

the assumption that the model of academic achievement success was dependent upon what measure was used. That is, most models of achievement were different from the others.

Table 40 presents the crosstabulation of the predictors with the dependent variables. The results (Table 40) indicate that participation in the gifted student program was structurally the second best predictor of Indian student achievement, entering into four of the seven reading and all three of the math oriented equations; or seven of the ten models. The next best structural predictors were percentage of books lost per student and grade level, both of which entered into five of the ten models. While grade level, father's status, participation in the gifted program, and the number of encyclopedia sets per student were the best predictors of reading oriented tests for Indian students, the percentage of books lost per student and participation in the gifted program were the best predictors in math oriented models after previous grades. With respect to the amount of contributed variance, there was no predictor that was clearly the next best after previous grades. Both participation in the gifted program and percentage of books lost per student were fairly consistent (2-4%), but other variables (e.g., father's status) also contributed similar amounts of explained variance when they entered into equations.

It was also observed (Table 39) that other variables being forced into the word study skills and vocabulary knowledge equations, despite their level of statistical significance (reported as "Other"),

Table 40. Step of Entry for Predictor by Academic Achievement Model for Indian Students

Predictors	Word Study Skills	Reading Comprehension	Reading Test Total	Vocabulary Knowledge	Listening Comprehension
Academic Achievement					
1983 Reading Grade (m)	1	1	1	1	1
1983 Grade Point Average (m)					
Number of Days Absent in 1982-1983 (m)					
Student Evaluations					
1983 Citizenship Grade (m)					
Gifted Program (m)		3	6		
Background Characteristics					
Age in Months at Time of Test (n)					
Change of Schools (n)					
Emergency Telephone (m)	5		4		
Father's Status (n)	2		5		3
Free & Reduced Lunch (n)					
Home Phone Listed (n)					
Number of Parents Absent (n)					
Number of Parents Employed (n)					
Sex (n)					
Student's Residence (n)					5
School Environment and Learning Contexts					
Acreage Per Student (m)					
Cost of School Per Student (m)					
Encyclopedia Sets Per Student (m)		2		3	4
Grade Level (n)	3		3	2	
Library Open After School Per Student (m)					
Magazine Subscriptions Per Student (m)	4		2		
Percentage of Books Lost Per Student (m)					2

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 40. (Continued)

Predictors	Models: Auditory Test Total	Spelling	Math Concepts	Math Test Total	Science Knowledge
Academic Achievement					
1983 Reading Grade (m)	1	1			
1983 Grade Point Average (m)			1	1	1
Number of Days Absent in 1982-1983 (m)		2			
Student Evaluations					
1983 Citizenship Grade (m)					5
Gifted Program (m)	3	4	4	3	4
Background Characteristics					
Age in Months at Time of Test (n)					
Change of Schools (n)					
Emergency Telephone (m)		6			
Father's Status (n)		3			
Free & Reduced Lunch (n)		7			
Home Phone Listed (n)					
Number of Parents Absent (n)		5			
Number of Parents Employed (n)		9			
Sex (n)			3		
Student's Residence (n)		8			
School Environment and Learning Contexts					
Acreage Per Student (m)					
Cost of School Per Student (m)					
Encyclopedia Sets Per Student (m)	4				
Grade Level (n)	5				3
Library Open After School Per Student (m)					
Magazine Subscriptions Per Student (m)					
Percentage of Books Lost Per Student (m)	2		2	2	2

(m)--indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

contributed nearly as much to the total variance as the predictor variables in the equation. Secondly, it was found (Table 39) that variables acted as suppressors in only three of the models. In the reading test total and math test total models, the suppressor effect was quite small, and probably due to statistical error, distribution, or chance. The suppressing effect of the 1983 citizenship grade on Indian student's science achievement was, on the other hand, significant. Inclusion of this variable in the equation, therefore, enhanced the accountability of science achievement variance for Indian students by adding to the overall explanatory power of the other predictors. More importantly, however, was the implication of this suppressing effect. That is, citizenship was initially found to correlate positively with subsequent academic achievement, yet when other things were held constant this relationship reversed, so that having a high citizenship grade resulted in subsequent lower Indian student's science achievement.

Manipulable and Non-Manipulable Variables

Table 41 summarizes the percentage of manipulable and non-manipulable variables that entered into each of the models of academic achievement for Indian students. The results indicated that for the most part, entering predictors of the various areas of achievement were indeed variables that were by and large subject to change or manipulation by the school district. Interestingly, the one achievement area least subject to school district manipulation was spelling. This result was particularly intriguing because spelling

Table 41. Percentages of Manipulable and Non-Manipulable Variables Entering Indian Models

Dependent Variables	Manipulable f	Manipulable %	Non-Manipulable f	Non-Manipulable %
	Reading Oriented Models			
Word Study Skills	3/5	60	2/5	40
Reading Comprehension	3/3	100	0/3	0
Reading Test Total	4/6	67	2/6	33
Vocabulary Knowledge	2/3	67	1/3	33
Listening Comprehension	3/5	60	2/5	40
Auditory Test Total	4/5	80	1/5	20
Spelling	4/9	44	5/9	56
Average	3/5	60	2/5	40
	Math Oriented Models			
Math Concepts	3/4	75	1/4	25
Math Test Total	3/3	100	0/3	0
Science Knowledge	4/5	80	1/5	20
Average	3/4	75	1/4	25
	All Ten Models			
Average	3/5	60	2/5	40

has often been cited in the literature as the area Indian students have consistently done best in. The logic used to explain this phenomena (which was also alluded to in Chapter 3) has been that the schools have much more control over this curriculum area. Yet these results have suggested that such a conclusion has been incorrectly made.

The results (Table 41) also demonstrated the variability between the models with regards to the number of predictors that were manipulable by the school system. In some cases (reading comprehension and math test total) all entering predictors were manipulable. Conversely, in no case were all entering variables non-manipulable. Moreover, it was noted that the math oriented models were much more susceptible to school manipulation (75%) than the reading oriented models (60%).

Summary

Stepwise and forced entry multiple regression analyses were made for each of the ten dependent variables to establish models of academic achievement for Indian students in the Washoe County School District. The results, like those made for the Washoe County School District population (and the original models), were much less explanatory than expected. That is, no model explained more than 47% of the total variance; which meant that more than half of the variance in Indian student achievement was due to factors not included in these analyses. As expected, previous grades were found to be the most explanatory factors for Indian students. No other variable, however, stood out as the next best predictor. The results substantiated that each measure of academic achievement was generally subject to a completely different set of predictors, but that they were often factors that would be potentially manipulable by the school system.

These results have raised several questions: 1) How do the models of academic achievement for Indian students compare with the population models? and 2) How would these models of Indian student achievement compare to models constructed when including additional factors appropriate to Indian students only? To answer these questions, comparative analyses of the population/criterion and Indian student regression models were made and another group of analyses were made, after including such variables applicable to Indian students only among the predictors, as reported in Chapter 6.

Chapter 6

COMPARISONS OF ACADEMIC ACHIEVEMENT

The first two stages of this set of processes in the third research cycle have resulted in ten models of academic achievement for both the (weighted) Washoe County School District population and Indian students only. The main objective of this chapter, therefore, is to comparatively discuss the results from the first two stages and, secondarily, to compare the Indian models with models modified by the addition of antecedent variables unique to Indian students. Such discussion will provide empirical evidence towards the following research hypotheses:

H_9: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

H_{10}: Residence is not a determinant predictor of Indian students' achievement in the Washoe County School District.

The comparisons of the Indian and Indian modified models of achievement will, hopefully, provide a partial answer to the eighth research question:

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

To facilitate comparative analyses of Indian student and district population models of achievement, Table 42 was constructed in such a way as to visually compare both the structure and each individual predictor's contribution to both the total (table) and explained variances of each dependent variable of academic achievement, as measured by standardized achievement tests. The most immediate and obvious conclusion (Table 42) was that different antecedent variables were, indeed, predictive of Indian student achievement than were predictive for the Washoe County School District in general. Secondly, most models of Indian student achievement had substantially fewer antecedent predictors than for the district population models. Moreover, predictors tended to account for more of the table variance in Indian student achievement than in the achievement of students in general. That is, in comparison to the Washoe County School District population models of achievement, the Indian student models were much more parsimonious.

The Indian student models were found to explain more of the total variance than the population word study skills, reading comprehension, reading test total, auditory test total, math concepts, and math test total achievement models. A final general observation was that previous grades appeared to be more explanatory for Indian student word study skills, reading comprehension, reading test total, auditory test total, math concepts, and math test total achievement, than for the Washoe County School District population.

Table 42. Comparison of Population and Indian Regression Models

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Word Study Skills			
1983 Reading Grade (m)	14.32	58	1983 Reading Grade (m)	18.67	57
Acreage Per Student (m)	4.89	20			
Sex (n)	1.76	7			
Grade Level (n)	1.17	5	Grade Level (n)	1.28	4
Emergency Telephone (m)	1.44	6	Emergency Telephone (m)	.19	1
Father's Status (n)	.56	2	Father's Status (n)	4.40	13
1983 Citizenship Grade (m)	-.92	-4			
			Magazine Subscriptions Per Student (m)	4.08	12
Other[a]	1.62	6	Other[a]	4.07	12
Total	24.84	100	Total	32.69	99
		Reading Comprehension			
1983 Reading Grade (m)	21.85	67	1983 Reading Grade (m)	31.46	84
Acreage Per Student (m)	4.38	14			
Library Open After School Per Student (m)	.97	3			
Gifted Program (m)	1.52	5	Gifted Program (m)	2.30	6
Cost of School Per Student (m)	-.29	-1			
Change of Schools (n)	1.52	5			
Sex (n)	.77	2			
Emergency Telephone (m)	1.14	4			
Free & Reduced Lunch (n)	1.14	4			
1983 Citizenship Grade (m)	-1.26	-4			
			Encyclopedia Sets Per Student (m)	3.05	8
Other[a]	.68	2	Other[a]	.46	1
Total	32.42	101	Total	37.27	99

a--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Reading Test Total			
1983 Reading Grade (m)	25.74	66	1983 Reading Grade (m)	37.23	80
Acreage Per Student (m)	5.08	13			
Library Open After School Per Student (m)	.94	2			
Sex (n)	1.80	5			
Emergency Telephone (m)	1.87	5	Emergency Telephone (m)	.15	0
Grade Level (n)	.73	2	Grade Level (n)	-.22	-1
Father's Status (n)	.90	2	Father's Status (n)	1.01	2
1983 Citizenship Grade (m)	-1.57	-4			
			Magazine Subscriptions Per Student (m)	3.23	7
			Gifted Program (m)	2.61	6
Other[a]	3.69	9	Other[a]	2.74	6
Total	39.18	100	Total	46.75	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Vocabulary Knowledge			
1983 Reading Grade (m)	20.70	61	1983 Reading Grade (m)	20.59	76
Free & Reduced Lunch (n)	2.97	9			
Change of Schools (n)	1.50	4			
Emergency Telephone (m)	1.45	4			
Grade Level (n)	.69	2	Grade Level (n)	.40	1
Gifted Program (m)	1.63	5			
Library Open After School Per Student (m)	.74	2			
Magazine Subscriptions Per Student (m)	.92	3			
Number of Days Absent in 1982-1983 (m)	.90	3			
Home Phone Listed (n)	1.59	5			
			Encyclopedia Sets Per Student (m)	1.86	7
Other[a]	.93	3	Other[a]	4.30	16
Total	34.02	101	Total	27.15	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Listening Comprehension			
1983 Reading Grade (m)	16.67	54	1983 Reading Grade (m)	14.75	60
Grade Level (n)	3.04	10			
Change of Schools (n)	2.76	9			
Magazine Subscriptions Per Student (m)	1.43	5			
Free & Reduced Lunch (n)	2.03	7			
Number of Parents Absent (n)	-.04	0			
Home Phone Listed (n)	1.55	5			
Library Open After School Per Student (m)	.09	0			
Emergency Telephone (m)	1.24	4			
Student's Residence (n)	.91	3	Student's Residence (n)	1.55	6
			Percentage of Books Lost Per Student (m)	2.82	11
			Father's Status (n)	1.31	5
			Encyclopedia Sets Per Student (m)	2.30	9
Other[a]	1.04	3	Other[a]	1.90	8
Total	30.72	100	Total	24.63	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Auditory Test Total			
1983 Reading Grade (m)	16.46	63	1983 Reading Grade (m)	21.18	69
Emergency Telephone (m)	2.03	8			
Free & Reduced Lunch (n)	1.71	6			
Gifted Program (m)	1.48	6	Gifted Program (m)	3.18	10
Change of Schools (n)	1.55	6			
Student's Residence (n)	.59	2			
Father's Status (n)	.32	1			
Number of Days Absent in 1982-1983 (m)	.62	2			
Number of Parents Absent (n)	-.19	-1			
Home Phone Listed (m)	1.33	5			
			Percentage of Books Lost Per Student (m)	2.43	8
			Encyclopedia Sets Per Student (m)	2.37	8
			Grade Level (n)	.00	0
Other[a]	.39	2	Other[a]	1.35	4
Total	26.29	100	Total	30.51	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Spelling			
1983 Reading Grade (m)	24.72	62	1983 Reading Grade (m)	21.02	58
Student's Residence (n)	3.84	10	Student's Residence (n)	.08	0
Sex (n)	2.82	7			
Acreage Per Student (m)	2.91	7			
Encyclopedia Sets Per Student (m)	1.98	5			
Percentage of Books Lost Per Student (m)	2.13	5			
Number of Parents Employed (n)	-.04	0	Number of Parents Employed (n)	-.61	-2
			Number of Days Absent in 1982-1983 (m)	4.17	11
			Father's Status (n)	1.63	4
			Gifted Program (m)	3.55	10
			Number of Parents Absent (n)	2.45	7
			Emergency Telephone (m)	.36	1
			Free & Reduced Lunch (n)	2.03	6
Other[a]	1.25	3	Other[a]	1.86	5
Total	39.61	99	Total	36.54	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Math Concepts			
1983 Grade Point Average (m)	23.86	76	1983 Grade Point Average (m)	30.57	81
Gifted Program (m)	2.59	8	Gifted Program (m)	2.65	7
Grade Level (n)	1.75	6			
Percentage of Books Lost Per Student (m)	1.41	4	Percentage of Books Lost Per Student (m)	3.34	9
1983 Citizenship Grade (m)	-1.91	-6			
Home Phone Listed (n)	1.34	4			
Library Open After School Per Student (m)	.65	2			
			Sex (n)	.71	2
Other[a]	1.48	5	Other[a]	.28	1
Total	31.17	99	Total	37.55	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 42. (Continued)

Population Stepwise/Forced Entry Models			Indian Stepwise/Forced Forced Entry		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Math Test Total			
1983 Grade Point Average (m)	28.26	83	1983 Grade Point Average (m)	32.77	85
Gifted Program (m)	3.07	9	Gifted Program (m)	2.75	7
Percentage of Books Lost Per Student (m)	1.65	5	Percentage of Books Lost Per Student (m)	3.46	9
1983 Citizenship Grade (m)	-1.49	-4			
Age in Months at Time of Test (n)	.89	3			
Library Open After School Per Student (m)	.61	2			
Other[a]	1.21	3	Other[a]	-.30	-1
Total	34.20	101	Total	38.68	100
		Science Knowledge			
1983 Grade Point Average (m)	17.80	60	1983 Grade Point Average (m)	16.81	59
Age in Months at Time of Test (n)	4.61	15			
Acreage Per Student (m)	4.47	15			
Library Open After School Per Student (m)	1.07	4			
Sex (n)	.60	2			
Gifted Program (m)	1.62	5	Gifted Program (m)	3.99	14
			Percentage of Books Lost Per Student (m)	5.78	20
			Grade Level (n)	2.69	10
			1983 Citizenship Grade (m)	-1.58	-6
Other[a]	-.33	-1	Other[a]	.72	3
Total	29.84	100	Total	28.41	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

These two results tended to suggest that much of the observed differences in total variance might be a function primarily of the greater predictability of previous grades in these achievement areas. That is, previous grades accounted for between 14% and 28% (with an average of 21%) of the variance in the Washoe County School District population models of achievement, and between 15% and 37% (with an average of 25%) of the variance in the Indian student models of academic achievement. Hence, with respect to the ability of previous grades to account for total variance in academic achievement, previous grades had much more stability in the population than in the Indian models of achievement. However, when looking at the percentage of explained (rather than total) variance, previous grades were found to account for between 54% and 83% (with an average of 65%) of the explained variance in the population models, and between 57% and 85% (with an average of 70%) of the explained variance in the Indian student achievement models. That is, previous grades had much greater variability relative to other predictors in accounting for explained variance, than for total variance. Moreover, the percentages of explained variance by previous grades were very comparable for most models, with the greatest differences being between the population and Indian reading comprehension (17% difference), reading test total (14%), and vocabulary knowledge (15%) models.

Word Study Skills

In comparing the models for word study skills (Table 42), it was found that overall the antecedent predictors entering the equations accounted for 7.8% more variance in the Indian model than the Washoe County School District population model. The best predictor for both was previous class (reading) grades, with each having about the same amount of variance explained by previous grades. Interestingly, previous grades explained 4% more of the total variance in the Indian model, but 1% less of the explained variance. This meant that in comparison to the other predictors in the word study skills model for Indian students, this larger amount of total variance accounted for by previous grades was essentially the same (1% less) as the relative contribution of previous grades to the population model.

Other predictors entering into both the population and Indian word study skills models of achievement were grade level, emergency telephone listing, and father's status. That is, being in an upper grade level and having a natural father were predictive of higher achievement for both the population and Indian students. However, having an emergency telephone number listed at the school office (r = .15) predicted higher achievement for the population, while not having one listed (r = -.02) apparently predicted higher achievement for Indian students. Grade level contributed nearly equally to both models, but emergency telephone listing accounted for seven times more of the variance in the population model than in the Indian model, while father's status (i.e., having a natural father or not) explained eight times more in the Indian model than the population model. More importantly, father's status made the second largest contribution to Indian word study skills achievement, but had minimal contribution to the population model. Conversely, the emergency telephone listing variable made the smallest contribution to the Indian word study skills model, and only a moderately small contribution to the population model.

The school's acreage per student was the second largest contributor (5%) to the word study skills variance in the Washoe County School District population model, but was not a predictor in the Indian model. Specifically, less acreage per student (r = -.25) was significantly predictive of word study skills achievement (for a discussion of this, see the section on "Accounting For the Variance" below). Other antecedents entering only the population model were student's sex (2%) and student's 1983 citizenship grade (-1%). Thus, being female (r = .13) and having good citizenship grades (r = .13) were predictive of higher word study skills achievement. The one variable entering into the Indian model, but not into the population model, was the number of magazine subscriptions per student (4%), which interestingly meant that having fewer magazines per student (r = -.19) was predictive of higher word study skills achievement for Indian students. In regards to variables forced into the equation, but not statistically significant at or beyond the .15 level, it was found that these other factors contributed twice as much to the total variance in the Indian model (4%) as in the Washoe County School District population model (2%).

Reading Comprehension

The Indian model of achievement accounted for 4.8% more of the total reading comprehension variance than did the Washoe County School District population model. Previous grades were the best predictor of reading comprehension for both models, but the 1983 reading grade accounted for 9.6% more of the total variance (and contributed 17% more to the explained variance) in the Indian student model. The only other factor entering both models was participation in the gifted program, where participation predicted higher reading comprehension achievement for both the population ($\underline{r}$ = .22) and Indian students ($\underline{r}$ = .23). The participation in the gifted program variable accounted for more of the total variance in the Indian student model (2%) than in the population model (1%), but both contributed about the same percentage to the explained variance.

The second best predictor of reading comprehension achievement, after previous grades, in the Washoe County School District population model was once again the school's acreage per student (4%); that is, smaller school grounds promoted or predicted higher reading comprehension achievement for the population but not for Indian students. Other antecedents in the population model, but not in the Indian student model, were how long the library was open after school per student (1%), the cost of the school per student (-.3%), the change of schools made by the student (2%), the student's sex (1%), whether an emergency telephone number was listed (1%), whether the student was in the federal lunch program (1%), and the student's 1983 citizenship grade (-1%). In other words, having libraries open longer after school ($\underline{r}$ = .10), having less expensive schools ($\underline{r}$ = -.03), remaining at the same school for consecutive years (*r* = .18), being female (*r* = .08), having an emergency telephone number listed with the school (*r* = .15), not being in the federal lunch program (*r* = -.16), and having good citizenship grades (*r* = .13) were all predictive of higher reading comprehension achievement in the Washoe County School District population. In contrast, the only predictor, which was also the next best predictor after previous grades, in the Indian student model, but not the population model was the number of encyclopedia sets per student, where having more sets (*r* = .20) predicted higher reading comprehension achievement and explained 3% of the total variance, but contributed 8% of the explained variance. The other variables forced into the equation that were not statistically significant were not very good predictors either, as they accounted for less than 1% of the total variance in both models.

Reading Test Total

Overall, the Indian student model accounted for 7.6% more of the variance than the Washoe County School District population model for reading test total academic achievement (Table 42). Previous grades were the best predictors for both models, but they accounted for 11.5% more of the total variance, and contributed 14% more to the explained variance, in the Indian reading test total model. The emergency telephone listing variable accounted for more variance in the population model (2%) than in the Indian model (.2%), and contributed considerable more (5% versus 0%) to the explained variance. However, the effect was different for each. Having an emergency phone listed (r = .18) was predictive of higher reading test total achievement in the population, but not having one listed (r = -.01) was seemingly predictive of higher reading test total achievement for Indian students. Father's status contributed equally (2%) to the explained variance in the models, but did account for a little more (.1%) of the total table variance in reading test total achievement for Indian students. Thus, having a natural father was predictive of higher reading test total achievement for both the population (r = .11) and Indian students (r = .10). Interestingly, grade level was found to negatively contribute (-1%) to the explained variance for Indian students, while it positively added (2%) to the population model. This was caused by the fact that being in a lower grade level (r = -.02), rather than a higher grade level, was predictive of higher reading test total achievement for Indian students, while being in a higher grade (r = .10) was predictive of higher achievement in the population. Thus, grade level had divergent effects in the population and for Indian students in the area of reading test total achievement; that is, being in a higher grade level acted as a suppressor variable in the Indian model as well as predicting lower reading test total achievement rather than higher achievement for the Indian students.

As with the previous two models, which were concerned with subtests of reading achievement, the second best predictor of reading test total achievement after previous grades in the Washoe County School District (but not for Indian students only) was school acreage per student (5%), which contributed 13% of the explained variance.

Thus, going to schools with less acreage (r = -.28) was predictive of higher reading test total achievement for the population. Other factors accounting for the total variance in only the population model were how long the library was open after school per student (1%), student's sex (2%), and 1983 citizenship grade (-2%). In other words, going to schools where the library was open longer after school (r = .10), being female (r = .13), and having higher citizenship grades (r = .15) were all predictive of higher reading test total achievement in the population, but not for Indian students. The two predictors of Indian reading test total achievement that did not enter the population model were the number of magazine subscriptions per student (3%) and participation in the gifted program (3%). That is, having fewer magazines per student in the school library (r = -.17) and participating in the gifted program (r = .26) were predictive of higher reading test total achievement for Indian students but not the population in general.

With regards to the other variables that entered the equation as a result of the forced entry data analysis procedure, but were not statistically significant (i.e., p >.15), it was found that they accounted for 4% of the total variance in the population model and 3% of the total variance in the Indian student model, which was 6% of the explained variance in both the population and Indian models of reading test total achievement.

Vocabulary Knowledge

In contrast to the other areas of achievement discussed so far, the Washoe County School District population model (34%) accounted for more variance in vocabulary knowledge (Table 42) than the Indian model (27%). The 1983 reading grade, the best predictor, accounted for 20% of the total variance in both the population and Indian vocabulary models, but contributed 15% more of the explained variance in the Indian (76%) model than in the population model (61%). The only other antecedent that entered into both equations was grade level, but in neither case did the variable account for much of the total variance (less than 1%). However, being in a higher grade level was predictive of higher vocabulary achievement for both the population (r = .10) and the Indian students (r = .03).

Eight antecedent variables of vocabulary knowledge were predictors of the observed variance in the population model of vocabulary achievement, but were not in the Indian model. Participation in the federal lunch program (3%), change of schools (2%), emergency telephone listing (1%), participation in the gifted program (2%), length of time the library was open after school per student (1%), number of magazine subscriptions per student (1%), number of days absent in 1982-83 (1%), and whether a home phone was listed (2%) together accounted for 12% of the population vocabulary knowledge. That is, not being in the federal lunch program (r = -.23), not changing schools (r = .20), having an emergency telephone number listed (r = .17), participation in the gifted program (r = .23), attending a school where the library was open longer after school per student (r = .11), having fewer magazines (r = -.14), being absent more days (r = .09), and the listing of a home telephone number (r = .18) were all predictive of higher vocabulary achievement in the Washoe County School District population, but not for Indian students only. The number of encyclopedia sets per student, which accounted for 2% of the total variance, was the only predictor that was in the Indian model and not the population model of vocabulary knowledge. Thus, having more encyclopedias per student (r = .18) was predictive of Indian, but not population, vocabulary achievement.

There was considerable difference between the models with respect to the amount of table and explained variance contributed by the other variables forced into the respective models. Those entering variables which were not statistically significant (i.e., $p > .15$) accounted for 1% of the total (and 3% of the explained) variance in the population model, but they accounted for 4% of the total (and 16% of the explained) variance in the Indian model, of vocabulary knowledge. In other words, those variables forced into the Indian model of vocabulary knowledge by statistical procedures made a substantively larger contribution to both the table and explained variances.

Listening Comprehension

As with the vocabulary knowledge models, considerable differences between the Washoe County School District population model and the Indian model of listening comprehension achievement were found (Table 42). Of the ten antecedent factors in the population model, only two were found to be also predictive of Indian listening comprehension. Moreover, the population model accounted for more variance (31%) in listening comprehension test scores than the Indian model (25%). Previous grades accounted for 17% of the total variance and 54% of the explained variance in the population model, while they accounted for 15% of the total variance, but 60% of the explained variance, in the Indian model of listening comprehension. Student's residence was the only other common predictor, which explained 1% and 2% in the population and Indian models of listening comprehension respectively. Interestingly, the predictive association between residence and listening comprehension was different for the population and Indian students. While living in the urban Reno-Sparks (and Colony) area ($r = -.10$) was predictive of higher listening comprehension achievement in the Washoe County School District population, living on the Pyramid Lake Indian Reservation (and in the rural Washoe County area) ($r = .11$) was predictive of higher listening comprehension achievement for Indian students.

The eight antecedents of the Washoe County School District population model of listening comprehension, which did not contribute to understanding Indian student listening comprehension, were grade level (3%), change of schools (3%), number of magazine subscriptions per student (1%), participation in the federal lunch program (2%), number of parents absent (0%), home telephone listing (2%), how long the library was open after school per student (0%), and emergency telephone listing (1%). In other words, being in a higher grade level ($r = .18$), having not changed schools ($r = .20$), having fewer magazines per student in the school library ($r = -.16$), not participating in the federal lunch program (r = -.18), having both parents present at home (r = -.00), having a home telephone number listed at the school (r = .16), attending a school where the library was open longer after school per student (r = .12), and having an emergency telephone number listed at the school (r = .15) were all predictive of higher listening comprehension achievement for the population, but not the Indian students. In contrast, the percentage of books lost per student (3%), the father's status to the student (1%), and the number of encyclopedia sets per student (2%) were predictors of Indian student listening comprehension achievement, but not for the whole Washoe County School District population. Thus, attending schools where fewer books per student were lost (r = .13), having a stepfather, legal guardian, or father missing (r = .12), and going to schools with more encyclopedia sets per person (r = .20) predicted higher listening comprehension achievement for Indian students, but not for the population.

Once again, the other variables forced into the models accounted for more total variance in the Indian model (2%) than in the population model (1%). These other variables, however, did contribute twice as much explained variance in the Indian model (8%) as in the population model (3%).

Auditory Test Total

It was interesting to have found that the auditory test total model (Table 42) accounted for more total variance in achievement test scores for the Indian students (31%) than for the population (26%), because the population models for the two subtests (listening comprehension and vocabulary) explained more total variance than the Indian models. As the one antecedent in the Indian auditory test total model not in the two Indian subtest models was the participation in the gifted program variable, it would seem likely that this was a contributing factor in the auditory test total model accounting for more variance in achievement test scores. However, a second contributing factor was that the 1983 reading grade was also more predictive of auditory test total achievement than for listening comprehension or vocabulary achievement for Indian students. Previous grades explained 5% more of the table variance in the Indian model (21%) than in the population model (16%), although that 5% contributed only 6% to the explained variance. Moreover, participation in the gifted program explained 2% more of the total (or 4% more of the explained) variance in the Indian model (r = .26) than in the population model (r = .21) of auditory test total achievement.

As with the subtests, however, the remainder of the antecedent predictors in the two models were different. Together, emergency telephone listing (2%), participation in the federal lunch program (2%), change of schools (2%), student's residence (1%), father's status (0%), number of days absent in 1982-83 (0%), number of parents absent (0%), and home phone listing (1%) accounted for 8% of the total variance in the Washoe County School District population model, but not in the Indian model. That is, having an emergency telephone number listed with the school (r = .18), not participating in the federal lunch program (_r_ = -.17), staying at the same school (_r_ = .17), living in the urban Reno-Sparks (and Colony) area (_r_ = -.06), having a stepfather, legal guardian, or no father (_r_ = .05), being absent more days (_r_ = .08), having both parents present at home (_r_ = -.02), and having a home telephone listed (_r_ = .15) were all predictive of higher auditory test total achievement for the population, but not for Indian students only. The percentage of books lost per student (2%), the number of encyclopedia sets per student (2%), and grade level (0%) variables accounted for 4% of the total variance in the Indian model, which were not in the Washoe County School District population model, of auditory test total achievement. Thus, attending a school where fewer books were lost per student (_r_ = -.14), having more encyclopedia sets per student (_r_ = .20), and being in a higher grade (_r_ = .00) were all predictive of auditory test total achievement for Indian students, but not the population. Once again, the other variables forced into the models accounted for more variance in the Indian model (1%) than in the population model (0%).

Spelling

Predictors entering into the Washoe County School District population model of spelling accounted for 40% of the observed variance in achievement, while those entering into the Indian model explained 36% of the table variance (Table 42). Previous grades, the strongest predictor in both models, accounted for slightly more variance in the population model (25%) than in the Indian model (21%). Student's residence and number of parents employed also entered into both equations. While student's residence accounted for 4% of the total variance, and, as the second best predictor, contributed 10% to the explained variance in the population model, it accounted for less than 1% of either table or explained variance in the Indian model of spelling achievement. The number of parents employed entered both models, but as a suppressor variable, albeit more so in the Indian model (-1%) than in the population model (0%). Thus, living in the urban Reno-Sparks area (r_P = -.21; r_I = -.01) and having either both parents or just the father employed (r_P = -.004; r_I = -.03) were predictive of higher spelling achievement for both the population and Indian students.

In looking at the percentages of explained, rather than total (or table) variance (Table 42), it was found that a number of antecedents entered only one or the other model, and that several of these variables accounted for relatively substantive large amounts of the explained variance. In the Washoe County School District population model, student's sex (3%), acreage per student (3%), encyclopedia sets per student (2%), and percentage of books lost per student (2%) together accounted for 10% of the total variance and 24% of the explained variance in spelling achievement. Hence, being female (r = .18), attending schools with less acreage per student (r = -.30), attending schools with more encyclopedia sets per student (r = .19), and losing fewer books per student (r = -.20) were all predictive of higher spelling achievement for the population, but not for Indian students only. In contrast, number of days absent in 1982-83 (4%), father's status (2%), participation in the gifted program (4%), number of parents absent (2%), emergency telephone listing (0%), and participation in the federal lunch program (2%) all together explained 14% of the total variance and contributed 39% of the explained variance. That is, being absent fewer days (r = -.27), having a natural father (r = -.13), participating in the gifted program (r = .26), having both parents at home (r = -.13), not having an emergency telephone number listed with the school (r = -.03), and not participating in the federal lunch program (r = -.16) were all predictive of higher spelling achievement for Indian students only, and not the population. Other variables forced to enter into the respective models contributed 1% of the total variance in the population and 2% in the Indian models of spelling achievement.

Math Concepts

Taken together, all antecedents entering into the equations for math concepts achievement (Table 42) accounted for 31% of the variance in the Washoe County School District population model and 38% of the variance in the Indian model. Although the 1983 grade point average accounted for 7% more total variance in the Indian model (31%) than in the population model (24%), there was only a 5% difference in their relative contributions to the explained variances. Two other antecedents were also found to enter into both models of math concepts knowledge. Participation in the gifted program accounted for 3% of the total variance in both, while contributing 7% of the explained variance in the Indian model and 8% in the population model.

Percentage of books lost per student was the second best predictor in the Indian model, accounting for 3% of the total (and 9% of the explained) variance, while it accounted for only 1% of the total (and 4% of the explained) variance in the population model. Thus, participation in the gifted program (r_P = .23; r_I = .27) and attending schools where fewer books were lost per student (r_P = -.12; r_I = -.19) were predictive of higher math concepts achievement for both the population and Indian students only.

Student's sex, the one predictor entering the Indian model and not the population model of math concepts achievement, accounted for only 1% of the total variance. That is, being male (r = -.07) was predictive of higher math concepts achievement for Indians, but not for the population. Conversely, grade level (2%), 1983 citizenship grade (-2%), home phone listing (1%), and how long the library was open after school per student (1%), all of which entered into only the population model, accounted for 2% of the total variance in the population math concepts model. In other words, being in a higher grade level (r = .18), having higher citizenship grades (r = .10), having a home phone listed at the school (r = .16), and attending a school where the library was open longer after school per student (r = .08) were all predictive of higher achievement in the population, but not for Indian students only. Other variables forced into the models accounted for 1% of the total (or 5% of the explained) variance in the population model, but less than 1% of the total (or 1% of the explained) variance in the Indian model of math concepts achievement.

Math Test Total

Of all the models of academic achievement, the math test total models exhibited the greatest structural congruency in the sense that there were no predictors in the Indian model that were not also in the Washoe County School District population model (Table 42). Despite the fact that three of the antecedents in the population model did not enter the Indian model of math test total achievement, the Indian model still explained 39% of the total variance, in comparison to only 34% explained by the population model. The 1983 grade point average was the strongest predictor, contributing over 80% of the explained variance in both the population (83%) and Indian (85%) models. Previous grades, however, accounted for 5% more of the total variance in the Indian model (33%) than in the population model (28%). Participation in the gifted program was the second best predictor in the population model (3%), and the third antecedent of the Indian model (3%). Conversely, the percentage of books lost per student was the second best predictor in the Indian model (3%) and the third antecedent of the population model (2%). Both participation in the gifted program (r_P = .25; r_I = .28) and attending schools where fewer books were lost per student (r_P = -.12; r_I = -.17), therefore, were predictive of higher math test total achievement for both the population and the Indian students.

Two of the three predictors that entered just the population model added positively to the explained variance, while 1983 citizenship grade acted as a suppressor (-1%). The other two variables, age in months at the time of the test (1%) and how long the library was open after school per student (1%) positively explained another 2% of the variance in math test total achievement. Nonetheless, higher citizenship grades (r = .13), being older (in months) (r = .12), and attending a school where the library was open longer after school per student (r = .08) were predictive of high math test total achievement for the population, but not for Indian students only. Thus, those variables not entering the Indian model, but entering the population model, were structurally rather than statistically important. In looking at the other variables forced into the equations, it was found that these other variables accounted for 1% of the total (or 3% of the explained) variance in the population model, while negatively explaining or suppressing less that 1% of the total (or -1% of the explained) variance in the Indian model of achievement.

Science Knowledge

With respect to the percentage of total variance accounted for by the models, the least observed differences between the Washoe County School District population model and the Indian model were found for science knowledge achievement (Table 42). Six variables accounted for 30% of the total variance in the population model, while five factors accounted for 28% of the total variance in the Indian model of science achievement. The 1983 grade point average, again the best predictor, accounted for 18% of the total (or 60% of the explained) variance in the population model, and 17% of the total (or 59% of the explained) variance in the Indian model. The other antecedent common to both models, participation in the gifted program, was more than twice as predictive in the Indian model (4%) as in the population model (2%), and contributed nearly three times the amount of explained variance. Participation in the gifted program (r_P = .19; r_I = .30), then, was predictive of science achievement for both the population and Indian students only.

Both the age in months at the time of the test (5%) and the acreage per student (4%) variables made substantive contributions to the explained variance in the population model, but were not part of the Indian model. Conversely, the percentage of books lost per student (6%) and grade level (3%) made substantive contributions to the explained variance in the Indian model, but did not enter into the population model. Together, how long the library was open after school per student (1%) and the student's sex (1%) accounted for another 2% of the total variance in the population model, while the 1983 citizenship grade acted as a suppressor in the Indian model (-2%) of science knowledge achievement. In other words, being older (r = .24), attending schools with less acreage (r = -.21), attending schools that had a library open longer after school per student (r = .10), and being male (r = -.07) were all predictive of higher science achievement for the population model, but not for the Indian students only. On the other hand, attending a school with fewer books lost per student (r = -.22), being in a higher grade level (r = .12), and having higher citizenship grades (r = .13) were all predictive of science achievement for Indian students only, and not for the population. With respect to the other variables, it was found that the variables acted as a suppressor (0%) in the population model and added an additional 1% to the amount of variance explained by the Indian model of science achievement.

Accounting For the Variance

As discussed above, previous grades were the single best predictor of academic achievement for both students in the Washoe County School District in general, and for Indian students more specifically. Despite this result, it was also found that previous grades, on the average, accounted for only 21% of the variance in achievement for the population and 25% of the variance in achievement for Indian students. This meant that three-fourths or more of a student's academic achievement, as measured by standardized test scores, was attributable to phenomena other than previous academic performance. This raises the issue of how well other predictors accounted for the variance. Table 43, therefore, comparatively summarizes these factors found to be predictive of the various measures of academic achievement for the district and the Indian student population.

It was found (Table 43) that the other antecedent measure of previous academic success used in this study, the number of days absent in 1982-83, was an even poorer predictor than grades. The variable accounted for less than 1% of the variance in the population vocabulary knowledge and auditory test total models, and 4% of the variance in the Indian spelling model. Except for helping to explain variance in Indian student's spelling achievement, attendance was

Table 43. Comparison of Predictor Contributions to Models

	Word Study Skills		Reading Comprehension		Reading Test Total		Vocabulary Knowledge	
	P[a]	I[b]	P	I	P	I	P	I
Predictors	%	%	%	%	%	%	%	%
Academic Achievement								
Number of Days Absent in 1982-1983 (m)							.90	
Subtotal							.90	
Student Evaluations								
1983 Citizenship Grade (m)	- .92		-1.26		-1.57			
Gifted Program (m)	.		1.52	2.30	.	2.61	1.63	
Subtotal	- .92		.26	2.30	-1.57	2.61	1.63	
Background Characteristics								
Age in Months at Time of Test (n)								
Change of Schools (n)			1.52				1.50	
Emergency Telephone (m)	1.44	.19	1.14		1.87	.15	1.45	
Father's Status (n)	.56	4.40			.90	1.01		
Free & Reduced Lunch (n)			1.14				2.97	
Home Phone Listed (n)							1.59	
Number of Parents Absent (n)								
Number of Parents Employed (n)								
Sex (n)	1.76		.77		1.80			
Student's Residence (n)	.	.	.		.	.	.	
Subtotal	3.76	4.59	4.57		4.57	1.16	7.51	
School Environment and Learning Contexts								
Acreage Per Student (m)	4.89		4.38		5.06			
Cost of School Per Student (m)			- .29					
Encyclopedia Sets Per Student (m)				3.05				1.86
Grade Level (n)	1.17	1.28			.73	- .22	.69	.40
Library Open After School Per Student (m)			.97		.94		.74	
Magazine Subscriptions Per Student (m)		4.08				3.23	.92	
Percentage of Books Lost Per Student (m)	.	.	.	.	.	.	.	.
Subtotal	6.06	5.36	5.06	3.05	6.75	2.81	2.35	2.26
Total	8.90	9.95	9.89	5.35	9.75	6.78	12.39	2.26

[a]--Population Models. [b]--Indian Models.

[c]--Value is total rather than mean since there was only one occurrence of this factor.

(m)--Indicates variable that is potentially manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 43. (Continued)

Predictors	Listening Comprehension P[a] %	Listening Comprehension I[b] %	Auditory Test Total P %	Auditory Test Total I %	Spelling P %	Spelling I %	Reading Model Average P %	Reading Model Average I %
Academic Achievement								
Number of Days Absent in 1982-1983 (m)			.62			4.17	.76	4.17[c]
Subtotal			.62			4.17	.76	4.17[c]
Student Evaluations								
1983 Citizenship Grade (m)							-1.25	
Gifted Program (m)			1.48	3.18		3.55	1.54	2.91
Subtotal			1.48	3.18		3.55	.18	2.91
Background Characteristics								
Age in Months at Time of Test (n)								
Change of Schools (n)	2.76		1.55				1.83	
Emergency Telephone (m)	1.24		2.03			.36	1.53	.23
Father's Status (n)		1.31	.32			1.63	.59	2.09
Free & Reduced Lunch (n)	2.03		1.71			2.03	1.96	2.03[c]
Home Phone Listed (n)	1.55		1.33				1.49	
Number of Parents Absent (n)	-.04		-.19			2.45	-.11	2.45[c]
Number of Parents Employed (n)					-.04	-.61	-.04[c]	-.61[c]
Sex (n)					2.82		1.79	
Student's Residence (n)	.91	1.55	.59		3.34	.08	1.78	.82
Subtotal	8.45	2.86	7.34		6.62	5.94	6.12	3.64
School Environment and Learning Contexts								
Acreage Per Student (m)					2.91		4.32	
Cost of School Per Student (m)							-.29[c]	
Encyclopedia Sets Per Student (m)		2.30		2.37	1.98		1.98[c]	2.40
Grade Level (n)	3.04			.00			1.41	.36
Library Open After School Per Student (m)	.09						.67	
Magazine Subscriptions Per Student (m)	1.43						1.18	3.66
Percentage of Books Lost Per Student (m)	.	2.82		2.43	2.13		2.13[c]	2.62
Subtotal	4.56	5.12		4.80	7.02		5.30	3.90
Total	13.01	7.98	9.44	7.98	13.64	13.66	11.00	7.71

a--Population Models. b--Indian Models.

c--Value is total rather than mean since there was only one occurrence of this factor.

(m)--Indicates variable that is potentially manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 43. (Continued)

	Math Concepts		Math Test Total		Science Knowledge		Math Model Average	
	P[a]	I[b]	P	I	P	I	P	I
Predictors	%	%	%	%	%	%	%	%
Academic Achievement								
Number of Days Absent in 1982-1983 (m)								
Subtotal								
Student Evaluations								
1983 Citizenship Grade (m)	-1.19		-1.49			-1.58	-1.34	-1.58[c]
Gifted Program (m)	2.59	2.65	3.07	2.75	1.62	3.99	2.43	3.13
Subtotal	.68	2.65	1.58	2.75	1.62	2.41	1.88	2.60
Background Characteristics								
Age in Months at Time of Test (n)			.89		4.61		2.75	
Home Phone Listed (n)	1.34						1.34[c]	
Sex (n)	.	.71	.		.60		.60[c]	.71[c]
Subtotal	1.34	.71	.89		5.21		2.48	.71[c]
School Environment and Learning Contexts								
Acreage Per Student (m)					4.47		4.47[c]	
Grade Level (n)	1.75					2.69	1.75[c]	2.69[c]
Library Open After School Per Student (m)	.65		.61		1.07		.78	
Percentage of Books Lost Per Student (m)	1.41	3.34	1.65	3.46	.	5.78	1.53	4.19
Subtotal	3.81	3.34	2.26	3.46	5.54	8.47	3.87	5.09
Total	5.83	6.70	4.73	6.21	12.37	10.88	7.64	7.93

a--Population Models. b--Indian Models.
c--Value is total rather than mean since there was only one occurrence of this factor.
(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

found to be a poor predictor of achievement. More to the point, attendance was not a predictor of word study skills, reading comprehension, reading test total, listening comprehension, math concepts, math test total, or science knowledge for either the Washoe County School District elementary students in general or the Indian elementary students in particular. Nor was attendance a predictor of vocabulary knowledge or auditory test total achievement for Indian students. Structurally, attendance was a better predictor for the Washoe County School District population in general than for Indian students only, while in terms of total accountability attendance was a good predictor of spelling achievement only.

In looking at the student evaluation predictors (Table 43) several patterns stood out. Foremost was that participation in the gifted program was, both in terms of structure and accountability, a consistent predictor of achievement, particularly for the math oriented models. This meant that in the Washoe County School District, where participation in the gifted program was based upon previous demonstrated achievement and previous achievement (grades) was accounted for, the gifted program enhanced or compounded student achievement--the achievers become even better achievers. With respect to just the reading models, the gifted program antecedent entered into four of the Indian models, as compared to three of the population models. More importantly, participation in the gifted program accounted for, on the average, nearly twice as much of the total variance in the Indian reading oriented models (2.9%) as in the population reading oriented models (1.5%). In the math oriented models, the gifted program variable entered into all equations, but, on the average, explained more variance in the Indian models (3.1%) than in the population models (2.4%).

A second pattern in the previous student evaluation results (Table 43) was that the 1983 citizenship grade, when it entered into a model, was consistently a suppressor variable--adding negatively to the explained variance. Again, this means that higher 1983 citizenship grades resulted in lower subsequent achievement test scores. Moreover, citizenship was a much better predictor in the population models, only entering into the Indian science knowledge model. Thus, both measures of previous teacher's student evaluations were found to be good predictors of academic achievement, with citizenship being more important for the population in general and participation in the gifted program being more reliable for the Indian students.

A third category of predictors involved personal and familial background characteristics. It was found (Chapter 4) that these factors were far more important to understanding reading oriented than math oriented models of achievement. That is, the general reading model (Table 34) contained ten background variables, while the general math model had only three antecedents. The results in Table 43 reflect this general pattern as well. The most obvious result in the comparison of the Washoe County School District population models with the Indian models, was that background characteristics were twice as predictive for the population in general as for Indian students only.

That is, taken together, these variables entered thirty of a possible seventy times in the population reading oriented models, and four out of nine times in the population math models. In contrast, background variables entered only twelve of seventy, and one of nine, times in the Indian reading and math models, respectively.

Individually the predictors that accounted for more than 2% of the total variance were father's status in the Indian word study skills model (4%), participation in the federal lunch program in the population vocabulary knowledge (3%) and listening comprehension (2%) models and the Indian spelling (2%) model, the change of schools in the population listening comprehension (3%) model, emergency telephone listing in the population auditory test total (2%) model, student's sex (3%) and student's residence (4%) in the population spelling model, the number of parents absent in the Indian spelling (2%) model, and the student's age in the population science knowledge (5%) model. On the average, all background variables accounted for 6% of the total variance in population reading oriented models, which contrasted with 4% of the total variance in Indian reading oriented models. More dramatically, background characteristics accounted for over 2% of the total variance, on the average, in the Washoe County School District population math oriented models, but less than 1% in the Indian models. Overall, then, background characteristics were fair predictors, particularly structurally, for the district students in general, but were poor predictors of Indian student achievement.

Perhaps of greatest interest to this study was how the models compared (Table 43) with respect to school environment and learning context antecedents of academic achievement. Structurally, the most consistent predictor of achievement was grade level, although the amount of variance explained by this factor was negligible. The percentage of books lost per student was also a consistent predictor for the math oriented models. When comparing amounts of variance explained by the various contextual variables, it was found that they explained more variance, on the average, in the Washoe County School District reading oriented population models (5.3%) than in the same Indian models (3.9%), but they explained more in the Indian math oriented models (5.1%) than in the same population models (3.9%). Overall, then, these contextual antecedents were found to be fairly good predictors of achievement, and certainly better than student background characteristics.

In comparing the relative average contributions to the Washoe County School District population and Indian models of achievement (Table 43) by various measures of previous achievement, student evaluation, student and familial background characteristics, and school contextual factors, it was found that background characteristics accounted for the greatest amount of variance in reading oriented academic achievement (after previous grades) for students in general in the district. In contrast, it was found that school contextual factors accounted for the largest average amount of variance for Indian students. (It should be noted that the largest average percentage shown in Table 43 for Indian models was for the number of days absent, but that figure was not a true average since it was based on a frequency of only one appearance). It was also found that school contextual factors accounted for the largest average variance in math oriented models for both the population in general and for Indian students.

Similar results were obtained when structural occurrences of the four types of antecedents were compared. That is, in looking at just the reading oriented models first, it was found that, relative to the district population models, substantively more school contextual and student evaluation predictors were part of the Indian models. The ratios for population to Indian occurrences of predictors were as follows:

1)	Academic Achievement	2/7 : 1/7
2)	Student Evaluation	6/14 : 4/14
3)	Background Characteristics	30/70 : 12/70
4)	School Environment and Learning Contexts	17/49 : 12/49

Thus, relative to the typical student in the Washoe County School District, background characteristics were structurally much less predictive, and previous student evaluations by teachers and school contextual characteristics comparatively more predictive, for Indian students in the district.

The same pattern was found for the math oriented models as well, where the ratios for population to Indian occurrences of predictors were:

1)	Academic Achievement	(no occurrences)
2)	Student Evaluation	5/6 : 4/6
3)	Background Characteristics	4/9 : 1/9
4)	School Environment and Learning Contexts	7/12 : 4/12

Lastly, it was found that, on the average, all predictors, except previous grades, accounted for 11% of the total variance in the Washoe County School District reading oriented population models and 8% in the same Indian models. On the other hand, it was found that all predictors, except previous grades, accounted for essentially the same amounts of variance (8%), on the average, in both the population and Indian math oriented models.

Suppressor Variables

Five variables were observed to act as suppressor variables in one or more of the population and Indian models of academic achievement. That is, these variables suppressed the explained variance ($\underline{R}^2$), so that when the variables were held constant in the analysis, they contributed negatively to the variance in achievement (as measured by the particular dependent variable). Again, in doing so, these antecedent predictors increased the importance, or predicting power, of the other variables in the model. Thus, without the structural presence of the suppressor variable, the predictive power of the other antecedents would have been less by that percentage.

Of the five variables acting as suppressors, only the 1983 citizenship grade was of much explanatory consequence, adding an average of 1.5% to the accountability of models. In all cases where the citizenship grade variable was included, it was a suppressor variable. Both cost of school per student and the number of parents employed were found to be consistent suppressors, and made an average contribution to the total variance of 1% or less. Both grade level and number of parents absent acted as inconsistent suppressors. Grade level entered as a suppressor in only one model (Indian reading test total), whereas number of parents absent entered two population models as a suppressor. Again, the amount of explained variance was less than 1%. The interesting result, in contrast, was when the number of parents absent entered into one of the Indian models of achievement it made a positive rather than negative contribution to the explained variance. Generally speaking, then, suppressor variables had a greater effect upon the Washoe County School District population models than on the Indian models of academic achievement.

Manipulable and Non-Manipulable Variables

Table 44 compares the percentages of manipulable and non-manipulable antecedent predictors entering into the population and Indian models of academic achievement. Only two Indian models contained more than one-third non-manipulable variables, but seven of the population models had more than one-third non-manipulable variables. More importantly, three of the models actually had over one-half non-manipulable variables: the population listening and auditory test total models both had 60% non-manipulable predictors, and the Indian spelling model contained 56% non-manipulable factors. In contrast, five of the Indian models had 75% or more manipulable variables, while only one of the population models contained 75% or

Table 44. Comparison of Percentages of Manipulable and Non-Manipulable Variables for the Population and Indian Models

	Population		Indian		Population		Indian	
Type of Variable	f	%	f	%	f	%	f	%
	Word Study Skills				Reading Comprehension			
Manipulable	4	57	3	60	7	70	3	100
Non-Manipulable	3	43	2	40	3	30	0	0
	Reading Test Total				Vocabulary Knowledge			
Manipulable	5	62	4	67	6	60	2	67
Non-Manipulable	3	38	2	33	4	40	1	33
	Listening Comprehension				Auditory Test Total			
Manipulable	4	40	3	60	4	40	4	80
Non-Manipulable	6	60	2	40	6	60	1	20
	Spelling				Math Concepts			
Manipulable	4	57	4	44	5	71	3	75
Non-Manipulable	3	43	5	56	2	29	1	25
	Math Test Total				Science Knowledge			
Manipulable	5	83	3	100	4	67	4	80
Non-Manipulable	1	17	0	0	2	33	1	20

more manipulable predictors. Indeed, on the average, the population models had 59% manipulable variables, while the Indian models had 69% manipulable variables. Indian student achievement, as structurally compared to that of their classmates, then, involved considerably more manipulable factors. That is, Indian student achievement in the Washoe County School District was apparently structurally subject to much greater control or manipulation by the school system than was the academic achievement of district students in general.

These comparisons of percentages of manipulative and non-manipulative factors, however, did not take into consideration the amounts of variance actually accounted for by the various variables. Table 45, therefore, compares the population and Indian models for the percentages of both table (or total) and explained variances accounted for by manipulable, non-manipulable, other, and all predictors entering into the models of academic achievement. From the results presented in Table 45, it was obvious that, of both the total and explained variance, the preponderance of the variance was potentially manipulable by the school system. In all cases, over 60%, of the explained variance was attributable to manipulable variables. It was found that, on the average (Table 45), manipulable factors accounted for 26% of the total (or 81% of the explained) variance in the population models and 30% of the total (or 89% of the explained) variance in the Indian models of academic achievement. In other words, manipulable variables accounted for five times as much variance as non-manipulable variables in the population models and fifteen

Table 45. Comparison of Table and Explained Variances Accounted for by Manipulable and Non-Manipulable Variables

	Population Models		Indian Models		Average	
	% of Table Variance	% of Explained Variance	% of Table Variance	% of Explained Variance	% of Table Variance	% of Explained Variance
Word Study Skills						
Manipulable	19.73	79	22.94	70	21.34	74
Non-Manipulable	3.49	14	5.68	17	4.58	16
Other[a]	1.62	6	4.07	12	2.84	10
Total	24.84	99	32.69	99	28.76	100
Reading Comprehension						
Manipulable	28.31	87	36.81	99	32.56	93
Non-Manipulable	3.43	11	0.00	0	1.72	5
Other[a]	.68	2	.46	1	.57	2
Total	32.42	100	37.27	100	34.85	100
Reading Test Total						
Manipulable	32.06	82	43.02	92	37.54	88
Non-Manipulable	3.43	9	.79	2	2.11	5
Other[a]	3.69	9	2.74	6	3.22	2
Total	39.18	100	46.75	100	42.97	100
Vocabulary Knowledge						
Manipulable	26.34	77	22.45	83	24.40	80
Non-Manipulable	6.75	20	.40	1	3.58	12
Other[a]	.93	3	4.30	16	2.62	8
Total	34.02	100	27.15	100	30.60	100
Listening Comprehension						
Manipulable	19.43	63	19.87	81	19.65	71
Non-Manipulable	10.25	33	2.86	12	6.56	24
Other[a]	1.04	3	1.90	8	1.47	5
Total	30.72	99	24.63	101	27.68	100
Auditory Test Total						
Manipulable	20.59	78	29.16	96	24.88	88
Non-Manipulable	5.31	20	0.00	0	2.66	9
Other[a]	.39	2	1.35	4	.87	3
Total	26.29	100	30.51	100	28.41	100

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 45. (Continued)

	Population Models		Indian Models		Average	
	% of Table Variance	% of Explained Variance	% of Table Variance	% of Explained Variance	% of Table Variance	% of Explained Variance
Spelling						
Manipulable	31.74	80	29.10	80	30.42	80
Non-Manipulable	6.62	17	5.58	15	6.10	16
Other[a]	1.25	3	1.86	5	1.56	4
Total	39.61	100	36.54	100	38.08	100
Math Concepts						
Manipulable	26.33	84	36.56	97	31.44	92
Non-Manipulable	3.09	10	.71	2	1.90	6
Other[a]	1.48	5	.28	1	.88	2
Total	31.17	99	37.55	100	34.22	100
Math Test Total						
Manipulable	32.10	94	38.98	101	35.54	98
Non-Manipulable	.89	3	0.00	0	.44	1
Other[a]	1.21	3	-.30	-1	.46	1
Total	34.20	100	38.68	100	36.44	100
Science Knowledge						
Manipulable	24.96	84	25.00	88	24.98	86
Non-Manipulable	5.21	17	2.69	10	3.95	14
Other[a]	-.33	-1	.72	2	.20	1
Total	29.84	100	28.41	100	29.13	101
Average of All Models						
Manipulable	26.16	81	30.39	89	28.28	85
Non-Manipulable	4.85	15	1.87	6	3.36	10
Other[a]	.20	4	1.74	5	1.47	4
Total	32.21	100	34.00	100	33.11	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

times as much in the Indian models. Overall, manipulable factors accounted for eight times as much variance as non-manipulable variables.

On the other hand, the population models involved larger percentages of variance that were accounted for by non-manipulable variables. This was particularly true for reading comprehension, reading test total, vocabulary knowledge, listening comprehension, auditory test total, and math concepts (or 6 of 10) models. In comparison to the population models of achievement, therefore, the Indian models had much less explained, or table, variance that was accounted for by non-manipulable factors. That is, much more of the observed total variance in elementary Indian student achievement than that of students in general in the Washoe County School District was potentially manipulable by the school system.

Lastly, it should be noted that in a number of the models, and for the word study skills and vocabulary knowledge models for Indian students in particular, considerably much more of both the table and explained variance was accounted for by the "other" variables that were forced into the equations by the statistical procedures. This suggested that further comparative analyses of these other variables and the factors not entering into the models of academic achievement were necessary.

<u>The "Other" Predictors</u>

In reanalyzing the $SPSS^X$ stepwise and forced entry multiple regression results for the word study skills, it was found that eleven antecedents made up the "other" predictors in the Indian model, while twelve made up the "other" predictors in the population model. It was found that three of the variables accounted for most of the variance attributed to these other variables, which had been forced into the equation but were not statistically significant predictors. The number of days absent, which usually was not a statistically significant predictor of Indian achievement (except in the spelling model), contributed .8% ($p = .51$) to the "other" variance. Participation in the gifted program, which was a consistent predictor of Indian achievement in other models, contributed another 1.3% ($p = .33$). Interestingly, the 1983 citizenship grade made the largest contribution to the variance accounted for by the "other" predictors in the Indian model of word study skills achievement, explaining 2.5% ($p = .23$) of the variance. This was particularly noteworthy because the 1983 citizenship grade had been found to be a suppressor variable when it statistically entered into other models.

With respect to the Indian vocabulary model, participation in the gifted program contributed 2.1% ($p = .17$) to the variance accounted for by the other predictors (4.3%). Thus, participation in the gifted program accounted for over 2% of the variance, whether it entered statistically or was forced into the equation, in all ten models of Indian academic achievement--making it one of the best predictors. Three other antecedents accounted for most of the remaining variance explained by the statistically nonsignificant other variables: percentage of books lost per student (1%, $p = .27$); home telephone listed (.5%, $p = .63$); and 1983 citizenship grade (.9%, $p = .39$). Once again it was observed that, as part of the "other" predictors, the 1983 citizenship grade variable was not a suppressor, albeit it contributed very little to the total explained variance.

Unused Predictors

It was of interest to note which variables in the predictor pools did not enter into the equations, even after forced entry and level of significance were set aside. Most or all of the variance in these variables was accounted for by variables in the models. Table 46 lists the unused variables for both the Washoe County School District population and Indian models of achievement. The most obvious result was that acreage per student, student's age, and how long the library was open after school per student were unused in all Indian models, while in comparison only student's age (or its correlate grade level) were unused in all population models. Other unused predictors (for the seven reading oriented models) were cost of school per student, percentage of books lost per student, number of magazine subscriptions per student, and, for population models only, the number of encyclopedia sets per student and acreage per student. What was interesting was that many of these variables, when they did enter into achievement models (see Table 42), made relatively good contributions to the explained variance. This strongly suggested that these predictors were left unused because they co-varied with other entering predictors.

Table 46. Antecedent Predictors Not Entering Models After Stepwise/Forced Entry Regression

Dependent Variable	Population Predictors	Indian Predictors
Word Study Skills	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
	Cost of School Per Student (m)	Cost of School Per Student (m)
	Percentage of Books Lost Per Student (m)	Percentage of Books Lost Per Student (m)
		Library Open After School Per Student (m)
		Acreage Per Student (m)
Reading Comprehension	Magazine Subscriptions Per Student (m)	Magazine Subscriptions Per Student (m)
	Encyclopedia Sets Per Student (m)	
	Percentage of Books Lost Per Student (m)	Percentage of Books Lost Per Student (m)
	Grade Level (n)	
		Acreage Per Student (m)
		Age in Months at Time of Test (n)
		Library Open After School Per Student (m)
Reading Test Total	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
	Cost of School Per Student (m)	Cost of School Per Student (m)
	Percentage of Books Lost Per Student (m)	Percentage of Books Lost Per Student (m)
		Library Open After School Per Student (m)
		Acreage Per Student (m)
Vocabulary Knowledge	Acreage Per Student (m)	Acreage Per Student (m)
	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
		Library Open After School Per Student (m)
		Cost of School Per Student (m)
		Magazine Subscriptions Per Student (m)
Listening Comprehension	Acreage Per Student (m)	Acreage Per Student (m)
	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
		Library Open After School Per Student (m)
		Cost of School Per Student (m)
		Magazine Subscriptions Per Student (m)
Auditory Test Total	Acreage Per Student (m)	Acreage Per Student (m)
	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
		Library Open After School Per Student (m)
		Cost of School Per Student (m)
		Magazine Subscriptions Per Student (m)

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 46. (continued)

Dependent Variable	Population Predictors	Indian Predictors
Spelling	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
	Cost of School Per Student (m)	
	Magazine Subscriptions Per Student (m)	Magazine Subscriptions Per Student (m)
		Library Open After School Per Student (m)
		Percentage of Books Lost Per Student (m)
		Acreage Per Student (m)
Math Concepts	Age in Months at Time of Test (n)	Age in Months at Time of Test (n)
		Acreage Per Student (m)
		Library Open After School Per Student (m)
Math Test Total	Grade Level (n)	
		Age in Months at Time of Test (n)
		Library Open After School Per Student (m)
		Acreage Per Student (m)
Science Knowledge	Grade Level (n)	
		Age in Months at Time of Test (n)
		Library Open After School Per Student (m)
		Acreage Per Student (m)

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Summary

Comparative analyses of the Washoe County School District population and Indian models of achievement demonstrated that the Indian models were generally more parsimonious and potentially subject to greater manipulation by the school system than were models of achievement for the Washoe County School District students in general. However, none of the models accounted for more than 47% of the variance, with an average of only 33%, in the twenty population and Indian models. This meant that over half of the observed variance in academic achievement had to be attributed to factors or phenomena not included in this study. As previously mentioned, what was particularly intriguing was the finding that previous grades were generally poor predictors, albeit the best predictors included in this study, of academic achievement. That is, if a student did well in 1982-83, receiving high class grades, such knowledge would not allow us to make very good predictions on how well the student did on the next year's achievement tests.

With respect to the research questions and hypotheses, the comparative analyses of the population and Indian models of academic achievement have provided evidence towards several of the research questions and hypotheses. First, the results have provided empirical evidence for accepting the following research hypothesis:

> H_8: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

That is, these results have shown, also in answer to the fifth research question, that different factors were indeed antecedent predictors of Indian student achievement than for the Washoe County School District in general. This did not mean all variables were different, but rather that enough predictors were different to be substantively significant. In particular, previous grades and grade level were found to have been common predictors in most, if not all, models. In comparing the models, no variables were found to have been unique to, or entered only into, the Indian models. Conversely, six antecedent variables were found to be predictive of academic achievement for the population only. That is, acreage per student, having the library open longer after school per student, being older (in months), having a home phone number listed at the school, staying at the same school (i.e., no changes or transfers), and having less expensive schools were all predictive of achievement for the population, but not for Indian students only.

The research results have also provided overwhelming support accepting the hypothesis,

> H_{10}: Residence is not a determinant predictor of Indian students' achievement in the Washoe County School District.

Student's residence was a predictor for only two of the ten Indian models of achievement: listening comprehension (1.6%) and spelling (.1%). Interestingly, rural/reservation residence was predictive of listening comprehension, but urban/colony residence was predictive of spelling achievement for Indian students. But, in neither case was the amount of variance explained very great either. Indeed, residence was generally more important for the Washoe County School District students in general. If residence was a determinant factor at all, it was more so for the population, since residence was a stronger predictor for the population models. However, the results substantiated that, with the possible weak exception of predicting spelling achievement for the district in general (4% explained variance), residence was not a determinant predictor of Indian students' achievement, nor that of their classmates. These results, then, also provided an answer to the seventh research question. The empirical results of this research, contrary to previous studies, did not find residence--whether the student lived within the reservation, colony, county or city boundaries--to be a strong determinant of Indian student (or other) achievement.

Comparison of Indian and Indian Modified Models of Achievement

Within all settings involving Indian education, there are bound to be a certain number of characteristics, which would be measurable, that remained unique to Indian students only; for instance, the degree of Indianness, one's tribal affiliation or nationality, and participation in Title IV-A Indian Education programs (e.g., tutoring program). While information on a number of these characteristics was available, it was neither complete nor readily analyzable using advanced multiple regression techniques. There were several variables, however, that could be used, and it was therefore desirable to include these antecedents in another analysis procedure to determine if these factors were predictors; and if so, did they add to, subtract from, or replace components of the existing Indian models. Thus, before proceeding to further comparative analyses with respect to grade level, comparisons of the Indian and Indian modified models were made.

Methodological Clarifications

Specifically, the following antecedents were determined to be suitable and added, for further analyses, to the previously established reading and math pools of predictors.[28] The first variable was obtained from paperwork filed on all Indian students in the school district, which determined their status as federally authorized for Title V services. Part of this form requested information concerning the student's Indian ancestry and was a poor, but quantitative measure of the student's Indianness. Thus, the first antecedent variable added, was "Who is Native American?"

The other variables were taken primarily from records kept by the Nevada Intertribal Policy Board, which were concerned with various tribal Head Start programs. The two programs of concern were the Pyramid Lake Indian Reservation program (Reservation Head Start) and the Reno-Sparks Colony program (Colony Head Start), each of which were added as variables. All day care/preschool programs in the county were also contacted, and information on a few students was obtained. The one program from which information was not obtained was the Reno-Sparks Head Start program, which serviced the entire area. A fourth new antecedent, therefore, was preschool attendance, which included Head Start. Interestingly, the simple correlation between either the colony or reservation Head Start variables and the preschool variable was not very strong, which was why all three variables were included.

The last variable was the number of years the student had participated in some combination of preschool programs. Data ranged from no years to three years, but the frequency for three years was so low that it was recoded as two years for analytic purposes. Thus, by and large, most of these new variables were coded as "dummy" variables.

Indian Modified Models of Achievement

The results of the stepwise and forced entry multiple regression analyses are technically reported in Table I-1 (Appendix I) and summarized in Table 47. As can be seen from the results, two of the five additional antecedents entered into, and thereby modified, the vocabulary knowledge, math concepts, and math test total models of academic achievement. In no case did the new variables account for much more than 1% of the variance, while in the math concepts modified model preschool attendance acted as a suppressor variable. The amount of suppressed variance (-.1%), however, was so small that it was probably due to statistical error. Consequently, the addition of the five variables applicable to Indian students only, actually modified only three of the Indian models of achievement.

Comparison of Models

Table 48 compares the Indian and modified Indian models of

Table 47. Modified Predictor Models of Indian Academic Achievement

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Word Study Skills		Reading Comprehension	
1983 Reading Grade (m)	18.4	1983 Reading Grade (m)	31.6
Father's Status (n)	4.4	Encyclopedia Sets	
Grade Level (n)	1.2	Per Student (m)	3.4
Magazine Subscriptions		Gifted Program (m)	2.3
Per Student (m)	3.9	Other[a]	.4
Other[a]	5.2	Total	37.6
Total	33.0		
Reading Test Total		Vocabulary Knowledge	
1983 Reading Grade (m)	37.2	1983 Reading Grade (m)	19.9
Magazine Subscriptions		Reservation Head Start (n)	1.1
Per Student (m)	3.2	Encyclopedia Sets	
Grade Level (n)	-.2	Per Student (m)	2.1
Emergency Telephone (m)	.2	Grade Level (n)	.3
Father's Status (n)	1.0	Other[a]	5.2
Gifted Program (m)	2.6	Total	28.61
Other[a]	3.0		
Total	47.0		
Listening Comprehension		Auditory Test Total	
1983 Reading Grade (m)	14.6	1983 Reading Grade (m)	20.8
Percentage of Books		Percentage of Books	
Lost Per Student (m)	2.8	Lost Per Student (m)	2.3
Father's Status (n)	1.3	Gifted Program (m)	2.9
Encyclopedia Sets		Grade Level (n)	.0
Per Student (m)	2.2	Encyclopedia Sets	
Student's Residence (n)	1.5	Per Student (m)	2.5
Other[a]	2.9	Other[a]	2.6
Total	25.4	Total	31.2

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 47. (continued)

Dependent Variables/ Predictors	% of Table Variance	Dependent Variables/ Predictors	% of Table Variance
Spelling		Math Concepts	
1983 Reading Grade (m)	20.8	1983 Grade Point Average (m)	31.2
Number of Days Absent in 1982-83 (m)	4.3	Percentage of Books Lost Per Student (m)	3.3
Father's Status (n)	1.6	Preschool Attendance (n)	-.1
Gifted Program (m)	3.4	Sex (n)	.7
Number of Parents Absent (n)	2.5	Home Phone Listed (n)	1.3
Emergency Telephone (m)	.4	Other[a]	2.1
Free & Reduced Lunch (n)	2.0	Total	38.5
Student's Residence (n)	.1		
Number of Parents Employed (n)	-.6		
Other[a]	2.3		
Total	36.8		
Math Test Total		Science Knowledge	
1983 Grade Point Average (m)	33.8	1983 Grade Point Average (m)	16.7
Percentage of Books Lost Per Student (m)	3.5	Percentage of Books Lost Per Student (m)	5.8
Preschool Attendance (n)	.7	Grade Level (n)	2.6
Other[a]	2.8	Gifted Program (m)	4.0
Total	40.5	1983 Citizenship Grade (m)	-1.6
		Other[a]	1.0
		Total	28.6

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 48. Comparison of Indian and Modified Indian Regression Models

Indian Stepwise/Forced Entry Models			Modified Indian Stepwise/Forced Entry Models		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Word Study Skills			
1983 Reading Grade (m)	18.67	57	1983 Reading Grade (m)	18.37	56
Father's Status (n)	4.40	13	Father's Status (n)	4.41	13
Grade Level (n)	1.28	4	Grade Level (n)	1.19	4
Magazine Subscriptions Per Student (m)	4.08	12	Magazine Subscriptions Per Student (m)	3.86	12
Emergency Telephone (m)	.19	1			
Other[a]	4.07	12	Other[a]	5.21	16
Total	32.69	99	Total	33.04	101
		Reading Comprehension			
1983 Reading Grade (m)	31.46	84	1983 Reading Grade (m)	31.55	84
Encyclopedia Sets Per Student (m)	3.05	8	Encyclopedia Sets Per Student (m)	3.40	9
Gifted Program (m)	2.30	6	Gifted Program (m)	2.28	6
Other[a]	.46	1	Other[a]	.36	1
Total	37.27	99	Total	37.59	100
		Reading Test Total			
1983 Reading Grade (m)	37.23	80	1983 Reading Grade (m)	37.16	79
Magazine Subscriptions Per Student (m)	3.23	7	Magazine Subscriptions Per Student (m)	3.22	7
Grade Level (n)	-.22	-1	Grade Level (n)	-.22	-1
Emergency Telephone (m)	.15	0	Emergency Telephone (m)	.15	0
Father's Status (n)	1.01	2	Father's Status (n)	1.01	2
Gifted Program (m)	2.61	6	Gifted Program (m)	2.61	6
Other[a]	2.74	6	Other[a]	2.96	6
Total	46.75	100	Total	46.89	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 48. (Continued)

Indian Stepwise/Forced Entry Models			Modified Indian Stepwise/Forced Entry Models		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Vocabulary Knowledge		
1983 Reading Grade (m)	20.59	76	1983 Reading Grade (m)	19.87	69
			Reservation Head Start (n)	1.09	4
Encyclopedia Sets Per Student (m)	1.86	7	Encyclopedia Sets Per Student (m)	2.11	7
Grade Level (n)	.40	1	Grade Level (n)	.33	1
Other[a]	4.30	16	Other[a]	5.21	18
Total	27.15	100	Total	28.61	99
			Listening Comprehension		
1983 Reading Grade (m)	14.75	60	1983 Reading Grade (m)	14.60	58
Percentage of Books Lost Per Student (m)	2.82	11	Percentage of Books Lost Per Student (m)	2.82	11
Father's Status (n)	1.31	5	Father's Status (n)	1.32	5
Encyclopedia Sets Per Student (m)	2.30	9	Encyclopedia Sets Per Student (m)	2.23	9
Student's Residence (n)	1.55	6	Student's Residence (n)	1.53	6
Other[a]	1.90	8	Other[a]	2.87	11
Total	24.63	99	Total	25.37	100
			Auditory Test Total		
1983 Reading Grade (m)	21.18	69	1983 Reading Grade (m)	20.76	66
Percentage of Books Lost Per Student (m)	2.43	8	Percentage of Books Lost Per Student (m)	2.33	8
Gifted Program (m)	3.18	10	Gifted Program (m)	2.94	9
Grade Level (n)	.00	0	Grade Level (n)	.01	0
Encyclopedia Sets Per Student (m)	2.37	8	Encyclopedia Sets Per Student (m)	2.50	8
Other[a]	1.35	4	Other[a]	2.69	9
Total	30.51	99	Total	31.23	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 48. (Continued)

Indian Stepwise/Forced Entry Models			Modified Indian Stepwise/Forced Entry Models		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Spelling		
1983 Reading Grade (m)	21.02	58	1983 Reading Grade (m)	20.79	56
Number of Days Absent			Number of Days Absent		
in 1982-1983 (m)	4.17	11	in 1982-1983 (m)	4.28	12
Father's Status (n)	1.63	4	Father's Status (n)	1.63	4
Gifted Program (m)	3.55	10	Gifted Program (m)	3.40	9
Number of Parents Absent (n)	2.45	7	Number of Parents Absent (n)	2.47	7
Emergency Telephone (m)	.36	1	Emergency Telephone (m)	.37	1
Free & Reduced Lunch (n)	2.03	6	Free & Reduced Lunch (n)	2.05	6
Student's Residence (n)	.08	0	Student's Residence (n)	.08	0
Number of Parents			Number of Parents		
Employed (n)	-.61	-2	Employed (n)	-.61	-2
Othera	1.86	5	Othera	2.31	6
Total	36.54	100	Total	36.77	99
			Math Concepts		
1983 Grade Point			1983 Grade Point		
Average (m)	30.57	81	Average (m)	31.23	81
Percentage of Books			Percentage of Books		
Lost Per Student (m)	3.34	9	Lost Per Student (m)	3.33	9
			Preschool Attendance (n)	-.13	0
Sex (n)	.71	2	Sex (n)	.69	2
Gifted Program (m)	2.65	7			
			Home Phone Listed (n)	1.30	3
Othera	.28	1	Othera	2.10	5
Total	37.55	100	Total	38.51	100

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 48. (Continued)

Indian Stepwise/Forced Entry Models			Modified Indian Stepwise/Forced Entry Models		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Math Test Total			
1983 Grade Point Average (m)	32.77	85	1983 Grade Point Average (m)	33.84	84
Percentage of Books Lost Per Student (m)	3.46	9	Percentage of Books Lost Per Student (m)	3.46	8
			Preschool Attendance (n)	.70	2
Gifted Program (m)	2.75	7			
Other[a]	-.30	-1	Other[a]	2.84	7
Total	38.68	100	Total	40.48	101
		Science Knowledge			
1983 Grade Point Average (m)	16.81	59	1983 Grade Point Average (m)	16.67	58
Percentage of Books Lost Per Student (m)	5.78	20	Percentage of Books Lost Per Student (m)	5.84	20
Grade Level (n)	2.69	10	Grade Level (n)	2.63	9
Gifted Program (m)	3.99	14	Gifted Program (m)	3.97	14
1983 Citizenship Grade (m)	-1.58	-6	1983 Citizenship Grade (m)	-1.58	-6
Other[a]	.72	3	Other[a]	1.03	4
Total	28.41	100	Total	28.56	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

academic achievement. Comparisons indicated that four of the models were structurally modified, but that the models (except for vocabulary knowledge and math test total) accounted for less than one percent more of the total variance. However, it was found that the "other" variables statistically forced into the equations generally accounted for more of the variance in the modified models, which suggested the relative importance of these additional factors regardless of their contribution to the explained variance.

Focusing upon those models with structural changes, it was noted that three of them were also models with new predictors. The word study skills model was changed by the elimination of the emergency telephone listing variable. The vocabulary knowledge model was changed by the addition of the Reservation Head Start variable (1%). It was also noted that the 1983 reading grade and grade level antecedents explained less variance, while encyclopedia sets per student and "other" variables, which were forced into the equation, accounted for more variance. Taken together, all changes increased the amount of explained variance by 1.5%.

The math concepts model was modified through the addition of two variables and the elimination of one. Preschool attendance, which entered as a suppressor variable, thereby increasing the predictability of the other variables, and the home telephone listing variables replaced the participation in the gifted program antecedent. This implied that those Indian students who went to preschool apparently did worse when considered separately, but, when holding other things constant, it was found that attending preschool did help with math concepts achievement. These two additions, however, accounted for less variance. Both the 1983 grade point average and the other forced entry variables accounted for more variance. Overall, the modified model accounted for just under 1% more variance.

The modified Indian math test total model contained the same number of predictors as the original Indian model, but accounted for nearly 2% more variance. This was accounted for by the large increase in the amount of variance explained by the other variables, which accounted for 3% more variance in the modified model. Structurally, preschool attendance replaced participation in the gifted program as a predictor, but explained 2% less variance than did the gifted program.

Comparison of "Other" Predictors

These results suggested that there was some type of interaction among the preschool attendance and participation in the gifted program variables. That is, it would appear that preschool attendance may have acted as a substitute for participation in the gifted program. However, before such an inference could be drawn, more detailed analyses of the "other" predictors forced into the equation by analysis procedures, as well as those variables not entering the models, had to be made.

First, in looking at vocabulary knowledge, it was found that the participation in the gifted program variable did indeed enter, contributing over 2% ($p = .17$) to the total variance accounted for by the "other" variables. Thus, the only thing really affected by introducing the additional five factors to the analysis of vocabulary knowledge was to decrease the statistical level of significance of the previously significant participation in the gifted program variable. Moreover, it was noted that the only variable not to enter the model, other than those previously not entering (Table 46), was preschool attendance. It would seem, therefore, that the increased accountability of the modified Indian model of vocabulary achievement was due to the inclusion of the new variables, particularly the Reservation Head Start predictor. That is, the inclusion of the preschool variable in the modified vocabulary achievement model was not, as it appeared to be, a simple case of replacement due to redundancy of measurement with the participation in the gifted program variable. Both variables were predictive of vocabulary achievement, but when holding the predictors used in this analysis constant, the preschool attendance variable was significantly predictive and the participation in the gifted program variable was not.

In considering the next modified model, math concepts, basically the same results were found as for vocabulary knowledge. That is, participation in the gifted program contributed 2.4% ($p = .16$), or .2% less than in the original Indian model, to the variance accounted for by the "other" predictors. Once again, then, the participation in the gifted program variable was not less important, but rather not statistically significant enough to be included as a specified predictor. In looking at the variables not entering the math concepts modified model of achievement, besides those not entering the original Indian model, neither the Colony or Reservation Head Start predictors entered. Instead the preschool attendance variable entered the model as one of the other variables.

With respect to the home telephone listing variable, it must be inferred that some type of relationship existed between preschool factors and having a home telephone number listed with the school, such that it would cause the statistical level of significance to improve enough for it to be included in the modified model. That is, the amount of explained variance was about the same for both models, but was included with the "other" predictors in the original Indian model because the standardized Beta was not statistically significant. Nearly the same pattern that was found for math concepts was found for the math test total model. Participation in the gifted program contributed 2.4% (p = .16) to the total variance accounted for by the "other" variables. Thus, it was found that preschool attendance was not, despite appearances, a redundant measure with participation in the gifted program in either math concepts or math test total achievement; both preschool attendance and participation in the gifted program were predictive of Indian achievement. Hence, participation in one program was not a substitute for participation in the other.

In comparing antecedent predictors not entering various equations, it was found that the Colony and Reservation Head Start variables did not enter any of the models except for vocabulary knowledge, in which preschool attendance did not enter. Thus, except for vocabulary knowledge achievement, the more general preschool attendance variable was a better predictor than the more specific Head Start antecedents. It was also noted that inclusion of the Head Start variables was associated with the inclusion of the school cost per student antecedent and the exclusion of the percentage of books lost per student predictor (which contributed 1% to the total variance accounted for by other variables in the original Indian model of vocabulary achievement).

Although neither the number of years in preschool nor the Who is Native American variables were structurally included in any of the modified models of Indian achievement as a statistically significant predictor, analysis of the variables included in the "other" predictors procedurally forced into the equation indicated that they were, indeed, predictive of achievement. As the "other" predictors also accounted for more variance in the modified than in the original models, it was concluded that the addition of the preschool attendance and Who is Native American variables substantively increased the predictiveness of the Indian models of academic achievement; that is, they substantively added to our understanding of Indian achievement.

Summary

Reanalysis of the reading and math pools of antecedent predictors, with the inclusion of five additional variables applicable to Indian students only, were made to determine if these additional factors would modify the Indian models of academic achievement. The results of these analyses (Tables 47 and 48) demonstrated that four of the ten models were structurally changed, while comparisons with the original models showed that the modified models accounted for slightly more variance as would be expected when adding more variables to the pool. Consideration of the "other" variables forced into the models, along with those not entering the models, demonstrated considerable continuity with regards to the effects of these added variables. That is, Who was Native American, preschool attendance, and number of years in preschool consistently entered all but the vocabulary knowledge model (in which the two Head Start variables entered instead of preschool attendance), thus empirically showing that these factors made substantive contributions to explaining Indian student achievement.

These analyses have provided, therefore, empirical evidence concerned with the eighth research question:

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

That is, factors applicable to Indian students only do affect the antecedent structural models of achievement. In particular, adding these factors affected the structure of the vocabulary knowledge, math concepts, and math test total Indian models of achievement, but added little in terms of additional explained variance ($\underline{R}^2$) despite the obvious substantive addition.

Summary of Academic Achievement in the Washoe County School District

During this stage (second) of the first set of processes in the third research cycle of this study, three distinct groups of analyses were performed, using a combination of stepwise and forced entry multiple regression analysis techniques, to develop the best possible models (given the previously defined antecedent predictors) of academic achievement for both the Washoe County School District in general and for Indian students only. The first group of analyses produced the best models for predicting academic achievement for the Washoe County School District student population. The second group of analyses resulted in the best models for predicting Indian student academic achievement in the district. These later results were then compared and contrasted with the population models (from the first group of analyses) to ascertain similarities and differences in the two groups of predictor models.

Results of these various analyses demonstrated that, taken together and on the average, the models could account for only about one-third of the variance in academic achievement--for either Indian students only or for students in general. Moreover, it was found that even though previous academic achievement was an unexpectedly poor predictor of academic achievement, seldom accounting for more than 25% of the total variance, it was the best antecedent predictor used in this study. That is, previous grades did not fully reflect achievement, but rather tended to measure some other phenomena. More importantly, however, the results clearly demonstrated that the predictor models of academic achievement were different for Indian students than for students in general.

The third group of analyses introduced five new factors applicable to Indian students only, to determine if such variables would modify the Indian models of academic achievement. Results of these analyses showed that these factors generally resulted in little added predictability, albeit not always large or statistically significant.

Moreover, it was found that a consistent predictor of academic achievement was the grade level variable, which had also been found in the original analyses during the second cycle of the study (Chapter 4). As a result of these earlier conclusions (Chapter 4), it was hypothesized that different factors would be predictive of academic achievement at different grade levels. The next stage of this research cycle, therefore, was to develop models of academic achievement by grade level for the Washoe County School District and for Indian students only.

Chapter 7

MODELS OF ACADEMIC ACHIEVEMENT BY GRADE LEVEL

The objective of the third research cycle of this study (see Figure 4) were twofold: to test the models of academic achievement, which were exploratorily developed (as discussed in Chapter 4); and to determine the manipulability of those factors found to be predictive of academic achievement for the Washoe County School District elementary student population and Indian students only. To accomplish these two objectives, two sequential sets of methodological processes were conducted respective to each objective. The first set of processes was further done in a series of stages. The first stage, as reported in Chapter 5, was to analyze the interrelationships between those variables previously identified (Chapter 4) as predictive of both reading oriented and math oriented measures of academic achievement. The second stage was the testing of these previously constructed reading and math oriented predictor pools for predicting student academic achievement for the population and for Indian students only, also discussed in Chapter 5, and then to compare these models for structural accounting differences between the Indian and population models of academic achievement. As part of the second stage, three groups of analyses were made: first on the population, then on Indian students only, and lastly on Indian students only, but with additional unique predictors; and two sets of comparisons were made: population models compared with Indian models of achievement, and Indian models compared with Indian modified models of achievement.

The last stages of this set of processes, then, was to compare academic achievement for the population, and for Indian students only, by grade level. This stage, then, sought to test the ninth and eleventh research hypotheses:

H_9: Different antecedents are predictive of standardized achievement test scores at different grade levels in the Washoe County School District.

H_{11}: The models of academic achievement are more predictive at certain grade levels than others in the Washoe County School District.

Four groups of analyses were made to accomplish the objective of this stage, and to test these research hypotheses. The first and second groups of analyses set up new district level models for, respectively, the total population and Indian students without grade level as a predictor. The third and fourth groups of analyses set up grade level models of academic achievement for the population and Indian students only. As with previous analyses in this cycle of research, the models of academic achievement were developed by sequentially analyzing the data using both the stepwise and forced entry multiple regression techniques.

Before analyses by grade level could be made, therefore, new population and Indian models of academic achievement had to be constructed without grade level as a predictor. The theoretical justification for this was that district level models without grade level could be compared to the grade level models, but the existing models (with grade level) could not.

Methodological and Theoretical Clarification

Methodologically, the only change made was to remove grade level from the list of antecedent predictors (or independent variables) in the $SPSS^X$ systems files for the Washoe County School District population and Indian students only. Otherwise, all procedures remained the same as when analyzing the antecedents with grade level included. The theoretical purpose for removing grade level from the pool of predictors was to obtain comparative models for both the elementary Indian students and the Washoe County School District elementary student population, without grade level as a variable, so that models of achievement for each grade level (2nd-6th) could be analytically compared with the population models of achievement.

Population Models Without Grade Level

The results of the stepwise and forced entry multiple regression analyses without grade level for the ten dependent variables are reported in Table G-2 (Appendix G), while Table 49 compares those results with the the population models with grade level. Of the ten models of academic achievement in the Washoe County School District,

Table 49. Comparison of Population Regression Models With and Without Grade Level

Population Stepwise/Forced Entry Models With Grade Level			Population Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Word Study Skills			
1983 Reading Grade (m)	14.32	58	1983 Reading Grade (m)	14.59	59
Acreage Per Student (m)	4.89	20	Acreage Per Student (m)	4.81	20
Sex (n)	1.76	7	Sex (n)	1.82	7
Grade Level (n)	1.17	5			
			Age in Months at Time of Test (n)	.47	2
Emergency Telephone (m)	1.44	6	Emergency Telephone (m)	1.47	6
Father's Status (n)	.56	2	Father's Status (n)	.56	2
1983 Citizenship Grade (m)	-.92	-4	1983 Citizenship Grade (m)	-1.00	-4
Other[a]	1.62	6	Other[a]	1.83	7
Total	24.84	100	Total	24.55	99
		Reading Comprehension			
1983 Reading Grade (m)	21.85	67	1983 Reading Grade (m)	21.85	67
Acreage Per Student (m)	4.38	14	Acreage Per Student (m)	4.38	14
Library Open After School Per Student (m)	.97	3	Library Open After School Per Student (m)	.97	3
Gifted Program (m)	1.52	5	Gifted Program (m)	1.52	5
Cost of School Per Student (m)	-.29	-1	Cost of School Per Student (m)	-.29	-1
Change of Schools (n)	1.52	5	Change of Schools (n)	1.52	5
Sex (n)	.77	2	Sex (n)	.77	2
Emergency Telephone (m)	1.14	4	Emergency Telephone (m)	1.14	4
Free & Reduced Lunch (n)	1.14	4	Free & Reduced Lunch (n)	1.14	4
1983 Citizenship Grade (m)	-1.26	-4	1983 Citizenship Grade (m)	-1.26	-4
Other[a]	.68	2	Other[a]	.68	2
Total	32.42	101	Total	32.42	101

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 49. (Continued)

Population Stepwise/Forced Entry Models With Grade Level			Population Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Reading Test Total			
1983 Reading Grade (m)	25.74	66	1983 Reading Grade (m)	26.00	67
Acreage Per Student (m)	5.08	13	Acreage Per Student (m)	4.97	13
Library Open After School Per Student (m)	.94	2	Library Open After School Per Student (m)	.91	2
Sex (n)	1.80	5	Sex (n)	1.84	5
Emergency Telephone (m)	1.87	5	Emergency Telephone (m)	1.89	5
Grade Level (n)	.73	2			
Father's Status (n)	.90	2	Father's Status (n)	.90	2
1983 Citizenship Grade (m)	-1.57	-4	1983 Citizenship Grade (m)	-1.66	-4
Other[a]	3.69	9	Other[a]	4.05	10
Total	39.18	100	Total	38.90	100
		Vocabulary Knowledge			
1983 Reading Grade (m)	20.70	61	1983 Reading Grade (m)	20.92	62
Free & Reduced Lunch (n)	2.97	9	Free & Reduced Lunch (n)	2.95	9
Change of Schools (n)	1.50	4	Change of Schools (n)	1.48	4
Emergency Telephone (m)	1.45	4	Emergency Telephone (m)	1.46	4
Grade Level (n)	.69	2			
Gifted Program (m)	1.63	5	Gifted Program (m)	1.71	5
Library Open After School Per Student (m)	.74	2	Library Open After School Per Student (m)	.74	2
Magazine Subscriptions Per Student (m)	.92	3			
Number of Days Absent in 1982-1983 (m)	.90	3	Number of Days Absent in 1982-1983 (m)	.92	3
Home Phone Listed (n)	1.59	5	Home Phone Listed (n)	1.63	5
Other[a]	.93	3	Other[a]	1.96	6
Total	34.02	101	Total	33.77	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 49. (Continued)

Population Stepwise/Forced Entry Models With Grade Level			Population Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Listening Comprehension			
1983 Reading Grade (m)	16.67	54	1983 Reading Grade (m)	17.17	58
Grade Level (n)	3.04	10			
			Age in Months at Time of Test (n)	1.25	4
Change of Schools (n)	2.76	9	Change of Schools (n)	2.75	9
Magazine Subscriptions Per Student (m)	1.43	5	Magazine Subscriptions Per Student (m)	1.38	5
Free & Reduced Lunch (n)	2.03	7	Free & Reduced Lunch (n)	1.99	7
Number of Parents Absent (n)	-.04	0	Number of Parents Absent (n)	-.04	0
Home Phone Listed (n)	1.55	5	Home Phone Listed (n)	1.62	5
Library Open After School Per Student (m)	.09	0	Library Open After School Per Student (m)	.90	3
Emergency Telephone (m)	1.24	4	Emergency Telephone (m)	1.27	4
Student's Residence (n)	.91	3	Student's Residence (n)	1.03	4
Other[a]	1.04	3	Other[a]	.30	1
Total	30.72	100	Total	29.62	100
		Auditory Test Total			
1983 Reading Grade (m)	16.46	63	1983 Reading Grade (m)	16.48	63
Emergency Telephone (m)	2.03	8	Emergency Telephone (m)	2.02	8
Free & Reduced Lunch (n)	1.71	6	Free & Reduced Lunch (n)	1.71	6
Gifted Program (m)	1.48	6	Gifted Program (m)	1.49	6
Number of Transfers (n)	1.55	6	Number of Transfers (n)	1.53	6
Student's Residence (n)	.59	2	Student's Residence (n)	.61	2
Father's Status (n)	.32	1	Father's Status (n)	.32	1
Number of Days Absent in 1982-1983 (m)	.62	2	Number of Days Absent in 1982-1983 (m)	.63	2
Number of Parents Absent (n)	-.19	-1	Number of Parents Absent (n)	-.19	-1
Home Phone Listed (n)	1.33	5	Home Phone Listed (n)	1.34	5
Other[a]	.39	1	Other[a]	.33	1
Total	26.29	99	Total	26.27	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 49. (Continued)

Population Stepwise/Forced Entry Models With Grade Level			Population Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Spelling			
1983 Reading Grade (m)	24.72	62	1983 Reading Grade (m)	24.79	63
Student's Residence (n)	3.84	10	Student's Residence (n)	3.85	10
Sex (n)	2.82	7	Sex (n)	2.84	7
Acreage Per Student (m)	2.91	7	Acreage Per Student (m)	2.90	7
Encyclopedia Sets Per Student (m)	1.98	5	Encyclopedia Sets Per Student (m)	1.99	5
Percentage of Books Lost Per Student (m)	2.13	5	Percentage of Books Lost Per Student (m)	2.15	5
Number of Parents Employed (n)	-.04	0	Number of Parents Employed (n)	-.04	0
Other[a]	1.25	3	Other[a]	1.13	3
Total	39.61	99	Total	39.61	100
		Math Concepts			
1983 Grade Point Average (m)	23.86	76	1983 Grade Point Average (m)	24.14	77
Gifted Program (m)	2.59	8	Gifted Program (m)	2.70	9
Grade Level (n)	1.75	6			
			Age in Months at Time of Test (n)	1.43	5
Percentage of Books Lost Per Student (m)	1.41	5	Percentage of Books Lost Per Student (m)	1.46	5
1983 Citizenship Grade (m)	-1.19	-4	1983 Citizenship Grade (m)	-1.24	-4
Home Phone Listed (n)	1.34	4	Home Phone Listed (n)	1.39	4
Library Open After School Per Student (m)	.65	2	Library Open After School Per Student (m)	.64	2
Other[a]	.75	2	Other[a]	.73	2
Total	31.16	99	Total	31.25	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 49. **(Continued)**

Predictor (Population Stepwise/Forced Entry Models With Grade Level)	% of Table Variance	% of Explained Variance	Predictor (Population Stepwise/Forced Entry Models Without Grade Level)	% of Table Variance	% of Explained Variance
Math Test Total					
1983 Grade Point Average (m)	28.26	83	1983 Grade Point Average (m)	28.26	83
Gifted Program (m)	3.07	9	Gifted Program (m)	3.07	9
Percentage of Books Lost Per Student (m)	1.65	5	Percentage of Books Lost Per Student (m)	1.65	5
1983 Citizenship Grade (m)	-1.49	-4	1983 Citizenship Grade (m)	-1.49	-4
Age in Months at Time of Test (n)	.89	3	Age in Months at Time of Test (n)	.89	3
Library Open After School Per Student (m)	.61	2	Library Open After School Per Student (m)	.61	2
Other[a]	1.21	3	Other[a]	1.21	3
Total	34.20	101	Total	34.20	101
Science Knowledge					
1983 Grade Point Average (m)	17.80	60	1983 Grade Point Average (m)	17.80	60
Age in Months at Time of Test (n)	4.61	15	Age in Months at Time of Test (n)	4.61	15
Acreage Per Student (m)	4.47	15	Acreage Per Student (m)	4.47	15
Library Open After School Per Student (m)	1.07	4	Library Open After School Per Student (m)	1.07	4
Sex (n)	.60	2	Sex (n)	.60	2
Gifted Program (m)	1.62	5	Gifted Program (m)	1.62	5
Other[a]	-.33	-1	Other[a]	-.33	-1
Total	29.84	100	Total	29.84	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

five were essentially or exactly the same both with and without the inclusion of grade level. In three of the other models, grade level was replaced by the student's age variable. In the word study skills model, the new equation accounted for negligibly less (.3%) variance with student's age replacing grade level. In the listening comprehension model, the total explained variance was reduced by 1.1% when student's age replaced grade level. Somewhat in contrast, when student's age replaced grade level in the math concepts model, the new equation accounted for more, albeit a miniscule (.1%) amount of, variance. In the other two models, grade level was not replaced with any other predictor. For the reading test total model, removal of grade level from the equation reduced the total variance accounted for by .3%. Similarly, the vocabulary knowledge model explained .2% less of the variance, but, in addition to grade level, the number of magazine subscriptions also dropped out of the model.

In the five models where some changes did occur, the 1983 reading grade generally accounted for slightly more variance in the new models. Moreover, when student's age replaced grade level it never accounted for as much variance as grade level. Overall, the removal of grade level from the population models of achievement had minimal effect on the structure and accountability of those models.

Indian Models Without Grade Level

Table H-2 (Appendix H) reports the results of the stepwise and forced entry multiple regression analyses without grade level for Indian students, and Table 50 compares these results with those when

Table 50. Comparison of Indian Regression Models
With and Without Grade Level

Indian Stepwise/Forced Entry Models With Grade Level			Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Word Study Skills		
1983 Reading Grade (m)	18.67	57	1983 Reading Grade (m)	18.76	59
Father's Status (n)	4.40	13	Father's Status (n)	4.47	14
Grade Level (n)	1.28	4			
			Age in Months at Time of Test (n)	.31	1
Magazine Subscriptions Per Student (m)	4.08	12	Magazine Subscriptions Per Student (m)	3.89	12
Emergency Telephone (m)	.19	1	Emergency Telephone (m)	.21	1
Other[a]	4.07	12	Other[a]	4.36	14
Total	32.69	99	Total	32.00	101
			Reading Comprehension		
1983 Reading Grade (m)	31.46	84	1983 Reading Grade (m)	30.79	83
Encyclopedia Sets Per Student (m)	3.05	8	Encyclopedia Sets Per Student (m)	2.99	8
Gifted Program (m)	2.30	6	Gifted Program (m)	2.49	7
Other[a]	.46	1	Other[a]	.96	2
Total	37.27	99	Total	37.23	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--indicates variable that is not manipulable by the school district.

Table 50. (Continued)

Indian Stepwise/Forced Entry Models With Grade Level			Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Reading Test Total			
1983 Reading Grade (m)	37.23	80	1983 Reading Grade (m)	36.69	80
Magazine Subscriptions Per Student (m)	3.23	7	Magazine Subscriptions Per Student (m)	3.03	7
Grade Level (n)	-.22	-1			
Emergency Telephone (m)	.15	0	Emergency Telephone (m)	.16	0
Father's Status (n)	1.01	2	Father's Status (n)	1.03	2
Gifted Program (m)	2.61	6	Gifted Program (m)	2.89	6
Other[a]	2.74	6	Other[a]	2.30	5
Total	46.75	100	Total	46.10	100
		Vocabulary Knowledge			
1983 Reading Grade (m)	20.59	76	1983 Reading Grade (m)	20.72	77
Grade Level (n)	.40	1			
			Age in Months at Time of Test (n)	-.26	1
Encyclopedia Sets Per Student (m)	1.86	7	Encyclopedia Sets Per Student (m)	1.90	7
			Gifted Program (m)	2.35	9
Other[a]	4.30	16	Other[a]	2.01	7
Total	27.15	100	Total	26.72	101

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 50. (Continued)

Indian Stepwise/Forced Entry Models With Grade Level			Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Listening Comprehension			
1983 Reading Grade (m)	14.75	60	1983 Reading Grade (m)	14.76	60
Percentage of Books Lost Per Student (m)	2.82	11	Percentage of Books Lost Per Student (m)	2.76	11
Father's Status (n)	1.31	5	Father's Status (n)	1.29	5
Encyclopedia Sets Per Student (m)	2.30	9	Encyclopedia Sets Per Student (m)	2.32	10
Student's Residence (n)	1.55	6	Student's Residence (n)	1.49	6
Other[a]	1.90	8	Other[a]	1.80	7
Total	24.63	99	Total	24.42	99
		Auditory Test Total			
1983 Reading Grade (m)	21.18	69	1983 Reading Grade (m)	21.19	70
Percentage of Books Lost Per Student (m)	2.43	8	Percentage of Books Lost Per Student (m)	2.34	8
Gifted Program (m)	3.18	10	Gifted Program (m)	3.40	11
Encyclopedia Sets Per Student (m)	2.37	8	Encyclopedia Sets Per Student (m)	2.39	8
Grade Level (n)	.00	0			
			Age in Months at Time of Test (n)	.45	2
Other[a]	1.35	4	Other[a]	.34	1
Total	30.51	99	Total	30.11	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 50. (Continued)

Indian Stepwise/Forced Entry Models With Grade Level			Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Spelling			
1983 Reading Grade (m)	21.02	58	1983 Reading Grade (m)	20.43	56
Number of Days Absent in 1982-1983 (m)	4.17	11	Number of Days Absent in 1982-1983 (m)	4.20	11
Father's Status (n)	1.63	4	Father's Status (n)	1.64	4
Gifted Program (m)	3.55	10	Gifted Program (m)	3.70	10
Number of Parents Absent (n)	2.45	7	Number of Parents Absent (n)	2.44	7
Emergency Telephone (m)	.36	1	Emergency Telephone (m)	.38	1
Free & Reduced Lunch (n)	2.03	6	Free & Reduced Lunch (n)	1.93	5
Student's Residence (n)	.08	0	Student's Residence (n)	.08	0
Number of Parents Employed (n)	-.61	-2	Number of Parents Employed (n)	-.61	-2
Other[a]	1.86	5	Other[a]	2.54	7
Total	36.54	100	Total	36.73	99
		Math Concepts			
1983 Grade Point Average (m)	30.57	81	1983 Grade Point Average (m)	30.08	81
Percentage of Books Lost Per Student (m)	3.34	9	Percentage of Books Lost Per Student (m)	3.22	9
Sex (n)	.71	2	Sex (n)	.71	2
Gifted Program (m)	2.65	7	Gifted Program (m)	2.87	8
Other[a]	.28	1	Other[a]	.31	1
Total	37.55	100	Total	37.19	101

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 50. (Continued)

Indian Stepwise/Forced Entry Models With Grade Level			Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Math Test Total		
1983 Grade Point Average (m)	32.77	85	1983 Grade Point Average (m)	32.38	84
Percentage of Books Lost Per Student (m)	3.46	9	Percentage of Books Lost Per Student (m)	3.38	9
Gifted Program (m)	2.75	7	Gifted Program (m)	2.90	8
Other[a]	-.30	-1	Other[a]	-.11	0
Total	38.68	100	Total	38.55	101
			Science Knowledge		
1983 Grade Point Average (m)	16.81	59	1983 Grade Point Average (m)	16.89	62
Percentage of Books Lost Per Student (m)	5.78	20	Percentage of Books Lost Per Student (m)	5.58	20
Grade Level (n)	2.69	10			
			Age in Months at Time of Test (n)	1.45	5
Gifted Program (m)	3.99	14	Gifted Program (m)	4.36	16
1983 Citizenship Grade (m)	-1.58	-6	1983 Citizenship Grade (m)	-1.63	-6
Other[a]	.72	3	Other[a]	.76	3
Total	28.41	100	Total	27.41	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

grade level was included. Five of the models remained essentially the same, although not for the same measures of academic achievement. In four of the models, student's age replaced grade level, while in the reading test total model grade level was simply removed, which reduced the amount of variance accounted for by the model by .6%. The replacement of grade level by student's age reduced the percentage of explained variance by .7% in the word study skills model, and by .4% in the vocabulary knowledge, auditory test total, and science knowledge models. Surprisingly, in the vocabulary knowledge model, student's age was a suppressor variable. The participation in the gifted program variable also entered into the equation (2%).

As with the population models, in those models where student's age replaced grade level, student's age was found to account for less variance than grade level and the 1983 reading grade generally accounted for more variance. Overall, removal of grade level had minimal impact on the accountability of Indian models of student achievement, but did have a somewhat greater effect on the structure of the Indian model of vocabulary knowledge. That is, participation in the gifted program became a fairly good predictor of vocabulary knowledge when models were created for Indian students without grade level as a variable.

Modified Indian Models Without Grade Level

The results of the stepwise and forced entry multiple regression analyses using the modified set of predictors, which included five variables applicable to Indian students only, without grade level are reported in Table I-2 (Appendix I), while Table 51 compares these results with those when grade level was included. It was found that removing grade level as a predictor resulted in student's age entering in its place in only the modified Indian word study skills and science knowledge models, while in the vocabulary knowledge model both student's age and participation in the gifted program entered to replace grade level. As in the Indian vocabulary model, student's age entered the modified Indian model as a suppressor, after removing grade level.

In the reading test total and auditory test total models removal of grade level simply resulted in the removal of that variable and a concurrent small reduction in the percentage of variance accounted for by the predictors. Since grade level did not enter into the original modified Indian models of reading comprehension, listening comprehension, and spelling achievement, removal of grade level as a predictor had essentially no effect on those models. Interestingly, in two models, math concepts and math test total achievement, removal of grade level resulted in the entry of the participation in the gifted program variable, although in neither model was it a replacement for grade level or any other predictor that had previously entered. This meant that the participation in the gifted program variable, when considered in conjunction with factors peculiar to Indian students only, was suppressed by grade level. Thus, when considering Indian student achievement, but eliminating the grade level variable, both preschool attendance and participation in the

Table 51. Comparison of Modified Indian Regression Models With and Without Grade Level

Modified Indian Stepwise/Forced Entry Models With Grade Level			Modified Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Word Study Skills		
1983 Reading Grade (m)	18.37	56	1983 Reading Grade (m)	18.39	57
Father's Status (n)	4.41	13	Father's Status (n)	4.48	14
Grade Level (n)	1.19	4			
			Age in Months at Time of Test (n)	.28	1
Magazine Subscriptions Per Student (m)	3.86	12	Magazine Subscriptions Per Student (m)	3.66	11
Other[a]	5.21	16	Other[a]	5.59	17
Total	32.04	100	Total	32.40	100
			Reading Comprehension		
1983 Reading Grade (m)	31.55	84	1983 Reading Grade (m)	30.86	82
Encyclopedia Sets Per Student (m)	3.40	9	Encyclopedia Sets Per Student (m)	3.32	9
Gifted Program (m)	2.28	6	Gifted Program (m)	2.46	6
Other[a]	.36	1	Other[a]	.87	2
Total	37.59	100	Total	37.51	99
			Reading Test Total		
1983 Reading Grade (m)	37.16	79	1983 Reading Grade (m)	36.56	79
Magazine Subscriptions Per Student (m)	3.22	7	Magazine Subscriptions Per Student (m)	2.99	6
Grade Level (n)	-.22	-1			
Emergency Telephone (m)	.15	0	Emergency Telephone (m)	.16	0
Father's Status (n)	1.01	2	Father's Status (n)	1.04	2
Gifted Program (m)	2.61	6	Gifted Program (m)	2.85	6
Other[a]	2.96	6	Other[a]	2.66	6
Total	46.89	99	Total	46.26	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 51. (Continued)

Modified Indian Stepwise/Forced Entry Models With Grade Level			Modified Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Vocabulary Knowledge		
1983 Reading Grade (m)	19.87	69	1983 Reading Grade (m)	20.04	70
Reservation Head Start (n)	1.09	4	Reservation Head Start (n)	1.10	4
			Gifted Program (m)	2.30	8
Encyclopedia Sets Per Student (m)	2.11	7	Encyclopedia Sets Per Student (m)	2.13	8
Grade Level (n)	.33	1			
			Age in Months at Time of Test (n)	-.22	1
Other[a]	5.21	18	Other[a]	3.05	10
Total	28.61	99	Total	28.40	101
			Listening Comprehension		
1983 Reading Grade (m)	14.60	58	1983 Reading Grade (m)	14.60	58
Percentage of Books Lost Per Student (m)	2.82	11	Percentage of Books Lost Per Student (m)	2.77	11
Father's Status (n)	1.32	5	Father's Status (n)	1.30	5
Encyclopedia Sets Per Student (m)	2.23	9	Encyclopedia Sets Per Student (m)	2.25	9
Student's Residence (n)	1.53	6	Student's Residence (n)	1.48	6
Other[a]	2.87	11	Other[a]	2.81	11
Total	25.37	100	Total	25.21	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 51. (Continued)

Modified Indian Stepwise/Forced Entry Models With Grade Level			Modified Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Auditory Test Total		
1983 Reading Grade (m)	20.76	66	1983 Reading Grade (m)	20.76	67
Percentage of Books Lost Per Student (m)	2.33	8	Percentage of Books Lost Per Student (m)	2.25	7
Gifted Program (m)	2.94	9	Gifted Program (m)	3.12	10
Grade Level (n)	.01	0			
Encyclopedia Sets Per Student (m)	2.50	8	Encyclopedia Sets Per Student (m)	2.53	8
Other[a]	2.69	9	Other[a]	2.27	7
Total	31.23	100	Total	30.93	99
			Spelling		
1983 Reading Grade (m)	20.79	56	1983 Reading Grade (m)	20.17	54
Number of Days Absent in 1982-1983 (m)	4.28	12	Number of Days Absent in 1982-1983 (m)	4.30	12
Father's Status (n)	1.63	4	Father's Status (n)	1.63	4
Gifted Program (m)	3.40	9	Gifted Program (m)	3.53	10
Number of Parents Absent (n)	2.47	7	Number of Parents Absent (n)	2.46	7
Emergency Telephone (m)	.37	1	Emergency Telephone (m)	.38	1
Free & Reduced Lunch (n)	2.05	6	Free & Reduced Lunch (n)	1.96	5
Student's Residence (n)	.08	0	Student's Residence (n)	.08	0
Number of Parents Employed (n)	-.61	-2	Number of Parents Employed (n)	-.61	-2
Other[a]	2.31	6	Other[a]	3.09	8
Total	36.77	99	Total	36.99	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 51. (Continued)

Modified Indian Stepwise/Forced Models With Grade Level			Modified Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
		Math Concepts			
1983 Grade Point Average (m)	31.23	81	1983 Grade Point Average (m)	30.79	81
Percentage of Books Lost Per Student (m)	3.33	9	Percentage of Books Lost Per Student (m)	3.21	8
Preschool Attendance (n)	-.13	0	Preschool Attendance (n)	-.12	0
Sex (n)	.68	2	Sex (n)	.67	2
			Gifted Program (m)	2.56	7
Home Phone Listed (n)	1.30	3	Home Phone Listed (n)	1.29	3
Other[a]	2.10	5	Other[a]	-.26	-1
Total	38.51	100	Total	38.14	100
		Math Test Total			
1983 Grade Point Average (m)	33.84	84	1983 Grade Point Average (m)	33.56	83
Percentage of Books Lost Per Student (m)	3.46	8	Percentage of Books Lost Per Student (m)	3.39	8
Preschool Attendance (n)	.70	2	Preschool Attendance (n)	.69	2
			Gifted Program (m)	2.50	6
Other[a]	2.84	7	Other[a]	.18	0
Total	40.48	101	Total	40.32	99

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 51. (Continued)

Modified Indian Stepwise/Forced Models With Grade Level			Modified Indian Stepwise/Forced Entry Models Without Grade Level		
Predictor	% of Table Variance	% of Explained Variance	Predictor	% of Table Variance	% of Explained Variance
			Science Knowledge		
1983 Grade Point Average (m)	16.67	58	1983 Grade Point Average (m)	16.73	61
Percentage of Books Lost Per Student (m)	5.84	20	Percentage of Books Lost Per Student (m)	5.64	20
Grade Level (n)	2.63	9			
			Age in Months at Time of Test (n)	1.41	5
Gifted Program (m)	3.97	14	Gifted Program (m)	4.29	16
1983 Citizenship Grade (m)	-1.58	-6	1983 Citizenship Grade (m)	-1.62	-6
Other[a]	1.03	4	Other[a]	1.12	4
Total	28.56	99	Total	27.57	100

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

gifted program were predictors of math concepts and math test total achievement. Moreover, this result suggested that, when analyzing Indian student achievement using the modified predictor pools, participation in the gifted program would be a good predictor by grade level.

Thus, in contrast to the population and Indian models of achievement, removal of grade level from the predictors resulted in structural changes in the modified Indian models of achievement. Such changes, however, had little effect upon the amount of variance in the particular measure of achievement that the models accounted for. The greatest change in total explained variance was in the science model where replacement of grade level by student's age lowered the percentage of variance accounted for by about 1%. In only the word study skills and spelling models did the removal of grade level result in greater accountability, but the increase was less than one half of a percent.

Summary

Reanalysis of the ten dependent measures of academic achievement, after removing grade level from the pool of antecedent predictors, had minimal effect on the population and Indian models of achievement. In many cases (half or more) grade level was simply replaced by its correlate, student's age. Removal of the grade level variable had negligible effects on the percentage of variance accounted for by the models, although it was usually less than when grade level was included.

Removal of the grade level variable from the predictor pools, however, did result in several unanticipated structural changes in the modified Indian models of math concepts and math test total achievement. In these two cases, where grade level had not entered when considered, it had been expected that removal of that antecedent would have no real effect of the models. Instead, it was found that removal of grade level allowed for participation in the gifted program to enter as a good predictor of achievement. (It should be recalled that the participation in the gifted program variable had been part of the "other" variables forcibly entered into the equation when grade level was included. The implication here, then, was that removal of grade level allowed for increased statistical relevance of participation in the gifted program.)

In looking at those variables not entering the equations, the pattern of student's age simply replacing grade level was corroborated. Overall, then, the only real change to the models was that student's age became a predictor of student achievement when grade level was not included as a predictor. This result, therefore, suggested that when analyzing achievement by grade level, student's age should be a relatively consistent structural (if not explanatory) predictor.

Grade Level Models of Achievement

The third and fourth groups of analyses were done, respectively, for the population and Indian students only. The third group of analyses consisted of separate analyses for the population second, third, fourth, fifth, and sixth grade students on each of the ten measures of academic achievement. The fourth group of analyses were done exactly the same way, but for Indian students only.

Washoe County School District Population Models by Grade Level

The models of academic achievement reported in Tables G-2 (Washoe County School District population) and H-2 (Washoe County School District Indian students only) resulted in theoretical clarification of those models for further analyses by grade level. Separate analyses were then made for each grade (2nd-6th), which was methodologically accomplished by inserting a "select if grade level equals (a particular grade)" command in the revised population and Indian SPSS^X systems files, and rerunning the stepwise and forced entry multiple regression analyses on each of the ten measures of academic achievement. This resulted in ten models of academic achievement for each grade level (2nd-6th), for a total of fifty models of academic achievement by grade level. The results are discussed in Appendix J and technically reported in Tables J-1 through J-5 (Appendix J), while they are comparatively summarized in Table 52. All equations except the sixth grade auditory test total and spelling models were statistically significant at or beyond the .05 level. (All previously discussed models have been statistically significant; however, statistical nonsignificance was probably due the large reduction in the degrees of freedom in the multiple regression analyses by grade level).

Table 52. Predictors of Academic Achievement by Grade Level for Population

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Word Study Skills					
Library Open		1983 Reading		1983 Reading		1983 Reading		1983 Reading	
After School		Grade (m)	17.45	Grade (m)	43.95	Grade (m)	37.08	Grade (m)	17.87
Per Student (m)	8.43	Acreage Per		Sex (n)	9.64	Cost of School		Father's	
Sex (n)	6.09	Student (m)	2.26	Number of Parents		Per Student (m)	10.88	Status (n)	4.11
1983 Reading		Age in Months at		Absent (n)	-4.47	Father's		Change of	
Grade (m)	5.54	Time of Test (n)	6.81			Status (n)	3.14	Schools (n)	4.57
Change of						Number of Days		Emergency	
Schools (n)	3.81					Absent in		Telephone (m)	4.87
Percentage of						1982-1983 (m)	3.28	Cost of School	
Books Lost Per						Number of Parents		Per Student (m)	.66
Student (m)	1.03					Employed (n)	1.44		
1983 Citizenship						Gifted			
Grade (m)	2.76					Program (m)	-2.94		
Home Phone									
Listed (n)	.57								
Encyclopedia Sets									
Per Student (m)	3.56								
Other[a]	5.62	Other[a]	6.41	Other[a]	9.39	Other[a]	2.26	Other[a]	6.48
Total	37.41	Total	32.93	Total	58.51	Total	55.14	Total	38.56

a--Predictors forced into equation, but not significant at or beyond the .15 level.
b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Reading Comprehension					
1983 Reading Grade (m)	18.97	1983 Reading Grade (m)	38.71	1983 Reading Grade (m)	15.05	1983 Reading Grade (m)	50.23	1983 Reading Grade (m)	21.06
Library Open After School (m)	8.84	Number of Parents Absent (n)	5.03	Change of Schools (n)	10.16	Age in Months at Time of Test (n)	-1.88	Sex (n)	2.32
Home Phone Listed (m)	1.35	Acreage Per Student (m)	1.49	Student's Residence (n)	10.53	Number of Magazines Per Student (m)	1.99	Number of Parents Employed (n)	1.14
Free and Reduced Lunch (n)	3.44	Father's Status (n)	.82	Age in Months at Time of Test (n)	6.59			Number of Days Absent in 1982-1983 (m)	4.60
Age in Months at Time of Test (n)	2.12	Number of Days Absent in 1982-1983 (m)	.04	Father's Status (n)	4.11			Emergency Telephone (m)	4.48
Number of Parents Employed (n)	2.90	Age in Months at Time of Test (n)	4.72	1983 Citizenship Grade (m)	-4.70			Change of Schools (n)	2.78
Emergency Telephone (m)	3.72			Sex (n)	4.53			Age in Months at Time of Test (n)	2.01
Number of Days Absent in 1982-83 (m)	1.74							Free & Reduced Lunch (n)	8.77
1983 Citizenship Grade (m)	.43								
Other[a]	-1.66	Other[a]	6.62	Other[a]	2.46	Other[a]	9.37	Other[a]	4.43
Total	41.85	Total	57.43	Total	48.73	Total	59.71	Total	51.59

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Reading Test Total					
1983 Reading		1983 Reading		1983 Reading		1983 Reading		1983 Reading	
Grade (m)	16.03	Grade (m)	37.94	Grade (m)	31.49	Grade (m)	49.42	Grade (m)	31.18
Library Open		Acreage Per		Student's		Cost of School		Change of	
After School		Student (m)	3.10	Residence (n)	7.99	Per Student (m)	7.59	Schools (n)	4.48
Per Student (m)	12.74	Student's		Sex (n)	7.30	Age in Months at		Cost of School	
Home Phone		Residence (n)	5.15	Change of		Time of Test (n)	-2.88	Per Student (m)	3.23
Listed (n)	1.18	Father's		Schools (n)	5.29	Father's		Emergency	
Age in Months at		Status (n)	2.40			Status (n)	1.37	Telephone (m)	6.65
Time of Test (n)	2.32	Number of Parents				Number of Parents		Number of Days	
Number of Days		Absent (n)	2.60			Employed (n)	.83	Absent in	
Absent in		Age in Months at						1982-1983 (m)	3.93
1982-1983 (m)	1.61	Time of Test (n)	5.40						
Sex (n)	2.24	Percentage of							
Father's		Books Lost							
Status (n)	1.56	Per Student (m)	-.34						
1983 Citizenship									
Grade (m)	1.71								
Encyclopedia Sets									
Per Student (m)	1.70								
Change of									
Schools (n)	-1.05								
Percentage of									
Books Lost Per									
Student (m)	.28								
Other[a]	5.13	Other[a]	4.06	Other[a]	6.53	Other[a]	4.76	Other[a]	5.04
Total	45.45	Total	60.31	Total	58.60	Total	61.09	Total	54.51

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Vocabulary Knowledge					
1983 Reading Grade (m)	18.62	1983 Reading Grade (m)	27.92	Change of Schools (n)	21.36	1983 Reading Grade (m)	38.13	1983 Reading Grade (m)	13.71
Library Open After School Per Student (m)	13.07	Library Open After School Per Student (m)	6.16	1983 Reading Grade (m)	18.85	Acreage Per Student (m)	16.17	Free & Reduced Lunch (n)	10.71
Free & Reduced Lunch (n)	3.96	Number of Days Absent in 1982-1983 (m)	1.72	Emergency Telephone (m)	13.68	Age in Months at Time of Test (n)	-2.39	Sex (n)	3.97
Number of Days Absent in 1982-1983 (m)	2.86	Father's Status (n)	1.77	Gifted Program (m)	3.97	Father's Status (n)	4.63		
Sex (n)	2.89	Sex (n)	1.45	1983 Citizenship Grade (m)	-5.74	Number of Days Absent in 1982-1983 (m)	4.71		
Number of Parents Employed (n)	3.08			Encyclopedia Sets Per Student (m)	3.34	Number of Parents Employed (n)	-1.64		
Acreage Per Student (m)	-1.74			Sex (n)	3.18	Sex (n)	-.27		
1983 Citizenship Grade (m)	1.11								
Home Phone Listed (n)	-.86								
Other[a]	1.59	Other[a]	10.60	Other[a]	1.62	Other[a]	7.79	Other[a]	9.83
Total	44.57	Total	49.62	Total	60.26	Total	67.13	Total	38.22

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
Listening Comprehension									
Library Open After School Per Student (m)	18.10	1983 Reading Grade (m)	23.28	1983 Reading Grade (m)	21.29	1983 Reading Grade (m)	29.36	1983 Reading Grade (m)	14.48
1983 Reading Grade (m)	8.30	Father's Status (n)	4.84	Change of Schools (n)	10.95	Student's Residence (n)	10.98	Change of Schools (n)	10.67
Home Phone Listed (n)	3.55	Encyclopedia Sets Per Student (m)	5.66	Emergency Telephone (m)	12.93	Number of Parents Employed (n)	4.95	Free & Reduced Lunch (n)	14.69
Number of Days Absent in 1982-1983 (a)	2.37			Magazine Subscriptions Per Student (m)	11.60	Free & Reduced Lunch (n)	7.81	Age in Months at Time of Test (n)	4.78
Number of Parents Employed (n)	5.02			Cost of School Per Student (m)	-2.85	Gifted Program (m)	-3.27	Magazine Subscriptions Per Student (m)	5.16
Number of Parents Absent (n)	10.84			Number of Parents Employed (n)	-.30	Change of Schools (n)	4.13	Father's Status (n)	3.11
Magazine Subscriptions Per Student (m)	1.41					Emergency Telephone (m)	-.06	Sex (n)	1.46
						Age in Months at Time of Test (n)	-1.84		
						Magazine Subscriptions Per Student (m)	1.47		
						Percentage of Books Lost Per Student (m)	6.05		
Other[a]	1.89	Other[a]	7.41	Other[a]	9.61	Other[a]	3.32	Other[a]	.77
Total	51.48	Total	41.19	Total	63.23	Total	62.90	Total	55.12

a--Predictors forced into equation, but not significant at or beyond the .15 level.
b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Auditory Test Total					
Library Open		1983 Reading		1983 Reading		Library Open		1983 Reading	
After School		Grade (m)	28.51	Grade (m)	21.51	After School		Grade (m)	7.78
Per Student (m)	14.78	Library Open		Change of		Per Student (m)	21.23		
1983 Reading		After School		Schools (n)	19.54	1983 Reading			
Grade (m)	11.39	Per Student (m)	6.13	Emergency		Grade (m)	8.81		
Number of Parents		Father's		Telephone (m)	14.61	Number of Parents			
Employed (n)	7.29	Status (n)	3.57	Gifted		Employed (n)	1.81		
Number of Parents		Sex (n)	.93	Program (m)	5.10	Student's			
Absent (n)	11.98	Emergency		Sex (n)	3.63	Residence (n)	6.37		
Home Phone		Telephone (m)	3.32	Encyclopedia Sets		Free & Reduced			
Listed (n)	1.01	Change of		Per Student (m)	3.60	Lunch (n)	4.64		
Number of Days		Schools (n)	-1.72	Student's		Age in Months at			
Absent in				Residence (n)	5.21	Time of Test (n)	-.88		
1982-1983 (m)	2.30			1983 Citizenship					
Free & Reduced				Grade (m)	-5.98				
Lunch (n)	2.44								
Student's									
Residence (n)	.10								
Other[a]	-.08	Other[a]	9.60	Other[a]	-.87	Other[a]	7.00	Other[a]	12.70
Total	51.21	Total	50.34	Total	66.35	Total	48.98	Total[b]	20.48

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Spelling					
1983 Reading Grade (m)	12.84	1983 Reading Grade (m)	47.79	1983 Reading Grade (m)	29.58	1983 Reading Grade (m)	46.72	1983 Reading Grade (m)	25.23
Father's Status (n)	11.46	Percentage of Books Lost Per Student (m)	2.30	Student's Residence (n)	19.04	Student's Residence (n)	6.05	Number of Parents Employed (n)	1.32
Library Open After School Per Student (m)	5.32	1983 Citizenship Grade (m)	-.13	Sex (n)	7.58	Number of Parents Absent (n)	7.53	Father's Status (n)	1.55
Sex (n)	1.97	Free & Reduced Lunch (n)	-.03	Number of Parents Employed (n)	1.93	Number of Parents Employed (n)	-.81	Free & Reduced Lunch (n)	2.34
Number of Days Absent in 1982-1983 (m)	1.19	Emergency Telephone (m)	-.71			Father's Status (n)	.23		
Gifted Program (m)	5.72					Magazine Subscriptions Per Student (m)	2.46		
1983 Citizenship Grade (m)	-.47					Free & Reduced Lunch (n)	-1.26		
Change of Schools (n)	-2.21					Change of Schools (n)	-1.64		
Encyclopedia Sets Per Student (m)	7.75								
Other[a]	-2.59	Other[a]	5.41	Other[a]	1.34	Other[a]	7.85	Other[a]	-.03
Total	46.16	Total	54.63	Total	59.47	Total	67.13	Total[b]	30.41

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Math Concepts					
1983 Grade Point		1983 Grade Point		1983 Grade Point		1983 Grade Point		1983 Grade Point	
Average (m)	13.10	Average (m)	19.96	Average (m)	44.07	Average (m)	38.49	Average (m)	38.37
1983 Citizenship		Percentage of		Gifted		Sex (n)	1.21	Sex (n)	10.69
Grade (m)	1.62	Books Lost		Program (m)	11.25	1983 Citizenship			
Age in Months at		Per Student (m)	2.08	Percentage of		Grade (m)	7.88		
Time of Test (n)	3.60	1983 Citizenship		Books Lost					
Acreage Per		Grade (m)	1.62	Per Student (m)	2.05				
Student (m)	1.16	Home Phone							
Percentage of		Listed (n)	4.85						
Books Lost									
Per Student (m)	-.51								
Library Open									
After School									
Per Student (m)	3.69								
Other[a]	3.12	Other[a]	2.46	Other[a]	.45	Other[a]	.39	Other[a]	-.24
Total	25.68	Total	30.97	Total	57.92	Total	47.96	Total	48.82

a--Predictors forced into equation, but not significant at or beyond the .05 level.

b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
Math Test Total									
1983 Grade Point Average (m)	21.91	1983 Grade Point Average (m)	27.91	1983 Grade Point Average (m)	31.83	1983 Grade Point Average (m)	40.33	1983 Grade Point Average (m)	43.22
1983 Citizenship Grade (m)	2.76	Percentage of Books Lost Per Student (m)	1.13	Sex (n)	11.10	Library Open After School Per Student (m)	-3.12	Sex (n)	4.70
Acreage Per Student (m)	1.15	Sex (n)	2.88	Gifted Program (m)	11.98	1983 Citizenship Grade (m)	10.68	Acreage Per Student (m)	1.83
Gifted Program (m)	4.26	Home Phone Listed (n)	5.81	Percentage of Books Lost Per Student (m)	8.59			Age in Months at Time of Test (n)	1.10
Library Open After School Per Student (m)	3.41	Acreage Per Student (m)	-.43	1983 Citizenship Grade (m)	-6.44				
Other[a]	.20	Other[a]	.71	Other[a]	.64	Other[a]	1.19	Other[a]	-2.33
Total	33.69	Total	38.01	Total	57.70	Total	49.08	Total	48.52

a--Predictors forced into equation, but not significant at or beyond the .15 level.

b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 52. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Science Knowledge					
Library Open		1983 Grade Point		1983 Grade Point		1983 Grade Point		1983 Grade Point	
After School		Average (m)	17.07	Average (m)	31.70	Average (m)	25.11	Average (m)	25.82
Per Student (m)	13.77	Sex (n)	1.96	Percentage of		Acreage Per		Sex (n)	14.17
1983 Grade Point				Books Lost		Student (m)	11.54	Age in Months at	
Average (m)	17.31			Per Student (m)	5.57	Age in Months at		Time of Test (n)	2.49
1983 Citizenship						Time of Test (n)	1.57	Gifted	
Grade (m)	4.33					Sex (n)	1.66	Program (m)	4.86
Age in Months at						Home Phone			
Time of Test (n)	2.60					Listed (n)	-3.97		
Home Phone						Library Open			
Listed (n)	.14					After School			
						Per Student (m)	-5.83		
						1983 Citizenship			
						Grade (m)	16.46		
Other[a]	.88	Other[a]	5.76	Other[a]	4.11	Other[a]	-.08	Other[a]	.49
Total	39.03	Total	24.73	Total	41.37	Total	59.36	Total	47.83

a--Predictors forced into equation, but not significant at or beyond the .15 level.
b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

To capsulize, the stepwise and forced entry multiple regression analyses of student achievement (Table 52), as measured by academic achievement test scores, in the Washoe County School District revealed that considerable diversity existed between grade levels with respect to understanding elementary student success differences. That is, the results on all ten measures were indeed different, and often markedly so, for each grade level. Generally speaking, the achievement models by grade level accounted for considerably more of the total variance than did the population models. Indeed, the models were particularly more predictive, overall, in the fourth and fifth grades.

In contrast to the population models of achievement, previous grades were not always the best predictor. In a number of models other variables accounted for a greater percentage of the total variance. Moreover, a number of variables also explained nearly as much variance as previous grades, which meant those factors were nearly equally important to explaining academic achievement as was previous achievement. No other variable, however, was found to be as consist a predictor across the grade levels; indeed, most variables seldom entered into more than three different grade level models.

Washoe County School District Indian Student Achievement by Grade Level

The results of the stepwise and forced entry multiple regression analyses for Indian students by grade level in the Washoe County School District are discussed in Appendix K and technically reported in Tables K-1 through K-5 (Appendix K), while they are comparatively summarized in Table 53. Unlike most previous results where the

Table 53. Predictors of Academic Achievement by Grade Level for Indian Students

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Word Study Skills					
1983 Citizenship Grade (m)	20.28	Father's Status (n)	15.79	1983 Reading Grade (m)	61.35	1983 Reading Grade (m)	21.18	1983 Reading Grade (m)	22.84
Change of Schools (n)	2.65	1983 Reading Grade (m)	13.29	Father's Status (n)	.67	Father's Status (n)	16.87	Free & Reduced Lunch (n)	10.41
		Emergency Telephone (m)	3.67	Sex (n)	.01	Magazine Subscriptions Per Student (m)	7.19	Number of Days Absent in 1982-1983 (m)	8.62
						Free & Reduced Lunch (n)	6.48		
Other[a]	19.03	Other[a]	25.81	Other[a]	3.70	Other[a]	2.49	Other[a]	9.65
Total[b]	42.23	Total	58.56	Total	65.73	Total	54.21	Total	51.52

a--Predictors forced into equation, but not significant at or beyond the .15 level.
b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Reading Comprehension					
1983 Reading Grade (m)	19.13	1983 Reading Grade (m)	19.73	1983 Reading Grade (m)	38.53	1983 Reading Grade (m)	23.86	1983 Reading Grade (m)	49.16
Cost of School Per Student (m)	10.05	Number of Days Absent in 1982-1983 (m)	14.03	Magazine Subscriptions Per Student (m)	19.29	Home Phone Listed (n)	2.27	Home Phone Listed (n)	6.08
		Number of Parents Absent (n)	7.98			Encyclopedia Sets Per Student (m)	5.64	Encyclopedia Sets Per Student (m)	5.92
		Age in Months at Time of Test (n)	6.98					Number of Parents Absent (n)	-.61
								Sex (n)	2.52
Other[a]	14.60	Other[a]	16.58	Other[a]	7.80	Other[a]	17.89	Other[a]	10.17
Total[b]	43.78	Total	65.30	Total	65.62	Total	49.66	Total	73.24

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.

(m)--Indicates variable that is manipulable by the school district.

(n)--Indicates variable that is not manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Reading Test Total					
1983 Reading Grade (m)	19.74	Number of Days Absent in 1982-1983 (m)	23.76	1983 Reading Grade (m)	66.25	1983 Reading Grade (m)	35.14	1983 Reading Grade (m)	53.72
Age in Months at Time of Test (n)	10.88	1983 Reading Grade (m)	19.67	Acreage Per Student (m)	7.27	Father's Status (n)	8.05	Home Phone Listed (n)	3.21
Number of Days Absent in 1982-1983 (m)	4.50	Emergency Telephone (m)	7.87	Age in Months at Time of Test (n)	4.81	Percentage of Books Lost Per Student (m)	5.04		
		Free & Reduced Lunch (n)	2.95			Encyclopedia Sets Per Student (m)	3.05		
Other[a]	12.75	Other[a]	9.36	Other[a]	-.22	Other[a]	11.38	Other[a]	7.85
Total[b]	47.87	Total	63.61	Total	78.11	Total	62.66	Total	64.78

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Vocabulary Knowledge					
1983 Reading Grade (m)	36.74	Encyclopedia Sets Per Student (m)	21.34	Magazine Subscriptions Per Student (m)	30.92	1983 Reading Grade (m)	22.54	1983 Reading Grade (m)	21.43
		Cost of School Per Student (m)	11.93	1983 Reading Grade (m)	25.96	Sex (n)	4.91	Free & Reduced Lunch (n)	13.73
		Free & Reduced Lunch (n)	7.85	Free & Reduced Lunch (n)	4.67			Sex (n)	5.46
				1983 Citizenship Grade (m)	-2.58			Gifted Program (m)	13.50
				Library Open After School Per Student (m)	7.85				
				Number of Parents Absent (n)	5.36				
Other[a]	6.83	Other[a]	10.00	Other[a]	1.99	Other[a]	9.57	Other[a]	-.60
Total[b]	43.57	Total[b]	51.12	Total	74.17	Total[b]	37.02	Total	53.52

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Listening Comprehension					
1983 Reading Grade (m)	32.47	Encyclopedia Sets Per Student (m)	13.40	1983 Reading Grade (m)	22.53	1983 Reading Grade (m)	13.97	1983 Reading Grade (m)	16.20
Number of Parents Absent (n)	3.57	Number of Parents Employed (n)	4.03	Free & Reduced Lunch (n)	11.94	Sex (n)	3.48	Sex (n)	8.79
				Age in Months at Time of Test (n)	2.47			Percentage of Books Lost Per Student (m)	13.52
				Magazine Subscriptions Per Student (m)	14.94			Father's Status (n)	4.53
								Age in Months at Time of Test (n)	8.36
								Gifted Program (m)	10.38
								Number of Days Absent in 1982-1983 (m)	-4.67
Other[a]	15.46	Other[a]	14.92	Other[a]	12.43	Other[a]	12.93	Other[a]	2.34
Total[b]	51.50	Total[b]	32.35	Total	64.31	Total[b]	30.38	Total	59.45

a--Predictors forced into equation, but not significant at or beyond the .15 level.
b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Auditory Test Total					
1983 Reading		Encyclopedia Sets		Magazine		1983 Reading		1983 Reading	
Grade (m)	37.18	Per Student (m)	19.33	Subscriptions		Grade (m)	27.13	Grade (m)	20.16
		Number of Parents		Per Student (m)	29.14	Sex (n)	5.25	Free & Reduced	
		Employed (n)	3.56	1983 Reading				Lunch (n)	8.66
				Grade (m)	25.40			Sex (n)	8.49
				Free & Reduced				Gifted	
				Lunch (n)	8.75			Program (m)	16.94
				Age in Months at					
				Time of Test (n)	8.30				
Other[a]	5.71	Other[a]	13.80	Other[a]	2.29	Other[a]	6.90	Other[a]	3.19
Total[b]	42.89	Total[b]	36.69	Total	73.88	Total[b]	39.28	Total	57.44

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Spelling					
1983 Reading		Number of Days		1983 Reading		1983 Reading		1983 Reading	
Grade (m)	17.33	Absent in		Grade (m)	38.24	Grade (m)	23.25	Grade (m)	33.18
Magazine		1982-1983 (m)	10.10	Student's		Free & Reduced		Number of Days	
Subscriptions		Gifted		Residence (n)	4.98	Lunch (n)	16.47	Absent in	
Per Student (m)	9.74	Program (m)	7.85	Father's		Number of Parents		1982-1983 (m)	11.04
Student's				Status (n)	1.56	Employed (n)	1.25	Number of Parents	
Residence (n)	6.49			1983 Citizenship		Magazine		Absent (n)	13.61
				Grade (m)	11.32	Subscriptions		Number of Parents	
						Per Student (m)	7.19	Employed (n)	-2.80
						Father's		Age in Months at	
						Status (n)	4.41	Time of Test (n)	9.90
						Gifted		Father's	
						Program (m)	7.30	Status (n)	2.64
Other[a]	17.06	Other[a]	21.22	Other[a]	2.67	Other[a]	7.74	Other[a]	4.23
Total[b]	50.62	Total[b]	39.17	Total	58.77	Total	67.61	Total	71.80

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Math Concepts					
1983 Grade Point		Library Open		1983 Grade Point		1983 Grade Point		1983 Grade Point	
Average (m)	11.66	After School		Average (m)	59.28	Average (m)	33.55	Average (m)	51.23
		Per Student (m)	9.94	Home Phone		Sex (n)	4.91	Acreage Per	
		Sex (n)	2.88	Listed (n)	6.43	Acreage Per		Student (m)	3.53
				Percentage of		Student (m)	7.88	Age in Months at	
				Books Lost Per		Gifted		Time of Test (n)	9.21
				Student (m)	3.25	Program (m)	8.87	1983 Citizenship	
				Age in Months at				Grade (m)	-8.59
				Time of Test (n)	5.99				
				Gifted					
				Program (m)	3.38				
Other[a]	12.44	Other[a]	3.22	Other[a]	-.31	Other[a]	.85	Other[a]	3.07
Total[b]	24.10	Total[b]	16.04	Total	78.02	Total	56.06	Total	58.45

a--Predictors forced into equation, but not significant at or beyond the .15 level.
b--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Math Test Total					
1983 Grade Point Average (m)	22.18	Library Open After School Per Student (m)	10.68	1983 Grade Point Average (m)	52.13	1983 Grade Point Average (m)	42.47	1983 Grade Point Average (m)	49.39
Percentage of Books Lost Per Student (m)	11.11			Percentage of Books Lost Per Student (m)	2.16	Acreage Per Student (m)	10.85		
				Age in Months at Time of Test (n)	4.37				
Other[a]	.46	Other[a]	4.56	Other[a]	4.81	Other[a]	5.61	Other[a]	5.48
Total[b]	33.75	Total	15.24	Total	63.47	Total	58.93	Total	54.87

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 53. (Continued)

Predictors For 2nd Grade	% Table Variance	Predictors For 3rd Grade	% Table Variance	Predictors For 4th Grade	% Table Variance	Predictors For 5th Grade	% Table Variance	Predictors For 6th Grade	% Table Variance
				Science Knowledge					
Age in Months at Time of Test (n)	4.89	Gifted Program (m)	10.73	1983 Grade Point Average (m)	37.12	1983 Grade Point Average (m)	20.66	1983 Grade Point Average (m)	26.56
Home Phone Listed (n)	5.87			Age in Months at Time of Test (n)	9.10	Acreage Per Student (m)	8.66	Percentage of Books Lost Per Student (m)	14.00
				Acreage Per Student (m)	5.62	Sex (n)	3.91	Age in Months at Time of Test (n)	8.42
				Home Phone Listed (n)	4.01				
				1983 Citizenship Grade (m)	-.65				
Other[a]	15.56	Other[a]	7.64	Other[a]	4.30	Other[a]	3.24	Other[a]	2.73
Total[b]	26.32	Total[b]	18.37	Total	59.50	Total	36.47	Total	51.71

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not statistically significant; all other equation were significant at or beyond the .05 level.
(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

equations had been statistically significant (except for the two sixth grade equations noted above), a large number of the grade level models for Indian students were not statistically significant at or beyond the .05 level. Specifically, none of the results for the second grade Indian students, the vocabulary knowledge, listening comprehension, auditory test total, math concepts, math test total, and science knowledge models for the third grade Indian students, and the vocabulary knowledge, listening comprehension, and auditory test total models for the fifth grade Indian students were not statistically significant. The failure to obtain statistical significance for the second and third grade models was probably due to the small sample sizes involved with these groups of students and resulting loss of degrees of freedom. Regardless of why statistical significance was not achieved, the results were still of substantive interest.

In brief, the stepwise and forced entry multiple regression analyses of Indian student achievement, as measured by academic achievement test scores, in the Washoe County School District demonstrated that considerable diversity existed between grades with respect to understanding or predicting such achievement. That is, the results showed that different antecedent variables were predictive of academic achievement for each grade level, and that grade level models of achievement were different from the models for all Indian students. Generally speaking, the Indian grade level models accounted for considerably more variance than the Indian models, and they often incorporated fewer predictors. However, no clear patterns were discernible, other than the observation that the fourth grade models usually accounted for more variance than the models at other grades.

In comparison to both the population and Indian models of academic achievement, previous grades were not always predictive of such achievement at all grade levels. Indeed, grades were statistically predictive in the third grade only for word study skills, reading comprehension, and reading test total achievement. Moreover, in many of the grade level models, factors other than previous grades were almost as explanatory of achievement as previous grades; whereas in the aggregate population and Indian models, previous grades were always the best predictor.

Comparison of Population and Indian Models of Achievement by Grade Level

Once the analyses of academic achievement by grade level had been completed, it remained to compare the population and Indian grade level results for similarities in structure, accountability, and manipulativeness. That is, examination of the results by grade level has thus far demonstrated that there were differences for both the population and the Indian students with respect to understanding academic achievement by grade level. The question now was whether the population and Indian models of achievement at a particular grade level were comparatively similar or different in terms of their overall structure, their ability to account for variance in achievement, and their overall susceptibility to manipulation by the school system.

Comparison of second grade models. Table 54 comparatively presents the population and Indian results of the stepwise and forced entry regression analyses for second grade academic achievement in the Washoe County School District. While both the population and Indian models generally accounted for the same amounts of variance, and previous grades were usually an antecedent for both groups, that was about all the similarities that existed between them.

First of all, all the Indian models were, generally, statistically nonsignificant. Second, with regards to specific models, few predictors were common to both the population and Indian models. However, the percentage of variance accounted for was usually quite different. For example, in the word study skills model, the 1983 citizenship grade explained only 3% of the population total variance, but accounted for 20% (or almost three times as much) of the total variance for Indian students.

Additionally, in all but one of the cases the direction of the relationship between the predictor and achievement was the same for both the population and Indian students. The one exception was with the citizenship variable. Interestingly, the 1983 citizenship grade was inversely related (r = -.13) to word study skills for the population, but positively associated (r = .43) with word study skills for Indian second grade students. Thus good citizenship was related to higher word study skills for Indian students, but lower word study skills for the population in general. Otherwise, for both the population and Indian students, not changing schools was associated

Table 54. Percentage of Variance Contributed by Variables to the Total Model Variance for Second Grade Population and Indian Students

	Models							
	Word Study Skills		Reading Comprehension		Reading Test Total		Vocabulary Knowledge	
Predictors	POP	IND	POP	IND	POP	IND	POP	IND
Academic Achievement								
1983 Reading Grade (m)	5.54		18.97	19.13	16.03	19.74	18.62	26.74
1983 Grade Point Average (m)								
Number of Days Absent in 1982-1983 (m)			1.74		1.61	4.50	2.86	
Student Evaluations								
1983 Citizenship Grade (m)	2.76	20.28	.43		1.71		1.11	
Gifted Program (m)								
Background Characteristics								
Age in Months at Time of Test (n)			2.12		2.32	10.88		
Change of Schools (n)	3.81	2.65			-1.05			
Emergency Telephone (m)			3.72					
Father's Status (n)					1.56			
Free & Reduced Lunch (n)			3.44				3.96	
Home Phone Listed (n)	.57		1.35		1.18		-.86	
Number of Parents Absent (n)								
Number of Parents Employed (n)			2.90				3.08	
Sex (n)	6.09				2.24		2.89	
Student's Residence (n)								
School Environment and Learning Contexts								
Acreage Per Student (m)							-1.74	
Cost of School Per Student (m)				10.05				
Encyclopedia Sets Per Student (m)	3.56				1.70			
Grade Level (n)								
Library Open After School Per Student (m)	8.43		8.84		12.74		13.07	
Magazine Subscriptions Per Student (m)								
Percentage of Books Lost Per Student (m)	1.03				.28			

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 54. (Continued)

Predictors	Listening Comprehension POP	Listening Comprehension IND	Auditory Test Total POP	Auditory Test Total IND	Spelling POP	Spelling IND
Academic Achievement						
1983 Reading Grade (m)	8.30	32.47	11.39	37.18	12.84	17.33
1983 Grade Point Average (m)						
Number of Days Absent in 1982-1983 (m)	2.37		2.30		1.19	
Student Evaluations						
1983 Citizenship Grade (m)					-.47	
Gifted Program (m)					5.72	
Background Characteristics						
Age in Months at Time of Test (n)						
Change of Schools (n)					-2.21	
Emergency Telephone (m)						
Father's Status (n)					11.46	
Free & Reduced Lunch (n)			2.44			
Home Phone Listed (n)	3.55		1.01			
Number of Parents Absent (n)	10.84	3.57	11.98			
Number of Parents Employed (n)	5.02		7.29			
Sex (n)					1.97	
Student's Residence (n)			.10			
School Environment and Learning Contexts						
Acreage Per Student (m)						
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)					7.75	
Grade Level (n)						
Library Open After School Per Student (m)	18.10		14.78		5.32	
Magazine Subscriptions Per Student (m)	1.41					
Percentage of Books Lost Per Student (m)						

(m)--indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 54. (Continued)

Predictors	Math Concepts POP	Math Concepts IND	Math Test Total POP	Math Test Total IND	Science Knowledge POP	Science Knowledge IND
Academic Achievement						
1983 Reading Grade (m)						
1983 Grade Point Average (m)	13.10	11.66	21.91	22.18	17.31	
Number of Days Absent in 1982-1983 (m)						
Student Evaluations						
1983 Citizenship Grade (m)	1.62		2.76		4.33	
Gifted Program (m)			4.26			
Background Characteristics						
Age in Months at Time of Test (n)	3.60				2.60	4.89
Emergency Telephone (m)						
Father's Status (n)						
Free & Reduced Lunch (n)						
Home Phone Listed (n)					.14	5.87
Number of Parents Absent (n)						
Number of Parents Employed (n)						
Number of Transfers (n)						
Sex (n)						
Student's Residence (n)						
School Environment and Learning Contexts						
Acreage Per Student (m)	1.16		1.15			
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)	3.69		3.41		13.77	
Magazine Subscriptions Per Student (m)						
Percentage of Books Lost Per Student (m)	-.61			11.11		

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

with higher word study skills achievement; being absent more often and being younger were related to higher reading test total scores; having one or both parents absent from the home was correlated with higher listening comprehension achievement; and being older and having a home telephone listed were associated with higher science achievement test scores.

Another clear difference was that the second grade population models involved many more variables. Fourth, the "other" variables forced into the equation by analytic techniques (but which were not statistically significant at or beyond the .15 level) accounted for much less variance in the population models than in the Indian models. Fifth, while the amount of variance accounted for in the population grade level models by individual predictors was often quite large (e.g., >10%), other predictors often made fairly small (e.g., 3%) contributions. In comparison, most variables in the Indian models made moderate (e.g., 3% to 10%) to large (e.g., >10%) contributions towards explaining the total variance. Lastly, it was noted that previous grades, when a predictor, usually accounted for more variance (often twice as much as in the population models) in the Indian models.

With respect to factors other than previous grades, it was found that the number of days absent, whether the home telephone was listed, and how long the library was open after school were all consistent predictors of the population reading models. Father's status, number of parents absent, and how long the library was open after school all accounted for sizable amounts of variance when they entered in to the second grade population reading oriented models. In contrast, no antecedent entered more than one of the Indian second grade reading oriented models, but the 1983 citizenship grade, student's age, and cost of school all made sizable contributions when they entered. With regards to the math oriented models, citizenship grades and how long the library was open after school entered all three population models, but no variable entered into all three of the Indian models.

Comparison of third grade models. Table 55 presents the results for both the third grade population and Indian multiple regression analyses of academic achievement, as measured by standardized achievement tests, in the Washoe County School District. It was found that the only models having any similarity were the word study skills, reading comprehension, and reading test total models of achievement, which were also the only Indian models that were statistically significant.

With regards to predictors that were part of both the population and Indian third grade models, the 1983 reading grade entered both in only word study skills, reading comprehension, and reading test total models. While for both the population and Indian students being younger was associated with higher reading comprehension achievement, having more encyclopedia sets available per student was positively correlated with higher listening comprehension test scores. In contrast, lower absenteeism, although structurally a predictor, was not correlated (r = .00) with population reading comprehension, yet was related (r = -.36) to higher reading comprehension for Indian

Table 55. Percentage of Variance Contributed by Variables to the Total Model Variance for Third Grade Population and Indian Students

	Models							
	Word Study Skills		Reading Comprehension		Reading Test Total		Vocabulary Knowledge	
Predictors	POP	IND	POP	IND	POP	IND	POP	IND
Academic Achievement								
1983 Reading Grade (m)	17.45	13.29	38.71	19.73	37.94	19.67	27.92	
1983 Grade Point Average (m)								
Number of Days Absent in 1982-1983 (m)			.04	14.03		23.76	1.72	
Student Evaluations								
1983 Citizenship Grade (m)								
Gifted Program (m)								
Background Characteristics								
Age in Months at Time of Test (n)	6.81		4.72	6.98	5.40			
Change of Schools (n)								
Emergency Telephone (m)		3.67				7.87		
Father's Status (n)		15.79	.82		2.40		1.77	
Free & Reduced Lunch (n)						2.95		7.85
Home Phone Listed (n)								
Number of Parents Absent (n)			5.03	7.98	2.60			
Number of Parents Employed (n)								
Sex (n)							1.45	
Student's Residence (n)					5.15			
School Environment and Learning Contexts								
Acreage Per Student (m)	2.26		1.49		3.10			
Cost of School Per Student (m)								11.93
Encyclopedia Sets Per Student (m)								21.34
Grade Level (n)								
Library Open After School Per Student (m)							6.16	
Magazine Subscriptions Per Student (m)								
Percentage of Books Lost Per Student (m)					-.34			

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 55. (Continued)

Predictors	Models: Listening Comprehension POP	IND	Auditory Test Total POP	IND	Spelling POP	IND
Academic Achievement						
1983 Reading Grade (m)	23.28		28.51		47.79	
1983 Grade Point Average (m)						
Number of Days Absent in 1982-1983 (m)						10.10
Student Evaluations						
1983 Citizenship Grade (m)					-.13	
Gifted Program (m)						7.85
Background Characteristics						
Age in Months at Time of Test (n)						
Change of Schools (n)			-1.72			
Emergency Telephone (m)			3.32		-.71	
Father's Status (n)	4.84		3.57			
Free & Reduced Lunch (n)					-.03	
Home Phone Listed (n)						
Number of Parents Absent (n)						
Number of Parents Employed (n)		4.03		3.56		
Sex (n)			.93			
Student's Residence (n)						
School Environment and Learning Contexts						
Acreage Per Student (m)						
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)	5.66	13.40		19.33		
Grade Level (n)						
Library Open After School Per Student (m)			6.13			
Magazine Subscriptions Per Student (m)						
Percentage of Books Lost Per Student (m)					2.30	

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 55. (Continued)

	Models					
	Math Concepts		Math Test Total		Science Knowledge	
Predictors	POP	IND	POP	IND	POP	IND
<u>Academic Achievement</u>						
1983 Reading Grade (m)						
1983 Grade Point Average (m)	19.96		27.91		17.07	
Number of Days Absent in 1982-1983 (m)						
<u>Student Evaluations</u>						
1983 Citizenship Grade (m)						
Gifted Program (m)						10.75
<u>Background Characteristics</u>						
Age in Months at Time of Test (n)						
Change of Schools (n)						
Emergency Telephone (m)						
Father's Status (n)						
Free & Reduced Lunch (n)						
Home Phone Listed (n)	4.85		5.81			
Number of Parents Absent (n)						
Number of Parents Employed (n)						
Sex (n)		2.88	2.88		1.90	
Student's Residence (n)						
<u>School Environment and Learning Contexts</u>						
Acreage Per Student (m)			-.43			
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)		9.94		10.68		
Magazine Subscriptions Per Student (m)						
Percentage of Books Lost Per Student (m)	2.08		1.13			

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

students. Similarly, higher reading comprehension achievement was correlated (r = -.27) with having both parents at home for the population, but was associated (r = .28) with having one or both parents absent from the home for Indian students. Other than that, the population and Indian third grade models shared no common predictors. Of these four shared predictors, both student's age and number of parents absent accounted for similar amounts of variance in both the population and Indian models, albeit more for in the Indian models. The number of days absent, however, explained considerably less than 1% of the variance in the population model, but 14% in the Indian model; and the number of encyclopedia sets explained 13% in the Indian model in comparison to 6% in the population model.

As in the second grade models, the "other" variables forced into the models accounted for considerably more variance in the Indian models. However, of those variables that accounted for variance, the ones entering into the Indian models usually explained moderate (3% to 10%) or large (>10%) amounts of variance. In contrast, no antecedent predictor accounted for more than 7% of the total variance in the population models.

Other than previous grades, which entered all population models, no factor was common to all reading or math oriented models for either the population or Indian third grade students. Father's status entered into five of the population reading oriented models, and home telephone listing, student's sex, and percentage of books lost did, however, enter two of the population math models. In comparison, absenteeism and the number of encyclopedia sets entered three of the Indian reading models, and how long the library was open after school per student entered two of the Indian math models. With respect to explaining the variance, student's age and how long the library was open after school per student did the best for the population reading models, and number of days absent, father's status, and number of encyclopedia sets accounted for the most variance in the Indian reading models, when these factors entered. The listing of the home telephone number explained the most variance for the population models, and participation in the gifted program and how long the library was open after school per student contributed the most to the Indian math oriented models, when those antecedents entered the models.

Comparison of fourth grade models. Overall, the multiple regression analyses results for fourth grade achievement (Table 56), for both the population and Indian students, were more explanatory than for any of the other grades. On the average, the reading oriented models accounted for 59% and 69% of the total variance, while the math oriented models explained an average of 52% and 67% of the total variance for the population and Indian students respectively. Despite this, the models had very few structural similarities beyond previous grades, and even with this, differences were clear. That is, previous grades accounted for more of the total variance for fourth grade Indian students than for fourth grade students in the Washoe County School District in general. In particular, previous grades explained twice as much variance in the fourth grade Indian reading

Table 56. Percentage of Variance Contributed by Variables to the Total Model Variance for Fourth Grade Population and Indian Students

	Models							
	Word Study Skills		Reading Comprehension		Reading Test Total		Vocabulary Knowledge	
Predictors	POP	IND	POP	IND	POP	IND	POP	IND
Academic Achievement								
1983 Reading Grade (m)	43.95	61.95	15.05	38.53	31.49	66.25	21.35	25.96
1983 Grade Point Average (m)								
Number of Days Absent in 1982-1983 (m)								
Student Evaluations								
1983 Citizenship Grade (m)			-4.70				-5.74	-2.58
Gifted Program (m)							3.97	
Background Characteristics								
Age in Months at Time of Test (n)			6.59			4.81		
Change of Schools (n)			10.16		5.29		21.35	
Emergency Telephone (m)							13.68	
Father's Status (n)		.67	4.11					
Free & Reduced Lunch (n)								4.67
Home Phone Listed (n)								
Number of Parents Absent (n)	-4.47							5.36
Number of Parents Employed (n)								
Sex (n)	1.64	.01	4.53		7.30		3.18	
Student's Residence (n)			10.53		7.99			
School Environment and Learning Contexts								
Acreage Per Student (m)						7.27		
Cost of School Per Student (m)								
Encyclopedia Sets Per Student (m)							3.34	
Grade Level (n)								
Library Open After School Per Student (m)								7.85
Magazine Subscriptions Per Student (m)				19.29				30.92
Percentage of Books Lost Per Student (m)								

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 56. (Continued)

Predictors	Listening Comprehension POP	Listening Comprehension IND	Auditory Test Total POP	Auditory Test Total IND	Spelling POP	Spelling IND
Academic Achievement						
1983 Reading Grade (m)	21.29	22.53	21.51	25.40	29.58	38.24
1983 Grade Point Average (m)						
Number of Days Absent in 1982-1983 (m)						
Student Evaluations						
1983 Citizenship Grade (m)			-5.98			11.32
Gifted Program (m)			5.10			
Background Characteristics						
Age in Months at Time of Test (n)		2.47		8.30		
Change of Schools (n)	10.95		19.54			
Emergency Telephone (m)	12.93		14.61			
Father's Status (n)						1.56
Free & Reduced Lunch (n)		11.94		8.75		
Home Phone Listed (n)						
Number of Parents Absent (n)						
Number of Parents Employed (n)	-.30				1.94	
Sex (n)			3.63		7.58	
Student's Residence (n)			5.21		19.04	4.98
School Environment and Learning Contexts						
Acreage Per Student (m)						
Cost of School Per Student (m)	-2.85					
Encyclopedia Sets Per Student (m)			3.60			
Grade Level (n)						
Library Open After School Per Student (m)						
Magazine Subscriptions Per Student (m)	11.60	14.94		29.14		
Percentage of Books Lost Per Student (m)						

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 56. (Continued)

Predictors	Math Concepts POP	Math Concepts IND	Math Test Total POP	Math Test Total IND	Science Knowledge POP	Science Knowledge IND
Academic Achievement						
1983 Reading Grade (m)						
1983 Grade Point Average (m)	44.07	59.28	31.83	52.13	31.70	37.12
Number of Days Absent in 1982-1983 (m)						
Student Evaluations						
1983 Citizenship Grade (m)			-6.44			
Gifted Program (m)	11.25	3.38	11.98			-.65
Background Characteristics						
Age in Months at Time of Test (n)		5.99		4.37		9.10
Change of Schools (n)						
Emergency Telephone (m)						
Father's Status (n)						
Free & Reduced Lunch (n)						
Home Phone Listed (n)		6.43				4.01
Number of Parents Absent (n)						
Number of Parents Employed (n)						
Sex (n)			11.10			
Student's Residence (n)						
School Environment and Learning Contexts						
Acreage Per Student (m)						5.62
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)						
Magazine Subscriptions Per Student (m)						
Percentage of Books Lost Per Student (m)	2.05	3.25	8.59	2.16	5.57	

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

comprehension and reading test total models as in the same population models.

Other predictors common to both the population and Indian models were having higher citizenship grades in the vocabulary knowledge models, number of magazine subscriptions (i.e., having fewer subscriptions) in the listening comprehension models, student's residence (i.e., living in the Reno-Sparks urban area) in the spelling models, participation in the gifted program in the math concepts models, and having a lower percentage of books lost in the math concepts and math test total models of fourth grade achievement.

The only other predictor that entered the same models for both the population and Indian students was student's sex, which entered both word study skills models. Unlike the other predictors, however, the direction (and strength) of the relationship was quite different. That is, higher word study skills achievement for the population in general was associated ($\underline{r}$ = .35) with the student being female, but was not even correlated ($\underline{r}$ = -.00) with student's sex for Indian students. In other words, student's sex (i.e., being male) was only structurally related to their word study skills achievement test scores when other factors were held constant.

While there were some differences in the amount of variance these factors explained in the population and Indian models, the largest differences were in the spelling model, where student's residence accounted for 19% of the total population variance but only 5% of the Indian variance, math concepts model, where participation in the gifted program explained 11% of the population and 3% of the Indian variances, and in the math test total model where percentage of books lost per student accounted for 9% of the population and 2% of the Indian variances.

In contrast to second and third grade models, fourth grade models of academic achievement exhibited several predictor patterns. Student's sex was generally a moderate (e.g., 3-10%) predictor in six of the seven reading oriented population models, while change of schools and student's residence were moderate to strong (e.g., >10%) predictors in five of the seven reading oriented population models. Percentage of books lost per student was a weak (e.g., <3%) to moderate predictor in all three of the population, and two of the Indian, math oriented models. Participation in the gifted program was a strong predictor (e.g., >10%) in two of the population, but a weak predictor (e.g., <3%) in two of the Indian, math oriented models. Student's age, on the other hand, was a moderate to strong predictor of all three, and home phone listing was a moderate predictor of two of the three, math oriented models for Indian students. Number of magazine subscriptions was a strong predictor in four of the Indian reading oriented models, while student's age and participation in the federal lunch program were each predictive of three of the Indian reading oriented models. Perhaps of greatest interest was the finding that participation in the gifted program was a better predictor of fourth grade achievement for the population than for the Indian students, because participation in the gifted program was a fairly consistent predictor in the Indian models of achievement.

Comparison of fifth grade models. The results of the multiple regression analyses of fifth grade academic achievement are presented in Table 57. Once again, several of the models were not found to be, overall, statistically significant: vocabulary knowledge, listening comprehension, and auditory test total achievement for Indian students.

In contrast to all models at other grade levels, and all other fifth grade models, the fifth grade population and Indian spelling models were quite similar. Structurally, both spelling models included previous reading grade, father's status, participation in the federal lunch program, number of parents employed, and number of magazine subscriptions as predictors of spelling achievement. The direction of the relationship between these predictors found in both the population and Indian spelling models was generally the same. Thus, having a natural father, not participating in the federal lunch program, and having fewer magazine subscriptions per student were all related to higher subsequent spelling achievement for both the population and Indian students. Parental employment, however was differentially correlated with spelling achievement. For the population, have a father or both parents employed was related (r = -.04) to higher spelling test scores, while for the Indian students having a mother or neither parent employed was associated (r = .04) with higher spelling achievement. However, in neither case was employment really even weakly correlated with spelling achievement.

Table 57. Percentage of Variance Contributed by Variables to the Total Model Variance for Fifth Grade Population and Indian Students

	Models							
	Word Study Skills		Reading Comprehension		Reading Test Total		Vocabulary Knowledge	
Predictors	POP	IND	POP	IND	POP	IND	POP	IND
Academic Achievement								
1983 Reading Grade (m)	37.08	21.18	50.23	23.23	49.42	35.14	38.13	22.54
1983 Grade Point Average (m)								
Number of Days Absent in 1982-1983 (m)	3.28						4.71	
Student Evaluations								
1983 Citizenship Grade (m)								
Gifted Program (m)	-2.94							
Background Characteristics								
Age in Months at Time of Test (n)			-1.88		-2.88		-2.39	
Emergency Telephone (m)								
Father's Status (n)	3.14	16.87			1.37	8.05	4.63	
Free & Reduced Lunch (n)		6.48						
Home Phone Listed (n)				2.27				
Number of Parents Absent (n)								
Number of Parents Employed (n)	1.44				.83		-1.64	
Number of Transfers (n)								
Sex (n)							-.27	4.91
Student's Residence (n)								
School Environment and Learning Contexts								
Acreage Per Student (m)							16.17	
Cost of School Per Student (m)	10.88				7.59			
Encyclopedia Sets Per Student (m)				5.64		3.05		
Grade Level (n)								
Library Open After School Per Student (m)								
Magazine Subscriptions Per Student (m)		7.19	1.99					
Percentage of Books Lost Per Student (m)						5.04		

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 57. (Continued)

	Models					
	Listening Comprehension		Auditory Test Total		Spelling	
Predictors	POP	IND	POP	IND	POP	IND
Academic Achievement						
1983 Reading Grade (m)	29.36	13.97	8.81	27.13	46.72	23.13
1983 Grade Point Average (m)						
Number of Days Absent in 1982-1983 (m)						
Student Evaluations						
1983 Citizenship Grade (m)						
Gifted Program (m)	-3.27					7.30
Background Characteristics						
Age in Months at Time of Test (n)	-1.84		-.88			
Change of Schools (n)	4.13				-1.64	
Emergency Telephone (m)	-.06					
Father's Status (n)					.23	4.41
Free & Reduced Lunch (n)	7.81		4.64		-1.26	16.47
Home Phone Listed (n)						
Number of Parents Absent (n)					7.53	
Number of Parents Employed (n)	4.95		1.81		-.81	1.25
Sex (n)		3.48		5.25		
Student's Residence (n)	10.98		6.37		6.05	
School Environment and Learning Contexts						
Acreage Per Student (m)						
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)			21.23			
Magazine Subscriptions Per Student (m)	1.47				2.46	7.19
Percentage of Books Lost Per Student (m)	6.05					

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 57. (Continued)

Predictors	Math Concepts POP	Math Concepts IND	Math Test Total POP	Math Test Total IND	Science Knowledge POP	Science Knowledge IND
Academic Achievement						
1983 Reading Grade (m)						
1983 Grade Point Average (m)	38.49	33.55	40.33	42.47	29.11	20.66
Number of Days Absent in 1982-1983 (m)						
Student Evaluations						
1983 Citizenship Grade (m)	7.88		10.68		16.46	
Gifted Program (m)		8.87				
Background Characteristics						
Age in Months at Time of Test (n)					1.57	
Change of Schools (n)						
Emergency Telephone (m)						
Father's Status (n)						
Free & Reduced Lunch (n)						
Home Phone Listed (n)					-3.97	
Number of Parents Absent (n)						
Number of Parents Employed (n)						
Sex (n)	1.21	4.91			1.06	3.91
Student's Residence (n)						
School Environment and Learning Contexts						
Acreage Per Student (m)		7.88		10.85	21.54	8.66
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)			-3.12		-5.83	
Magazine Subscriptions Per Student (m)						
Percentage of Books Lost Per Student (m)						

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

The only structural differences were that the population spelling model also had student's residence and number of parents absent as predictors, while the Indian spelling model had participation in the gifted program as a predictor.

With respect to the amount of variance accounted for in fifth grade spelling achievement, the two were different in a number of ways, even though the "other" variables forced into the models accounted for 8% of the variance in both, and that, overall, both models accounted for a little over 67% of the total variance in spelling achievement. The two greatest differences were with respect to the 1983 reading grade, which accounted for 47% of the population variance, but only 23% of the Indian student variance. Secondly, participation in the federal lunch program was a suppressor (-1%) in the population model, but explained over 16% of the total variance in the Indian model of fifth grade spelling achievement.

Other structural similarities, besides all models having previous grades as a predictor (and those discussed for spelling), included having a natural father as being related to higher word study skills and reading test total test scores, being male as associated with higher math concepts and science knowledge scores, and attending schools with less acreage per student as being associated with higher science knowledge test scores. However, with respect to student's sex, differences in pattern did occur. While males had higher math concepts and science achievement test scores among both the population and Indian students, females (r = .02) among the population students and males (r = -.18) among the Indian students had higher scores in vocabulary knowledge.

With regards to the amount of variance explained in the two models, however, there existed considerable differences. There were, as well, considerably more predictors in the population models, but the entering predictors tended to account for more variance in the Indian models. For example, previous grades accounted for more variance in all the population models except for auditory test total, math concepts, and math test total. Moreover, the sample sizes were extremely reduced for the analyses by grade level, which adversely affected the degrees of freedom in the multiple regression analyses.

In looking for patterns in the predictors, no variable entered all seven reading oriented models, other than the 1983 reading grade. The number of parents employed entered the largest number, being a predictor in six of the population reading oriented models. In contrast, the most consistent predictors across fifth grade Indian reading oriented models were sex and father's status, both of which entered into three of the reading oriented models. In terms of accountability across models, residence, acreage, school costs, and how long the library was open after school made the most consistent contributions when they entered the population models. For the Indian students, father's status, participation in the federal lunch program, the gifted program, and the number of magazine subscriptions per student contributed best when they entered into the fifth grade reading oriented models.

For math oriented models, the 1983 citizenship grade all three of the population models, while sex (i.e., being male was associated with higher achievement) and library hours after school per student were included in two of the population math oriented models. In contrast, acreage entered into all three of the Indian fifth grade math oriented models, while sex (i.e., being male was associated with higher achievement) entered into two of the math models. Although citizenship and acreage accounted for the most variance in the math oriented considerable differences. There were, as well, considerably more predictors in the population models, but the entering predictors tended to account for more variance in the Indian models. For example, previous grades accounted for more variance in all the population models, except for auditory test total, math concepts, and math test total. Moreover, the sample sizes were extremely reduced for the analyses by grade level, which adversely affected the degrees of freedom.

These results presented several interesting patterns. First, even though school acreage was not predictive in the (aggregate) Indian models of math and science achievement, it was predictive of fifth grade achievement for Indian students. Second, when school acreage was predictive of fifth grade achievement (i.e., in the science model), this factor accounted for almost two and one half times as much variance as it did in the population model. Third, student's sex was found to be important in predicting academic achievement, but particularly for Indian students. That is, student's sex was inversely associated with, and predictive of, vocabulary knowledge (r = -.17), listening comprehension (r = -.15), auditory test total (r = -.20), math concepts (r = -.20), and science knowledge (r = -.18) achievement. This meant that, for Indian students, being male was associated with, and predictive of, higher achievement. Fourth, citizenship grades, or the student's classroom behavior as subjectively evaluated by the teacher, was a fairly strong predictor (e.g., >10%) of math oriented achievement--particularly for science knowledge achievement--for fifth grade students in the Washoe County School District in general, but not for fifth grade Indian students. Lastly, it was observed that how long the library was open after school acted as a suppressor variable in the fifth grade population math test total and science knowledge achievement models. In sum, except for student's sex, fifth grade math and science achievement were found to be subject to considerable school system manipulation.

Comparison of sixth grade models. The results of the stepwise and forced entry multiple regression analyses of sixth grade academic achievement are comparatively summarized in Table 58. At the outset, it must be noted that the auditory test total and spelling models, for the sixth grade population, were not statistically significant. Relative to the second through fifth grade models of achievement for students in the Washoe County School District, the population and Indian sixth grade models had considerable similarities, although such congruencies were still outweighed by differences. That is, five of the models shared one or more common predictors (other than previous

Table 58. Percentage of Variance Contributed by Variables to the Total Model Variance for Sixth Grade Population and Indian Students

Predictors	Models: Word Study Skills POP	Word Study Skills IND	Reading Comprehension POP	Reading Comprehension IND	Reading Test Total POP	Reading Test Total IND	Vocabulary Knowledge POP	Vocabulary Knowledge IND
Academic Achievement								
1983 Reading Grade (m)	17.87	22.84	21.06	49.16	31.18	53.72	13.71	21.43
1983 Grade Point Average (m)								
Number of Days Absent in 1982-1983 (m)		8.62	4.60		3.93			
Student Evaluations								
1983 Citizenship Grade (m)								
Gifted Program (m)								13.50
Background Characteristics								
Age in Months at Time of Test (n)			2.01					
Change of Schools (n)	4.57		2.78		4.48			
Emergency Telephone (m)	4.87		4.48		6.65			
Father's Status (n)	4.11							
Free & Reduced Lunch (n)		10.41	8.77				10.71	13.73
Home Phone Listed (n)				6.08		3.21		
Number of Parents Absent (n)				-.61				
Number of Parents Employed (n)			1.14					
Sex (n)			2.32	2.52			3.97	5.46
Student's Residence (n)								
School Environment and Learning Contexts								
Acreage Per Student (m)								
Cost of School Per Student (m)	.66				3.23			
Encyclopedia Sets Per Student (m)				5.92				
Grade Level (n)								
Library Open After School Per Student (m)								
Magazine Subscriptions Per Student (m)								
Percentage of Books Lost Per Student (m)								

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 58. (Continued)

	Models					
	Listening Comprehension		Auditory Test Total		Spelling	
Predictors	POP	IND	POP	IND	POP	IND
Academic Achievement						
1983 Reading Grade (m)	14.48	16.20	7.78	20.16	25.23	33.18
1983 Grade Point Average (m)						
Number of Days Absent in 1982-1983 (m)		-4.67				11.04
Student Evaluations						
1983 Citizenship Grade (m)						
Gifted Program (m)		10.38		16.94		
Background Characteristics						
Age in Months at Time of Test (n)	4.78	8.36				9.90
Emergency Telephone (m)						
Father's Status (n)	3.11	4.53			1.55	2.64
Free & Reduced Lunch (n)	14.69			8.66	2.34	
Home Phone Listed (n)						
Number of Parents Absent (n)						13.61
Number of Parents Employed (n)					1.32	-2.80
Number of Transfers (n)	10.67					
Sex (n)	1.46	8.79		5.49		
Student's Residence (n)						
School Environment and Learning Contexts						
Acreage Per Student (m)						
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)						
Magazine Subscriptions Per Student (m)	5.16					
Percentage of Books Lost Per Student (m)		13.52				

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 58. (Continued)

	Models					
	Math Concepts		Math Test Total		Science Knowledge	
Predictors	POP	IND	POP	IND	POP	IND
Academic Achievement						
1983 Reading Grade (m)						
1983 Grade Point Average (m)	38.37	51.23	43.22	49.39	25.82	26.56
Number of Days Absent in 1982-1983 (m)						
Student Evaluations						
1983 Citizenship Grade (m)		-8.59				
Gifted Program (m)					4.86	
Background Characteristics						
Age in Months at Time of Test (n)		9.21	1.10		2.49	8.42
Change of Schools (n)						
Emergency Telephone (m)						
Father's Status (n)						
Free & Reduced Lunch (n)						
Home Phone Listed (n)						
Number of Parents Absent (n)						
Number of Parents Employed (n)						
Sex (n)	10.69		4.70		14.17	
Student's Residence (n)						
School Environment and Learning Contexts						
Acreage Per Student (m)		3.53	1.83			
Cost of School Per Student (m)						
Encyclopedia Sets Per Student (m)						
Grade Level (n)						
Library Open After School Per Student (m)						
Magazine Subscriptions Per Student (m)						
Percentage of Books Lost Per Student (m)						14.00

(m)--Indicates variable that is potentially manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

grades). First, both the population and Indian reading comprehension models included student's sex as a predictor. Second, being female (i.e., student's sex) was associated with having higher subsequent vocabulary knowledge for both the population and Indian students. However, for the population not being in the federal lunch program was correlated (*r* = -.36) with subsequent higher vocabulary knowledge, but being in the federal lunch program was associated (*r* = .24) with subsequent higher achievement for the Indian students. Third, both the population and Indian listening comprehension models had student's age, father's status, and student's sex as predictors of achievement. Nonetheless, while being younger and male was associated with higher listening comprehension achievement for both the population and Indian students, having a natural father was only related (*r* = -.19) to higher scores for the population. In contrast, having a stepfather, legal guardian, or no father was associated (*r* = .20) with higher listening comprehension scores for the Indian students. Fourth, the number of parents employed and father's status accounted for variance in both sixth grade spelling models. In this instance, while having either the father or both parents employed was associated with higher spelling achievement for both the population and Indian students, not having a natural father was weakly related (*r* = .06) to higher spelling achievement test scores for the population and having a natural father was related (*r* = -.15) to spelling achievement test scores for Indian students only. Lastly, student's age (i.e., being younger) was predictive of both population and Indian science knowledge achievement. As with other grade levels, however, these mutually shared predictors differentially accounted for the variance in academic achievement. In all cases, the predictors (including previous grades), accounted for more of the total variance in the Indian models. Similarly, most predictors in the Indian models accounted for moderate (3-10%) or large (>10%) amounts of the total variance; indeed, in only three cases was the contribution slight (<3%). In comparison, most contributions to the total variance for the population models were slight or moderate, with only four predictors (other than previous grades) making very large contributions.

In looking for structural patterns in the predictors, one difference, relative to the other grade levels, was the number of variables entering models for Indian students. That is, more predictors entered into sixth grade models than entered into the same models at the other grade levels for Indian students. No predictor (other than previous grades), however, entered into more than four of the reading oriented Indian models. In looking at the population models, participation in the federal lunch program and change of schools were predictive in four of the models, while emergency telephone listing, father's status, and student's sex were predictive in three of the reading oriented population models. In comparison, student's sex was predictive in four of the models, while absenteeism, participation in the gifted program, and participation in the federal lunch program accounted for variance in three of the Indian reading oriented models. Emergency telephone listing, participation in the federal lunch program, change of schools, and number of magazine subscriptions per student were, when they entered into the population models, the most consistent and explanatory predictors. In the Indian models, the number of days absent, participation in the gifted program, student's age, participation in the federal lunch program, student's sex, number of encyclopedia sets per student, and percentage of books lost per student were the most accountable factors when they entered. While student's sex entered all three of the population math oriented models, student's age entered two of them, but student's sex was the most accountable. Although student's age entered into two of the Indian math oriented models, both citizenship grades and percentage of books lost were also very explanatory predictors. Again, because participation in the gifted program was such a good predictor for the Indian models of achievement, it was surprising that participation in the gifted program was not a statistically significant predictor of any of the Indian math oriented sixth grade models. However, the fact was that there was only one sixth grade Indian student (out of those included in this study) who was in the gifted program; indeed, there was only a total of six Indian students (included in this study) in the the gifted student program.

Accounting for the variance. While previous grades (either the 1983 reading grade or the 1983 grade point average) were predictive of all population grade level models, they were not predictive of two second grade, and seven third grade, models for Indian students. In looking at other variables, it was found that student's age, emergency telephone listing, father's status, change of schools, and student's sex all entered one or more reading oriented models at each grade level for the population. Student's sex, however, was not found to be consistent across the grade levels in terms of whether males or females had higher achievement. In the second and fourth grades females did better, while in the third and sixth grades males did better; and in the fifth grade females did better in vocabulary knowledge and males did better in math concepts and science knowledge achievement. Conversely, for Indian students, while sex was not even a predictor of second grade achievement and was a predictor in only one model for each of the third and fourth grades, in all cases where it was predictive (including fifth and sixth grades) it was males who did better.

Similarly, few clear patterns were found with the other common predictors, except for the fact that having an emergency telephone number listed at the school was always predictive of higher achievement and in only one case (second grade word study skills) was changing schools predictive of higher achievement. Generally, being younger was predictive of higher reading oriented achievement and being older (in months) was predictive of science oriented achievement; except for sixth grade, when being younger was always more predictive. Father's status was even more irregular in the direction, although it tended more towards the natural father being more predictive. In stark contrast, no single factor was found to be predictive at all grade levels (second through sixth). Additionally, the number of days absent, participation in the federal lunch program, the number of parents absent, the number of parents employed, and the number of magazine subscriptions per student each entered one or more reading oriented models in four of the five grade levels for the population. Conversely, only father's status, participation in the federal lunch program, and the number of parents absent were predictive of variance in four of the five grade levels for Indian students. However, no patterns of direction were found, although having a natural father and lower absenteeism tended to predict higher achievement.

In looking at the math oriented models, the 1983 grade point average was the only predictor at all five grade levels for the population. The 1983 grade point average, however, was a predictor in only four of the five grade levels for Indian students. While 1983 citizenship grade, student's sex, and school acreage were predictive of math oriented achievement at four of the grade levels for the population, no variables (other than 1983 grade point average) were predictive at four or more of the grade levels for Indian students.

In terms of accounting for the total variance, a number of variables were found to make rather large contributions. That is, fairly consistent contributors to Indian achievement across grade levels were absenteeism, participation in the federal lunch program, participation in the gifted program, school cost, encyclopedia sets per student, magazine subscriptions per student, and the percentage of books lost per student. In comparison, relatively consistent contributors to the population models were participation in the gifted program, emergency telephone listing, number of parents absent, change of schools, school acreage, student's sex, and how long the library was open after school.

Table 59 comparatively presents the percentages of total variance accounted for by the population and Indian models at each grade level. These results indicated that Indian models accounted for more total variance than the population models in 66% of the cases, while the population models explained more variance than the related Indian models in 34% of the cases. In particular, the Indian models were more explanatory than the population models for all ten measures of sixth grade achievement, and in all but fourth grade spelling achievement.

In looking at each achievement area, several trends were found concerning the predictability of academic achievement by grade level. First of all, it was found that in all achievement areas except math concepts, the models were less predictive of sixth grade achievement than of fifth grade achievement for the population. In contrast, for Indian sixth grade students it was found that in all areas except word study skills and math test total, the grade level models were more predictive of sixth than fifth grade achievement. Second, the overall patterns of accountability for the population and Indian students were roughly similar, particularly for the second, third, and fourth grade. Conversely, the patterns of accountability were least similar

Table 59. Comparison of Total Variance Accounted for by the Population and Indian Models for Each Grade Level

Grade Level	Population %	Indian %	Population %	Indian %
	Word Study Skills		Reading Comprehension	
2nd Grade	37.41	42.33	41.85	43.78
3rd Grade	32.93	58.56	57.43	65.30
4th Grade	58.51	65.73	48.73	65.62
5th Grade	55.14	54.21	59.71	49.66
6th Grade	38.56	51.52	51.59	73.24
Average	44.51	54.45	51.86	59.52
	Reading Test Total		Vocabulary Knowledge	
2nd Grade	45.45	47.87	44.57	43.57
3rd Grade	60.31	63.61	49.62	51.12
4th Grade	58.60	78.11	60.26	74.17
5th Grade	61.09	62.66	67.13	37.02
6th Grade	54.51	64.78	38.22	53.52
Average	55.99	63.41	51.96	51.88
	Listening Comprehension		Auditory Test Total	
2nd Grade	51.48	51.50	51.21	42.89
3rd Grade	41.19	32.35	50.34	36.69
4th Grade	63.23	64.31	66.35	73.88
5th Grade	62.90	30.38	48.98	39.28
6th Grade	55.12	59.45	20.48	57.44
Average	54.78	47.60	47.47	50.04

Table 59. (Continued)

Grade Level	Population %	Indian %	Population %	Indian %
	Spelling		Math Concepts	
2nd Grade	46.16	50.62	25.68	24.10
3rd Grade	54.63	39.17	30.97	16.04
4th Grade	59.47	58.77	57.82	78.02
5th Grade	67.13	67.61	47.96	56.06
6th Grade	30.41	70.80	48.82	58.45
Average	51.56	57.39	42.25	46.53
	Math Test Total		Science Knowledge	
2nd Grade	33.69	33.75	39.03	26.32
3rd Grade	38.01	15.24	24.73	18.37
4th Grade	57.70	63.47	41.37	59.50
5th Grade	49.08	58.93	59.86	36.47
6th Grade	48.52	54.87	47.83	51.71
Average	45.40	45.25	42.56	38.47

for the sixth grade models; which explains the differences noted previously.

Nonetheless, no model accounted for more than 79% of the total variance, while on the other hand the least amount explained was only 15% of the variance. Similarly, the models accounted for, on the average, only 42%, 44%, 57%, 58%, and 43% (with an overall average of 49%) of the total variance in the second through sixth grade population models, and 41%, 40%, 68%, 49%, and 60% (with an overall average of 52%) of the total variance for the second through sixth grade Indian models. This meant that, on the average, between 22% and 85% (or a grand average of 50%) of the variance in academic achievement for second through sixth grade students in the Washoe County School District must be explained by factors not included in this study. These results, moreover, substantiated the assumption that understanding academic achievement was, and remains, strongly dependent upon how such achievement was/is measured. That is, if one selected reading test total scores as their measure of academic achievement, they would most likely draw entirely different conclusions than if they used word study skills or science knowledge achievement, because they would be able to account for the reading test total achievement much better.

In looking at the ability of specific types of factors to predict academic achievement across the five analyzed grade levels (2nd through 6th), it was found that the other antecedent measure of academic success, absenteeism, was structurally much more predictive of achievement for population second grade students (Table 54) than for any other grade (Table 55 through Table 58), in that being absent more was weakly associated with subsequent higher achievement test scores in six of the seven reading oriented models. Absenteeism was also quite predictive of achievement for third and sixth grade Indian students, particularly with respect to accounting for achievement variance, having entered into three of the seven reading oriented models. That is, when absenteeism was a predictor, it accounted for moderate (3-10%) to large (>10%) amounts of the variance. In fact, absenteeism for Indian students was moderately correlated, where lower absenteeism was associated with subsequent higher achievement, with third grade reading comprehension (r = -.36), reading test total (r = -.52), and spelling (r = -.38), and sixth grade word study skills (r = -.32) and spelling (r = -.51) achievement test scores. Absenteeism was not, however, a predictor for either group in the fourth grade, nor for the Indian students in the fifth grade.

In contrast to the structural predictiveness of absenteeism in the second grade for the population, it was a predictor of reading test total scores only for second grade Indian students. Interestingly, being absent more often was related to higher second grade reading test achievement for Indian students as well. Indeed, greater absenteeism was associated with higher subsequent achievement for the general population in the second, third, and fifth grades, while for the Indian students less absenteeism was, conversely, generally related to higher subsequent achievement. However, absenteeism did have a suppressive effect on sixth grade listening comprehension for Indian students, which meant that, while low absenteeism appeared to be related ($r = -.13$) to higher listening comprehension achievement, when other factors were held constant it was found that increased absenteeism actually resulted in higher test scores. Thus, unlike either the population or Indian aggregate models of achievement, where absenteeism was not very predictive, absenteeism was predictive by grade level.

In short, absenteeism was structurally quite predictive of second grade achievement for the population, very explanatory of third grade reading comprehension, reading test total and spelling achievement for Indian students, and accounted for moderate amounts of sixth grade word study skills and spelling achievement for Indian students.

There were two antecedent student evaluation measurements included in the analyses for the reading oriented areas of achievement, and one in the math oriented areas. In the population and Indian models, participation in the gifted program was found to be both a structurally and explanatorily consistent predictor, especially for the math oriented population models and for Indian students. Nonetheless, participation in the gifted program was a predictor in only two of the population second grade models, two of the Indian third grade models, four of the population and two of the Indian fourth grade models, two of the population and two of the Indian fifth grade models, and one of the population and three of the Indian sixth grade models. Moreover, it was structurally more predictive of the reading oriented population models across the grades, and also accounted for more variance than in either the aggregate population or Indian models.

The 1983 citizenship grade had generally been a suppressor variable in the population and Indian models, but across the grades it was suppressive less than half the time. Grade level analyses (Tables 54 - 58), furthermore, demonstrated that citizenship grades were a predictor of achievement only for the second, third, and fourth grade reading oriented achievement and structurally much more so for the population than for Indian students. Moreover, it was found in the reading oriented models for the population, citizenship grades were generally a positive predictor in the second grade, but a negative or suppressive predictor in the third and fourth grades. More importantly, it was found that citizenship grades explained quite large amounts of the second grade word study skills and fourth grade spelling variance for Indian students. That is, their 1983 citizenship grades was very predictive of how successful they were in 1984 with respect to word study skills and spelling.

In comparison, 1983 citizenship grade was predictive of math oriented achievement for second through fifth grade students in the population, but, in sharp contrast, only for the sixth grade Indian students. Moreover, the 1983 citizenship grade explained between 8% and 16% of the total variance for fifth grade students in the population, but suppressed -9% of the total variance for sixth grade Indian students. That is, knowing the Indian student's previous citizenship grade increased the accountability of the math concepts model.

The most important observation concerning personal and familial factors from the analyses across the grade levels (Tables 54-58) was that for Indian students they were less important in explaining second than third grade achievement, less predictive of third grade than fourth grade test scores and so on, so that for the sixth grade students they were quite explanatory. Moreover, when such factors did predict achievement for Indian students, they often accounted for more variance than when they entered the population models. In contrast, the predictiveness of personal and familial variables fluctuated considerably for the Washoe County School District population in general. The trend was particularly clear with respect to the reading oriented models. That is, there were seven times as many personal factors that entered the population second grade reading oriented models as entered the Indian models, twice as many that entered the population third and fourth grade models, and two and one half times as many that entered the fifth grade models. Conversely, there were only slightly more personal and familial predictors that entered the sixth grade population models than in the Indian models.

On the other hand, the number of personal and familial variables explaining math oriented achievement, as well as how much variance they accounted for, fluctuated for both groups, being four times more important for the population in the third grade and six times as important for Indian students in the fourth grade.

Structurally, the best or most consistent personal and familial predictors for reading oriented models of achievement were student's sex--despite the variable's inconsistency in whether being male or female was related to higher achievement--(entering 16 of 35 possible models), father's status (15 out of 35 models), change of schools (15 out of 35 models), and number of parents employed (14 out of 35 models) for the population, and student's age (entering 10 out of 35 possible models) and emergency telephone listing (10 out of 35 models) for the Indian students. Unlike for the population, student's sex (entering into only 8 of 35 models) was a poor predictor for Indian students. None of the variables were predictive of achievement in even half of the models across grade levels. The same was generally true of the personal and familial predictors for the math oriented models, except for student's sex which was predictive of achievement in 8 of the 15 possible population models. The best personal and familial predictor of Indian student achievement was student's age, which entered 6 of 15 models. Again, there were also fewer sex differences among Indians, with sex entering into only 3 of 15 models.

Several other structural predictor patterns were of interest. First, several of the familial predictors were clearly more important to explaining achievement for the population than for Indian students. This was particularly true for emergency telephone listing, number of parents employed, change of schools, and student's residence. Secondly, some predictors were more important at particular grade levels than others. Age was more predictive in the fourth grade for Indian students and in the fifth grade for the population (and equally predictive for both in the sixth grade). The number of parents employed was most predictive for the population's fifth grade students, while student's residence was most predictive of fourth grade achievement.

A third pattern found in this panel data was for father's status, which was structurally a good predictor in the early grades, then dropped off, picked up, and dropped off again for the population in general. In contrast, father's status was not much of a predictor in the early grades, but was a good predictor by the sixth grade, when the variable was equally important for both groups. A similar pattern was observed across the results of this panel data for student's sex and student's age. Another pattern was were both the home phone listing and the number of parents absent accounted for more achievement variance in more population models in the early grades and not the later grades, while they accounted for more variance in more Indian models in the later grades and not the earlier grades. Overall, it appeared from this panel data that the social class, or the socioeconomic status, of one's parents/family was somewhat more important at each grade level for explaining Indian student achievement. The last pattern that was observed in this panel data was where student's residence was less predictive at each grade level, so that it was not even predictive of sixth grade achievement for the population in general.

With respect to school context factors, the cost of school construction, the number of encyclopedia sets, the percentage of books lost, and school acreage for the math oriented models, all demonstrated the reversal pattern as well. In contrast to the other variables, across the grade levels, school cost began as a predictor of Indian achievement and then became a predictor of population achievement. The variable for how long the library was open after school was a predictor in all population second grade models of achievement, but was not a predictor for any models in the sixth grade. No one school context factor, except perhaps school acreage or how long the library was open after school per student, stood out across the grades as a good predictor for either the population or Indian students, and, proportionately, were about as structurally predictive for the population as for Indian students.

Lastly, it was observed that when either personal and familial or school context variables were predictive of Indian achievement, they generally accounted for considerably more variance than when they entered the population models. Overall, as with the Indian models of achievement, the school context variables were more explanatory for Indian students than for the population in general.

Manipulable and Non-Manipulable Variables

Table 60 comparatively presents the number and percentages of predictors that were potentially manipulable or non-manipulable by the school system in each domain (or model) of achievement, by grade level, for the Washoe County School District population and Indian

Table 60. Percentages of Manipulable and Non-Manipulable Predictors and Total Variance by Grade Level for the Population

	2nd Grade				3rd Grade				4th Grade				5th Grade				6th Grade				Average			
	Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Word Study Skills																								
Manipulable	5	62	1	50	2	67	2	67	1	33	1	33	4	67	2	50	3	60	2	67	3	60	2	67
Non-Manipulable	3	38	1	50	1	33	1	33	2	67	2	67	2	33	2	50	2	40	1	33	2	40	1	33
Reading Comprehension																								
Manipulable	6	67	2	100	3	50	2	50	2	29	2	100	2	67	2	67	3	38	2	40	3	50	2	67
Non-Manipulable	3	33	0	0	3	50	2	50	5	71	0	0	1	33	1	33	5	62	3	60	3	50	1	33
Reading Test Total																								
Manipulable	6	55	2	67	3	43	3	75	1	25	2	67	2	40	3	75	4	80	1	50	3	50	2	67
Non-Manipulable	5	45	1	33	4	57	1	25	3	75	1	33	3	60	1	25	1	20	1	50	3	50	1	33

Table 60. (Continued)

	2nd Grade				3rd Grade				4th Grade				5th Grade				6th Grade				Average			
	Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Vocabulary Knowledge																								
Manipulable	5	55	1	100	3	60	2	67	5	71	4	67	3	43	1	50	1	33	2	50	3	50	2	67
Non-Manipulable	4	45	0	0	2	40	1	33	2	29	2	33	4	57	1	50	2	67	2	50	3	50	1	33
Listening Comprehension																								
Manipulable	4	57	1	50	2	67	1	50	4	67	2	50	5	50	1	50	2	29	4	57	3	50	2	50
Non-Manipulable	3	43	1	50	1	33	1	50	2	33	2	50	5	50	1	50	5	71	3	43	3	50	2	50
Auditory Test Total																								
Manipulable	3	38	1	100	3	50	1	50	5	62	2	50	2	33	1	50	1	100	2	50	3	50	1	50
Non-Manipulable	5	62	0	0	3	50	1	50	3	38	2	50	4	67	1	50	0	0	2	50	3	50	1	50

Table 60. (Continued)

	2nd Grade				3rd Grade				4th Grade				5th Grade				6th Grade				Average			
	Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Spelling																								
Manipulable	6	67	2	67	4	80	2	100	1	25	2	50	2	25	3	50	1	25	2	33	3	50	2	50
Non-Manipulable	3	33	1	33	1	20	0	0	3	75	2	50	6	75	3	50	3	75	4	67	3	50	2	50
Average for Reading Oriented Models																								
Manipulable	5	55	1	50	3	60	2	67	3	50	2	50	3	43	2	67	2	40	2	50	3	50	2	67
Non-Manipulable	4	45	1	50	2	40	1	33	3	50	2	50	4	57	1	33	3	60	2	50	3	50	1	33

Table 60. (Continued)

	2nd Grade				3rd Grade				4th Grade				5th Grade				6th Grade				Average			
	Fop		Ind		Fop		Ind		Fop		Ind		Fop		Ind		Fop		Ind		Fop		Ind	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Math Concepts																								
Manipulable	5	83	1	100	3	75	1	50	3	100	3	60	2	67	3	75	1	50	3	75	3	75	2	67
Non-Manipulable	1	17	0	0	1	25	1	50	0	0	2	40	1	33	1	25	1	50	1	25	1	25	1	33
Math Test Total																								
Manipulable	5	100	2	100	3	60	1	100	4	80	2	67	3	100	2	100	2	50	1	100	3	75	2	100
Non-Manipulable	0	0	0	0	2	40	0	0	1	20	1	33	0	0	0	0	2	50	0	0	1	25	0	0

Table 60. (Continued)

	2nd Grade				3rd Grade				4th Grade				5th Grade				6th Grade				Average			
	Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind		Pop		Ind	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Science Knowledge																								
Manipulable	3	60	0	0	1	50	1	100	2	100	3	60	4	57	2	67	2	50	2	67	2	50	2	67
Non-Manipulable	2	40	2	100	1	50	0	0	0	0	2	40	3	43	1	33	2	50	1	33	2	50	1	33
Average for Math Oriented Models																								
Manipulable	4	80	1	50	2	67	1	100	3	100	3	60	3	75	2	67	2	50	2	67	3	75	2	67
Non-Manipulable	1	20	1	50	1	33	0	0	0	0	2	40	1	25	1	33	2	50	1	33	1	25	1	33
Average for All Models																								
Manipulable	5	67	1	50	3	60	2	67	3	60	2	50	3	50	2	67	2	50	2	50	3	60	2	67
Non-Manipulable	3	33	1	50	2	40	1	33	2	40	2	50	3	50	1	33	2	50	2	50	2	40	1	33

students only. Similarly, Table 61 comparatively presents the percentages of table and explained variables accounted for by manipulable and non-manipulable factors. As the "other" variables that were methodologically forced into the equations often accounted for relatively large amounts of variance, the results in Table 61 and the discussion below were based upon variances accounted for by the statistically significant ($p < .15$) manipulable and non-manipulable predictors only, and not the "other" variables; (see Appendix L for calculations including the "other" variables).

Generally speaking, it was found that more manipulable than non-manipulable variables were predictive of academic achievement across the grade levels. On the average, there were only three manipulable for every two non-manipulable variables in the population grade level models, but twice as many manipulable as non-manipulable predictors in the Indian grade level models (Table 60). In looking at just the reading oriented models, on the average, half of the variables were manipulable for the population, while twice as many predictors were manipulable for the Indian students. On the other hand, three times as many predictors were manipulable in the math oriented models, on the average, for the population, yet there were still twice as many manipulable variables in the Indian models.

In the second grade, more of the population than the Indian predictors were, on the average, potentially manipulable by the school system. In five of the Indian models, all predictors were potentially manipulable variables, but this was the case in only one of the

Table 61. Percentages of Explained Manipulable and Non-Manipulable Variances by Grade Level

	2nd Grade		3rd Grade		4th Grade		5th Grade		6th Grade		Average	
	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %
Word Study Skills												
Manipulable	67	88	74	52	89	99	91	55	73	75	79	74
Non-Manipulable	33	12	26	48	11	1	9	45	27	25	21	26
Reading Comprehension												
Manipulable	81	100	79	69	22	100	104	93	64	87	70	90
Non-Manipulable	19	0	21	31	78	0	-4	7	36	13	30	10
Reading Test Total												
Manipulable	84	69	72	95	60	94	101	84	91	94	82	87
Non-Manipulable	16	31	28	5	40	6	-1	16	9	6	18	13

Table 61. (Continued)

	2nd Grade		3rd Grade		4th Grade		5th Grade		6th Grade		Average	
	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %
Vocabulary knowledge												
Manipulable	79	100	92	81	58	86	99	82	48	65	75	83
Non-Manipulable	21	0	8	19	42	14	1	18	52	35	25	17
Listening Comprehension												
Manipulable	61	90	86	77	80	72	56	80	36	62	64	76
Non-Manipulable	39	10	14	23	20	28	44	20	64	38	36	24
Auditory Test Total												
Manipulable	56	100	93	84	58	76	72	84	100	68	76	82
Non-Manipulable	44	0	7	16	42	24	28	16	0	32	24	18

Table 61. (Continued)

	2nd Grade		3rd Grade		4th Grade		5th Grade		6th Grade		Average	
	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %
Spelling												
Manipulable	74	81	83	100	100	88	97	63	78	65	86	79
Non-Manipulable	26	19	17	0	0	12	3	37	22	35	14	21
Average for Reading Models												
Manipulable	72	90	83	80	67	88	89	77	70	74	76	82
Non-Manipulable	28	10	17	20	33	12	11	23	30	26	24	18
Math Concepts												
Manipulable	84	100	83	78	100	84	97	91	78	83	88	87
Non-Manipulable	16	0	17	22	0	16	3	9	22	17	12	13

Table 61. (Continued)

	2nd Grade		3rd Grade		4th Grade		5th Grade		6th Grade		Average	
	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %	Pop %	Ind %
Math Test Total												
Manipulable	100	100	77	100	81	93	100	100	89	100	89	99
Non-Manipulable	0	0	23	0	19	7	0	0	11	0	11	1
Science Knowledge												
Manipulable	93	0	90	100	100	76	102	88	65	83	90	69
Non-Manipulable	7	100	10	0	0	24	-2	12	35	17	10	31
Average for Math Models												
Manipulable	92	67	83	93	94	84	100	93	77	89	89	85
Non-Manipulable	8	33	17	7	6	16	0	7	23	11	11	15
Average for All Models												
Manipulable	78	83	83	84	75	87	92	82	72	78	80	83
Non-Manipulable	22	17	17	16	25	13	8	18	28	22	20	17

population models. Conversely, both had one model that contained more non-manipulable than manipulable variables; the Indian science model had all (100%) non-manipulable predictors and the population auditory test total model had 67% non-manipulable predictors.

On the average, twice as many variables (67%) were potentially manipulable as not in the third grade models for Indians, while 60% were manipulable in the population models. In particular, the Indian math oriented models involved, on the average, all manipulable variables (math concepts had one non-manipulable variables). The reading test total model for the population had more non-manipulable than manipulable predictors, but none of the third grade Indian models had fewer than half manipulable variables.

In looking at the results for fourth grade students (Table 60), it was found that on the average, 60% of the population and 50% of the Indian achievement model predictors were potentially manipulable. In looking at just the reading oriented models, half of the predictors for both the population and Indian students were, on the average, manipulable. However, in four of the population and one of the Indian reading oriented models only one-third or less of the predictors were manipulable. In contrast, nearly all the population math oriented predictors were manipulable, while only about two-thirds of them were potentially manipulable for the Indian students only.

Over the ten fifth grade achievement models it was found that, on the average, half of the population and two-thirds of the Indian predictors were potentially manipulable factors. Nonetheless, over half of the predictors (57%) in the population models were, on the average, non-manipulable variables, with four of the seven models having more non-manipulable variables. In contrast, none of the Indian models had fewer than 50% manipulable predictors, although five of the seven were half and half. With respect to the math oriented models, it was found that three times as many variables in the population and twice as many antecedents in the Indian math oriented models were potentially manipulable predictors.

On the average, half of the predictors in the academic achievement models for both the population and Indian sixth grade students were potentially manipulable and half were not. However, as in the fifth grade models, it was found that, on the average, 60% of the predictors in the population (as compared to 50% in the Indian) reading oriented models were non-manipulable variables. Again, four of the seven population and two of the seven Indian reading oriented models involved fewer than 50% manipulable variables. In contrast, all three population math oriented had 50% manipulable variables, and all three Indian models had between 67% and 100% manipulable predictors.

In looking at specific domains or types of achievement models, it was found (Table 60) that all ten models, on the average, were composed of 50% or more manipulable variables. Generally speaking, the models had more manipulable variables for the Indian students only. On the average, the three math oriented models and word study skills models had more than 50% manipulable factors for the population, while the three math oriented models, and the word study skills, reading comprehension, reading test total, and vocabulary knowledge models for Indian students only all had more than 50% manipulable factors. Only in math concepts did the population models have a larger percentage of manipulable predictors, while the Indian word study skills, reading comprehension, reading test total, vocabulary knowledge, math test total, and science knowledge models all had more manipulable predictors than the same population models.

Considerably more population than Indian grade level models involved more non-manipulable (>50%) than manipulable variables. Overall, 14 of the 35 (40%) population reading oriented models had more non-manipulable than manipulable variables, while 4 of the 7 (57%) fourth, fifth and sixth grade population reading oriented models had more non-manipulable than manipulable predictors. Spelling, followed by reading comprehension and reading test total had the greatest percentage of models with more manipulable than non-manipulable variables. In comparison the fourth grade word study skills model was the only one of the 35 (3%) Indian reading oriented models that had more non-manipulable than manipulable predictors. The second grade science model was the only one of the 15 Indian math oriented models by grade level that had more non-manipulable (100%) than manipulable (0%) variables, while none of the population math oriented models had more non-manipulable than manipulable predictors.

On the other hand, 3 (9%) of the 35 population and 5 (14%) of the 35 Indian reading oriented models were found (Table 60) to have 80% or more manipulable predictors. Of these, all five of the Indian models, but only one of the three population models, actually involved all (100%) manipulable variables. In contrast, 6 (40%) of the 15 population and Indian oriented models (each) had 80% or more manipulable predictors. Again, of these, four of the population and all six of the Indian models involved all (100%) manipulable variables. Thus, overall, 3 (6%) of the 50 population grade level models of achievement, in sharp comparison to 11 (22%) of the 50 Indian grade level models involved all manipulable variables. That is, nearly four times as many models of Indian achievement (by grade level) were composed entirely of manipulable antecedent factors.

Table 61 comparatively presents the table and explained variances accounted for by factors potentially manipulable and not manipulable by the school system in each domain (or model) of achievement, by grade level, for the Washoe County School District population and Indian students only. Again, the figures in Table 61 do not include percentages of variance accounted for by the "other" variables methodologically forced into the equations. As such, the explained variances, rather than table variances, will be discussed. The results presented clear empirical evidence that the largest percentages of explained variances in academic achievement were attributable to factors potentially manipulable by the school system. On the average, across the ten achievement domains (or models) and the five grade levels, four times as much of the variance in population achievement and nearly five times (4.8) as much of the variance in Indian student achievement, was accounted for by antecedent variables potentially manipulable by the school system as was attributable to factors beyond the school's control.

With respect to just the reading oriented models, three times as much variance in the population models and four and a half times as much variance in the Indian models was attributed to manipulable variables. In contrast, eight times as much variance in the population and five and a half times as much in the Indian math oriented models was accounted for by non-manipulable variables. Moreover, at all grade levels two-thirds (67%) or more of the average explained variance in reading oriented, math oriented and total (across all ten models of) achievement was attributable to manipulable variables.

In six of the second grade reading oriented models, manipulable variables accounted for more variance in the Indian than in the population models. On the average, 18% more of the explained variance was accounted for by manipulable variables in the Indian second grade reading oriented models. Conversely, 25% more of the explained variance in the population than in the Indian second grade math oriented models was manipulable.

The percentage of manipulably explained variance in the third grade models were, on the average, quite similar with four times as much variance having been explained by potentially manipulable predictors as by non-manipulable factors for both the population and Indian students only. Just the opposite of the results for the second grade, more variance was attributed to manipulable antecedent variables in the population than in the Indian models, except for reading test total where manipulable variables explained 23% more variance in the Indian model. With regards to the third grade math oriented models, more achievement variance was attributable to manipulable predictors of math concepts for the population, but all variance in math test total and science knowledge achievement for Indian students only was manipulable.

In looking at the average percentages of explained variance in achievement, the largest average difference between the population and Indian students was for fourth grade students. That is, the fourth grade Indian models, on the average, had 12% more variance in achievement that was accounted for by manipulable variables, than the fourth grade population models. In comparison, the population fourth grade math oriented models had 10% more manipulable variance than the Indian models, on the average, and the Indian fourth grade reading oriented models had 21% more manipulable variance.

With respect to fifth grade students, 12% more of the achievement variance in the reading oriented models, 7% more of the variance in the math oriented models, and 10% more of the variance overall, on the average, was potentially manipulable by the school system for the population than for Indian students only. Indeed, only the fifth grade Indian listening comprehension and auditory test total achievement models involved more manipulable variance than the population models.

The results (Table 61) indicated that, on the average, 4% more of the explained variance in reading oriented models, 12% more in the math oriented models, and 6% more overall, was manipulable for Indian students but not for the population. Indeed, there was more explained manipulable variance in the Indian models for all models of achievement except auditory test total and spelling.

In looking at each achievement model, manipulable factors accounted for three times as much variance, on the average, as non-manipulable variables, except in population reading comprehension (70% manipulable), population listening comprehension (64%), Indian word study skills (74%), and Indian science knowledge (69%) models. Comparatively, the models ranked as follows in terms of each model's average manipulable variance:

Model	% Manipulable	
	Population	Indians
Word Study Skills	79	74
Reading Comprehension	70	90
Reading Test Total	82	87
Vocabulary Knowledge	75	83
Listening Comprehension	64	76
Auditory Test Total	76	82
Spelling	86	79
Math Concepts	88	87
Math Test Total	89	99
Science Knowledge	90	69

That is, manipulable variables accounted for the largest average amount of variance across the five grade levels in science achievement for the population (but the least amount for the Indian students) and in math test total achievement for the Indian students (and the second largest amount for the population). Moreover, the most obvious differences in manipulable variables were in science knowledge (21%) and reading comprehension (20%).

In contrast to the results on percentages of predictors (Table 60), the results of the number of models with larger percentages of variance accounted for by non-manipulable variables indicated that only 3 (6%) of the 50 population and 1 (2%) of the 50 Indian models of achievement (i.e., science knowledge) had more than 50% of the explained variance accounted for by non-manipulable variables. Conversely, in 28 (56%) of the 50 population and 34 (70%) of the 50 Indian models, manipulable predictors accounted for 80% or more of the explained variance. Moreover, in 9 (18%) of the population and 11 (22%) of the Indian models, 100% of the explained variance was attributed to antecedent predictors potentially manipulable by the school system.

Summary

Comparisons of the results from the stepwise and forced entry multiple regression analyses for the Washoe County School District population and Indian student academic achievement, as measured by standardized achievement test scores, in grades two through six provided empirical evidence that tremendous differences existed between the two groups with respect to explaining such achievement. Generally speaking, the Indian grade level models of achievement were found to be structurally smaller and composed of much fewer non-manipulable predictors, and they often accounted for larger percentages of the total variance. While structurally, previous grades were found to be a very consistent predictor (i.e., entered all models) for the population, such was not the case for the Indian student models. However, previous grades, as did most variables when they entered, accounted for more variance in the Indian models than in the population models.

In terms of total (or table) variance, the grade level models of achievement generally accounted for more variance than the aggregate population and Indian models of achievement. While more of the aggregate models accounted for over half of the total variance, 24 (48%) of the 50 population and 31 (62%) of the 50 Indian models of achievement by grade level accounted for over half of (and up to 73%) the total variance; and, again, often with fewer predictors.

Comparisons in terms of the manipulability of the predictors and the amounts of variance explained by those antecedent variables of academic achievement showed that, on the average, between four (80%) and five (83%) times as much explained variance was accounted for by manipulable variables as by non-manipulable variables. More specifically, 56% of the population and 70% of the Indian models of achievement by grade level had manipulable predictors that accounted for 80% or more of the explained variance. Additionally, in 5 (10%) of the 50 population and 12 (24%) of the 50 Indian models by grade level, manipulable factors also accounted for over 50% of the total (or table) variance.

Additionally, the "other" variables, which were procedurally forced into the equations ($p > .15$) were found (see Appendix L) to account for more than 10% of the total variance in 22% of the (50) grade level models of achievement. That is, statistically nonsignificant factors in toto often accounted for substantively large amounts of the total variance in the models of academic achievement for Indian students.

In conclusion, the empirical results of these analyses by grade level, therefore, have clearly supported the ninth and eleventh research hypotheses:

> H_9: Different antecedents are predictive of standardized achievement test scores at different grade levels in the Washoe County School District.

> H_{11}: The models of academic achievement are more predictive at certain grade levels than others in the Washoe County School District.

With respect to the latter hypothesis, the models were most predictive of fourth grade achievement for Indian students and fifth grade achievement for the population.

Chapter 8

THE MANIPULABILITY OF ACHIEVEMENT

The third research cycle of this study was conducted through two sequential sets of processes pursuant to the objectives of the cycle: to test the previously developed (in the second research cycle) models of academic achievement; and to determine the manipulability, and types (e.g., personal, school) of factors found to be predictive of elementary school students' academic achievement in the Washoe County School District for both the total (weighted) population and for Indian students only. The first set of research processes involved three successive stages, the results from which were reported in Chapters 5, 6, and 7.

Specifically, the results from the evaluation of the correlates of academic achievement in the Washoe County School District (Chapter 5), the multiple regression analyses of population and Indian student academic achievement (Chapter 5), the comparison of these results (Chapter 6), and the multiple regression analyses of population and Indian achievement by grade level have been discussed. These results have demonstrated that antecedent predictors of academic achievement varied considerably and were dependent upon how academic achievement was operationally defined or measured. Additionally, the results have shown that academic achievement was explained by different factors for Indian students than for the Washoe County School District student population in general. Similarly, the results have shown that different factors accounted for achievement at each of the grade levels. The results also indicated that those antecedent factors included in this study were much more explanatory by grade level than for the aggregate population or Indian samples, and that they accounted for more variance in Indian student than in the population academic achievement models by grade level. Moreover, the results of the by grade level analyses have suggested that the largest percentage of explained variance in academic achievement, indeed three to five times as much, was attributable to variables potentially manipulable by the school system.

The second set of procedures was done in two stages, both of which will be discussed below. The first stage framed the results of the first set of research procedures (of the third research cycle) in terms of the antecedent predictors of academic achievement, and the second stage framed the same results in regards to the amount of variance in academic achievement that had been explained by the antecedent predictors. The second part of the third research cycle, therefore, was conducted to provide empirical and statistical evidence concerning the last two research questions:

9. Do manipulable variables account for more of the total variance than non-manipulable variables?

10. Do more manipulable than non-manipulable variables account for the explained variance?

However, as noted in Chapter 5, the results of the first two research cycles suggested the following hypotheses with respect to these two research questions:

H_{12}: Manipulable variables account for more total observed and explained variance in standardized achievement test scores than non-manipulable variables in the Washoe County School District.

H_{13}: More manipulable than non-manipulable variables account for the variance in standardized achievement test scores in the Washoe County School District.

Thus, the second set of research processes was done to test these hypotheses concerning the manipulability of the antecedent predictors and the observed variances in elementary student academic achievement by the school system. Additionally, procedures were followed to determine if significant differences in manipulability and types (i.e., student achievements, evaluations, personal/familial characteristics, and school/ learning context factors) of predictors existed between the general Washoe County School District elementary student population and Indian students. Following these discussions, conclusions concerning the results from both sets of the research processes in the third research cycle (as reported in Chapters 5, 6, 7, and 8) will be made.

Characteristics of Academic Achievement

Several groups of analyses were made during both stages in order to evaluate the characteristics of academic achievement in the Washoe

County School District for Indian students and for the general elementary student population. The first group of analyses were concerned with comparing manipulative characteristics of the general reading and math oriented predictor pools (see Chapter 4) with those of the population and Indian predictor pools based upon the results obtained in this research cycle (see Chapter 5). The second group of analyses compared the manipulability of specific achievement models, as well as the average for reading and math oriented models and for all ten models of achievement. The last group of analyses compared the ability of the different types of factors to account for the observed variances in achievement test scores.

Methodological Clarification

To assess these issues a number of statistics for testing hypotheses about the different characteristics were used. Which technique was employed was essentially dictated by the characteristics of the data and the hypothesis in question. To test the proportional differences in variables used to develop the regression models the binomial test was selected over the *z*-test because in most cases *n* was less than 25 (Siegel, 1956) and Np was less than 5 (Blalock, 1979). Moreover, the binomial test provided the exact probability of observed proportional differences. In order to test proportional predictor differences between the Washoe County School District population and Indian models of achievement, a bivariate nonparametric technique was necessary. Once again, because *n* was small, Fisher's Exact Test was employed (Agresti and Finlay, 1986; Blalock, 1979; Siegel, 1956).

Since there were more than two types of antecedent predictors, to determine if more of one type entered into the models more than others, the chi-square test was used.

In assessing hypotheses concerned with the amount of variance accounted for by the various models, several statistical techniques were also employed. It should be noted that comparisons of the predictor pools, with respect to amounts of explained variance, could not be made because the pools were qualitatively based upon simple appearance in one or more of the models rather than upon quantitative frequency counts. Comparisons of the average amounts of variance explained by the seven reading and three math models for the original, population and Indian models, however, were made by calculating the arithmetic means and variances of the manipulable and non-manipulable variances that had been accounted for. The t-test was used to test the observed differences in these means. However, because the sample sizes and variances were often unequal, an alternative form of the t-test, as suggested by Wright (1986:457-458), was used.

Statistical comparisons of the amount of variance accounted for by manipulable and non-manipulable variables in the specific population and Indian models were also made. Both the binomial test and the chi-square test was used to test these observed differences.

Lastly, statistical comparisons were made to test hypotheses concerning the amount of variance accounted for by antecedents of previous student achievement, student evaluations, personal and familial background characteristics, and school environment and learning context variables. The arithmetic mean and variance for each type of predictor was first calculated for both the seven reading and three math models. Once again, because of small original n sizes and unequal variances, an alternative form of the t-test was used to test the observed mean differences of each type of predictors between Indian students and the Washoe County School District population.

Comparative Analyses of Academic Achievement Predictors

Three separate sets of analyses were made concerning the proportions of manipulable and non-manipulable variables. The first set analyzed the proportions found in the original, population and Indian general reading and math pools. The second set compared the number of manipulable and non-manipulable variables in and across models. The last set of analyses evaluated the number of antecedent variables from each of the four types of factors that were predictors of academic achievement for the Washoe County School District population and Indian students. It should be noted, however, that analyses of the models/pools without grade level and the models by grade level were not made because such questions, while of interest, were beyond the scope of the present study.

Comparison of reading and math predictor pools. General reading and math pools of antecedent predictors were constructed from the results of the stepwise multiple regression analyses (Original Pools), which were discussed in Chapter 4, and the stepwise and forced entry multiple regression analyses, as presented in Chapter 5, for the population (Population Pools), and Indian students only (Indian Pools). These predictor pools were qualitatively developed; that is, if an antecedent variable entered into one or more of the seven reading or three math achievement models for the particular group, then the predictor was included in the respective predictor pool. These reading and math predictor pools are presented in Table 62, along with a listing of the 30 antecedent independent variables (by type of factor) selected for the multivariate regression analyses in this study.

The original reading predictor pool was composed of 21 (78%) of the 30, and the original math predictor pool incorporated 10 (30%) of the 30, independent variables. These predictor pools, then, made up the set of independent variables used for further analyzing the population and Indian students. The population reading predictor pool had 18 (86%) of the 21 predictors in the original reading predictor pool, while the population math predictor pool encompassed all 10 (100%) of the predictors in the original math pool. In comparison, the Indian reading predictor pool was composed of 13 (62%) of the 21 antecedent variables in the original reading pool, and the Indian math predictor pool had 6 (60%) of the 10 predictors that were in the original math pool.

The 30 independent antecedent variables used in the initial stepwise multiple regression analyses proportionally had 60% manipulable and 40% non-manipulable predictors. This meant that the percentage of expected manipulable variables in the original predictor

Table 62. Comparison of Original, Population and Indian Predictor Pools

Types of Predictors/ Antecedent Variables	Original Reading Pool	Population Reading Pool	Indian Reading Pool
A. Academic Achievement			
1. Number of Days Absent in 1982-1983 (m)	X	X	X
2. 1983 Reading Grade (m)	X	X	X
B. Student Evaluations			
1. 1983 Citizenship Grade (m)	X	X	
2. Gifted Program (m)	X	X	X
3. Number of Times Held Back a Grade (m)			
C. Background Characteristics			
1. Age in Months at Time of Test (n)	X		
2. Change of Schools (n)	X	X	
3. Emergency Telephone (m)	X	X	X
4. Father's Status (n)	X	X	X
5. Free & Reduced Lunch (n)	X	X	X
6. Home Phone Listed (n)	X	X	
7. Number of Parents Absent (n)	X	X	X
8. Number of Parents Employed (n)	X	X	X
9. Racial Ethnic Group (n)			
10. Sex (n)	X	X	
11. Student's Residence (n)	X	X	X

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

Table 62. (Continued)

Types of Predictors/ Antecedent Variables	Original Reading Pool	Population Reading Pool	Indian Reading Pool
D. School Environment and Learning Contexts			
1. Acreage Per Student (m)	X	X	
2. Cost of School Per Student (m)	X	X	
3. Encyclopedia Sets Per Student (m)	X		X
4. Grade Level (n)	X	X	X
5. Library Open After School Per Student (m)	X	X	
6. Magazine Subscriptions Per Student (m)	X	X	X
7. Number of Second Grade Special Education Students Per Student (m)			
8. Percentage of Books Added Per Student (m)			
9. Percentage of Books Lost Per Student (m)	X		X
10. School's Age (n)			
11. School's Total Enrollment (m)			
12. School's Median Family Income (m)			
13. Total Library Circulation Per Student (m)			
14. Total Staff Per Student (m)			
Proportion of Manipulable (m) to Non-Manipulable (n) Variables			
60:40	52:48	50:50	54:46

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 62. (Continued)

Types of Predictors/ Antecedent Variables	Original Reading Pool	Population Reading Pool	Indian Reading Pool
A. <u>Academic Achievement</u>			
1. Number of Days Absent in 1982-1983 (m)			
2. 1983 Grade Point Average (m)	X	X	X
B. <u>Student Evaluations</u>			
1. 1983 Citizenship Grade (m)	X	X	X
2. Gifted Program (m)	X	X	X
3. Number of Times Held Back a Grade (m)			
C. <u>Background Characteristics</u>			
1. Age in Months at Time of Test (n)	X	X	
2. Change of Schools (n)			
3. Emergency Telephone (m)			
4. Father's Status (n)			
5. Free & Reduced Lunch (n)			
6. Home Phone Listed (n)	X	X	
7. Number of Parents Absent (n)			
8. Number of Parents Employed (n)			
9. Racial Ethnic Group (n)			
10. Sex (n)	X	X	X
11. Student's Residence (n)			

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is <u>not</u> manipulable by the school district.

Table 62. (Continued)

Types of Predictors/ Antecedent Variables	Original Reading Pool	Population Reading Pool	Indian Reading Pool
D. School Environment and Learning Contexts			
1. Acreage Per Student (m)	X	X	
2. Cost of School Per Student (m)			
3. Encyclopedia Sets Per Student (m)			
4. Grade Level (n)	X	X	X
5. Library Open After School Per Student (m)	X	X	
6. Magazine Subscriptions Per Student (m)			
7. Number of Second Grade Special Education Students Per Student (m)			
8. Percentage of Books Added Per Student (m)			
9. Percentage of Books Lost Per Student (m)	X	X	X
10. School's Age (n)			
11. School's Total Enrollment (m)			
12. School's Median Family Income (m)			
13. Total Library Circulation Per Student (m)			
14. Total Staff Per Student (m)			
Proportion of Manipulable (m) to Non-Manipulable (n) Variables			
60:40	60:40	60:40	67:33

(m)--Indicates variable that is manipulable by the school district.
(n)--Indicates variable that is not manipulable by the school district.

pools was 60%, as that was the proportion of manipulable antecedents used in the analyses. For the population and Indian predictor pools, the expected percentages of manipulable variables was 52% and 60% for the reading and math oriented predictor pools respectively, because that was the proportion of manipulable antecedents that actually entered into the original predictor pools that were used in the multiple regression analyses for the population and Indian students. The expected and actual number and percentage of manipulable variables in the reading oriented predictor pools were as follows:

	Manipulable Variables Expected		Manipulable Variables Entered		p-value
Predictor Pool	n	%	n	%	
Original	18	60	11	52	.13
Population	11	52	9	50	.18
Indian	11	52	7	54	.22

A binomial test of proportions for each predictor pool indicated that none of the observed percentages of manipulable variables in the original, population, and Indian reading oriented predictor pools were statistically greater or less than expected by chance. It was substantively interesting to note, however, that the Indian reading predictor pool was the only one to have a larger percentage of manipulable predictors than expected.

The expected and actual number and percentage of manipulable variable in the math oriented predictor pools were as follows:

	Manipulable Variables Expected		Manipulable Variables Entered		p-value
Predictor Pool	n	%	n	%	
Original	18	60	6	60	.25
Population	6	60	6	60	.25
Indian	6	60	4	67	.31

Again, a binomial test of proportions for each of the predictor pools showed that none of the observed percentages of manipulable variables in the math oriented pools were statistically larger or smaller than expected by chance. Indeed, for both the original and population, the math predictor pools had exactly the same percentage of manipulable variables as was expected by chance alone, while, once more, the Indian pool had a larger percentage of manipulable variables than expected by chance.

The number and percentage of manipulable and non-manipulable variables, then, in each of the three reading pools were as follows:

	Manipulable Variables		Non-Manipulable Variables	
Predictor Pool	n	%	n	%
Original	11	52	10	48
Population	9	50	9	50
Indian	7	54	6	46

A chi-square statistical test of the observed distributions was not significant ($\underline{\chi}^2$ = .05, p = n.s.), which meant that the distributions of manipulable and non-manipulable variables were not statistically significantly different between the three reading oriented predictor pools.

The number of manipulable and non-manipulable variables in each of the three math oriented predictor pools were as follows:

	Manipulable Variables		Non-Manipulable Variables	
Predictor Pool	n	%	n	%
Original	6	60	4	40
Population	6	60	4	40
Indian	4	67	2	33

The chi-square statistical test was not statistically significant ($\underline{\chi}^2$ = .09, p = n.s.), which meant that the observed distributions in the three math oriented predictor pools of manipulable and non-manipulable variables were not statistically significantly different.

In sum, statistical tests of the observed differences in manipulable and non-manipulable antecedent variables in the original, population, and Indian predictor pools were not statistically significantly ($p < .05$) different from what would have been expected by chance based upon the proportion of manipulable variables included in the various multiple regression analyses. Nonetheless, in comparing the distributions of manipulable variables, the fact that the Indian reading and math oriented predictor pools were the only ones to have a larger proportion of manipulable variables than was expected by chance was substantively significant.

Comparisons of manipulability by models of achievement. The second group of analyses was concerned with the distributions of manipulable and non-manipulable predictors for each specific achievement model, as well as for the reading and math oriented models in general. Table 63 presents the number and percentage of manipulable and non-manipulable variables that entered in each of the original (stepwise only), population, and Indian models of achievement. The average number and percentage of predictors in the seven reading oriented, three math oriented, and all ten models are also presented in Table 63. Analyses of manipulable and non-manipulable predictors through statistical examination of differences in the proportions between the original, population, and Indian models all proved to be nonsignificant (i.e., $p > .05$). Thus,

Table 63. Number and Percentage of Manipulable and Non-Manipulable Variables in the Original, Population and Indian Regression Models of Achievement

	Original Models		Population Models		Indian Models	
	n	%	n	%	n	%
Word Study Skills						
Manipulable	3	60	4[a]	57	3[b,c]	60
Non-Manipulable	2	40	3	43	2	40

a--A binomial test between the original and population models resulted in p = .29.
b--A binomial test between the original and Indian models resulted in p = .35.
c--A Fisher's exact probability test between population and Indian models resulted in p = .44.

	Original Models		Population Models		Indian Models	
Reading Comprehension						
Manipulable	5	83	7[a]	70	3[b,c]	100
Non-Manipulable	1	17	3	30	0	0

a--A binomial test between the original and population models resulted in p = .16.
b--A binomial test between the original and Indian models resulted in p = .57.
c--A Fisher's exact probability test between population and Indian models resulted in p = .42.

	Original Models		Population Models		Indian Models	
Reading Test Total						
Manipulable	5	62	5[a]	62	4[b,c]	67
Non-Manipulable	3	38	3	38	2	33

a--A binomial test between the original and population models resulted in p = .28.
b--A binomial test between the original and Indian models resulted in p = .32.
c--A Fisher's exact probability test between population and Indian models resulted in p = .42.

Table 63. (Continued)

	Original Models n	Original Models %	Population Models n	Population Models %	Indian Models n	Indian Models %
Vocabulary Knowledge						
Manipulable	3	50	6[a]	60	2[b,c]	67
Non-Manipulable	3	50	4	40	1	33

a--A binomial test between the original and population models resulted in p = .20.
b--A binomial test between the original and Indian models resulted in p = .38.
c--A Fisher's exact probability test between population and Indian models resulted in p = .49.

	Original Models n	Original Models %	Population Models n	Population Models %	Indian Models n	Indian Models %
Listening Comprehension						
Manipulable	2	29	4[a]	40	3[b,c]	60
Non-Manipulable	5	71	6	60	2	40

a--A binomial test between the original and population models resulted in p = .19.
b--A binomial test between the original and Indian models resulted in p = .12.
c--A Fisher's exact probability test between population and Indian models resulted in p = .33.

	Original Models n	Original Models %	Population Models n	Population Models %	Indian Models n	Indian Models %
Auditory Test Total						
Manipulable	3	60	4[a]	40	4[b,c]	80
Non-Manipulable	2	40	6	60	1	20

a--A binomial test between the original and population models resulted in p = .11.
b--A binomial test between the original and Indian models resulted in p = .25.
c--A Fisher's exact probability test between population and Indian models resulted in p = .16.

Table 63. (Continued)

	Original Models		Population Models		Indian Models	
	n	%	n	%	n	%
Spelling						
Manipulable	4	57	4[a]	57	4[b,c]	44
Non-Manipulable	3	43	3	43	5	56

a--A binomial test between the original and population models resulted in p = .29.
b--A binomial test between the original and Indian models resulted in p = .20.
c--A Fisher's exact probability test between population and Indian models resulted in p = .34.

	Original Models		Population Models		Indian Models	
	n	%	n	%	n	%
Average for Reading Models						
Manipulable	4	57	5[a]	56	3[b,c]	60
Non-Manipulable	3	43	4	44	2	40

a--A binomial test between the original and population models resulted in p = .26.
b--A binomial test between the original and Indian models resulted in p = .34.
c--A Fisher's exact probability test between population and Indian models resulted in p = .42.

	Original Models		Population Models		Indian Models	
	n	%	n	%	n	%
Math Concepts						
Manipulable	4	67	5[a]	71	3[b,c]	75
Non-Manipulable	2	33	2	29	1	25

a--A binomial test between the original and population models resulted in p = .31.
b--A binomial test between the original and Indian models resulted in p = .40.
c--A Fisher's exact probability test between population and Indian models resulted in p = .51.

Table 63. (Continued)

	Original Models n	Original Models %	Population Models n	Population Models %	Indian Models n	Indian Models %
Math Test Total						
Manipulable	4	100	5[a]	83	3[b,c]	100
Non-Manipulable	0	0	1	17	0	0

a--A binomial test between the original and population models resulted in p = 1.00.
b--A binomial test between the original and Indian models resulted in p = 1.00.
c--A Fisher's exact probability test between population and Indian models resulted in p = .67.

	Original Models n	Original Models %	Population Models n	Population Models %	Indian Models n	Indian Models %
Science Knowledge						
Manipulable	4	67	4[a]	67	4[b,c]	80
Non-Manipulable	2	33	2	33	1	20

a--A binomial test between the original and population models resulted in p = .33.
b--A binomial test between the original and Indian models resulted in p = .33.
c--A Fisher's exact probability test between population and Indian models resulted in p = .45.

	Original Models n	Original Models %	Population Models n	Population Models %	Indian Models n	Indian Models %
Average for Math Models						
Manipulable	4	80	5[a]	71	3[b,c]	75
Non-Manipulable	1	20	2	29	1	25

a--A binomial test between the original and population models resulted in p = .28.
b--A binomial test between the original and Indian models resulted in p = .41.
c--A Fisher's exact probability test between population and Indian models resulted in p = .51.

Table 63. (Continued)

	Original Models n	%	Population Models n	%	Indian Models n	%
Average for All Models						
Manipulable	4	67	5[a]	62	3[b,c]	60
Non-Manipulable	2	33	3	38	2	40

[a]--A binomial test between the original and population models resulted in $p = .27$.

[b]--A binomial test between the original and Indian models resulted in $p = .33$.

[c]--A Fisher's exact probability test between population and Indian models resulted in $p = .44$.

none of the observed differences in the distributions of manipulable (and non-manipulable) variables were statistically significantly different from what would have been expected by chance alone. That such differences in the proportions were not statistically significant may have been due to the small n sizes (i.e., 3 to 10 variables per model) involved.

Comparisons of types of antecedent predictors. The last set of analyses were concerned with determining if observed differences between the population and Indian models, with respect to the numbers of previous student achievements, previous student evaluations, personal and familial background characteristics, and school environment and learning contexts, were statistically significant. For these analyses the distinction between reading oriented and math oriented models was retained. As the number of variables for each type of predictor was very small (or none), which may be why statistical significance was not found, in any one of the ten models of achievement, model by model analyses were not made. Table 64 reports the observed and expected frequencies for each of the four types of antecedents for both the reading and math oriented models, and the calculated chi-square value for the observed differences between the population and Indian models. Frequencies were tabulated by counting each predictor from each model into one of the four types. For example, previous grades entered into all seven of the population reading oriented models and previous attendance also entered into two of the seven models, resulting in an observed

Table 64. Comparison of Variable Frequencies of Academic Achievement, Student Evaluation, Personal and Familial Background Characteristics, and School Environment and Learning Context Predictors

Frequency	Reading Oriented Models Population	Indian	Total	Math Oriented Models Population	Indian	Total
Academic Achievement						
Observed	9	8	17	3	3	6
Expected	8.5	8.5		3	3	
	χ^2 = .06, p = n.s.			χ^2 = 0.0, p = n.s.		
Student Evaluations						
Observed	6	4	10	5	4	9
Expected	5	5		4.5	4.5	
	χ^2 = .40, p = n.s.			χ^2 = .22, p = n.s.		
Personal and Familial Background Characteristics						
Observed	30	12	42	4	1	5
Expected	21	21		2.5	2.5	
	χ^2 = 7.72, $p < .01$			χ^2 = 1.8, p = n.s.		
School Environment and Learning Contexts						
Observed	17	12	29	7	4	11
Expected	14.5	14.5		5.5	5.5	
	χ^2 = .86, p = n.s.			χ^2 = .82, p = n.s.		

frequency of nine predictors for the academic achievement type of variables in the population models.

Results of the chi-square test indicated that the only observed difference that was statistically different was for the number of background characteristics in the reading population models. That is, the number of times background characteristics structurally predicted reading oriented academic achievement for the population was statistically greater than expected by chance. This meant, as well, that background characteristics were statistically less important in explaining the reading oriented academic achievement of Indian students than for students in the Washoe County School District in general.

Summary. Statistical analyses of the proportion or frequencies of manipulable and non-manipulable antecedent predictors found no differences between the original, population, and Indian models, except for the observed difference between the population and Indian reading oriented models with respect to the importance of personal and familial background characteristics. That is, background factors, all but one of which would not be manipulable by the school system, were statistically less important in explaining Indian student reading oriented achievement than for students in the Washoe County School District in general.

Comparative Analysis of Explained Variance

Similar to the analyses of the proportion of variables entering into the various models that would be potentially manipulable by the school system, three sets of evaluations were made of the variance accounted for by manipulable and non-manipulable variables. The first group of analyses compared the average amounts of variance explained by manipulable and non-manipulable antecedent predictors in the original, population, and Indian reading and math oriented models of achievement. The second set of analyses compared each of the ten population and Indian models of achievement for amounts of variance explained by manipulable and non-manipulable factors. The last set of analyses compared the population and Indian models with respect to the average amounts of variance explained by previous student academic achievement, previous student evaluations, personal and familial background characteristics, and school environment and learning context types of predictors. Separate analyses were made for the reading and math oriented models of academic achievement.

Comparison of average variances in reading and math oriented models. An assumption made for these analyses was that the average percentage of variance explained by manipulable variables should be theoretically proportionate to the percentage of manipulable variables in the respective reading and math oriented predictor pools. As such, the percentage of manipulable variables in the population reading (50%) and math (60%) and Indian reading (54%) and math (67%) predictor pools were used as expected percentages of explained variance.

The expected and actual average percentages of explained variance accounted for by manipulable variables in the reading oriented models, therefore, were as follows:

Predictor Pool	% of Variance Expected	Average % of Explained Variance	p-value
Original	52	79	.01
Population	50	82	.001
Indian	54	92	.001

The z-test of proportions for the average percentage of explained variance was statistically significant for the original (z = 2.7, p <.01), population (z = 3.2, p <.001), and Indian (z = 4.2, p <.001) reading oriented models of achievement. This meant that the average proportion of explained variance in the reading oriented models accounted for by manipulable factors was statistically significantly greater than expected relative to the proportion of manipulable variables in the reading oriented predictor pools used for the original, population, and Indian multiple regression analyses.

In fact, manipulable variables accounted for between four and nine times as much variance, on the average, as did non-manipulable variables in reading oriented achievement. That is, over three-fourths of the explained variance in reading oriented achievement was potentially manipulable by the school system. Moreover, it was clear that manipulable predictors accounted for substantively more explained variance (i.e., >10% more) in the Indian reading oriented models (92%), than in either the original (79%) or the population (82%) models.

Further, the expected and actual average amounts of explained variance accounted for by manipulable variables in the <u>math oriented models</u> were as follows:

Predictor Pool	% of Variance Expected	Average % of Explained Variance	p-value
Original	60	91	.001
Population	60	90	.001
Indian	67	96	.001

As with the reading oriented models, the z-test of proportions for the average amount of explained variances was found to be statistically significant for the original (z = 3.44, p <.001), population (z = 3.33, p <.001), and Indian (z = 3.62, p <.001) math oriented models of achievement. Again, this meant that in each of the three cases, the average percentage of explained variance accounted for by manipulable predictors was significantly larger than expected based upon the proportion of manipulable factors in the math oriented pools used for the original, population and Indian multiple regression analyses.

Manipulable variables unquestionably accounted for more than nine times as much variance, on the average, as did non-manipulable factors in the math oriented models. Over nine-tenths of the explained variance in math oriented achievement test scores, then, was potentially manipulable by the school system. Additionally, it was found that manipulable variables accounted for substantively more variance (i.e., 5%), on the average, in the Indian than in the other math oriented models.

The average expected and actual average percentages of explained variance accounted for by manipulable variables across the ten models of academic achievement were as follows:

Predictor Pool	Average % of Explained Variance	Average % of Explained Variance	p-value
Original	56	83	.01
Population	55	84	.01
Indian	60	94	.001

Clearly, substantively more variance, on the average, was accounted for by manipulable predictors in the Indian models of academic achievement than in the original or population models of achievement. The results of the z-test analyses also indicated that statistically more variance, on the average, was accounted for by manipulable variables than was expected based upon the average proportions of manipulable variables in the original, population and Indian models.

As a result of these analyses, statistical comparisons of variances attributed to manipulable predictors were made between the original, population, and Indian reading and math oriented models of achievement. Table 65 reports the means and t-ratio values by pairs of models for total variances accounted for by manipulatle variables. While none of the statistical comparisons were significant ($p < .05$) several substantively significant results were found. As noted above, the mean amounts of variance accounted for by the reading and math oriented models were essentially the same in both the original and population models of achievement. On the other hand, the average amount of manipulable variances explained by the Indian models was considerably different from those in the original and population

Table 65. Mean Comparisons of Average Amounts of Variances Accounted for by Manipulable Variables

Types of Models	Average % of Table Variance Accounted for by Manipulable Variables %	%	t-ratio
	Original	Population	
Reading Oriented	25.19	25.46	-.09
Math Oriented	28.15	27.89	.10
	Population	Indian	
Reading Oriented	25.46	29.08	-1.02
Math Oriented	27.89	33.51	-.88

models. Additionally, it was again noted that manipulable variables accounted for substantively more variance in the Indian than the population (or original) models.

The results of the mean comparisons of variance accounted for by non-manipulable variables are presented in Table 66. Interestingly, the mean comparison (t-test) of the average amount of non-manipulable variance in the population reading oriented models was statistically significantly ($t = 2.19$, $p < .05$) greater than the variance accounted for by non-manipulable variables in the Indian reading oriented models. That is, antecedent predictors, which were not potentially manipulable by the school system, accounted for statistically significantly less variance in reading oriented models of Indian student achievement than they did for the Wasnoe County School District students in general, which punctuates the results reported earlier for the number of non-manipulable predictors for Indian students.

Table 67 summarizes the table and explained variances for each model, for the reading and math oriented model averages, and for the averages of the ten models. The results (Table 67) indicated that non-manipulable variables accounted for the largest amounts of variance in the population models first, then the original models, and lastly the Indian models. Indeed, non-manipulable variables accounted for more than twice as much explained variance, on the average, in the population models (16%) as in the Indian models (6%). Moreover, the amount of explained variance accounted for by non-manipulable

Table 66. Mean Comparisons of Average Amounts of Variances Accounted for by Non-Manipulable Variables

Types of Models	Average % of Table Variance Accounted for by Non-Manipulable Variables %	%	t-ratio
	Original	Population	
Reading Oriented	5.41	5.61	-.15
Math Oriented	2.81	3.06	-.14
	Population	Indian	
Reading Oriented	5.61	2.19	2.19*
Math Oriented	3.06	1.13	1.99

*--$p < .05$.

Table 67. Comparisons of Table and Explained Variances in the Original, Population, and Indian Models of Achievement

Model[a]	Original Models				Population Models				Indian Models			
	Manipulable		Non-Manipulable		Manipulable		Non-Manipulable		Manipulable		Non-Manipulable	
	Tab[b] %	Exp[c] %	Tab[b] %	Exp[c] %	Tab[b] %	Exp[c] %	Tab[b] %	Exp[c] %	Tab[b] %	Exp[c] %	Tab[b] %	Exp[c] %
SKLS	18.41	81	4.26	19	19.73	85	3.49	15	22.94	80	5.68	20
READ	28.57	95	1.61	5	28.31	89	3.43	11	36.81	100	0.00	0
READT	32.46	85	5.55	15	32.06	90	3.43	10	43.02	98	.79	2
VOC	22.32	73	8.38	27	26.34	80	6.75	20	22.45	98	.40	2
LIST	18.20	64	10.02	46	19.43	65	10.25	35	19.87	87	2.86	13
AUDIT	17.36	75	5.69	25	20.59	79	5.31	21	29.16	100	0.00	0
SPELL	31.66	83	6.69	17	31.74	83	6.62	17	29.10	84	5.58	16
Average for Models	24.14	79	6.03	22	25.46	82	5.61	18	29.05	92	2.19	8
MATH	27.32	90	3.08	10	26.33	89	3.09	11	36.56	98	.71	2
MATHT	32.82	100	0.00	0	32.10	97	.89	3	38.98	100	0.00	0
SCI	24.30	82	5.36	18	24.96	83	5.21	17	25.00	90	2.69	10
Average for Models	28.15	91	2.81	9	27.80	90	3.06	10	33.51	96	1.13	4
Average for All Models	25.34	83	5.06	17	26.16	84	4.85	16	30.39	94	1.87	6

[a]--Model names are as follows: SKLS--Word Study Skills; READ--Reading Comprehension; READT--Reading Test Total; VOC--Vocabulary Knowledge; LIST--Listening Comprehension; SPELL--Spelling; AUDIT--Auditory Test Total; MATH--Math Concepts; MATHT--Math Test Total SCI--Science

[b]--Percentage of table (or total) variance accounted for in the dependent variable.

[c]--Percentage of explained variance accounted for in the dependent variable. The variance accounted for by the "other" variables statistically forced into the equation was not included in the comparisons or for purposes of calculating the explained variance.

variables, on the average, was essentially the same for both the original (17%) and population (16%) models.

Comparison of variances by models. Table 68 comparatively presents the amounts of variance for each of the ten dependent variables accounted for by manipulable and non-manipulable antecedent predictors in the population and Indian models, along with the calculated chi-square value. The results of the statistical tests indicated that the auditory test total variance was the only one of the ten crosstabulations that was statistically significant at or beyond the .05 level. That is, the chi-square test of observed manipulable and non-manipulable variances indicated that non-manipulable variables accounted for statistically significantly ($p < .05$) more variance in the population than in the Indian model of auditory test total achievement.

Comparison of explained variances by types of predictors. The results of the mean comparisons (or *t*-tests) of variance explained by previous academic achievement, student evaluations, personal and familial background characteristics, and school environment and learning context factors between the population and Indian reading and math oriented models are presented in Table 69. Three of these statistical evaluations were found to be statistically significant at or beyond the .05 level. First, the mean amount of variance explained by previous student evaluations was statistically significantly greater in both the Indian reading oriented ($t = -2.19$, $p < .05$) and

Table 68. Comparisons of Variances Accounted for by Manipulable and Non-Manipulable Predictors

Model	Table Variance Population %	Table Variance Indians %
Word Study Skills		
Manipulable	19.73	22.94
Non-Manipulable	3.49	5.68
Total	23.22	28.62
	$\chi^2 = 0.01$	p = n.s.
Reading Comprehension		
Manipulable	28.31	36.81
Non-Manipulable	3.43	0
Total	31.74	36.81
	$\chi^2 = 2.22$	$p < .20$
Reading Test Total		
Manipulable	32.06	43.22
Non-Manipulable	3.43	.79
Total	35.49	44.01
	$\chi^2 = 1.11$	p = n.s.

Table 68. (Continued)

Model	Table Variance: Population %	Table Variance: Indians %
Vocabulary Knowledge		
Manipulable	26.34	22.45
Non-Manipulable	6.75	.40
Total	33.09	22.85
	$X^2 = 2.71$	$p < .10$
Listening Comprehension		
Manipulable	19.43	19.87
Non-Manipulable	10.25	2.86
Total	29.68	22.73
	$X^2 = 2.24$	$p < .20$
Auditory Test Total		
Manipulable	20.59	29.16
Non-Manipulable	5.31	0.00
Total	25.90	29.16
	$X^2 = 4.47$	$p < .05$

Table 68. (Continued)

Model	Table Variance Population %	Indians %
Spelling		
Manipulable	31.74	29.10
Non-Manipulable	6.62	5.58
Total	38.36	34.68
	χ^2 = .06	p = n.s.
Math Concepts		
Manipulable	26.60	36.56
Non-Manipulable	3.09	.71
Total	29.69	37.27
	χ^2 = .90	p = n.s.
Math Test Total		
Manipulable	32.10	38.98
Non-Manipulable	.89	0.00
Total	32.99	38.98
	χ^2 = .00	p = n.s.
Science Knowledge		
Manipulable	24.96	25.00
Non-Manipulable	5.21	2.69
Total	30.17	27.69
	χ^2 = .20	p = n.s.

Table 69. Comparison of Average Amounts of Variances Accounted For by Type of Predictor

Type of Variable	Reading Oriented Models: Mean % of Variance For Population	Reading Oriented Models: Mean % of Variance For Indians	Reading Oriented Models: t-value	Math Oriented Models: Mean % of Variance For Population	Math Oriented Models: Mean % of Variance For Indians	Math Oriented Models: t-value
Academic Achievement	20.00	24.15	-1.31	23.31	26.72	-1.09
Student Evaluations	.13	1.66	-2.19*	1.29	2.60	-7.71***
Background Characteristics	6.12	2.08	3.81**	2.48	.24	1.15
School Environment	4.54	3.34	1.10	5.37	5.09	.30

*--$p < .05$
**--$p < .01$
***--$p < .001$

math oriented ($\underline{t}$ = -7.71, p <.001) models. This meant that previous teacher evaluations were statistically significantly more important in explaining Indian student achievement than elementary student population achievement in general.

Second, the average amount of variance explained by personal and familial background characteristics was statistically significantly greater in the population reading oriented ($\underline{t}$ = 3.81, p <.01) models than in the same Indian models. In other words, contrary to most assumptions, but in line with the findings of Coleman et al. (1966), background characteristics were more explanatory of population than Indian student reading oriented achievement. That is, Coleman et al. concluded that based upon their large cross-sectional study, background characteristics were the most influential predictors of student achievement. While the results of the study reported here, that over three-fourths of the variance in academic achievement test scores was manipulable, have shown that Coleman et al. were not correct in their conclusion that background factors were the most predictive of achievement, the results have suggested that they may have been partially right to the degree that background factors were significantly more predictive of population rather than Indian student achievement. Third, the results demonstrated that, on the average, previous grades (or academic achievement) accounted for substantively more variance in the Indian models than in the population models.

Summary. Statistical analyses of the proportions of predictors and variance that were potentially manipulable by the school system, demonstrated that significantly larger amounts of variance, indeed between three and nine times as much variance, was accounted for by proportionately more manipulable variables as by non-manipulable factors. The analyses also found that substantively more explained variance in the Indian models was potentially manipulable by the school system. Furthermore, statistically significantly more explained variance was accounted for by non-manipulable variables in the reading oriented models of achievement for the population than for Indian students only.

Statistical comparisons of the four types of predictors found that teachers' previous evaluations were statistically significantly more predictive of Indian student achievement than population achievement. That is, how the previous teacher subjectively evaluated the Indian student's citizenship, or whether the teacher recommended the Indian student for participation in the gifted student program, were significantly more important to understanding Indian rather than population achievement. Conversely, personal and familial background characteristics were found to be significantly more important to understanding population than Indian student reading oriented achievement.

Conclusions

Through two sets of research processes the results of the third research cycle have provided empirical evidence concerning a number of research questions and related hypotheses concerning the academic achievement of elementary students in the Washoe County School District, and for the Indian students in particular. The first set of processes involved three stages, while the second set had two stages. The results of the first stage delineated those independent variables that correlated (Chapter 4) with academic achievement, as measured by ten subtest and test scores of the Stanford Achievement Test, and their intercorrelations with each other (Chapter 5). The results of the second stage produced predictor models of achievement, for each of the ten dependent variables, for both the Washoe County School District elementary student population and for the Indian students (Chapter 5), which were then compared and contrasted (Chapter 6). As grade level had proved to be a good predictor, and because it had been suggested by the literature to be a potential predictor, grade level was removed from the predictor pools and new models were developed (Chapter 7).

From the ten models for both the population and the Indian students, separate predictor pools for the population and Indian students were also built (Table 62). The results from the third stage produced predictor models for each of the five grade levels (second through sixth) included in the study, for both the population and Indian students. The second set of processes in the research cycle, as reported in this chapter, further analyzed the results to determine what proportion of the predictors and how much of the total variance were potentially manipulable by the school system, and what types of factors (e.g., student evaluations or personal/familial variables) were the most predictive of academic achievement.

Specifically, the third cycle of the research sought empirical evidence concerning the following research questions:

5. Are different factors antecedent predictors of achievement for Indian and non-Indian students?

6. Are different factors antecedent predictors of achievement across different grade levels?

7. Is residence (reservation, colony, urban) a determinant of Indian student achievement?

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

9. Do manipulable variables account for more of the total variance than non-manipulable variables?

10. Do manipulable variables account for more of the explained variance than non-manipulable variables?

The third research cycle also sought empirical evidence to either refute or verify the following research hypotheses concerned with these questions:

H_8: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

H_9: Different antecedents are predictive of standardized achievement test scores at different grade levels in the Washoe County School District.

H_{10}: Residence is not a determinant predictor of Indian student achievement in the Washoe County School District.

H_{11}: The models of academic achievement are more predictive at certain grade levels than others in the Washoe County School District.

H_{12}: Manipulable variables account for more total variance in achievement than non-manipulable variables in the Washoe County School District.

H_{13}: More manipulable than non-manipulable variables account for the observed variances in achievement in the Washoe County School District.

Antecedent Predictors

The eighth research hypothesis (H_8) was formulated, as an answer to the fifth research question, as a result of both the review of previous studies and the results of the first two cycles of this study. As such, verification of the hypothesis that different antecedents were predictors of Indian achievement than for the general population was highly probable. Indeed, the results of the second (and third) stage fully verified that different antecedent variables were involved in predicting Indian student achievement than for their classmates. These differences, however, were not absolute. In particular, when predictors were looked at across specific achievement models and general predictor pools formed for the population and Indian students, no significant differences existed in terms of the number of manipulable and non-manipulable variables. On the other hand, considerable differences existed with respect to how much variance specific variables explained in Indian student and population achievement. Previous grades, however, was generally the best predictor in terms of the number of models and total variance it was involved with.

Different factors were both structurally and explanatorily ($\underline{R}^2$) involved in predicting or explaining the academic achievement of

Indian students than for the Washoe County School District students in general. Moreover, the results clearly substantiated the basic assumption of this study that how one measures academic achievement affects what factors account for such success (or failure). Different factors were predictive of word study skills than reading comprehension, and both involved slightly different predictors, and accounted for different amounts of variance, than reading test total achievement. Hence, structural and explanatory differences were observed for both dependent measures and sample groups (population and Indian students).

These results also verified the ninth research hypothesis, that different antecedents were indeed predictive of standardized achievement scores (or academic achievement) at different grade levels. Moreover, large differences in the predictors, and amounts of variance explained by those variables, were also found both between the various measures (or models) of academic achievement and the population and Indian students by grade level. Perhaps the most interesting result was that the predictors accounted for significantly more of the measured variance in achievement at particular grade levels than for the aggregate population or Indian samples in general. Moreover, the grade level models exhibited greater structural differences between the population and Indian students than did the models for the aggregate population and Indian student samples. Indeed, for second and third grade Indian students, previous grades often were not predictive, or were less predictive, of academic achievement than other factors.

In sum, the empirical results of this study established that different antecedent factors were predictive of elementary Indian student achievement than for population achievement, that predictors differed considerably and were dependent upon how academic achievement was specifically measured, and that predictors of achievement at different specific grade levels varied tremendously, particularly for Indian students. That is, if one desired to explain what factors contributed to a student's academic achievement (in the Washoe County School District), then whether the student was Indian or not, what grade level the student was in, and how such achievement was measured would all have to be known, because the results of this study have shown that student academic achievement varies considerably by these factors. Accordingly, the empirical results clearly suggested the following research generalizations with respect to the eighth and ninth research hypotheses, and the fifth and sixth research questions:

1. Different antecedent factors are predictive of different measures of academic achievement.

2. In comparing student achievement between Indian students and other students in general, different antecedent factors are predictive of achievement for Indian students than their classmates.

3. In general, previous grades are a consistent, even if not an especially powerful, predictor of academic achievement, as variously measured by academic achievement tests.

4. Antecedent predictors of academic achievement are different at each grade level, for both Indian students and students in general.

Student's Residence

The review of previous research in Chapter 1 suggested that where a student lived was a particularly strong determinant of student achievement, especially in the Washoe County School District. It was of interest, therefore, to determine if such was still the case:

7. Is residence (reservation, colony, rural, urban) a determinant of Indian student achievement?

Data analyses in the second cycle of this research, however, suggested the following hypothesis concerning residence:

H_{10}: Residence is not a determinant predictor of Indian student achievement in the Washoe County School District.

That is, this hypothesis was deduced as a direct result of the multiple regression analyses discussed in Chapter 4, in which residence structurally entered into only one of the ten models of academic achievement constructed through stepwise multiple regression techniques. Indeed, such results were somewhat unexpected since descriptive analyses had been statistically significant ($\underline{X}^2 = 142$, p $<.001$; $\underline{X}^2 = 13.93$, p $<.001$). Conversely, associative analyses had indicated that residence was only weakly, and consistently negatively, associated with achievement. Hence, the results of the third research cycle also supported the tenth hypothesis that:

H_{10}: Residence is not a determinant predictor of Indian student achievement in the Washoe County School District.

Results of the stepwise and forced entry multiple regression analyses for Indian students, as reported in this chapter, found that residence, whether the student's home was in either the urban Reno-Sparks city/Indian Colony area or the rural Washoe County/Pyramid

Lake Indian Reservation area, was structurally a predictor in two of the ten predictor models of Indian achievement (listening comprehension, 1.6%; spelling, .1%). In the case of listening comprehension, residence was positively associated with achievement, which meant that students living in the county or on the reservation were associated (r = .108) with higher achievement. Conversely, residence was negatively related (r = -.007) to spelling, which meant that residing in the city or colony area was related to higher achievement. In comparison, residence was a predictor in three of the Washoe County School District population models. In all cases, living in the city or colony was associated with higher achievement. Moreover, residence was not very explanatory of achievement for either Indian students or the population, although the average amount of variance accounted for by residence was twice as much in the population models (1.8%) than in the Indian models (.8%). Indeed, the only occasion where residence accounted for much variance was in the population spelling model (4%).

That residence was more applicable to explaining achievement for the population in general rather than Indian students became even more obvious when grade level analyses were made. By grade level, residence was found for Indian students to be predictive of only spelling achievement, and then only for second and fourth graders. Conversely, residence was found for the population to be predictive at all grade levels, except for the sixth grade. Residence was a predictor for fourth grade reading comprehension, third and fourth grade reading test total, fifth grade listening comprehension, second and fifth grade auditory test total, and fourth and fifth grade spelling in the general population. That is, residence was a predictor in 8 (16%) of 50 population predictor models by grade level, but only 2 (4%) of 50 Indian student models.

It should be noted that a number of the other antecedents may have been measuring some cognate concept of residence as well. That is, residence was moderately correlated with school acreage per student (r = .42, $p < .001$), and weakly correlated with the student's age (r = -.19, $p < .001$), the average cost of school per student (r = .27, $p < .001$), and the number of magazine subscriptions per student (r = .15, $p < .001$). These correlations suggested that all of these factors may have been measuring some economic or affluence factor. However, residence was not correlated (r = .00) at all with the socioeconomic measure, which was the participation in the federal lunch program variable. Thus, it appeared that residence may have been reflecting what Rutter, et al. (1979) referred to as school ethos. Hence, the failure of residence to predict Indian student achievement may have been caused by an interactive effect with other predictors. However, it was also found that these four weak to moderate correlates of residence were no more predictive of Indian student achievement than residence itself. Thus, the results of this study, contrary to other studies, verified the tenth research hypotheses that residence was not a determinant predictor of Indian student academic achievement.

<u>Achievement by Grade Level</u>

The results of the stepwise multiple regression analyses in the second cycle and the previous comparison test results in the first cycle of the research indicated that grade level was a good predictor of academic achievement (Chapter 4). These results, therefore, suggested the following hypothesis:

> H_{11}: The models of academic achievement are more predictive at certain grade levels than others in the Washoe County School District.

That is, based upon the statistical test results of academic achievement by grade level reported in Chapter 3, which found tremendous variation in levels of achievement between grade levels, and the structural predictiveness of grade level in the original analyses, it seemed probable that the ability to account for observed achievement variance would also vary.

The stepwise and forced entry multiple regression analysis results, discussed above, fully verified the eleventh research hypothesis. The results also demonstrated that the grade levels at which models were most predictive of Indian achievement differed from those for the population, and that, as previously discussed, the models by grade level were generally more predictive than the models for all grades combined; that is, for the aggregate population and Indian samples (Table 42):

Grade Level	Mean Total Model Variance		Mean Reading Oriented Model Variance		Mean Math Oriented Model Variance	
	Population	Indians	Population	Indians	Population	Indians
2	42%	41%	45%	46%	33%	28%
3	44%	40%	50%	50%	31%	16%
4	57%	68%	59%	69%	52%	67%
5	58%	49%	60%	48%	52%	50%
6	43%	60%	41%	62%	48%	55%
Avg %	49%	52%	51%	55%	43%	43%
Aggregate Avg %	32%	34%	32%	34%	32%	35%

The predictors, then, accounted for the largest average percentage of the observed variances in student achievement for the fourth (57%) and fifth (58%) grades in the population, but were most predictive for the fourth (68%) and sixth (60%) grades for Indian students. Moreover, the differences between the average percentage of variance accounted for by the aggregate population and Indian models was clearly less than that explained by the grade level models, both individually and on the average.

Manipulability of Academic Achievement

Most of the previous studies discussed in Chapter 1 were found to have consistently concluded that most, if not all, factors structurally predictive of academic achievement were beyond the control of the school system. More importantly, those factors accounting for the largest amounts of the observed variance in academic achievement were found to be non-manipulable by the schools. On the other hand, several less prestigious, but equally rigorous, studies suggested that many factors predicting, and accounting for the variance in, academic achievement were indeed potentially controllable by the school system. These conflicting conclusions, therefore, posed two intriguing research questions for this study:

9. Do manipulable variables account for more of the total variance than non-manipulable variables?

10. Do more manipulable than non-manipulable variables account for the explained variance?

Results of the correlational analyses, discussed in Chapter 4, found proportionately more of the measured independent variables that were correlated with the ten dependent measures of academic achievement to be manipulable (18 or 60%) rather than non-manipulable (12 or 40%). Similarly, the resultant reading and math oriented predictor pools of the stepwise multiple regression analyses, using these 30 best correlates of achievement, incorporated more manipulable (Reading--52%; Math--60%) than non-manipulable variables (Reading--48%; Math--40%). Thus, the conclusions of Chapter 4 suggested the following hypotheses concerning the manipulability of factors predictive of academic achievement:

H_{12}: Manipulable variables account for more total variance in achievement than non-manipulable variables in the Washoe County School District.

H_{13}: More manipulable than non-manipulable variables account for the observed variances in achievement in the Washoe County School District.

The last stage of the third research cycle, reported above, was conducted to specifically analyze the regression results to test these two hypotheses. While on the average (and for all models except several grade level models) more manipulable than non-manipulable variables entered the models and accounted for greater amounts of variance, many results were not statistically significant. Thus, the empirical results failed to completely statistically validate these two research hypotheses. Substantively, however, and in terms of straight percentages, the results supported the hypotheses.

Moreover, the results also indicated that the number of manipulative predictors and the amount of variance explained by manipulable variables was seldom statistically different between Indian students and the Washoe County School District population. Several important statistical findings, however, were made concerning non-manipulable factors. It was found that statistically significantly fewer non-manipulable factors entered into the Indian student reading oriented models of achievement, and accounted for significantly less of the total variance than in the population models. That is, non-manipulable factors were significantly more important to explaining student achievement in the Washoe County School District population than for Indian students.

At this point, the manipulability of students' class grades needs to be readdressed. A large number of researchers would more than likely disagree that class grades were manipulable by the school system, perhaps because, for example, they agree with studies showing they were biologically or ancestrally determined, or they might believe grades make valid measurements. Such a debate, however, was beyond the scope of this study. Those interested in pursuing this are referred to Brod's studies on predicting grade point averages (1975) and grade-averaging bias among teachers of Indian students (1976a).

To summarize Brod's position, he has convincingly demonstrated that for Indian students most factors explaining grade point averages are within the academic domain and subject to changes by the school system. Indeed, Brod (1975) found that only 35% of the variance in grade point averages was attributable to scholastic achievement, IQ scores, and absenteeism. Results from data collected for this study, but not included in the multivariate analyses because the factors were not antecedent to the achievement test scores, also provided support for this. That is, when the relationship between test scores and 1984 class grades were evaluated, it was indeed found that, on the average, only 30% of the variance in grades explained test scores. In addition, it must be remembered that the Washoe County School District had no standardized grading policy, leaving classroom grading procedures and decisions up to the individual teachers. It was also found in this study (Chapter 3) that Indian students tended to be graded using the nontraditional system more than their classmates. Taken together, then, class grades were assumed to be potentially manipulable by the school system.

In summary, the results of this research suggest that more manipulable than non-manipulable variables were predictive of academic achievement, and that manipulable variables usually accounted for more of the variance; particularly with respect to Indian student achievement.

Factors Unique to Indian Students

A number of studies have suggested that observed variances in

Indian students' academic achievement were related to factors unique to the Indian students themselves. That is, their lower observed achievement was the result of characteristics unique to them being Indian. Blood quantum, or the percentage of Indian ancestry, has been the most typical measure used, although language, degree of assimilation, and living on a reservation have also been used. This study, however, sought to determine if other measures. which were also unique to Indian students, were related to their achievement:

8. Do factors applicable to Indian students only (e.g., tribal affiliation, preschool) affect the antecedent structural models of achievement?

As discussed in this chapter, two of these variables were found to be predictive of Indian students' academic achievement, although the factors did not account for much of the total variance. Specifically, participation in the Pyramid Lake Indian Reservation Head Start program accounted for 1.1% of the total variance in vocabulary knowledge achievement, and participation in some type of preschool program was predictive of 0.7% of the variance in math test total achievement and as a suppressor variable (-.1%) of the variance in math concepts achievement for Indian students.

The results of these analyses suggested that some factors unique to Indian students may be predictive of Indian student achievement. However, the results were not substantial enough to propose any generalizations at this point. Rather, the results established the need for further research in this area.

Types of Predictors

Four types of independent variables or antecedent predictors were included in this study: previous academic achievement; previous student evaluations; personal and familial background characteristics; and school environment and learning context variables. While no specific questions or hypotheses were posed concerning these types of variables, questions concerning them have been implied and now must be made explicit:

1. Was any one type of variable more predictive of academic achievement?
2. Were any particular types of factors more predictive of Indian student achievement?
3. Were any particular types of factors more predictive of student achievement in the Washoe County School District population?
4. Did any of the types of factors account for statistically more or less variance for Indian students than the population?

As discussed above, the results of these analyses clearly provided empirical evidence to support answers to these questions concerning the types of predictors involved in this study. With regards to the first question, previous academic achievement was clearly the most predictive type of factors if previous grades were included. Without class grades, however, previous academic achievement type predictors would generally be the least predictive type of antecedent variables, as absenteeism was not a very good predictor. That is, previous grades were what made the academic achievement type factors most predictive. After previous grades, background characteristics were the next best predictors for reading oriented achievement in the

Washoe County School District, but school environment and learning context factors were for math oriented achievement, for both the Washoe County School District population and Indian students, as well as the best predictor for Indian students' reading oriented achievement.

In regards to the second and third questions, it was found that previous academic achievement and student evaluations were more predictive for Indian students, while background characteristics were more predictive of achievement for the Washoe County School District elementary student population in general. School environment factors were more predictive of population reading oriented achievement, but were essentially equally strong predictors of math oriented achievement for both Indian students and the population.

The results also found, in response to the last question, that background characteristics were statistically more predictive of population rather than Indian reading oriented achievement. But of greater interest was the finding that student evaluations were statistically more predictive of Indian than population achievement, particularly math oriented achievement.

Summary

This chapter has reported the results of four distinct stages in this research project. First, the correlates of academic achievement were analyzed. This was followed by the establishment of predictor models for the Washoe County School District population and Indian students, from which comparative analyses were also made. Additional analyses were made on Indian students using several variables unique to them, and for the population and Indian students without grade level as a predictor. The next stage consisted of creating achievement models for each of the studied grades for both the Washoe County School District and for the Indian students. The last stage reported in this chapter involved analyzing the predictor models in terms of their potential manipulability and general types of variables.

The results of this study were found to have generally supported the research hypotheses and, regardless of support for the hypotheses, provided empirical "answers" to the research questions. These results showed that different predictors were predictive of Indian students' achievement than were predictive of student achievement in the Washoe County School District in general, that predictor models varied tremendously by grade level (but were more explanatory), that residence was not a determinant (or even poor) predictor of Indian achievement, that there were a few factors unique to Indian students that added to the explained variance, that the predictors accounted for the greatest average amount of variance at the fifth grade level for the Washoe County School District population and at the fourth grade level for Indian students, and that more manipulable variables accounted for more total variance than non-manipulable variables. Moreover, personal and familial background characteristics were found, contrary to previous studies, to be statistically less accountable of reading oriented achievement for Indian students, but that previous teacher evaluations of students were statistically more predictive of both reading and math oriented achievement for Indian students. That is, the results presented in this chapter have shown that those factors which accounted for the academic achievement of students (in general) in the Washoe County School District were not much help in explaining the academic achievement of Indian students, and that those factors that do help explain Indian achievement were more often factors which were potentially manipulable by the school system.

Chapter 9

THE ACADEMIC ACHIEVEMENT OF THE WASHOE COUNTY SCHOOL DISTRICT ELEMENTARY SCHOOL POPULATION AND INDIAN STUDENTS: SUMMARY AND CONCLUSIONS

To facilitate making the results of this research cumulative with the existing understanding of academic success for both Indian students and their classmates, which was an express goal of this study, the results had to be explicitly integrated with existing knowledge. Generally, the study enhanced understanding through the accomplishment of the research objectives, which were: (1) to describe and compare characteristics of elementary school Indian and non-Indian students (including academic achievement) in the Washoe County School District; (2) to inductively identify and isolate antecedent predictors of achievement test scores in the Washoe County School District; (3) to deductively determine which factors best predicted achievement for the population and Indian students and to compare population and Indian models at both the aggregate and individual grade levels; and (4) to empirically assess whether factors found to explain academic achievement for elementary school Indian students and their classmates were within the school system, and therefore potentially manipulable by it, or, as found in most other research, outside the control of the schools, and not subject to manipulation by the school system. How, then, did these results add to the theoretical understanding of Indian education? What can the school system change to improve Indian student academic success? The fourth, and last, cycle of this research project sought to answer these questions by integrating and synthesizing the results of this study with the existing cumulative understanding of Indian student educational success.

To recapitulate, this study was designed with four successive research cycles, each building upon the previous cycle. The first cycle (see Chapter 3) involved both inductive and deductive processes. First, characteristics of student education in Washoe County School District were described and the hypothesis that Indian students' achievement test scores were significantly lower than those for their classmates was tested. Data analyses during this cycle inferentially indicated that Indian students were significantly different from their classmates in a preponderance of the factors measured, and that Indian students were scoring significantly lower than non-Indian students on academic achievement tests (see Chapter 3).

The second cycle (see Chapter 4) of the research inductively reanalyzed the data, using more sophisticated stepwise multiple regression statistical analysis procedures, to identify which of the measured factors might be good predictors of academic achievement. These analyses failed to find, as hypothesized, that ethnicity (i.e., being Indian) was a predictor of academic achievement. Grade level, however, was found to be a consistent predictor of academic achievement, which verified the hypothesis that grade level would be a predictor of achievement. On the basis of these anlayses, general reading and math pools of predictors were developed, which were used as theoretical models of achievement.

The third cycle of the research deductively tested the inductively developed predictor models of academic achievement. Using stepwise and forced entry multiple regression techniques in sequence, population models were first established, then similar analyses were made for Indian students only (see Chapter 5). When compared (see Chapter 6), the results of these analyses indicated, as hypothesized, that the antecedent factors predicting Indian student achievement were different from those predicting student achievement for the Washoe County School District student population in general. Following these analyses, the stepwise and forced entry multiple regression analyses were redone for the Indian students, but with the additional factors pertinent to the Indian students only. The modified regression analysis results (see Chapter 6) found that the variables concerning preschool and Head Start were indeed predictors of Indian student achievement.

As grade level had been shown to consistently predict achievement, the next stage of the third research cycle consisted of re-analyzing the predictors without grade level as a variable to establish models without grade level for the population and Indian students for comparison with models by grade level as a control. Analyses were then conducted for each grade level. The results (see Chapter 7) of these analyses showed that not only did different antecedent factors predict achievement at different grade levels, but they also accounted for significantly larger amounts of the observed (or table) variance in academic achievement, as measured by test scores.

The second set of processes, in the third research cycle, consisted of analyses of the predictor variables and explained variances to determine whether they could be manipulated (i.e., changed or altered somehow) by the school system. These results (see Chapter 8) indicated that the proportion of manipulable and non-manipulable predictors in the Washoe County School District population and Indian models of achievement were not statistically significantly different in comparison to each other or in comparison to the proportion of manipulable and non-manipulable variables used in the analyses (i.e., the General Reading and General Math predictor pools). Similarly, the amounts of total variance accounted for by manipulable and non-manipulable variables in the population and Indian models generally were not found to be significantly different. The one exception was that non-manipulable variables accounted for significantly more of the total variance for the population than for Indian students in the seven reading oriented models of achievement. Additionally, it was found that manipulable factors (with or without previous grades) generally accounted for the largest amount of variance, although this was more true for the Indian students than for the general Washoe County School District population.

More importantly, the results showed, contrary to most previous research, that personal and familial background characteristics were statistically more important in explaining achievement for the population than for Indian students. That is, background characteristics, which were also usually beyond the manipulative control of the school system, were found not to be very important in understanding Indian student academic achievement. What was found to be statistically significantly more important in explaining the academic achievement of Indian students was previous teacher's evaluations of the student (i.e., citizenship grades and participation in the gifted program).

The fourth (see Figure 5, Chapter 1) and last research cycle (discussed below) involved inductively building a theory of Indian education, grounded upon the conclusions drawn from the results of the first three research cycles and synthesized with existing literature. This last cycle, then, essentially involved theorizing. The first stage of the cycle consisted of pooling together various findings and conclusions. This was followed by inductive data analyses to formulate generalizations from the study. These generalizations were then pieced together and synthesized with existing ideas into a proposed theory of Indian education. However, this last stage was not accomplished because more empirically based understanding of classroom interactions and culture, along with clearer attitudinal data, were deemed necessary. That is, several links in the body of knowledge concerning Indian education still needed to be understood.

Discussion

The objective of this last cycle in the study was to abstract the results of the first three cycles, draw some summative conclusions concerning these results, and then try to discover if any relationship existed between these conclusions. The first stage of this research cylce, therefore, was to consolidate and discuss the results of each cycle, from which general conclusions were inductively formulated.

The results of the first cycle of research concerning differences in academic achievement and student and school characteristics will be discussed first. This will be followed by a discussion of the results concerning the predictors of academic achievement from the second research cycle and the first three stages of the third research cycle. Next, the results concerning the potential manipulability (by the school system) of predictors of academic achievement from the last stage of the third research cycle will be discussed. Lastly, the types of factors that were found from the last part of the third research cycle to be characteristic of academic achievement will be discussed.

Academic Achievement

Statistical comparisons of nationally standardized mean test scores for Indian and non-Indian students in the Washoe County School District found that Indian students' academic achievement in all measured areas was significantly ($p < .001$) lower than that of their classmates (see Table 12, Chapter 3). When analyzed by grade level (Table 13), test score differences were considerably smaller, but more varied. For instance, in the second grade, Indian students' achievement test scores were statistically lower than their classmates in only language knowledge and auditory test total achievement. In the third grade, however, Indian students were statistically significantly different from their classmates in all but listening comprehension and spelling, yet in the fourth grade Indian students' achievement was <u>not</u> significantly different from non-Indian students' achievement in reading comprehension, spelling and science knowledge. In the fifth grade, Indian students did significantly poorer than non-Indian students in all areas but spelling, and by the sixth grade Indian students were consistently achieving below their classmates in all areas of achievement.

Comparisons of mean test scores found that Indian students' achievement scores were anywhere from .30 to .61 standard scores below their classmates, with an average difference of .46 (or nearly one-half of a standard score). On the other hand, by grade level, substantive differences in achievement test score means (Table 70) for Indian students and their classmates also exhibited tremendous variability, ranging from a minimal difference of only .12 standard scores in second grade spelling to a maximum difference of 1.02 (or more than one full) standard score in sixth grade math concepts.

Table 70. Mean Differences in Standardized Achievement Test Scores Across Grade Levels for Models

Model	Grade Level				
	2nd	3rd	4th	5th	6th
Word Study Skills	.19	.52	.56	.44	.40
Reading Comprehension	.30	.36	.27	.50	.71
Reading Test Total	.24	.47	.43	.51	.62
Vocabulary Knowledge	.64	.49	.51	.65	.82
Listening Comprehension	.37	.20	.43	.48	.77
Auditory Test Total	.58	.37	.49	.53	.57
Spelling	.12	.33	.13	.32	.66
Math Concepts	.33	.41	.53	.66	1.02
Math Test Total	.32	.38	.46	.61	.90
Science Knowledge	.37	.52	.24	.57	.65
Average	.35	.40	.40	.53	.71

Moreover, average differences showed a parabolic increase from the second to the sixth grade.

In comparing substantive mean differences across grade levels (which were based upon panel data) for each measure of achievement (Table 70), then, the general pattern indicated differences were greater for each successive grade level. However, there were several deviations from this general pattern. The most important were in the achievement areas of vocabulary knowledge, listening comprehension, and auditory test total scores, where Indian students were found to have been dramatically behind their peers in the second grade (Table 70). Indian students in the third grade, however seemed to have closed this gap considerably, while the fourth grade Indian students remained about as far behind as the third graders. The fifth grade Indian students, on the other hand, were essentially as far behind their classmathes as were the second grade Indian students. More importantly, these differences between Indian students and their classmates seemed to increase in the sixth grade.

A second deviation from the pattern of increasing differences in achievement across grade levels was in the area of word study skills, in which Indian students were not much (nor statistically) different than their classmates in the second grade, but third and fourth grade Indian students were more than half a standard score behind. Although the differences were decreased for them in the fifth and sixth grades, Indian students were nonetheless still .4 standard scores behind their classmates. The last deviation from the general pattern concerned the differences between the Indian students and their classmates in reading comprehension, reading test total, and science knowledge achievement, which were less in the fourth grade than in the third grade. Indeed, the differences between Indian and non-Indian students in reading test total and science test scores were smallest in the fourth grade.

These substantive differences in achievement test scores raised several interesting questions about the observed differences in Indian and non-Indian test achievement. That is, were Indian students really performing all that poorly? Is one half of a standard score that much of a substantively real difference? In her study of Washoe County School District students, Quirk (1965) found that grade equivalent means on the battery total for Indian students were not substantively much different from their classmates' means; indeed, the differences were not statistically significant. In his meta-analysis, Day (1983) indirectly corroborated Quirk's observations, as he found that in the 1960s there was a tendency for reading and math test total scores to converge toward the comparison mean. Day's study further indicated that reading and math achievement in the 1980s was "as high or higher than it has been at any time in the last thirty years" (1983:2-22). Unlike Quirk, however, Day drew the conclusion that, "nevertheless, these remain well below the national norms, and the academic needs of Indian students have not been met" (1983:2-22).

Evaluation of other studies, then, provided no easy solution to the questions about the substantive importance of these statistically different test scores. Mean test scores were, therefore, compared with other statistical characteristics (such as the mode, median (see Appendix D), and maximum and minimum scores), from which the significance of these substantive differences emerged. In particular, reading, math, and science test scores were found to have modal differences between Indian and non-Indian students of 2.09, 0.71, and 0.75 standard deviations, respectively. That is, the standard score obtained by the largest number of Indian students in reading was over two standard scores below the score obtained by the largest number of non-Indian students.

In addition to these other statistics, evaluation of mean test score differences by grade level were made. If the observed differences between the Indian and non-Indian students remained consistent across the grade levels, then it could be concluded that the statistically significant differences were not substantively important. Conversely, any increases or decreases in these differences across the grade levels would have indicated the substantive importance of the differences in the test score. Table 70 presents the mean differences between Indian and non-Indian students in standardized achievement test scores across the grade levels for each of the models (or measures) of academic achievement. As discussed above, tremendous variability, rather than consistency was found across the grade levels. These results, therefore, empirically demonstrated that the observed differences in achievement test scores between Indian students and their classmates were substantively important as well as statistically significant.

Based upon these various sources of evidence, it was concluded that the observed differences in academic achievement between Indian and non-Indian students were indeed both statistically and substantively significant, despite the apparently minimal differences (i.e., less than half a standard score).

Hence, in response to the questions posed above, the observed one half of a standard deviation difference between Indian and non-Indian students was indeed a substantively important difference. Moreover, it was concluded that Indian students, as a group, in the Washoe County School District were performing significantly more poorly than their classmates; and more poorly than other students nationally because all observed mean test scores for Indian students (Table 12) were also below the national average.

Statistical analyses of other student academic achievements (i.e., class grades, attendance) also found that Indian students were statistically significantly different from their peers in eighteen of twenty-one (86%) measured aspects. But the three factors in which statistical differences were not found were substantively significant. First, Indian students, interestingly enough, and in sharp contrast to other findings, were found to be present at school slightly more often, on the average, than non-Indian students during the 1982-83 school year. Conversely, Indian students were present statistically significantly fewer days than their classmates during the 1983-84 school year. Second, while they were enrolled at school slightly more days than non-Indians in 1982-83, they were, nonetheless, enrolled slightly fewer days in 1983-84. These results were contradictory with those that indicated Indian students were statistically significantly absent from school more than non-Indian students during both school years. That is, it was found that the number of days absent was statistically greater for Indian students, but that Indian students were not significantly present less, or not enrolled more, than non-Indians.

These results suggested that how one defines and measures attendance will influence their results. On the other hand, these results were also condemning of the attendance recordkeeping processes themselves. Many discrepancies were found in students' records during the data collection and coding, which were left uncorrected. These record errors, then, probably accounted for, in part, Indian students being both present and absent more than non-Indian students. Certainly more systematic recordkeeping by the Washoe County School District teachers would help in part to rectify this dilemma.

Even more surprising was that none of these three measures were strongly intercorrelated. Despite this, the number of days absent in 1982-83 was the only antecedent variable used in the multivariate analyses. The logic for this was that the school system probably kept better records of absenteeism than presence. Absenteeism, however, was found to be a poor predictor of either Indian or population achievement, accounting for less than 1% of the variance in vocabulary knowledge and auditory test total achievement for the population, and 4% of the variance in spelling for the Indian students. The failure of absenteeism to predict achievement may have been due to the poor measurement of this factor, or it may have been because attendance/absenteeism was not predictive of achievement in the Washoe County School District.

Absenteeism was, however, a somewhat better predictor at particular grade levels. It was predictive in 6 (86%) of the 7 population and 1 (14%) of the 7 Indian reading oriented models for second graders, 2 (29%) of the population and 3 (43%) of the Indian third grade reading oriented models, 2 (29%) of the population fifth grade models, and 2 (29%) of the population and 3 (43%) of the Indian sixth grade models. Across the grade levels, absenteeism was found to account for variance in 12 (34%) of the 35 population and 7 (20%) of the 35 Indian reading oriented models. Absenteeism did, however, account for sizable amounts of the variance in the third and sixth grade models, but otherwise made minimal to moderate contributions to the explained variance.

In looking at the relationship between the number of days absent and achievement, it was interesting to find absenteeism positively correlated for both Indian and population second grades, as well as for third and fifth grade population students. This meant that achievement improved with increased absenteeism. Conversely, a negative or inverse relationship, as expected, was found for population sixth graders and for all other grades. That is, as achievement improved, absenteeism dropped off. These results, therefore, have challenged, despite measurement problems, the existing assumption of many educators calling for an increase in the number of days in the classroom and the reduction of absenteeism in order to improve academic achievement.[29] That is, despite the reliability problems with the original teacher coding of the information, the results of this study have seriously questioned the assumption that absenteeism was/is a good predictor of academic achievement; particularly in the Washoe County School District and similarly composed school systems.

Differences between Indian and non-Indian students were not limited to just academic achievement. For example, with respect to teacher evaluations, it was found that Indian students received statistically lower citizenship grades (which were based upon the teacher's subjective evaluation), were twice as likely to be retained one or more grades by past teachers, and half as likely to be placed in the gifted student program by the teacher. This latter difference proved to be particularly important in terms of predicting Indian student achievement (see also below). Another example was the particularly serendipitous finding was that Indian students in this study did not attend schools that had a certified librarian.

The results of this explanatory study have described, then, some of the scope and depth in the achievement, student evaluation, personal and familial characteristics, and school and learning contexts differences between Indian and non-Indian students. Indian students in the Washoe County School District were consistently and statistically below their non-Indian classmates, as well as below the national average, in all measured areas of academic achievement, as measured by standardized test scores. Indian students' class grades were also significantly lower than those of their classmates and they were absent from school significantly more than non-Indian students Moreover, Indian students had significantly lower citizenship grades, and were retained more often, but placed into the gifted program less often, than their classmates. Indian students were found to have significantly different personal and familial background characteristics than non-Indian students, and they attended schools that were often significantly different from schools most likely attended by non-Indian students.

Comparable and Contrastable Characteristics of Models

As suggested in Chapter 1, much of the apparently contradictory findings in previous studies may be attributable to the failure of the researchers to develop different models for each ethnic group and at each grade level. It was also concluded that the selection of the dependent variable(s) was usually too selective and narrow to fairly represent student academic achievement. Thus, it was suggested that a broader spectrum of measures, as used in this study, would produce a more complete and accurate representation of student achievement, albeit it would also be more complex and difficult to conduct such research.

<u>Predictors of academic achievement</u>. More to the point of the research questions, this study has found that those factors that explained the observed statistical differences (or variance) in academic achievement for Indian students and their classmates were quite often different. In an attempt to demonstrate this, Table 71 indicates the number and percentage of predictors shared by both the population and Indian student models, along with the number of predictors unique to each of them.

These results indicated that, on the average, 61% of the variables that predicted academic achievement for Indian students also accounted for variance in the population models, while, on the average, 36% of the predictors in the population models were similarly predictors in the Indian models. This meant that, on the average, 64% of the antecedents in the population models of achievement were <u>not</u> predictive of Indian student achievement and that, on the average, 39% of the factors that did help to explain Indian student achievement were not explanatory of general student academic achievement.

Hence there were considerably more factors involved in explaining population achievement, which were of little utility in understanding Indian student achievement, than were involved in accounting for Indian student achievement. More importantly, this also meant that over one third (39%) of the predictors that explained Indian achievement would not have been found or known if separate achievement models had not been made. Equally, if not more importantly, these results also meant that nearly two thirds of the variables involved in

Table 71. Predictors and Variance Common to and Unique to the Population and Indian Achievement Models

Model[a]	Predictors and Variance Common to Both Models: Predictors n	Predictors Pop[b] %	Predictors Ind[c] %	Explained Variances Pop[b] %	Explained Variances Ind[c] %	Predictors and Variances in Population Models Only: Predictors n	Predictors %	Variance Tab[d] %	Variance Exp[e] %	Predictors and Variances in Indian Models Only: Predictors n	Predictors %	Variance Tab[d] %	Variance Exp[e] %	Variance Explained by "Other" Variables: Pop[b] %	Ind[c] %
SKLS	4	57	80	71	75	3	43	5.73	23	1	20	4.08	12	6	13
READ	2	20	67	72	90	8	80	8.37	27	1	33	3.05	8	1	2
READT	4	50	67	75	81	4	50	6.25	16	2	33	5.84	13	9	6
VOC	2	20	67	63	77	8	80	11.70	35	1	33	1.86	7	2	16
LIST	2	20	40	57	66	8	80	12.10	40	3	60	6.43	25	3	9
AUDIT	2	20	40	69	79	8	80	7.96	29	3	60	4.80	16	2	5
SPELL	3	43	33	72	56	4	57	9.84	24	6	67	14.54	39	4	5
MATH	3	43	75	88	97	4	57	1.83	6	1	25	.71	2	6	1
MATHT	3	50	100	96	101	3	50	.01	1	0	0	0.00	0	3	-1
SCI	2	33	40	65	73	4	67	10.75	36	3	60	6.89	24	-1	3
Average	3	36	61	73	80	5	64	7.45	24	2	39	4.82	15	4	6

a--Model names are as follows:

SKLS--Word Study Skills
READ--Reading Comprehension
READT--Reading Test Total
VOC--Vocabulary Knowledge
LIST--Listening Comprehension
AUDIT--Auditory Test Total
SPELL--Spelling
MATH--Math Concepts
MATHT--Math Test Total
SCI--Science Knowledge

b--Population models

c--Indians models

d--Percentage of table (or total) variance accounted for in the dependent variable.

e--Percentage of explained variance accounted for in the dependent variable.

accounting for population achievement have nothing to do with explaining Indian student achievement.

Variances in academic achievement. Table 71 also shows the percentage of table variance accounted for by those variables not entering into both the population and Indian models. Between 0% and 14% of the total variance (or about 5% on the average) was accounted for by factors unique to the Indian student models, and between 0% and 12% of the total variance (or about 7% on the average) was explained by variables unique to the population models. With respect to table variance, therefore, it appeared that the amount of variance accounted for by factors unique to each of the population and Indian models was not, on the average, too large. On the other hand, when contrasted with the percentage of predictors unique to the population and Indian models, it was found that the fewer predictors unique to the Indian models (39%) accounted for relatively more table variance (5%), on the average, than did the larger percentage of predictors unique to the population models (64%) that accounted for relatively less, on the average, table variance (7%).

Furthermore, the percentage of the explained variance in the population and Indian models (Table 71) indicated that considerable variation existed in terms of the percentage of explained variance that was contributed by predictors common to both the population and Indian models of achievement. On the average, predictors found in both the population and Indian student models contributed 73% of the explained variance in the population models, and 80% of the explained variance in the Indian models. (It should be noted that the "other" predictors forced into the equations accounted for an average of 4% of the explained variance in the population models and 6% in the Indian models.)

Predictors common to both the population and Indian models contributed the largest amounts of explained variance in the math concepts and math test total models for both groups. Predictors found in both models also accounted for a large percentage of the explained variance in the Indian reading comprehension model (90%), but not in the population model (72%). Conversely, predictors common to both models contributed the least amount of explained variance in the spelling (72% and 56% respectively) and science knowledge (65% and 73% respectively) models for both the population and Indian students.

Predictors by grade level. It would be reasonable to assume that if the observed differences in the percentages of predictors and variances that were commonly shared by (as well as unique to) both the population and Indian student models of academic achievement by grade level were about the same as for the aggregate models, then such percentages were probably due to random chance or error rather than being dependent upon the group of students involved. Conversely, if the percentages of predictors and explained variance common to both the population and Indian student achievement models were smaller by grade level than for the aggregate groups, then it would be equally safe to conclude that the observed differences in the percentages of predictors and variances common to both the aggregate population and

Indian models were, indeed, substantively significantly dependent upon the respective groups of students.

Comparisons by grade level, however, were considerably different. In fact, there were no commonly shared predictors in six of the ten third grade models. In other words, predictors in the population models explained none of the observed achievement variance in 60% of the third grade Indian models. Additionally, in 33 (66%) of the 50 grade level models there was only one commonly shared predictor in the population and Indian models. More importantly, in 31 (62%) of the 50 grade level models half or more of the predictors were unique to the Indian models. Of these, in only 7 (14%) of the 50 grade level models did the factors unique to the Indian models account for less than 10% of the total variance; but in 6 (12%) of the 50 grade level models they accounted for more than one third of the total variance. In other words, considerably fewer predictors and much less explained variance were commonly shared by the population and Indian models of achievement by grade level than were shared by the aggregate models.

Unique characteristics of models. It would seem plausible, therefore, to conclude that the observed differences in antecedent variables that predicted academic achievement for the population and Indian students were substantively significant. A binomial test for statistical significance of the proportion of variables unique to the Indian models and the proportion of variables common to both the population and Indian models indicated that the observed proportions in the listening comprehension and auditory test total achievement models were indeed statistically significant. Hence, the proportions of observed predictors that were unique to these Indian models were statistically different from the proportion of antecedents common to both the population and Indian models.

Additionally, the probability levels for the binomial tests of the other eight models were all less than .20; indeed four of them were significant at or beyond the .10 level. Thus, although the probability levels were higher (i.e., $p > .05$) than accepted levels (i.e., $p < .05$) for eight of the binomial tests of significance for differences between proportions of common and unique predictors of Indian achievement, for explanatory purposes these differences were taken to be significant.

It was concluded, therefore, that the predictors entering the Indian models of academic achievement were not only different (as hypothesized), but that they were significantly different from those predicting achievement for the Washoe County School District elementary school population. Moreover, it was found that differences in which predictors explained academic achievement increased when evaluated for a particular grade level.

Frequent predictors. What, then, were the most frequent (i.e., entered more than four of the seven reading oriented and three of the math oriented models) predictors of academic achievement in the Washoe County School District population and for Indian students only? What were the most frequent predictors at specific grade levels? For the population, the following were the most frequent predictors (the number in the parentheses indicates the number of models the predictor entered out of the seven reading and three math oriented models):

1. Population Reading Models: 1983 Reading Grade (7), Emergency Telephone Listing (6), Participation in the Federal Lunch Program (4), Change of Schools (4), Student's Sex (4), Acreage Per Student (4), Grade Level (4), and How Long the Library Was Open After School Per Student (4);
2. Population Math Models: 1983 Grade Point Average (3), Participation in the Gifted Program (3), and How Long the Library Was Open After School Per Student (3).

The following were the most frequent predictors for Indian students:

1. Indian Reading Models: 1983 Reading Grade (7), Participation in the Gifted Program (4), Father's Status (4), Number of Encyclopedia Sets Per Student (4), and How Long the Library Was Open After School Per Student (4);
2. Indian Math Models: 1983 Grade Point Average (3), Participation in the Gifted Program (3), and Percentage of Books Lost Per Student (3).

Of the most frequent predictors, the 1983 reading grade and how long the library was open after school per student were the only two predictors that were frequent predictors for both population and Indian student reading oriented achievement. Similarly, the 1983 grade point average and participation in the gifted program were the most frequent predictors of both population and Indian math oriented achievement.

Frequent predictors by grade level. In contrast, there were even fewer common frequent predictors by grade level. The most frequent predictors of second grade achievement were:

1. Population Reading Models: 1983 Reading Grade (7), Number of Days Absent (6), 1983 Citizenship Grade (5), Home Telephone Listing (6), Number of Parents Employed (4), Student's Sex (4), and How Long the Library Was Open After School Per Student (7);

2. Population Math Models: 1983 Grade Point Average (3), 1983 Citizenship Grade (3), Student's Age (2), Acreage Per Student (2), and How Long the Library Was Open After School (3);
3. Indian Reading Models: 1983 Reading Grade (6);
4. Indian Math Models: None.

Previous grades was the only variable to predict Indian student achievement in more than half the reading oriented models for second grade Indian students. No variable was a predictor in all three math oriented models for Indian students. Thus, previous grades was the only predictor for both the population and Indian second grade models.

Even fewer factors were found to be frequent predictors of third grade achievement:

1. Population Reading Models: 1983 Reading Grade (7) and Father's Status (5);
2. Population Math Models: 1983 Grade Point Average (3);
3. Indian Reading Models: None.
4. Indian Math Models: None.

No factor was found to predict third grade Indian achievement in four or more of the reading oriented models; indeed only three factors were predictive in even three of the models. Nor was there any variable predictive of Indian student achievement in all three math oriented models. Thus, in the third grade, none of the frequently occurring variables were predictors in both the population and Indian models.

The following variables were the most frequent predictors of fourth grade academic achievement:

1. Population Reading Models: 1983 Reading Grade (7), Change of Schools (5), Student's Sex (6), and Student's Residence (4);
2. Population Math Models: 1983 Grade Point Average (3) and Percentage of Books Lost per student (3);
3. Indian Reading Models: 1983 Reading Grade (7) and the Number of Magazine Subscriptions Per Student (4);
4. Indian Math Models: 1983 Grade Point Average (3) and Student's Age (3).

Once again, the only frequently occurring variable that was predictive of both population and Indian fourth grade achievement was previous grades.

The following variables were the most frequent predictors of fifth grade academic achievement:

1. Population Reading Models: 1983 Reading Grade (7), Student's Age (5), Father's Status (4), and Number of Parents Employed (6);
2. Population Math Models: 1983 Grade Point Average (3) and 1983 Citizenship Grade (3);
3. Indian Reading Models: 1983 Reading Grade (7);
4. Indian Math Models: 1983 Grade Point Average (3) and Acreage Per Student (3).

Previous grades, as at other grade levels, was the only variable that was predictive of both population and Indian fifth grade achievement.

Lastly, the most frequent predictors of sixth grade academic achievement were as follows:

1. Population Reading Models: 1983 Reading Grade (7), Participation in the Federal Lunch Program (4), and Change of Schools (4);
2. Population Math Models: 1983 Grade Point Average (3) and Student's Sex (3);
3. Indian Reading Models: 1983 Reading Grade (7) and Student's Sex (4);
4. Indian Math Models: 1983 Grade Point Average (3).

The only frequent predictor found for both the population and Indian students was, once more, previous grades.

Across the grade level models the only variable found to be a frequent predictor of academic achievement at each grade level was previous grades (either the 1983 reading grade or the 1983 grade point average); and that was only for the Washoe County School District population in general. Thus, in response to the question concerning the most frequent predictors, other than specifying what they were by grade level, or for the aggregate population and Indian samples, there were none (again, except for previous grades).

The obvious conclusion, then, concerning predictors of academic achievement was that no general model of achievement was, or could be, predictive of both general population and Indian student achievement, nor of more than any one specific grade level. Thus, in order to understand and explain academic achievement, there must be separate models for Indian students only, and for every specific grade.

Manipulability of Academic Achievement

The results of this study presented overwhelming evidence that the largest percentage of observed variances and predictors in academic achievement, for both Indian students and the population, were potentially manipulable by the school system. With respect to proportions of manipulable variance in achievement test scores, it was found that three to nine times as much explained variance was manipulable as was not, and that statistically significantly more variance than would have been expected was explained by manipulable factors. In terms of proportions of manipulable and non-manipulable variables, the proportions observed in the Washoe County School District population and Indian models of academic achievement were not statistically different from the proportions among the independent variables used in the multiple regression analyses. Comparatively, the population and Indian models substantively differed, but were not statistically different in terms of either numbers of manipulable and non-manipulable predictors nor in the amounts of variance explained by manipulable and non-manipulable variables. While the results were less evident by grade, essentially the same pattern was found.

With respect to non-manipulable variables only, it was found that the population reading oriented models contained predictors that accounted for statistically more variance than expected for the population, and less than expected for Indian students only. That is, non-manipulable factors were statistically more important in explaining reading oriented academic achievement, as measured by standardized achievement test scores, in the population than for the Indian students.

Thus, it was concluded that, overall, manipulable factors were much better predictors of students' academic achievement than were variables that were beyond the control of the school system, and that non-manipulable factors were less important to understanding Indian students' academic achievement than the academic achievement of the Washoe County School District students in general.

Characteristics of Academic Achievement

Data were collected and analyzed on four general types of characteristics concerning, or often found in context with, academic achievement: 1) previous student achievement; 2) previous student evaluations (made by teachers); 3) personal and familial background characteristics; and 4) school environment and learning context characteristics. By far, the largest number of variables, for which data were collected, were concerned with the school environment and learning context. This was the case primarily because such data were readily available and because it was hypothesized that such factors were, contrary to many other studies, predictive of academic achievement. The second largest number of variables were concerned with previous (and present) student achievement. These factors demonstrated moderate to large intercorrelations, as would be expected, and were, therefore, limited to just several variables that had low inter-correlation coefficients. The third largest type of characteristics were concerned with personal and familial traits or characteristics, while the fewest variables dealt with student evaluations.

From out of all of these predictors, pools of variables were identified as being the best factors for explaining academic achievemet in the Washoe County School District (Chapter 4). A total of 31 variables (see Table 62) were so identified. Two of these factors were used independently as they measured the same thing (previous grades), because the 1983 reading grade correlated best with the word study skills, reading comprehension, reading test total, vocabulary knowledge, listening comprehension, auditory test total, and spelling (i.e., the reading oriented) achievement test scores, and the 1983 grade point average associated best with the math concepts, math test total, and science knowledge (i.e., the math oriented) achievement test scores. Thus, for each of the (stepwise) regression analyses, thirty (30) independent variables were entered, of which two dealt with previous achievement, three with student evaluations, eleven with student and familial background characteristics, and fourteen with school environment and learning contexts; (see Chapter 4 for complete reduction procedures). Analyses of these resulted in two general predictor pools, one for reading oriented and one for math oriented dependent variables. The reading predictor pool included the two previous achievement variables, two of the three student evaluation variables, ten of the eleven background variables, and seven of the fourteen school variables, for a total of twenty-one (21) predictors. The math predictor pool was much smaller, with only ten (10) predictors, which included one of the three previous achievement variables, two of the three student evaluation variables, three of the eleven background variables, and four of the fourteen school variables. All the predictors in the math pool, except for the previous grades variable (i.e., 1983 grade point average), were also in the reading pool; thus, the math pool was, in a sense, a subset of the reading pool.

Statistical comparisons of the proportions of variables from each of these four types of variables were made between the general pools and the resultant predictor pools for the Washoe County School District population and Indian students, and between the population and Indian student models. The results of the latter analyses (Table 69) showed that statistically significantly more variance was accounted for by the student evaluation type of predictors in the Indian models than in the population models, and that statistically significantly more variance was explained by the personal and familial background type factors in the population than in the Indian reading oriented models.

Comparatively, then, personal and familial background characteristics were significantly more important to understanding population, rather than Indian achievement, in the Washoe County School District. In contrast, student evaluations were significantly more important to understanding Indian, rather than population, achievement in the Washoe County School District.

Conclusions

The results of this study have provided empirical evidence for the following conclusions concerning the academic achievement of elementary school students in the Washoe County School District:

C_1: Standardized achievement test scores for Indian students are significantly lower than test scores for non-Indian students.

C_2: Standardized achievement test scores, holding grade level constant, for second, third, fourth, fifth, and sixth grade Indian students are significantly lower than for their respective classmates.

C_3: Class grades and grade point averages for Indian students are significantly lower for Indian students than for non-Indian students.

C_4: Indian students are absent significantly more than non-Indian students.

C_5: Teacher evaluations of Indian students are significantly lower than for non-Indian students.

C_6: The personal and familial background characteristics for Indian students are significantly different from those of non-Indian students.

C_7: The school environments and learning contexts most likely attended by Indian students are substantively different from those most likely attended by non-Indian students.

C_8: Holding other relevant variables constant, grade level is an antecedent predictor of some standardized achievement test scores.

C_{8a}: Holding other relevant variables constant, for both the population and Indian students only, grade level is a predictor of:
(1) Word Study Skills
(2) Reading Test Total
(3) Vocabulary Knowledge

C_{8b}: Holding other relevant variables constant, for the population only, grade level is also a predictor of:
(1) Listening Comprehension
(2) Math Concepts

C_{8c}: Holding other relevant variables constant, for the Indian students only, grade level is also a predictor of:
(1) Auditory Test Total
(2) Science Knowledge

C_{8d}: Holding other relevant variables constant, for either the population and Indian students only, grade level is not a predictor of:
(1) Reading Comprehension
(2) Spelling

C_9: Holding other relevant variables constant, when explaining academic achievement, grade level must be controlled for or taken into consideration.

C_{10}: Holding other relevant variables constant, previous grades, on the average, account for only one fourth or less of the observed variance in standardized achievement test scores.

C_{11}: Holding other relevant variables constant, a significant number of the predictors of standardized achievement test scores for Indian students are different from the predictors for the Washoe County School District in general.

C_{11a}: Holding other relevant variables constant, previous grades are predictive of both population and Indian students' standardized achievement test scores.

C_{11b}: Holding other relevant variables constant, previous grades, on the average, account for more variance in standardized achievement test scores for Indian students than for the general population.

C_{11c}: Holding other relevant variables constant, besides previous grades, the only predictors to account for variance in the same reading oriented standardized achievement test for both the population and Indian students were:

(1) Emergency telephone number listing (i.e., having a number listed was associated with higher achievement for the population, but, conversely, not having a number listed was associated with higher achievement test scores for Indian students);

(2) Father's status to the student (that is, having a natural father is associated with higher achievement, except for listening comprehension and auditory test total achievement);

(3) Grade level (that is, the higher one's grade level, the higher their academic achievement, except for reading test total achievement where being in a lower grade level is correlated with higher achievement for Indian students);

(4) Participation in the gifted program (that is, being in the gifted program is associated with higher achievement when controlling for previous grades);

(5) Student's residence (that is, residing in the Reon-Sparks/Reno-Sparks Indian Colony area is associated with higher achievement test scores); and

(6) Number of parents employed (that is, having just the father or both parents employed is related to higher achievement test scores).

C_{11d}: Holding other relevant variables constant, besides previous grades, the only predictors to account for variance in the same math oriented standardized achievement test for both the population and Indian students are:

(1) Participation in the gifted program (that is, being in the gifted program is associated with higher achievement when controlling for previous grades); and

(2) The percentage of books lost (from the library) per student (that is, having fewer books lost per student is associated with higher achievement test scores).

C_{12}: Holding other relevant variables constant, student absenteeism is not a good predictor of student achievement.

C_{13}: Residence (i.e., living in either the urban Reno-Sparks/Colony area or the rural Washoe County/Pyramid Lake Indian Reservation area) is not a determinant predictor of standardized achievement test scores for Indian students.

C_{14}: Multivariate models of academic achievement for Indian students tend to have fewer predictors, but account for more variance, and are more likely than the population models to have variables that are potentially manipulable by the school system.

C_{14a}: Multivariate models of academic achievement by grade level for Indian students tend to have few predictors, but account for more variance, and are more likely than the population models by grade level to have variables that are potentially manipulable by the school system.

C14b: In multivariate models, antecedent predictors that are potentially manipulable by the school system, although nearly equal in numbers in the variable pools, account for three to five times as much variance in standardized achievement test scores as do variables that are non-manipulable by the school system.

C_{15}: Holding other relevant variables constant, non-manipulable variables account for significantly more variance in population reading oriented models, than in the Indian student models, of academic achievement.

C_{16}: Holding other relevant variables constant, a significant number of the predictors of standardized achievement test scores for Indian students by grade level are different from the predictors for the Washoe County School District in general.

C_{17}: Holding other relevant variables constant, predictors potentially manipulable by the school system account for significantly more of the explained variance, although nearly equal in numbers in the variable pools, in standardized achievement test scores than do predictors that are beyond the school system's control.

C_{18}: In multivariate models, different antecedent factors are predictive of each different measure of standardized achievement test.

C_{19}: In multivariate models, there are particular factors, which are uniquely characteristic of Indian students only, that are predictive of standardized achievement test scores.

C_{19a}: Holding other relevant variables constant, participation in a preschool program is predictive of math concepts and math test total standardized achievement test scores for Indian students.

C_{19b}: Holding other relevant variables constant, participation in the Pyramid Lake Indian Reservation Head Start program is predictive of vocabulary knowledge standardized achievement test scores for Indian students.

C_{20}: Holding other relevant variables constant, previous student evaluations by teachers are significantly more predictive of both reading and math oriented standardized achievement test scores for Indian students than Washoe County School District students in general.

C_{21}: Holding other relevant variables constant, personal and familial background characteristics are significantly more predictive of population than Indian students' reading oriented standardized achievement test scores.

C_{22}: In multivariate models by grade level, non-manipulative factors are increasingly (panal data) important in accounting for variances in standardized achievement test scores for Indian students at each successive grade level (second to sixth).

C_{23}: In multivariate models by grade level, Indian students' academic achievement is dramatically lower (panal data) in the fifth grade; particulary with respect to standardized achievement scores.

C_{24}: While ethnicity, when holding other relevant variables constant, may not be a predictor of standardized achievement test scores, there exist substantively sufficient differences to justify holding ethnicity constant (or developing ethnic-based models of achievement).

With respect to the research hypotheses, the empirical results of this study have verified the following:

H_1: Standardized achievement test scores for Indian students are significantly lower than scores for non-Indian students in the Washoe County School District.

H_2: Class grades, attendance, and other measures of achievement are significantly different for Indian and non-Indian students in the Washoe County School District.

H_3: Teacher evaluations are different for Indian and non-Indian students in the Washoe County School District.

H_4: Personal and familial background characteristics are significantly different for Indian and non-Indian students in the Washoe County School District.

H_5: School environment and learning context variables are different for Indian and non-Indian students in the Washoe County School District.

H_6: Grade level is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

H_8: As compared to the general population, different antecedent factors are predictive of standardized achievement test scores for Indian students in the Washoe County School District.

H_9: Different antecedents are predictive of standardized achievement test scores at different grade levels in the Washoe County School District.

H_{10}: Residence (i.e., urban/colony or rural/reservation) is not a determinant predictor of Indian students' achievement in the Washoe County School District.

H_{11}: The models of academic achievement are more predictive at certain grade levels than others in the Washoe County School District.

H_{12}: Manipulable variables account for more total variance in standardized achievement test scores than non-manipulable variables in the Washoe County School District.

H_{13}: More manipulable than non-manipulable variables account for the observed variances in standardized achievement test scores in the Washoe County School District.

But the data results refuted the following hypothesis:

H_7: Ethnicity is an antecedent predictor of standardized achievement test scores in the Washoe County School District.

In other words, ethnicity per se (or as a predictor variable) in conjunction with other predictors was not a direct antecedent predictor of standardized achievement test scores. Ethnicity was, however, indirectly an antecedent factor of academic achievement, because: (1) previous class grades were found to have predicted (later) academic achievement and Indian students tended to have had lower class grades; and (2) student evaluations, which tended to be significantly lower for Indian students, were found to have predicted Indian achievement. That is, previous class grades and student evaluations were predictive of achievement test scores and ethnicity was found to be an antecedent of both previous class grades and student evaluations. Consequently, it was concluded that ethnicity (or being self identified as Indian) indirectly affected achievement test scores through teacher evaluations and rewards.

In summary, this study has demonstrated that Indian students, relative to their classmates, were failing academically, received lower evaluations from teachers, were significantly different from their non-Indian classmates in terms of personal and familial background, and tended to go to schools that were considerably different than the schools most likely attended by non-Indian students. This study has shown that, while not necessarily a predictor of standardized achievement tests, ethnicity and grade level must be controlled for. That is, compared to the general population those factors that explained standardized achievement test scores tended to be different for Indian students and for each respective grade level. Potentially manipulable variables were significantly more important to explaining academic achievement than were non-mapipulable factors for the population in general and for Indian students. Furthermore, these potentially manipulable factors were more predictive of Indian student than population achievement; in contrast, personal and familial characteristics were more important to understanding the Washoe County School District population achievement than the Indian students' achievement. Student evaluations, which, again, tended to be lower for Indian students, were significantly better predictors of Indian student than population achievement, and, therefore, being Indian was an indirect antecedent of achievement test scores, primarily through previous teacher evaluations.

Chapter 10

ACADEMIC ACHIEVEMENT OF INDIAN STUDENTS: DISCUSSION AND IMPLICATIONS

This study was primarily an inductive comparison of the educational success, as defined by high academic achievement, of elementary school Indian students and their classmates in the Washoe County School District. The majority of previous studies on Indian and non-Indian students' academic or educational success have concluded that the primary explanations for such success were not located within the schools, but rather within the students themselves, their families, their community, and their culture. On the other hand, a minority of the previous studies have concluded that factors within the school or the control of the school system were equally important to understanding academic success. The impetus for this research was both theoretical and applied. Theoretical because a review of the literature documented the need for further empirical research to fill in gaps in the current understanding of academic and educational success, and because the same review concluded that there existed a lack of cohesive theoretical understanding of the academic achievement of Indian students. Applied because the school system studied, the Washoe County School District, desired empirical knowledge about the achievement level of Indian students in their system, and because school officials desired empirical knowledge for future policy implementations.

An inductive and deductive examination of the academic success of elementary school Indian students and their classmates in the Washoe County School District was made, therefore, to add to current understanding of elementary student academic success and to attempt a synthesization of the theoretical understanding of the academic achievement of Indian students. In other words, while the purpose of this study was to exploratorily compare the educational sucess of Indian and non-Indian students, the goal was to more fully understand (relatively) Indian student academic success. Pursuant to this research goal, this study encompassed four objectives: (1) to describe and compare characteristics of elementary school students and their academic achievement; (2) to identify antecedent predictors of academic achievement success; (3) to develop predictor models of academic success; and (4) to determine the potential manipulability of such academic success by the school system.

To achieve these objectives, this research project conducted what it referred to as a processual study. A processual study was defined as a combination of research processes interconnected by numerous individual (subjective) decisions as to when, where, why, and how to begin and end a particular cycle of research. A research process was defined as a particular stage in the research cycle interconnected with individual decisions; that is, a research process was conceptualized as dynamic, interactive, and replete with subjective choices and not a static, pre-existing stage devoid of any choices or interactions. A research cycle was conceptualized as a set of research processes (or stages and decisions) that encompassed a distinct (but subjectively identified) beginning and end. As such, a research cycle could have parallel or sequential sets of research processes, or simply one set of processes, while each set of research processes could have one or more parallel or sequential research processes (or stages and decisions). Similarly, a study could be composed of a single research cycle, or it could have two or more parallel or sequential research cycles.

Due to the scope of the research objectives, this study was composed of four sequential research cycles. The first cycle of research entailed two parallel sets of research processes; one inductive and descriptive, the other deductive and comparative in nature. The first cycle began with the review of the literature and ended with the descriptive and comparative results reported in Chapter 3. The second cycle of research was concerned with developing predictor models of achievement and began with the results and conclusions of the first research cycle, while the second cycle ended with predictor pools and models of achievment, the results of which were discussed in Chapter 4.

The third research cycle was the most complex cycle, as it involved two sequential sets of research processes. The first set of processes involved three stages, which were to establish correlational (as reported in Chapter 4) and inter-correlational (as reported in Chapter 5) matrices, to build (as reported in Chapter 5) and compare (as reported in Chapter 6) predictor models for the elementary student population and Indian students only, and to develop predictor models of academic achievement for the population and Indian students by grade level (as reported in Chapter 7). The second set of processes in the third research cycle included two stages, as discussed in Chapter 8. The first sought to determine whether manipulable or non-manipulable antecedent predictors or any type of antecedent factor (i.e., previous achievement, previous evaluations, personal/familial characteristics, school environment/learning context factors) accounted for the larger amounts of explained variance. The second stage involved the same processes, but evaluated the percentages of explained variance accounted for by manipulable/non-manipulable predictors, and by the four types of antecedents for Indian and population models.

The fourth research cycle dealt with drawing conclusions from the first three research cycles, making inferences concerning these results, and integrating such generalizations into the existing knowledge; that is, the discussion in Chapter 9 was essentially that of theory construction. While conclusions and generalizations were developed, the research cycle was stopped after the first stage, based upon the (subjective) decision that too many gaps in the understanding of educational success existed to formulate a valid theory.

As discussed in Chapter 9, the results and conclusions of this study generally supported the various research hypotheses that were either originally derived from the literature review or the initial conclusions of the earlier research cycles in this study. More importantly, the results provided new exploratory and additional descriptive knowledge about the academic achievement of elementary school Indian students and their classmates, in regards to the research questions posed in Chapter 1. But what do all of these generalizations and this knowledge tell one about Indian education?

It will be recalled that the review of the literature in Chapter 1 documented the protracted interest in Indian education, and the overwhelming sense that Indian students were failing. Beginning with the Meriam Report (Meriam et al., 1928), continuing through to the Kennedy Report (U.S. Senate, 1969), and up to the recent evaluation of Title IV, Part A projects (Development Associates, 1983; Young et al., 1983), research and evaluation of Indian education has failed to produce much theoretical understanding of Indian education, which in turn, has resulted in no applicable solutions for what can be done to change it. That is, there exists substantial empirical evidence of Indian student failure, but very little research that has attempted to explain why observed differences continue to exist between American Indian and non-Indian students' academic achievement.

It was concluded that this has been generally due to the fact that most researchers of Indian education have relied upon more general theories of education and, therefore, have presumed that the differences were primarily due to factors such as heredity (e.g., Jensen, 1969), luck (e.g., Jencks et al., 1972), or familial and cultural influences (e.g., Coleman et al., 1966; Plowden Report, 1967), all of which were beyond the control of the educational institution (see Bridge, Judd, and Moock, 1979; and Mosteller and Moynihan, 1972; Shea, 1976 for reviews of this literature). Yet, as also shown in the literature review, this theoretical position has not been left unchallenged (e.g., Brod, 1976b; Heyns, 1974, 1978; Mayeske et al., 1972; Rutter et al., 1979). That is, studies have suggested that some factors can be manipulated by the school system, and that such factors were equally, if not more, important to academic achievement than the non-manipulative factors cited by dominant theory.

Moreover, this alternative theoretical position has demonstrated that many of the conclusions formulated by the presiding theory were based upon research that was asking different types of questions and often encompassed different goals. That is, Coleman et al., Jencks et al., and others have been studying education with the goal of understanding how education could eliminate social inequality, not with the goal of understanding how educational equality or success could be achieved. Indeed, in discussing factors that were potentially manipulable by the school system, and thus could help increase academic achievement, Jencks et al., conceded that:

> If we think of school life as an end in itself rather than a means to some other end, <u>such differences are enormously important</u>. Eliminating these differences would not do much to make adults more equal, but it would do a great deal to make the quality of children's (and teacher's) lives more equal (1972:256; emphasis added).

It was also pointed out that this dominant theoretical position was based upon large scale, cross sectional (or correlational) designs, which often tended to blur regional and local differences or to not account for longitudinal factors. Lastly, this dominant theory has not provided much explanation for differences by grade level; presumably because the theory assumed that education was cumulative in nature, and that early pre-school home environmental influences determined the student's success or failure. The general conclusion or impression, then, that one is left with from reviewing previous research has continued to be one where school experiences seemingly have very little effect on student success, particularly Indian student success. According to this theoretical position, it does not matter what school (in the long run) students attend, and that the school environment has had little effect on student success because such achievement was due to what the students brought with them to the school.

The one exception found to this theoretical void concerning Indian education was Damian McShane's (1983) transcultural and developmental model. While McShane may have had student equality as his goal when he developed his model, it nonetheless retained the essence of the dominant position that educational achievement is essentially non-manipulable by the school system through its inherent emphasis on underlying personal and familial characteristics. McShane's focus upon a multivariate model that encompassed interactional aspects was, however, an important step in the right direction. Moreover, McShane's model attempted to include both environmental and interactional aspects, which was noted (in Chapter 1) to be similar in nature to the conceptual model of education recently proposed by Stockard and Mayberry (1987). Stockard and Mayberry's model has focused upon factors that were potentially manipulable (as well as some that would not be manipulable) by the school system. Their conceptual model, on the other hand, has failed to account for the multicultural educational processes of acculturation or the more propagandistic processes of assimilation. That is, Stockard and Mayberry's model addressed the socialization, but not the enculturation, of students.

Thus, it was concluded, from the review of previous studies, that there existed no model or theory that adequately explained Indian education, as narrowly defined by academic achievement. As stated at the beginning of this chapter, the intent of the last cycle of this study had been to develop a grounded theory of Indian education; which would have been based upon a synthesis of existing knowledge, concerning both Indian and non-Indian education, and the empirical generalizations of this study. Although it was concluded that the generalizaitons of this study were important, too much of the variance in academic achievement for Indian students (and the population in general) was left unexplained to construct an adequate theory; nor were the generalization from previous studies useful for doing so. However, this did not preclude more fully integrating some of the generalizations of this study, and suggesting some implications for further research.

Indian Education

The results of this study presented longitudinal and panel evidence for the formulation of theoretical generalizations that seemingly contradict existing understanding of Indian (and non-Indian) education. The results demonstrated that a number of variables within the control of the school system were influential in understanding academic achievement. Indeed, the study indicated that most of the factors that explain Indian student achievement were school environment and learning context, student evaluation, and previous student achievement characteristics, rather than personal and familial/cultural characteristics. More to the point, student evaluation factors were significantly more important in explaining Indian rather than population achievement, although personal and familial factors were significantly more important in explaining population rather than Indian academic achievement. This study did measure a number of the factors usually attributed to Indian students' educational failure (e.g., father's status, student's residence, parental employment), but failed to find them to be predictive of Indian student achievement. Indeed, this study has found that, on the average, between 92% and 96% of the variance in the academic achievement of Indian students was within the school system's potential control.

One factor that had been hypothesized to be predictive of Indian student academic achievement early in this study was the student's ethnicity. This personal/familial/cultural characteristic, however, was not found to be directly predictive of academic achievement. That is, being self-identified to the school system as being Indian was not an antecedent predictor of future achievement when other factors were included. Nonetheless, it was found that different factors explained Indian student academic achievement than accounted for the academic achievement of students in general in the Washoe County School District. Thus, it was concluded that ethnicity was, indeed, a factor in understanding and having an indirect effect on academic achievement, but one that must be controlled for rather than one that acts as a direct predictor.

Understanding Indian education, therefore, must include being Indian as a separate modeling measure; which requires a separate theory. This means, practically speaking, that school systems must accomodate this fact _if_ they want to achieve equality of education. For example, although school systems cannot control whether or not a student is Indian, they can potentially decrease the influence of this factor through sensitizing both teachers and students to its discriminating influence. School systems could also develop policies and curricula that reflect the appropriate needs of Indian students to structurally or institutionally enhance Indian students' academic achievement rather than simply assuming that the population models and theories necessarily apply. That is, ethnic group is not a biological reality, but rather a cultural fact, and in any case is not a predisposition of innate intelligence or potential; nor is it a default explanation of the resultant student (or adult).

The conclusions of this study, then, were most consistent with those made by Brod (1975, 1976b, 1978, 1979b) and Rutter et al. (1979). This study collaborated Brod's findings that potentially manipulable variables within the school system accounted for much of the variance in academic achievement (test scores). In contrast to Brod's findings, however, this study found this to be true for students in both urban and rural school settings. This also provided empirical evidence that refuted commonly held assumptions (e.g., Dankworth, 1969) that residence was a determinant predictor of Indian students' academic achievement. That is, living in an urban area, including urban Indian colonies, has been held to lead to higher academic achievement than living in a rural area or on a rural Indian reservation.

These results, moreover, supported the conclusions made by Rutter and his colleagues (1979), based upon their longitudinal study of English students, that there was tremendous variability between various groups and schools in student achievement, educational characteristics, and predictors of success. That is, this study found considerable differences between the Washoe County School District population and Indian students with respect to academic achievement success, student and school characteristics, and the antecedent predictors of academic achievement. Additionally, these results verified the assumption made by Rutter and his associates that a reliance upon one or two measures of academic achievement underestimates the importance of schooling.

A study by Driessen and Elliott (1968) had found that students' aspirations varied considerably by grade level, which led to the research hypothesis of this study that Indian student and population academic achievement would also vary by grade level and, more importantly, that the predictors would vary as well. The results of this study clearly showed that there was tremendous variation in the grade level models of academic achievement for both the Washoe County School District population and Indian students, as well as between the Indian students and the population. Moreover, the models for some grade levels accounted for nearly twice as much of the variance (R^2) in the standardized achievement test scores as that found in the aggregate population and Indian models. These results were of particular significance to understanding the academic achievement of Indian students for several reasons.

First, the assumption has been generally made in other studies that standardized achievement tests were measuring cumulative knowledge and learning. If such were the case, then, presumably, the amount of variance accounted for by the models should accumulate or increase because the factors explaining achievement would also be additive in nature. While the panal data used in this study were not true longitudinal data, it was possible to tentatively examine this assupmtion. Examination of the results, however, did not indicate that factors explained more variance for either the population or the Indian students. Tremendous variability was found for both the antecedents that were predictive of achievement at each grade level and the amounts of variance they accounted for. If the standardized achievement tests were measuring cumulative understanding, then it would be expected that the test scores would reflect this through progressively higher scores at each grade level. Again, the panel results of this study did not find this to hold. In terms of mean test scores, the panel results indicated that Indian and non-Indian students were doing relatively well in the second grade. The test scores for both Indian and non-Indian students generally showed a positive change in the panel results from the second to the third, and then to the fourth grades (see Figures 8 to 17). But this observed pattern in the panel results was interceded by either a leveling off or decline in standardized achievement test scores for both Indian and non-Indian students in the fifth grade.

Thus, the results of this study suggested that each grade level involved unique curriculums and goals, rather than integrative curricula and goals that built upon the achievement of previous grade levels. Yet, if each grade level had a different curriculum that was not somehow related to past and future curricula, how can the academic achievement of any group of students be validly assessed or explained--particularly across grade levels? That is, how valid were the standardized achievement tests given to third grade students if the test assumed students held accumulated knowledge from the second grade? More importantly, how can the Washoe County School District achieve cumulative understanding? It would seem, at this juncture, that the hope of the teachers was that a cumulative effect would somehow occur. That it was not occurring was somewhat evident by the finding that previous class grades were not very strong predictors of academic achievement. On the other hand, it could be that previous grades just were not particularly good predictors of academic achievement test scores because they were not valid measures of academic achievement. It may be, then, that previous grades were not valid measures, rather than the tests themselves; (again, assuming the tests were measuring some relevant phenomena). Indeed, it may well be that previous test scores would more validly and reliably represent a student's previous achievement. Of course, this would also imply the ludicrousness of class grades.

The second reason why these results were significant to Indian education was because the panal data provided some evidence of support for a "plateau" or "drop-off" effect.[30] As just discussed, the mean test scores from the panel data for both Indian and non-Indian students appeared to demonstrate generally positive progress or changes in standardized achievement test scores in the second, third, and fourth grades. But this pattern was interceded by either a leveling off or a decline in scores for both Indians and non-Indians in the fifth grade. Similarly, it has been noted that the ability of predictor antecedents to explain the variance in scores also declined, which suggested that this "drop-off" was probably due to factors not measured in this study. Following this fifth grade "drop-off," however, both Indian and non-Indian students showed positive increases in their test scores. But Indian students at this grade level failed to achieve at the same level as their classmates. That is, while non-Indian students made a significant turnaround at the sixth grade, Indian students essentially leveled off or "plateaued out."

Additionally, the predictor models showed the same pattern in terms of the explanatory power of the predictors, particularly with regards to previous reading grades. For example, previous grades accounted for as much as 66% of the total variance (in that achievement model) for fourth grade Indian students, but no more than 42% of the variance for fifth grade students. More importantly, previous grades explained more variance in all fourth grade models than in the same fifth grade models, and the total explained variance was always greater for fourth grade. The obvious question at this point was, what was causing this to happen?

To try and explain this "plateau effect," the conclusions were re-evaluated to try and discover some clues. First of all, it will be recalled that it was suggested that standardized achievement tests were not very cumulative. However, what might have been occurring was that the exams were more cumulative at one or more of the upper grade levels. From Table 10 in Chapter 2 it will be recalled that the intermediate level exam was used for grades 4, 5, and 6. However, Form 1 was administered to both the fourth and fifth grades and Form 2 to the sixth grade. Thus, it would seem probable that the exams were potentially more cumulative for fifth grade students than others. If this was the case, it would partially explain why the scores dropped off for fifth grade students.

Second, it was observed that Indian students were achieving their highest scores in the third and fourth grade (indeed in some cases they were above or very close to the national norms), yet previous achievement factors indicated that class grades assigned by teachers were not reflective or predictive of their relatively high performances on the standardized achievement tests (see Table 16, Chapter 3). That is, their class grades were considerably lower than would be expected for students with the standardized achievement test scores that Indian students had in the following grades (assuming cumulative knowledge). Such discrepancies between classroom achievement (class grades) and standardized test score measurements of achievement have also been linked to organizational differentiation (Cicourel and Kitsuse, 1963) and sex/gender differences (Ballantine, 1983; Dolan, 1987). Indeed, a recent report on sex differences between grades and test scores in math and science found that

> when students reported their rank in the graduating class, 42 percent of Montana's female students and 34 percent of the male students taking the SAT, were in the top 10 percent of their graduating class. However, the males in this group outscored females by 80 points on the mathematics test (Dolan, 1987:7).

This finding led Dolan to raise the obvious question which could be asked of any group of students with such a discrepancy:

> Why do female [or Indian] students rank so much higher according to GPA, a rank determined by teacher grades, yet are outscored on the math [and other types of] test[s] by such a significant margin? (Dolan, 1987:7).

While Dolan more recently focused upon the school's criteria for grading achievement, Cicourel and Kitsuse (1963) had earlier brought attention to the school system's processes of organizational differentiation and the ascription of labels based upon achievement and social types. Cicourel and Kitsuse had found that test/grade discrepancies were viewed by the school system as characteristics of the students, rather than the grading or testing processes:

> Students perform below or above their tested ability as a consequence of motivational, personal, and social "problems," not methods of teaching, preparation (readiness), or aptitude (1963:62-63).

In a real sense, this "gate keeping" process, then, has led to a self-fulfilling prophesy, because

> the classification of students as achievement types in effect produces a distribution of students who are conceived by the organizational personnel to have "problems" (1963:65).

Moreover, teacher evaluation factors (e.g., citizenship grades, placement in the gifted program) indicated that teachers were telling Indian students that they were not very good students. Thus, Indian students were not being adequately rewarded for their measured achievements. This was particularly important, because "where academic achievement is rewarded by faculty and peers, students tend to achieve better" (Ballantine, 1983:184; McDill et al., 1967). That is, students tend to conform to the academic norms of the school they attend, and teacher evaluations have provided such cues. More importantly, Brookover and his associates (Brookover et al., 1967; Brookover et al., 1973; Brookover and Schneider, 1975; Brookover et al., 1979; Brookover et al., 1982) have shown the importance of student perceptions of teacher evaluations to the school climate and "that school climate explains much of the difference in levels of school achievement, differences sometimes attributed to race, SES [socio-economic status] and home effects" (Ballantine, 1983:184; Brookover and Erickson, 1975:375-376).

When combined with other research evidence that the fourth grade is about when Indian students begin to become aware of their being Indian, it would seem probable that the fifth grade standardized achievement test scores may have resulted, at least in part, from a self-fulfilling prophecy. That is, fourth grade Indian students may have learned, or were somehow told, that Indians cannot succeed, and therefore began to fail. That is, the school did make a difference.

Third, examination of the predictor models and variables by grade level, (Appendixes J and K) both in terms of overall accountability and in terms of manipulable and non-manipulable variables, provided further evidence. That is, in the fourth grade, previous grades were incredibly powerful predictors of achievement test scores, but in the fifth grade they were nearly half as powerful. That is, if an Indian student did well in terms of classroom grades in the third grade, these previous grades were much more predictive of fourth grade achievement tests than were fourth grade class grades of fifth grade achievement. Good class grades, then, in the fourth grade were less predictive of fifth grade achievement, which suggest that in the fourth grade Indian students were not rewarded for their demonstrated achievement. It was also found that manipulable variables were more predictive for fourth grade than for fifth grade Indian students' academic achievement. More importantly, non-manipulable variables become increasingly important in the fifth grade, and were most important by the sixth grade.

Conversely, for non-Indian students, previous grades remained relatively consistent with regards to the amount of variance they explained in standardized achievement test scores for fourth to sixth grade students, although such predictability was less than that for Indian students. Hence, there was much greater congruence between class grades and achievement test scores for non-Indian students. Similarly, there was less fluctuation in the antecedent predictors of population achievement, particularly with respect to whether such variables were manipulable by the school system or not. In other words, personal and familial background characteristics were more important for predicting academic achievement in the general population than for Indian students only.

A fourth possibility was that something unique happened in the fifth grade that made that grade particularly tough for Washoe County School District students, but especially for Indian students. After all, the standardized achievement test scores did drop for both Indian and non-Indian students. That is, if the tests themselves were cumulative, and presumably the class curriculum too, then this would certainly constitute unique circumstances (assuming tests at other grade levels were less cumulative). One possibility might have been that fifth grade teachers were somehow different than fourth grade teachers in their expectations, teaching styles and personal characteristics. For instance, the only elementary school level Indian teacher in the Washoe County School District, who taught at the school with the largest Indian student population, taught fourth grade. Perhaps this was such a positive experience that getting another non-Indian teacher in the fifth grade resulted in greater disenchantment for the Indian students, than if she/he had had non-Indian teachers all along. That is, having a role model that Indian students could self-identify with may have resulted in increased achievement or different expectations, but the return to a non-Indian teacher in the fifth grade suppressed those gains and actually compounded the situation.

Another possibility was found through examination of other elementary teachers' characteristics, which suggested that one potentially major difference was teacher's sex. Overall only 19% of the elementary school teachers were males. Of these, only 13% were teaching at the fourth grade level, but 30% were teaching at the fifth grade level and 49% were at the sixth grade level (see Table A-3, Appendix A). Such figures, then, suggested that another problem occurring at the fifth grade level was that students were far more likely to have a male teacher for the first time. Indeed, it was found that, of the three schools with large numbers of Indian students, one school had all female teachers (School number 69), and the other two did not have any male teachers until the fifth grade. Moreover, Indian students had a 33% chance at one school (Number 03) and 66% chance at the other school (Number 33) of having a male teacher. While this may seem inconsequential, when considered with other results from this study, it becomes important.

It will be recalled that Indian students were significantly more likely to have a father missing or someone other than their natural father present in the home. From this fact it can be taken that Indian students may have been more likely than non-Indian students to have a difficult time relating to a male teacher. It will also be recalled that this very factor, father's status, was a strong predictor for fifth grade Indian students (see Table 53).

What does all of this mean? It means that Indian students probably were not being properly rewarded by their teachers and/or were not adjusting to the likely change of having a male teacher in the fifth grade for the first time. Moreover, the system may have been getting to the Indian student, so that a process of self-fulfilling prophecy became a reality. These panel data analyses indicated that Indian students were generally not statistically or substantively different from their classmates, in terms of teacher assigned class grades and academic achievement test scores, when they first started school. Indeed, achievement patterns, as measured by grades and test scores, from this panal study indicated that Indian students appeared to have often made greater gains in the early years of school than their classmates. Yet, it was also informally observed by the researcher that many teachers in the Washoe County School District honestly believed that Indian students could not succeed because they were Indian. Such an attitude was partially measured by the various teacher evaluation measures (e.g., citizenship grade). It will be recalled, however, that Indian students generally received lower teacher evaluations, but that they were significant, albeit not very accountable, predictors of their academic achievement test scores.

Such sociocultural discrimination could have easily produced a downward spiral of self-fulfilling prophecy. Because the relationship between expected background characteristics and test scores was generally stronger for the population in general, and because the teachers generally believed that most of these students could succeed, non-Indian students found themselves taking off towards significantly more positive educational fulfillment at the sixth grade level. Similarly, because non-Indian students were more likely to have a natural father, they probably would have a sociocultural advantage over Indian students in interacting with male teachers. That is, students with natural fathers probably have had more experience to draw upon when they encountered or had to interact with a male teacher for the first time, while Indian students would, most likely, have had to first learn new interpersonal relationship skills before they could proceed academically.

This is not to say that Indian students with natural fathers may not also be culturally disadvantaged because they may have had a completely different sociocultural family structure as well. That is, most educational systems contain the assumption that a student comes from a family with an accepted familial structure, and one which would have prepared them to "properly" interact in the classroom. Yet this was not the case for Indian students; they had to first learn how to be members of the school system (e.g., how to interact with male teachers) before they can learn what the system wants them to know (e.g., academic achievement). Non-Indian students also had a structural advantage in that they were more likely to have attended schools where they would have had male teachers at various grade levels, while most Indian students did not encounter male teachers for the first time until the fifth grade.

Taken together, then, it would appear that Indian students were being programmed towards failure between the third and fifth grades, which was a reality at the sixth grade level (when previous grades were, once again, a powerful predictor of achievement). Hence, the panal data results indicated that after a generally rugged fifth grade year, Indian students in the sixth grade showed a steady level or "plateau" of achievement, while non-Indian students' academic achievement apparently took off. That is, it would appear that education for Indian students failed to be cumulative, but was increasingly cumulative for non-Indian students. Moreover, although this study did not include data on middle and high school students, numerous studies have documented that this pattern of a widening gap between Indian students and their classmates continues through the twelfth grade, when Indian students have been found to be performing at about eighth grade achievement levels (e.g., Brod, 1979b; Brod and Brod, 1981; Coleman et al., 1966; Coombs, 1970).

At this point it is important to reiterate that this analysis was based upon a panel study design, rather than a true longitudinal research design. However, predictors did occur prior to the exams. This fact, then, increased the confidence in generalizing that education for Indian students in the sixth grade was not only not equal, but was becoming increasingly unequal. In other words, education was differentiating for Indian students, but increasingly homogenizing for non-Indian students. Thus, education in the sixth grade was working for non-Indian students, as institutionalized socialization, but had stopped functioning, as institutionalized enculturation (or assimilation), for Indian students.

Implications

Perceptibly, the results and conclusions of this study have suggested a number of important methodological, theoretical, and practical, or applied, implication.

Methodological Implications

A major conclusion of this study was that each test and subtest of the scholastic achievement test was a different measure of academic achievement. That is, knowledge about a student's reading test total or math test total scores was not always equally representative of either the subtests in reading and math or the other test scores (e.g., auditory, spelling, and science subtests and tests). Nor were the antecedent factors that accounted for the explained variance in the reading or math test total scores necessarily inclusive of the predictors of either the respective subtests or the other ignored subtest and test scores. Therefore, knowing that a student had a standardized score of say .10 on the reading test total would have hidden the fact that he/she had a .22 in word study skills and a -.02 in reading comprehension. Similarly, knowing that a set of particular factors, say previous grades, school acreage, library hours, student's sex, emergency telephone listing, grade, level, father's status and citizenship grade, were predictive of reading test total scores, hides the fact that participation in the gifted program, school cost, and change of schools, rather than student's sex, emergency telephone listing, grade level, father's status and citizenship grade, were predictive of the reading comprehension subtest scores.

That test total scores were not representative of all student achievement was particularly evident in the models by grade level; especially for Indian students. For example, third grade Indian students had the following mean scores (Table 13) for the two reading subtest and the test total scores:

Achievement Subtest/Test	Mean z-Score
Word Study Skills	-.37
Reading Comprehension	.08
Reading Test Total	.10

Granted, these mean scores were not dramatically different, but were, nonetheless, substantively different, and the test total score certainly hid the lower subtest scores. (It should be remembered that not all reading subtests were included in this study either, which is why the test total mean was more than the average of the two measured subtests). Similarly, the predictors of these test scores for second grade Indian students (Table K-1) were different for each subtest/test:

Achievement Subtest/Test	Predictors
Word Study Skills	1983 citizenship grade, change of schools
Reading Comprehension	1983 reading grade, school cost
Reading Test Total	1983 reading grade, age, student's absenteeism

Clearly, the subtests were measuring things that became lost or confounded when totaled together. Thus, the researcher who reported that the predictors of reading achievement, as measured by the reading test total score, were previous grades, age, and absenteeism would have reported misleading conclusions. And in this example the conclusions would have validated existing beliefs, when in fact a number of other atypical factors were also predictive of second grade reading achievement for Indian students.

Perhaps more importantly, it was observed that some of the dependent measures were subject to greater control and manipulation by the school system than others. For example, if only the reading test total and math test total scores had been used in this study, the conclusion would have been that 82% of the explained variance in reading achievement for the population and 92% for the Indian students, was explained by manipulable variables. Such a conclusion, however, could have masked that the following percentages of variance were accounted for by manipulable variables in the subtests:

	Manipulable Variables	
Achievement Test	Population	Indians
Word Study Skills	79%	70%
Reading Comprehension	87%	99%

That is, the percentage of variance accounted for by manipulable predictors was often quite different from the percentage for the test total. Moreover, other tests (e.g., auditory test total, spelling, science knowledge) also had different amounts of variance and predictors that were potentially manipulable by the school system (see Table 45).

Interestingly, a recent study of Indian and other students in the Minneapolis Public Schools also found evidence that achievement was not the same throughout the parts of a criterion referenced exam. Witthuhn (1984) reported finding different patterns of performance on mathematics strands of a locally developed criterion referenced benchmark test. Witthuhn reported that:

> The results of the analysis of the criterion referenced mathematics tests of more than 10,000 Minneapolis students indicate that significant differences in the total test scores of students are related to the ethnic group and socioeconomic class of the students, but that those differences do not exist uniformly throughout all parts of the mathematics curriculum (1984:61).

Witthuhn's research indicated that Indian students had problems with numeration, but demonstrated relative strength on the geometry strand. These findings, then, reiterate the results of the current research that the measurements of achievement tests vary considerably, which have presumably influenced (or contaminated) the results of those studies that used only test total scores. In Witthuhn's study, for example, if only the geometry strand had been used, Indian students would have shown mathematical strength in that school district, while reliance on the numeration strand would have led to the conclusion that Indian students were severely below expectation and use of the test total would have also indicated that they were failing.

In summary, the results of this study, which have been similarly reported by Witthuhn, have seriously implicated any research finding based solely upon standardized achievement test total scores. Methodologically, such generalized measures were shown not to be fully representative of Indian (and non-Indian) student achievement. Thus, future research will have to either delineate the focus of the study or ensure they have multifaceted measures of students' academic achievement. Failure to do so, would clearly bias any results obtained using just test total scores, because, as discussed above, the image of achievement based upon these generalized scores will often validate the existing theory that students' achievement is determined by factors that are beyond the control of the school system.

A second methodological implication derived from the findings was that less than half of the variance was accounted for by demographic/behavioral variables. Hence, it must be suggested that future research must include attitudinal, interactive, and cultural data on both students and their families, and school personnel, if more of the variance in academic achievement differences is to be explained. Moreover, additional analyses of characteristics unique to Indian students (or whatever study group) must also be included. Methodologically, observation of individual student actions and classroom interactions must be better understood, although Phillips'

(1983) study on the "invisible culture" has provided much needed understanding in this area.

A related methodological implication, therefore, concerned the data collection methods. Clearly, a triangulation of existng records, non-participant observation, interviewing, and survey methods is needed to obtain all the different types of data implied above as necessary. Such a position, no doubt, will require greater reliance upon inductive research and the "dumping" of theoretical biases. But that is what is needed before a theory of Indian education can really emerge.

Theoretical Implications

Although this research has not provided adequate conclusions to develop a theory of Indian education, it has evolved several important generalizations and considerations, along with a model for future studies. Foremost was the conclusion that any theory of Indian education will have to acknowledge that the school system does exert tremendous influence over both population and Indian student achievement, but also that it has greater control over the academic achievement of Indian students. That is, it was found that the predictors of the Washoe County School District population included significantly more non-manipulable variables than did the Indian models. Additionally, any theory will have to be complex enough to accommodate differences by grade level and recognize that the goals of education are different at each grade level, and thus the predictors will be different. The general theory will have to make explicit that it is applicable to Indian students only, because the antecendent predictors of Indian student achievement were different enough to warrant a distinctive theory.

In a study of a reservation schools in Arizona, Boloz and Varrati (1983) reported that given the chance through positive school image (i.e., ethos), proper curriculum, and school control, Navajo students who remain in the system demonstrated significantly higher achievement test scores. That is, the school system can make changes, but research must demonstrate and school personnel must accept, such ideas. The results of Boloz and Varrati and this study, then, suggest that any guiding theory of Indian education must encompass the effects and replacement of negative assumptions with positive ones; e.g., Indian student success rather than failure.

More importantly, when the conclusions of this study are juxtaposed with other recent research findings concerning classroom interactional differences for Indians and non-Indians in the classroom (Greenbaum, 1985; Philips, 1983), it would seem appropriate that theoretical understanding must include interactional characteristics. While many studies have shown attitudinal factors to be predictors of achievement, none have considered interactional differences. Indeed, the positive relationships in student and teacher interactions, teacher's sex, positive attitudes and achievement are theoretical and empirical unknowns, other than the assumption that they correlate positively; which, as this study has shown, may not be true. For instance, analysis of teacher distributions by sex suggested that having a male teacher may be negatively related to achievement, especially for Indian students.

All of these issues, however, address a more fundamental theoretical implication: the goals of Indian education. That is, the dominant belief is that the goal of education for Indians is assimilation or pluralism at best; but for most Indians themselves, the goal of education which is the prescribed goal of education for non-Indians, is socialization.

Assimilation refers to both cultural and social processes of change, and to cultural and social goals. As cultural processes, assimilation can be either crosscultural or intracultural. Crosscultural assimilation occurs when two or more cultures are in contact with each other, and involves the replacement of one of the cultures with the other. Crosscultural assimilation, then, involves groups of people (often entire societies or cultures) rather than individuals, and may occur through either force ("forced assimilation") by the dominant cultural group, or, in rare instances, by the choice of the subordinate cultural group. Additionally, the assimilated culture (the one losing its identity) may be either the subordinate or dominant culture, but since voluntary crosscultural assimilation is essentially sociocultural suicide, it seldom occurs. Thus, the goal of crosscultural assimilation is the elimination of one culture, which is also referred to as assimilation (or being assimilated).

Intracultural assimilation, in comparison, is the cultural process whereby a culture continues from one generation to the next by replacing the cultural void of new individual members; that is, it is the process whereby individuals obtain their culture. Intracultural assimilation is a fairly natural process that occurs within a specific culture or society. Intracultural assimilation, then, is the cultural process whereby the group of people transfer or instill their culture to the new members born into the group. The goal of intracultural assimilation, also referred to as assimilation (or being assimilated), is the incorporation of individuals into the culture.

Assimilation as a social process can best be conceptualized as a combination of crosscultural and intracultural processes. The social process of assimilation is one of homogenizing subcultures or minority groups with the dominant culture or majority group. Thus, assimilation as a social process, like crosscultural assimilation, involves groups rather than individuals, but, like intracultural assimilation, occurs within one culture or society. As such, it is often directed by the dominant/majority group, and, while it is often meant for the group, it is often directed toward individuals. As such, this social process of assimilation of individuals, is referred to as enculturation. Enculturation, then, is the process of eliminating a distinct minority (or cultural group) member through the homogenization of individuals by their incorporation of those traits designated by the majority. Thus, both assimilation, as a social process, and enculturation involve the incorporation of an alien culture by either the entire minority group (through assimilation) or the individual (through enculturation), and the goal, referred to as being assimilated, is the elimination of native (to the minority or cultural group member) traits for alien traits (from the majority). However, since the process of enculturating individuals into sociocultural group is often voluntary and, more important, additive rather than eliminative, it can also lead to a different goal, that of pluralism.

These processes of assimilation and enculturation are often confused with the social process of socialization, which is the process whereby an individual learns his native culture. That is, the individual interacts with others to achieve a series of specialized and acknowledged goals and/or directed skills important to and valued by the cultural group he/she is born into. A well socialized individual is someone who has fully absorbed or assimilated his/her native culture. Socialization, then, is the microlevel process of the macrolevel intracultural assimilation. That is, socialization occurs within identifiable small groups, and organizations, and intracultural processes occur within communities, regions and societies.

While the overriding purpose of socialization is to facilitate making individuals into actively participating members of their culture/society, there are two distinct goals of socialization. The most commonly accepted or preferred goal of socialization is to homogenize individuals for maximum conformity. In this respect socialization appears to be like assimilation or enculturation; indeed, this is why schools are often viewed as the great equalizers.

In contrast, the second goal of socialization is to differentiate individuals to foster creativity and initiative, to develop each person's potential and to produce individuals who can transform society. Both goals, despite their apparent contradiction, are fundamental to socialization (and education).

Education is the unbiased, institutionalized socialization of new native members. Education involves both formal and informal (e.g., the "hidden curriculum," Ballantine, 1983) processes to achieve both goals of socialization, and when schools emphasize one goal over another they engage in propaganda, which is biased, one-sided, institutionalized socialization. Yet, schools where Indians are students have two sets of goals: assimilation and membership/socialization. That is, socialization is usually referred to as the prescribed goal of education for non-Indians, but intracultural assimilation is also assumed. But the prescribed goal of education in many, if not most, schools for Indian students is crosscultural and/or social assimilation. Most schools do not have socialization as a goal for Indian students. This is not meant to imply, however, that within the Indian student's own cultural community the desired goal of education also involves the goal of socialization.

Consequently, the implication is that there are dialectical functions for the schools attended by Indian students. That is, on the one hand the school is to educate and on the other, it is to propagandize (or assimilate). But at schools where there are no

Indian students (and assuming few other minority students) the school's function is simply to educate; although this does not negate the possibility of the school simply propagandizing. Using the educational process, schools can achieve the twin goals of socialization for the cultural group that that school is a part of, or it can pursue, using the propaganda process, the goal of assimilation for "alien" students. But schools (and the educational institution) cannot perform both education and propaganda. Nor can they achieve both the goals of education for Indian students because crosscultural assimilation and socialization cannot co-exist; one requires the absence of the other (Edwards, 1985b).

Thus, this again raises the issue of whether or not academic achievement tests are validly measuring student's achievement pursuant to the school's goals for them. Do academic achievement tests measure both socialization and assimilation? Obviously, they measure socialization for non-Indian students, since that is the prescribed goal of education for them. In regards to Indian students, the long standing assumption has been that assimilation and socialization were the same process. More importantly, it has been assumed that the end product, homogenized members of society, was the same because schools, through both social assimilation and socialization, was the great equalizer. But Indian education as socialization would not result in the same end product since Indian cultures are different from the dominant culture. In other words, the processes of Indian assimilation and non-Indian socialization may both lead to the same end, but Indian socialization would result in their being members of their own unique cultural group or society. Tests, therefore, actually measure different parts of the final products or outcomes and not the processes themselves; that is, they measure the skills and knowledge necessary for surviving in the majority's cultural world. Hence, achievement tests are measuring homogenization and a common understanding of the dominant culture, regardless of the process leading to the product. Thus, because of their similar goals, academic achievement tests probably measure both socialization (for non-Indians) and assimilation (for Indians).

This becomes problematic since Indian students are socialized into their respective cultural ways prior to entering into the school systems. The theoretical implication, therefore, is that if Indian students are entering into the educational institution having been differentially socialized (e.g., Greenbaum, 1985; Philips, 1983), they will have entirely different antecedents to academic success than other students, which is what this study found.

Moreover, since the educational institution is attempting to assimilate rather than socialize Indian students while at the same time socialize non-Indian students, one would expect early high levels of accountability of academic achievement followed by declines. In other words, the students would be forced to learn to survive, but would then reach a plateau and level out. Thus, when one attempts to account for variance in the academic achievement of Indian students, previous achievement and evaluations would be presumable very explanatory at first, and then level off or drop out. Clearly, this was the pattern found in the results of this study. Moreover, this is understandable since socialization is generally meaningful to students, while assimilation is generally not desired. Conversely, if socialization is the primary goal, then the achievement pattern would reflect greater continuity and continued growth. It is particularly pertinent that in the district studied by Boloz and Varrati (1983) (see also Boloz and Jenness, 1984), the school system was explicitly attempting to socialize, rather than assimilate, Navajo students; and the result was increased achievement (i.e., continuity of achievement) across the grade levels.

Theoretically, then, it seems appropriate that future research should assume that, if the goal explicitly or implicitly is assimilation, then academic failure is likely to be found for Indian students, while if the goal is socialization, then academic success for Indian students is more probable. More specifically, if the goal of schools for Indian students is socialization to help the student to become a good person/member of their particular Indian society, then Indian education would be occurring. Conversely, if the goal for them is to conform to, and become an assimilated member of, non-Indian society, then what would be occurring is the "education" (or propagandization) <u>of</u> Indians. Since assimilation is generally not a desired goal for Indian students themselves, and is essentially disruptive to their own socialization, the goal of assimilation would clearly initiate a process of failure that takes hold at about the fifth or sixth grade.

Practical/applied implications. A secondary purpose of this study was to provide information to the Washoe County School District that would be useful in improving the academic achievement of Indian students. With this purpose in mind, several specific implications were drawn from the results and conclusions of this study.

The most important implication, obviously, is that the school district can do things to alter Indian student academic achievement (vis-a-vis success). This study has pointed out a number of factors potentially manipulable by the district. In particular, both measures of teacher evaluation--participation in the gifted student program and citizenship grades--are statistically significant predictors of achievement. That is, broadly speaking, participation in the gifted program is contingent upon teacher agreement (i.e., evaluation), and the results of this study strongly indicate that participation in this program has very positive effects on achievement test performance. Yet Indian students are half as likely to participate in the program. Similarly, it was found that citizenship grade, when it entered, was a fairly good predictor of achievement and may even lead to a situation of self-fullfilling prophacy. More importantly, citizenship grade, which is manipulable by the school system, was most predictive in the early elementary grade levels.

Additionally, the results indicated a relationship of some type between the participation in the gifted student program and Indian student participation in preschool, particularly in terms of predicting math concepts and math test total achievement scores. That is, without the preschool variable, participation in the gifted program was a fairly strong predictor of math concepts achievement. When the preschool factor was included, participation in the gifted program no longer significantly accounted for any of the variance in math concepts scores. Instead, preschool entered the equation as a suppressor variable of math concepts achievement. The implication, then, is that additional research is needed to understand this relationship.

More specifically, the Washoe County School District could probably improve Indian student achievement, over time, by equalizing or standardizing grading and evaluations by teachers by using achievement criteria rather than as rewards/punishments. Implicit to this, also is making teachers aware of assimilation goals (implicit or explicit) and the educational differences between Indian and non-Indian students and structural biases in achievement evaluation in an attempt to curtail self-fulfilling prophecy.

More generally, the results justify the need for different educational processes for Indian students; that is, different factors are predictive of their academic achievement and these must be considered. While a number of these factors have been identified, further research (e.g., teacher-student interaction patterns) is needed to better understand and explain Indian academic achievement. More importantly, the results demonstrate that familial differences and factors outside the school's control are not very important, and that, surprisingly, attendance differences do not really explain achievement differences either for Indian students or the population in general. Such results pose the implication that it is the teacher's evaluation of the student's attendance or the student's visibility (Brod, 1977) that is accounting for variance rather than attendance per se. Yet, other studies have indicated that upward grading bias (Brod, 1976a) and class grades (Brod, 1975) are a result of absenteeism, especially fourth quarter absenteeism, but not of achievement. This is particularly important because too often teachers and others assume that if an Indian (or any other ethnic) student is absent too often that he/she will not achieve well. But such an assumption is shown to be false by the empirical results of this study. Indeed, if attendance was a good predictor of achievement, Indian students would have had higher achievement test scores in 1984 than non-Indian students because they were present more.

Summary

This study has demonstrated the validity of its research hypotheses. It has descriptively presented characteristics concerning education in the Washoe County School District, which showed that the achievement level of Indian students, as measured by achievement test scores, was below that of their classmates, both at the aggregate and different grade levels. This study has also shown that different factors predicted such achievement for Indian students than for their classmates, and that, on the average, 60% of the predictors in the reading oriented models and 75% of the predictors in the math models (or 60% of the predictors in all ten models) that were associated with higher achievement for Indian students were potentially manipulable by the school system. Indeed, these same predictors accounted for between 80% and 100% (or, on the average, 92%) of the variance in the reading oriented models and between 90% and 100% (or, on the average, 96%) of the variance in the math oriented models. This meant that, on the average, 94% of the explained variance in achievement test scores for Indian students was attributable to factors potentially manipulable by the school system. On the other hand, for their classmates, 56% of the reading oriented models' and 71% of the math oriented models' (or 62% of all ten models') predictors were potentially manipulable by the school system. These factors accounted for between 65% and 90% (or, on the average, 82%) of the explained variance in the population reading oriented models and between 82% and 97% (or, on the average, 83%) of the explained variance in the population math oriented models. Thus, on the average, potentially manipulable variables accounted for 84% of the explained variance in achievement test scores for the population.

The study further found that non-manipulable variables were significantly more important to understanding population achievement than Indian student achievement. Contrary to what Coleman et al. (1966) have argued, this study found that personal and familial factors were not very predictive of academic achievement. Indeed, when such factors were predictive, personal and familial variables were significantly less predictive of Indian student than population achievement. Conversely, teacher evaluations were significantly more important to explaining Indian student achievement, and yet teachers were undergrading Indian students in comparison to their standardized achievement test scores later on.

This study, then, has shown that Indian students' academic achievement is below that of their classmates in the Washoe County School District, but that it is due to factors that are different from those explaining elementary education achievement in general, and that these factors are, potentially, more manipulable by the school system than are those accounting for population achievement. The results have shown the need to examine academic achievement separately for Indian students, and for each grade level. Moreover, it has been shown that a large factor in determining whether Indian students are failing or succeeding is how one measures academic achievement, and that a multifaceted assessment provides a much more valid representation of such achievement. However, before a complete theory of Indian education can be developed, further research into the unique characteristics of Indian students, classroom interactions, and student, family, and school personnel attitudes is needed.

ENDNOTES

[1]The special issue of Journal of Thought on "Indian Education: 1984," edited by Joe L. Kincheloe, Teresa Scott Kincheloe, and George H. Staley was brought to the attention of the investigator during discussions on the goals of Indian education. All of the articles in this special edition are of theoretical relevance and are included in the references. Interested readers are referred to this special edition for cognate readings.

[2]For a detailed discussion of such issues, see the October 1981 issue of American Psychologist. The main point of the criticism is that they underestimate the ability and achievement skills of minority students and are a poor assessment of their capabilities to function in the real world.

[3]The most obvious of these emerging roles would be that of truly Indian education: Indian directed socialization of their respective cultures. For additional types of possible goals, see Thomas Thompson (ed.) The Schooling of Native America (Department of Health, Education, and Welfare, U.S. Office of Education, Teacher Corps. Washington, D.C.: American Association of Colleges for Teacher Education, 1978) and Kincheloe, et al., (eds.) "Indian Education: 1984," Journal of Thought, 19, 3(Fall): 1-171.

[4]Dr. Carling Malouf has pointed out in personal discussions with the researcher that such a "cross-over effect" is subject to regional differences, and that in Alaska such evidence was not found in similar types of B.I.A. schools as those studied by Bryde. Another factor often not considered is that at about the same time as Bryde's research, reservation Indian youth were experiencing tremendously high rates of peer influenced suicide.

[5]It is noted that several faculty advisors to this dissertation pointed this very "fact" out as a potential variable for this study. It is, however, the researcher's opinion that residence is a very poor indicator of either culture contact or cultural integration (e.g., assimilation). For instance, most residents of the Reno area would probably find it hard to believe that the Reno-Sparks Indian Colony had more than one full time medicine man and religious leader. Yet,

it was discovered that at least one son was in the status of apprentice and was basically "bagging" school to learn culturally more important knowledge (i.e., culturally appropriate socialization rather than culturally confusing enculturation; see Edwards, 1985a, for greater discussion on this). Indeed, based upon discussions with residents of the Colony, it is the researcher's conclusion that for many residents the Colony is just as much an island of isolation and sanctuary as the Pyramid Lake Indian Reservation.

[6]Implicit to these goals was the interest to conduct multivariate analyses on this data to develop greater understanding concerning Indian education. The goals and objectives of this research, then, fulfill the district's implicit goals.

[7]Indeed the Indian population is the smallest: Asian/Pacific Islanders - 1,142 (3.66%); Blacks - 762 (2.44%); Hispanics - 1,727 (5.54%); Total Minorities - 4,355 (13.96%); Whites - 26,705 (85.62%) (W.C.S.D., 1984).

[8]It should be noted that none of these students were selected for the non-Indian comparison group. If they had, however, they would have been handled as non-Indians.

[9]Similar representation by classroom was included in the original sampling, but school recorded inconsistencies and policies made such impossible to control.

[10]While the district was agreeable to the researcher collecting information on non-Indian students for comparisons, they were not enthusiastic about collecting such data on over 7,000 non-Indians (5% sample).

[11]Considerable data on the students in grades 7-12 were also collected, but not used for this study for reasons previously stated.

[12]These students took the exams on the basis of teacher's prerogative. About 30% of the special education students, for whom data were collected, took part or all of the exams.

[13]Indeed several cases were not confirmed until May, 1985, some five months after the researcher had left the field.

[14]The researcher methodologically conceptualizes the existing records method as utilizing two primary techniques--original data analysis and secondary data analysis. The method is also conceptualized to be distinct from other methods utilizing communications; that is, the existing records method is distinct from the historical, content analysis, and library methods.

[15]In many respects this measures to a degree part of what Rutter, et al. (1979) refer to as school ethos.

[16]This was accomplished using SPSS^X procedures. Non-Indian cases were weighted using a determined weight factor of 26.4.

[17]The researcher agonized over the selection of terminology to use in this study. In another study (Edwards, 1986b), it was demonstrated that the term Indian invokes negative judgments about the subject, whereas specific tribal/national terms (e.g., Paiute) or the term Native American did not. Regardless of this--indeed, in contempt of the researcher's own conclusions--the term Indian was selected because it was conceptualized as more recognizable by most potential readers (and stylistically easier to use).

[18]While most students are aware of the racial ideas often included in the definition, it is noted that those students who are least likely to self-identify as Indian are those who are of lower blood quantum (i.e., less than one-quarter) or who are culturally or ethnically isolated from other Indians. Hence it would seem that in reality Indian is culturally and not racially conceptualized.

[19]Analyses of the data based upon 669 cases are reported elsewhere by Edwards (1985a, 1986a).

[20]Of these 149 variables, seven are applicable to Native American students only: 1) Is there a 506 Form on student? (FORM506); 2) Who is Native American? (WHONA); 3) What is the student's nationality or tribal affiliation? (NATION); 4) What is the status of the student's nation or tribe? (NATSTA); 5) Did the student attend preschool? (PRESCH); 6) What type of preschool program? (TYSCH); and 7) Number of years in a preschool program (YRPRE).

[21]English as a Second Language (ESL) and special education (SPED) were originally planned to be used as teacher evaluation factors. However, since students designated to such categories by teachers did not take exams, these variables were controlled rather than incorporated.

[22]Urban residence was methodologically defined as being within the city limits of either Reno or Sparks.

[23]A number of sociocultural factors may be interacting to make the absence of telephones in the home environment a reality. Certainly economic and racial bias by the local economy and the phone company must be included. Cultural disapproval of telephones, along with cultural unfamiliarity are also important. On the reservation many phone calls would be long distance due to geographical location.

Dr. Carling Malouf has also pointed out that he is familiar with many cases were someone will get a telephone and all their relatives use it and run up the bills thereby causing the removal of the telephone from that home. Hence family cultural differences indirectly lead to telephone possession and use patterns.

[24]It is recognized that several of these listings are not unique to ethnic/cultural groups, but rather the students' personal reference group(s).

[25]It is noted that enrollment figures for the variable on school enrollment (SCHEN) in Table 25 are different from those for the total number of students (STUTOT) in Table 34, which reflects the tremendous difficulty in getting accurate measurements of even this simple variable. The data did come from two different services--school offices and school libraries--but made at about the same time.

[26]While there may be logical reasons for these differences, every student, faculty and staff person this researcher has interacted with would much rather eat lunch and play/relax than go to the library--unless of course one is being disciplined by being sent to the library!

[27]Based upon these results, and informal interviews and observations, it would seem that the process of self-fulfilling prophecy also exists. That is, teachers and students believe that Indian students will fail, and they then do so.

[28]The term "suitable" means that the variables were somewhat correlated with the dependent variables, were not highly intercorrelated, did not have too great of a variance (or absence of variance), and were appropriately measured for sophisticated analyses.

[29]The researcher refers to this belief as ascribing to the theory of educational osmosis.

[30]To some degree this same phenomenon was observed for the population as well.

REFERENCES

Agresti, Alan and Barbara Finlay
1986 Statistical Methods For the Social Sciences, 2nd Edition. San Francisco: Dellen Publishing Company.

Alwin, D.F. and L.B. Otto
1977 "High school context effects on aspirations." Sociology of Education, 50:259-273.

Anderson, Kenneth E., E. Gordon Collister, and Carl E. Ladd
1953 The Educational Achievement of Indian Children. U.S. Department of the Interior, Bureau of Indian Affairs. [Washington, D.C.: U.S. Government Printing Office].

Aurbach, Herbert A.
1967 Proceeding of the National Research Conference on American Indian Education. U.S. Department of Health, Education, and Welfare, Office of Education. [Kalamazoo, MI: Society for the Study of Social Problems].

Ballantine, Jeanne H.
1983 The Sociology of Education: A Systematic Analysis. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Barlow, Donald L.
1984 "The process of Native American influence on the education of Native American children." Journal of Thought 19, 3 (Fall): 163-171.

Beatty, Willard W.
1953 "Forward." Pp. xi-xvi in K. Anderson et al., The Educational Achievement of Indian Children. U.S. Department of the Interior, Bureau of Indian Affairs. [Washington, D.C.: U.S. Government Printing Office].

Berry, Brewton
1968 The Education of the American Indians: A Survey of Literature. U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Research. [Washington, D.C.: U.S. Government Printing Office].

Blalock, Hubert M., Jr.
1979 Social Statistics, Revised Second Edition. New York: McGraw-Hill Book Company.

Boloz, Sigmund A. and Diana Jenness
1984 "The sun is shining in my eyes: the Navajo child enters kindergarten expecting to write and he can." Journal of American Indian Education 23, 2 (May):33-36.

Boloz, Sigmund A. and Richard Varrati
1983 "Apologize or analyze: measuring academic achievement in the reservation school." Journal of American Indian Education 22, 1 (October):23-28.

Branchard, Ralph J.
1953 "A comparative study of the intermediate grades of two Indian schools and two public schools in Rolette County." Fargo, ND: University of North Dakota, unpublished Master's thesis.

Bridge, R.G., C.M. Judd, and P.R. Moock
1979 The Determinants of Educational Outcomes: The Impact of Families, Peers, Teachers, and Schools. Cambridge, MA: Ballinger Publishing Company.

Brod, Rodney L.
1975 Native American Academic Achievement and Predictors of Grade Point Average. Technical Report, No. 1. Black River Falls, WI: School District Joint, No. 2.

1976a Predictors of Grade-Averaging Bias Among Teachers of Native American Students. Technical Report, No. 2. Black River Falls, WI: School District Joint, No. 2.

1976b "Major sources of Native American academic under-achievement: evidence against current sociological assessments." Paper presented at the annual meetings of the Social Science Division, American Association for the Advancement of Science, Pacific Division, Missoula, MT.

1977 Predicting School Attendance of Native Americans and Their Classmates. Technical Report, No. 3. Black River Falls, WI: School District Joint, No. 2.

Brod, Rodney L.
1978 Fort Belknap Educational Needs Assessment. Harlem, MT: Fort Belknap Community Council, Educational Department.

1979a Fort Belknap Vocational Educational Needs Assessment. Harlem, MT: Fort Belknap Community Council, Educational Department.

1979b Choctaw Education. Box Elder, MT: LPS & Associates.

Brod, Rodney L. and Mary Jean Brod
1981 Educational Needs of the Colville Confederated Tribes. Box Elder, MT: LPS & Associates.

Brookover, Wilbur B., et al.
1982 Creating Effective Schools. Holmes Beach, FL: Learning Publications.

Brookover, Wilbur B., et al.
1973 Elementary School Social Environments and Achievements. East Lansing, MI: College of Urban Development, Michigan State University.

Brookover, Wilbur B., et al.
1979 School Social Systems and Student Achievement: Schools Can Make A Difference. New York: Praeger.

Brookover, Wilbur B. and Edsel L. Erickson
1975 Sociology of Education. Homewood, IL: The Dorsey Press.

Brookover, Wilbur B., Edsel L. Erickson and Lee M. Joiner
1967 Self-Concept of Ability and School Achievement, III, Cooperative Research Project No. 2831. East Lansing, MI: Educational Publication Services, Michigan State University.

Brookover, W.B., C. Beady, P. Flood, J. Schweitzer, and J. Wisenbaker
1979 School Social Systems and Student Achievement. New York: Praeger Publishing Company.

Brookover, Wilbur B. and Jeffrey M. Schneider.
1975 "Academic environments and elementary school achievement." Journal of Research and Development in Education, 8:82-91.

Bryde, John S.
1965 "The Sioux Indian student: a study of scholastic failure and personality conflict." Denver, CO: University of Denver, unpublished Doctoral dissertation.

1970 The Sioux Indian Student: A Study of Scholastic Failure and Personality Conflict. Vermillion, SD: Dakota Press.

Campbell, Ernst Q. and C.N. Alexander
1965 "Structural effects and interpersonal relationships." American Journal of Sociology, 71:284-289.

Chadwick, Bruce A.
1972 "The indelible feast." Pp. 131-145 in H.M. Bahr et al., (eds.), Native Americans Today: Sociological Perspectives. New York: Harper & Row.

Cicourel, Aaron V. and John I. Kitsuse
1963 The Educational Decision-Makers. Indianapolis, IN: The Bobbs-Merrill Company, Inc.

Coleman, James S., Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Wainfeld, and Robert L. York
1966 Equality of Educational Opportunity. U.S. Department of Health, Education, and Welfare, Office of Education. [Washington D.C.: U.S. Government Printing Office].

Coleman, James S. Thomas Hoffer, and Sally Kilgore
1982 High School Achievement. New York: Basic Books, Inc., Publishers.

Coombs, L. Madison.
1970 The Educational Disadvantage of The American Indian Student. Las Cruces, NM: New Mexico State University Press.

Coombs, L. Madison, Ralph E. Kron, E. Gordon Collister, and Kenneth E. Anderson
1958 The Indian Child Goes to School: A Study of Interracial Differences. Washington, D.C.: U.S. Department of the Interior, Bureau of Indian Affairs, U.S. Government Printing Office.

Dale, George A.
1955 Education for Better Living: A Study of the Pine Ridge Educational Program. Washington, D.C.: U.S. Department of the Interior, Bureau of Indian Affairs, U.S. Government Printing Office.

Dankworth, Richard T.
1969 Educational Achievement of Indian students in Public Secondary Schools as Related to Eight Variables, Including Residential Environment. Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Research, U.S. Government Printing Office.

Day, Harry
1983 "Trends in academic achievement among Indian students in public schools." Pp 2-1 to 2-26 in Development Associates, Inc., Academic Performance, Attendance, and Expectations of Indian Students in Public Schools. Monograph 1. Arlington, VA: Development Associates, Inc. (ED 237 277)

Development Associates, Inc.
1983 Academic Performance, Attendance, and Expectations of Indian Students in Public Schools. Monograph 1. Arlington, VA: Development Associates, Inc. (ED 237 277)

DiSilvestro, I. Anthony
1961 "An analysis of the language achievement of Indian children in Washoe County elementary schools with proposals for improvement." Reno, NV: University of Nevada, unpublished professional paper.

Dolan, Dan
1987 "Does Montana treat female mathematics and science students poorly?" MSU Mathematics Newsletter, 30, 2 (Jan):7-8.

Dooley, David
1984 Social Research Methods. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Dorn, Donald D.
1954 "A comparative study of Indian and white children in the intermediate grades of the Cass Lake Public Schools." Fargo, ND: University of North Dakota, unpublished Master's thesis.

Dorris, Michael
1984 "Thoughts on Native American studies: the process of 'unlearning'." Journal of Thought 19, 3 (Fall):74-80.

Driessen, Jon and Delbert S. Elliott
1968 "Occupational and educational aspirations of high school students: a longitudinal study." Boulder, CO: University of Colorado, unpublished manuscript, Institute of Behavioral Science, Delinquency and Opportunity Project.

Edington, Evertt D.
1969 "Academic achievement of American Indian students--review of recent research." San Francisco, CA: The Rural Sociological Society. (ED 032 163)

Edwards, Karl O.
1985a "A comparison of Native American and Non-Native American elementary school student academic achievement in a large western school district." Paper presented at the annual meetings of the Education Section, American Association for the Advancement of Science, Pacific Division, Missoula, MT.

1985b "The dialectics of Indian education and socialization." Paper presented at the annual meetings of the Kyi-Yo Indian Youth Conference, Missoula, MT.

1986a "Descriptive characteristics of Indian and non-Indian achievement in Washoe County School District." Unpublished paper.

1986b "Indian is a dirty word." Billings, MT: Rocky Mountain College. (Mimeographed)

Elliott, Delbert S. and Harwin L. Voss
1971 Delinquency and Dropout. Boulder, CO: University of Colorado.

Flying Earth, Patricia Locke and Dean Chavers
1984 "The status of Indian education." Journal of Thought 19, 3 (Fall):31-47.

Foster, Carl G.
1984 "Knowledge, skills, attitude, achievement: An Indian program that worked." Journal of Thought 19, 3 (Fall):149-152.

Fuchs, Estelle and Robert J. Havighurst
1972 To Live on This Earth: American Indian Education. Garden City, NY: Doubleday and Company, Inc.

Glass, G.V.
1976 "Primary, secondary, and meta-analysis of research." Educational Research 5, 10:3-8.

1978 "Integrating findings: the meta-analysis of research." Review of Research in Education 6:351-379.

Goldsamt, Milton and Earl Jones
1983 "Reading and mathematics achievement test score patterns of Indian students served by the Title IV, part A projects in public schools." Pp. 9-2 to 9-94 in Development Associates, Inc., Academic Performance, Attendance, and Exploration of Indian Students in Public Schools. Monograph 1. Arlington, VA: Development Associate. (ED 237 277)

Gordon, Sandra L. and Barbara J. Boseker
1984 "Enriching education for Indian and non-Indian students." Journal of Thought 19, 3 (Fall):143-148.

Graham, Eleanora L.
1951 "An analysis of the errors made in the standardized achievement tests by Indian children in grades 6, 7, and 8 in Becker County, Minnesota." Greeley, CO: Colorado State College of Education, unpublished Master's thesis.

Greenbaum, Paul E.
1985 "Nonverbal differences in communication style between American Indian and Anglo elementary classrooms." American Educational Research Journal 22, 1 (Spring):101-115.

Havighurst, Robert J.
1970 The Education of Indian Children and Youth: Summary and Recommendations. The National Study of American Indian Education, Series IV, No. 6. Training Center for Community Programs, Center for Urban and Regional Affairs. Minneapolis, MN: University of Minnesota.

1957 "Education among American Indians: Individual and cultural aspects." The Annals of the American Academy of Political and Social Science 311 (May):105-115.

Hertzberg, Hazel Witman
1984 "The all Indian Pueblo council school." Journal of Thought 19, 3 (Fall):128-136.

Heyns, B.
1974 "Social selection and stratification within schools." American Journal of Sociology, 79:1434-1451.

1978 Summer Learning. New York: Academic Press.

Hill, L. Brooks and Philip D. Lujan
1984 "Symbolicity among Native Americans." Journal of Thought 19, 3 (Fall):109-120.

Hopkins, David A.
1951 "A brief history of Indian education on the Tongue River [Northern Cheyenne] Reservation." Missoula, MT: Montana State University, unpublished Master's thesis.

Hopstock, Paul
1983 "Summary and conclusions concerning academic performance of Indian students in Part A projects in public schools." Pp 9-1 to 9-4 in Development Associates, Inc., Academic Performance, Attendance, and Expectations of Indian Students in Public Schools. Monograph 1. Arlington, VA: Development Associates, Inc. (ED 237 277)

Hurlburt, Graham and Gurney Toews
1984 "Education for employment: a Manitoba model." Journal of Thought 19, 3 (Fall):159-162.

Isaac, Stephen and William B. Michael
1985 Handbook in Research and Evaluation. Second edition. San Diego, CA: EdITS Publishers.

Jencks, Christopher, Marshall Smith, Henry Acland, Mary Jo Bane, David Cohen, Herbert Gintis, Barbara Heyns, and Stephen Michelson
1972 Inequality: A Reassessment of the Effect of Family and Schooling in America. New York: Basic Books.

Jensen, Arthur R.
1969 "How much can we boost IQ and scholastic achievement?" Harvard Educational Review 39:1-123.

Jones, Russell A.
1985 Research Methods in the Social and Behavioral Sciences. Sunderland, MA: Sinaur Associates, Inc.

Kayser, Joyce
1963 "Schclastic performance and ethnicity." Journal of American Indian Education 3, 1 (Oct):27-30.

Kerlinger, Fred N.
1986 Foundations of Behavioral Research. Third Edition. New York, NY: Holt, Rinehart and Winston, Inc.

Kincheloe, Joe L. and Teresa Scott Kincheloe
1984 "The radical impulse: AIM's struggle for an Indian educational alternative." Journal of Thought 19, 3 (Fall):91-108.

Kincheloe, Joe L. and George H. Staley
1984 "Indian studies on the reservation: no easy answers." Journal of Thought 19, 3 (Fall):81-86.

Kincheloe, Joe L., Teresa Scott Kincheloe and George H. Staley (Eds.)
1984 "Indian education: 1984." Journal of Thought 19, 3(Fall):1-171.

Kincheloe, Teresa Scott
1984 "The wisdom of the elders: cross-cultural perspectives." Journal of Thought 19, 3 (Fall):121-127.

Kuhn, Thomas S.
1970 The Structure of Scientific Revolutions, Second Edition. Chicago, IL: The University of Chicago Press.

Lee, Knute H.
1953 "A comparison of the tenth, eleventh and twelfth grades of six schools in Sioux County, North Dakota and Carson County, South Dakota." Fargo, ND: University of North Dakota, unpublished Master's thesis.

Littlebear, Dick
1984 "Why I advocate bilingual education and linguistic studies." Journal of Thought 19, 3 (Fall):87-90.

Little Soldier, Lee
1984 "Indian education: a complex issue." Journal of Thought 19, 3 (Fall):59-64.

Lloyd, David O.
1961 "Comparison of standardized test results of Indian and Non-Indian [Students] in an integrated school system." Journal of American Indian Education 1, 1 (Jan):8-16.

Mayeske, G.W., T. Okada, W.M. Cohen, A.E. Beaton, and C.E. Wisler
1972 A Study of the Achievement of Our Nation's Students. Washington, D.C.: U.S. Government Printing Office.

McDill, Edward and Leo Rigsby
1973 The Academic Impact of Educational Climates. Baltimore, MD: The Johns Hopkins University Press.

McQuiston, John M. and Rodney L. Brod
1984 "Structural and cultural conflict in American Indian education." Journal of Thought 19, 3 (Fall):48-58.

McShane, Damian
1983 "Explaining achievement patterns of American Indian children: a transcultural and developmental model." Peabody Journal of Education 61, 1 (Fall):34-48.

McShane, Damian (ed.)
1983 "The transcultural education of American Indian and Alaska Native children: Teachers and Students in Transaction." Special Issue of the Peabody Journal of Education 61, 1 (Fall):1-112.

Mehan, H.
1979 Learning Lessons: Social Organization in the Classroom. Cambridge, MA: Harvard University Press.

Meriam, Lewis, Roy A. Brown, Henry Roe Cloud, Edward Everett Dale, Emma Duke, Herbert R. Edwards, Fayett Avery McKenzie, Mary Louise Mark, W. Carson Tyan, Jr., and William J. Spillman
1928 The Problem of Indian Administration. [The Meriam Report]. Baltimore, MD: The John Hopkins Press.

Mosteller, F. and D.P. Moynihan (Eds.)
1972 On Equality of Educational Opportunity. New York: Vintage Books.

Nelson, J.I.
1972 "High school context and college plans: The impact of social structure on aspirations." American Sociological Review, 37:143-148.

Parmee, Edward A.
1968 A Modern Apache Indian Community and Government Education Programs. Tucson, AZ: The University of Arizona Press.

Peters, Herbert D.
1963 "Performance of Hopi children of four intelligence tests." Journal of American Indian Education 2, 2 (Jan):27-31.

Peterson, Shailer
1948 How Well Are Indian Children Educated? Lawrence, KS: Haskell Institute Print Shop. (ALSO: Summary Supplement, 12p.).

Philips, Susan U.
1983 The Invisible Culture. New York: Longman.

Plowden Report
1967 Children and Their Primary Schools. London: HMSO.

Preuss, Marjorie C.
1969 "An investigation of background factors in American Indian academic performance." Reno, NV: University of Nevada, unpublished Master's thesis.

Purkey, S. and M. Smith
1982 Effective Schools -- A Review. Madison, WI: University of Wisconsin at Madison, Wisconsin Center for Educational Research.

Quirk, Virginia C.
1965 "A comparative analysis of the educational achievement of Indian and non-Indian students enrolled in the Orvis Ring elementary school and the E. Otis Vaughn junior high school." Reno, NV: University of Nevada, unpublished Master's thesis.

Reynolds, Paul D.
1971 A Primer in Theory Construction. Indianapolis, IN: Bobbs-Merrill Educational Publishing.

Rist, Severt R.
1961 "Shoshone Indian education: a descriptive study based on certain influential factors affecting academic achievement of Shoshone Indian students, Wind River Reservation, Wyoming." Missoula, MT: Montana State University, unpublished Master's thesis.

Ritzer, George
1980 Sociology: A Multiple Paradigm Science, Revised Edition. Boston, MA: Allyn and Bacon, Inc.

Rudes, Blair
1983 "Summary and conclusions concerning Indian student Public school attendance and retention/dropout." Pp 13-1 to 13-4 in Development Associates, Inc., Academic Performance, Attendance, and Expectations of Indian Students in Public Schools. Monograph 1. Arlington, VA: Development Associates, Inc. (ED 237 277)

Rutter, Michael, Barbara Maughan, Peter Mortimore, Janet Ouston and Alan Smith
1979 Fifteen Thousand Hours: Secondary Schools and Their Effects on Children. Cambridge, MA: Harvard University Press.

Safer, Dwight
1964 "An exploratory study of mental maturity, achievement, and personality test results in relation to the academic progress of Indians and Non-Indians in grades four through eight in six public school districts and one parochial school in Fremont County, Wyoming." Laramie, WY: University of Wyoming, unpublished Doctoral dissertation.

Saslow, H.L. and M.J. Harrover
1968 "Research on psychosocial adjustment of Indian youth." American Journal of Psychiatry, 125:224-231.

Shea, B.M.
1976 "School and its antecedents: Substantive and methodological issues in the status attainment process." Review of Educational Research, 46:463-526.

Siegel, Sidney
1956 Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Company.

Silverman, David
1985 Qualitative Methodology and Sociology. Brookfield, VT: Gower Publishing Company.

Stockard, Jean and Maralee Mayberry
1987 "School environments and student achievement: Toward a framework for understanding environmental influences." Paper presented at the annual meetings of the Pacific Sociological Association, Eugene, OR.

Summers, A.A. and B.L. Wolfe
1977 "Do schools make a difference?" American Economic Review, 65:639-652.

Szasz, Margaret C.
1977 (1974) Education and the American Indian: The Road to Self-Determination Since 1928. Albuquerque, NM: University of New Mexico Press.

Thomas, Linda Sue
1984 "Ethical considerations for planned social change in the education of American Indian people." Journal of Thought 19, 3 (Fall):153-158.

Thompson, Hildegard
1957 "Education among American Indians: Institutional aspects" The Annals of the American Academy of Political and Social Science 311 (May):95-104.

Thompson, Thomas
1978 The Schooling of Native America. Department of Health, Education and Welfare, U.S. Office of Education, Teacher Corps. [Washington, D.C.: American Association of Colleges for Teacher Education].

Uhlman, Esther R.
1953 "A comparative study of achievement and intelligence of Indians and whites in the public schools of Lapwai, Idaho." Moscow, ID: University of Idaho, unpublished Master's thesis.

United States Senate
1969 Indian Education: A National Tragedy--A National Challenge. [The Kennedy Report]. 91st Congress, 1st Session. Washington, D.C.: U.S. Government Printing Office.

Van Otten, George A. and S. Harry Tsutsui
1984 "Reflections on Indian education." Journal of Thought 19, 3 (Fall):137-142.

Wallace, Walter L.
1971 The Logic of Science in Sociology. New York, NY: Aldine Publishing Company.

Washoe County School District (W.C.S.D.)
1984 Needs Assessment. Title IV-A Indian Education Proposal for a Chapter 2 Block Grant. Reno, NV: Washoe County School District.

Wax, Murray
1964 Formal Education in an American Indian Community. An Society for the Study of Social Problems Monograph. Social Problems, Emory University, Atlanta, GA: Society for the Study of Social Problems. [Also: U.S. Department of Health, Education and Welfare, Office of Education].

Whiteman, Henrietta V.
1984 "Educational excellence: an Indian perspective." Journal of Thought 19, 3 (Fall):65-73.

Wiatrowski, M.D., S. Hansell, C.R. Massey, and D.L. Wilson
1982 "Curriculum tracking and delinquency." American Sociological Review, 47:151-160.

Williams, Frederick
1986 Reasoning With Statistics: How to Read Quantitative Research, Third Edition. New York: Holt, Rinehart and Winston.

Witherspoon, Y.T.
1962 "The measurement of Indian children's achievement in the academic tool subjects." Journal of American Indian Education 1, 3 (May):5-9.

Witthuhn, Jan
1984 "Patterns of student performance on mathematics strands for American Indians and others." Journal of Experimental Education 53 (Fall):58-63.

Wright, Susan E.
1986 Social Science Statistics. Boston: Allyn and Bacon, Inc.

Wynne, E.A.
1980 Looking at schools: Good, Bad and Indifferent. Lexington, MA: Lexington Books.

Young, Malcolm B., Robert Russell, John Reimer, Paul Hopstock, Milton Goldsamt, Howard Fleischman and Blair Rudes
1983 The Evaluation of the Impact of the Part A Entitlement Program Funded Under Title IV of the Indian Education Act. Final Report. Arlington, VA: Development Associates, Inc. (ED 237 276)

APPENDIX A

DISTRICT INFORMATION

Table A-1. Research Populations and Samples

School Number	Number of Students in School	Number of Indian Students in Sample	Percentage of Indian Students	Number of Non-Indian Students in Sample
		Elementary Schools		
1	357	1	0.2	12
2	439	3	0.7	15
3	434	57 (56)[a]	13.1 (12.9)[a]	13
4	278	0	0.0	10
5	390	11	2.8	15
6	437	13 (14)	3.0 (3.2)	13
7	660	5	0.8	22
8	578	6	1.0	19
9	405	7	1.7	14
10	480	22 (18)	4.6 (3.8)	16
11	384	2	0.5	13
12	366	4 (2)	1.1 (0.5)	12
13	368	2	0.5	13
14	285	3 (1)	1.0 (0.4)	9
15	435	8 (7)	1.8 (1.6)	15
16	147	0	0.0	5
17	421	6 (3)	1.4 (0.7)	14
18	445	4	0.9	15
19	67	2	3.0	2
20	500	5	1.0	17
21	539	12 (10)	2.2 (1.9)	18
22	390	2	0.5	13
23	444	1 (2)	0.2 (0.4)	15
24	225	6	2.7	7
25	422	11 (10)	2.6 (2.4)	14
26	430	15 (12)	3.5 (2.8)	13
27	451	11 (8)	2.4 (1.8)	15
28	133	116 (113)[b]	87.2 (84.9)[b]	22[d]
29	327	6 (4)	1.8 (1.2)	11

[a]--Numbers in parentheses () are those provided by district records, other numbers are based on the school's records.
[b]--Includes 7th and 8th grade students.
[c]--School has only special education students.
[d]--Indicates that the non-Indian population was deliberately oversampled.

Table A-1. (continued)

School Number	Number of Students in School	Number of Indian Students in Sample	Percentage of Indian Students	Number of Non-Indian Students in Sample
		Elementary Schools (continued)		
30	360	6 (5)[a]	1.7 (1.4)[a]	12
31	147	0 (7)[c]	0.0 (4.8)[c]	0
32	382	10 (8)	2.6 (2.1)	13
33	558	47 (42)	8.4 (7.5)	18
34	286	10	3.5	10
35	188	13	6.9	6
36	418	11 (8)	2.6 (1.9)	14
37	620	17	2.7	22
38	527	17 (16)	3.2 (3.0)	17
39	417	4 (3)	1.0 (0.7)	14
40	107	3 (2)	2.8 (1.9)	4
41	323	4	1.2	11
42	339	5	1.5	11
	15909	488 (456)	3.1 (2.9)	544
		Middle Schools		
43	619	8	1.3	21
44	680	13	1.9	22
45	287	3	1.0	10
46	596	16	2.7	20
47	655	3	0.5	22
48	793	10	1.3	26
49	710	3	0.4	24
50	473	12	2.5	16
51	464	30	6.5	15
	5277	98	1.9	176

[a]--Numbers in parentheses () are those provided by district records, other numbers are based on the school's records.
[b]--Includes 7th and 8th grade students.
[c]--School has only special education students.
[d]--Indicates that the non-Indian population was deliberately oversampled.

Table A-1. (continued)

School Number	Number of Students in School	Number of Indian Students in Sample	Percentage of Indian Students	Number of Non-Indian Students in Sample
		High Schools		
52	51	4	7.8	2
53	1114	22	2.0	37
54	330	2	0.6	11
55	1005	12	1.2	34
56	1662	31	1.9	55
57	1415	10	0.7	47
58	1320	26	2.0	44
59	482	22	4.6	16
60	1704	27	1.6	57
	8927	156	1.7	303

[a]--Numbers in parentheses () are those provided by district records, other numbers are based on the school's records.
[b]--Includes 7th and 8th grade students.
[c]--School has only special education students.
[d]--Indicates that the non-Indian population was deliberately oversampled.

Table A-2. District, Middle and High School Transiency Reports (1979 - 1984)

School Number	1983-84 (%)	1982-83 (%)	1981-82 (%)	1980-81 (%)	1979-80 (%)	1978-79 (%)
			District Totals			
All Schools	53	46	52	55	59	52
			Middle Schools			
43	45	30	36	37	32	29
44	34	30	35	34	38	38
45	40	27	24	N/A	N/A	N/A
46	50	47	57	62	63	64
47	37	39	40	40	41	43
48	30	28	32	32	31	32
49	35	27	39	28	14	32
50	60	57	65	83	90	64
51	46	51	48	90	97	73
Average	41	37	42	48	47	45
			High Schools			
52	26	23	26	52	56	29
53	87	50	52	60	56	53
54	38	38	38	46	66	44
55	56	40	N/A	N/A	N/A	N/A
56	48	30	34	40	43	41
57	43	31	29	27	29	30
58	85	48	55	58	58	57
60	68	41	49	57	56	48
Average	62	39	42	47	49	45

Table A-3. Teacher Frequency Distributions
For Schools by Grade Level and Sex

School Number	2nd Grade M	2nd Grade F	3rd Grade M	3rd Grade F	4th Grade M	4th Grade F	5th Grade M	5th Grade F	6th Grade M	6th Grade F
01	0	2	0	2	0	3	0	3	0	2
02	0	2	0	2	0	2	1	2	0	3
03[a]	0	3	0	2	0	3	1	2	1	3
04	0	2	0	2	0	1	1	1	1	1
05	0	2	0	2	0	2	2	0	2	1
06	0	2	1	1	0	1	0	2	1	1
07	1	2	1	3	1	2	0	3	2	1
08	0	3	1	2	0	3	0	2	1	2
09	0	3	0	2	1	1	1	1	1	2
10	0	3	1	2	0	2	1	1	3	0
11	0	2	0	2	0	2	0	2	1	1
12	0	2	0	1	0	2	0	2	2	0
13	0	2	1	1	0	2	0	2	0	2
14	0	2	0	2	0	2	0	1	1	1
15	0	3	0	2	0	2	1	1	1	1
16	0	1	0	1	0	1	0	1	0	1
17	0	3	0	2	2	1	1	1	2	0
18	0	2	0	4	1	3	1	2	-	-
19	0	1	0	1	0	1	0	1	-	-
20	0	3	0	2	0	3	1	2	2	2
21	1	2	0	2	0	3	1	2	2	1
22	0	2	0	2	0	2	1	1	2	0
23	0	3	0	2	0	3	0	2	1	2
24	0	2	0	1	0	1	0	1	0	1
25	0	2	0	2	0	2	1	1	2	2
26	0	3	0	4	0	2	0	3	0	3

[a]--Indicates school with sizable Indian student population.

Table A-3. (continued)

School Number	Grade Level and Sex									
	2nd Grade		3rd Grade		4th Grade		5th Grade		6th Grade	
	M	F	M	F	M	F	M	F	M	F
27	0	2	0	2	1	1	1	1	1	1
28[a]	0	1	0	1	0	1	0	1	0	1
29	0	1	0	1	0	2	0	2	1	1
30	0	3	0	2	2	0	1	1	1	1
31	-	-	-	-	-	-	-	-	-	-
32	0	3	0	2	0	2	1	1	1	1
33[a]	0	3	0	2	0	3	2	1	2	1
34	0	3	0	3	0	1	1	1	2	0
35	0	1	0	2	0	1	1	0	1	0
36	0	3	0	3	0	2	0	2	1	2
37	0	4	0	3	0	3	0	3	1	2
38	0	3	0	3	1	2	1	2	2	1
39	0	2	0	3	1	1	2	0	0	2
40	0	1	0	1	0	1	0	2	0	1
41	0	2	0	2	1	1	1	1	2	0
42	0	2	0	2	0	2	1	1	0	1
Total	2	93	5	83	11	75	26	61	43	48
(%)	(2)	(98)	(6)	(94)	(13)	(87)	(30)	(70)	(47)	(53)

District Totals:	f	%
Male	87	19.5
Female	360	80.5
Total	447	100.0

[a]--Indicates school with sizable Indian student population.

APPENDIX B

CODING MANUAL

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
		Personal and Academic Characteristics (CARD NO. 1)	
1-4	SID	Study ID Number	Enter number
5-6	SCODE	School Code	Enter number
7-12	ID	Student ID Number	Enter number
13-16	GRID	Grid Number	Enter number
17	SPED	Special Education Code	See Coding Suppl. 1
18-19	LEVEL	Grade Level, 1983-84	Enter number
20	SEX	Student's Sex	Enter 0=Male 1=Female
21	RESID	Student's Residence	Enter 0=Urban/Reno-Sparks area 1=Colony 2=Rural/County 3=Reservation
22	TELE	Student's Phone Listed	Enter 0=no 1=yes
23-28	BDATE	Student's Birthdate	Enter number (MMDDYY)
29	BIRTH	Student's Birthplace	Enter 0=Reno/Sparks 1=Schurz, NV 6=Outside the U.S. 7=Elsewhere in Nevada 8=Out of State 9=N/A
30	PREATT	Previous W.C.S.D. Attendance	Enter 0=no 1=yes 9=N/A

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
31	REG	Racial Ethnic Group	Enter 0=N/A 1=Indian 2=Asian 3=Black 4=White 5=Hispanic
32-33	LASTSC	Last School Attended	Enter School Number 00=Outside W.C.S.D. 99=N/A
34	FATHER	Is Father Living?	Enter 0=no 1=yes
35	FASTA	Father's Status	Enter 0=Natural 1=Step 2=Guardian 9=N/A
36-37	FAOC	Father's Occupation	See Coding Suppl. 2
38	FAEMLO	Father's Employer Located Outside Commuter Area	Enter 0=no 1=yes 9=N/A
39	MOTHER	Is Mother Living?	Enter 0=no 1=yes
40	MOSTA	Mother's Status	Enter 0=Natural 1=Step 2=Guardian 9=N/A
41-42	MOOC	Mother's Occupation	See Coding Suppl. 2
43	MOEMLO	Mother's Employer Located Outside Commuter Area	Enter 0=no 1=yes 9=N/A

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
44	PABSENT	Number of Parents Absent	Enter 0=Both Present 1=Father Absent 2=Mother Absent 3=Both Absent
45	EMPLOY	Number of Parents Employed	Enter 0=Both 1=Father Only 2=Mother Only 3=Neither
46	EMERPER	Emergency Contact Person Listed	Enter 0=no 1=yes
47	EMERTEL	Emergency Contact Telephone Listed	Enter 0=no 1=yes
48-49	TTRAN84	Number of Transfers Since Starting W.C.S.D. Schools	Enter number
50	TRANS84	Number of Transfers During 1983-84	Enter number
51-52	MODIST84	Number of Continuous Months With District (1983-84)	Enter number
53	RETAIN84	Was Student Retained? (1982-83)	Enter 0=no 1=yes
54	TRETAIN84	Number of Times Retained (1983-84)	Enter number
55	FABIRTH	Father's Birthplace	Use Birth Codes used for students
56	MOBIRTH	Mother's Birthplace	Use Birth Codes used for students
57-60	AR84	Arithmetic Grade (83-84)	See Coding Suppl. 3

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
61-64	HW84	Handwriting Grade (83-84)	See Coding Suppl. 3
65-68	LA84	Language Grade (83-84)	See Coding Suppl. 3
69-72	RE84	Reading Grade (83-84)	See Coding Suppl. 3
73-76	SH84	Science/Health Grade (83-84)	See Coding Suppl. 3
77-80	SOC84	Social Studies Grade (83-84)	See Coding Suppl. 3
81-84	SP84	Spelling Grade (83-84)	See Coding Suppl. 3
85-88	ART84	Art Grade (83-84)	See Coding Suppl. 3
89-92	MUS84	Music Grade (83-84)	See Coding Suppl. 3
93-96	CZ84	Citizenship Grade (83-84)	See Coding Suppl. 3
97-101	DP84	Number of Days Present (83-84)	Enter number
102-105	DA84	Number of Days Absent (83-84)	Enter number
106-110	DNE84	Number of Days Not Enrolled (83-84)	Enter number
111	TRANS83	Number of Transfers During 1982-83	Enter number
112-113	MODIST83	Number of Continuous Months With District (82-83)	Enter number
114	RETAIN83	Was Student Retained? (81-82)	Enter 0=no 1=yes

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
115	TRETN83	Number of Times Retained (82-83)	Enter number
116-119	AR83	Arithmetic Grade (82-83)	See Coding Suppl. 3
120-123	HW83	Handwriting Grade (82-83)	See Coding Suppl. 3
124-127	LA83	Language Grade (82-83)	See Coding Suppl. 3
128-131	RE83	Reading Grade (82-83)	See Coding Suppl. 3
132-135	SH83	Science/Health Grade (82-83)	See Coding Suppl. 3
136-139	SOC83	Social Studies Grade (82-83)	See Coding Suppl. 3
140-143	SP83	Spelling Grade (82-83)	See Coding Suppl. 3
144-147	ART83	Art Grade (82-83)	See Coding Suppl. 3
148-151	MUS83	Music Grade (82-83)	See Coding Suppl. 3
152-155	CZ83	Citizenship Grade (82-83)	See Coding Suppl. 3
156-160	DP83	Number of Days Present (82-83)	Enter Number
161-164	DA83	Number of Days Absent (82-83)	Enter Number
165-169	DNE83	Number of Days Not Enrolled (82-83)	Enter Number
170	TFORM	Test Form	See Coding Suppl. 4
171-172	SKLSR	Reading Word Study Skills Score	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
173-174	WORDR	Reading Word Study Score	Enter number
175-176	READR	Reading Comprehension Score	Enter number
177-178	RER	Reading Score	Enter number
179-181	READTR	Reading Test Total Score	Enter number
182-183	VOCR	Vocabulary Knowledge Score	Enter number
184-185	LISTR	Listening Comprehension Score	Enter number
186-188	AUDITR	Auditory Test Total Score	Enter number
189-190	SPELLR	Spelling Score	Enter number
191-192	LANGR	Language Knowledge Score	Enter number
193-194	LASPTR	Language and Spelling Total Score	Enter number
195-196	MATHR	Math Concepts Score	Enter number
197-198	COMPR	Math Computation Knowledge Score	Enter number
199-200	APPLR	Math Applications Score	Enter number
201-203	MATHTR	Math Test Total Score	Enter number
204-205	SOCSR	Social Science Score	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
206-207	SCIR	Science Knowledge Score	Enter number
208-210	TOTLER	Total Battery Score	Enter number
211	FORM506	Is There a 506 Form on Student?	Enter 0=no 1=yes
212	WHONA	Who is Native American?	See Coding Suppl. 5
213-215	NATION	What is Student's Nationality or Tribal Affiliation?	See Coding Suppl. 6
216	NATSTA	What is Student's National or Tribal Status?	See Coding Suppl. 7
217	GIFT	Participation in the Gifted Student Program	Enter 0=no 1=yes
218	PRESCH	Preschool Attendance	Enter 0=no 1=yes
219	TYSCH	Type of Preschool	Enter 0=N/A 1=Reno Colony Headstart 2=Pyramid Lake 3=Other 4=Both 1 & 2
220	YRPRE	Number of Years in Preschool	Enter number
221-223	TEACH84	Teacher for 1983-84	Enter Teacher Number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
224	MEAL	Participation in the Federal Lunch Program	Enter 0=Not in Program 1=Free Lunch 2=Reduced Fare Lunch
225	THELD	Total Number of Retentions in W.C.S.D.	Enter number
226	SAT	Took SAT Test in 1984	Enter 0=no 1=yes
227	MOVE	Moved Out of School District Prior to Test in 1984	Enter 0=no 1=yes
228	DATA	Types of Data Available on Student	See Coding Suppl. 7
229	ESL	Does Student Participate in the ESL Program?	Enter 0=no 1=yes
230-232	AGE	Student's Age in Months at Time of Test	Enter number
		<u>Contextual/School Characteristics</u> (CARD NO. 2)	
1-2	SCHOOL	School Code	Enter number
3-6	SCHEN	School Enrollment (May)	Enter number
7-10	DATELIB	Date of Library Inventory	Enter number (MMYY)
11-15	BKS83	Number of Books Inventoried in 1983	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
16-18	BKSLOST	Number of Books Lost or Missing in 1983-84	Enter number
19-22	BKSDIS	Number of Books Discarded in 1983-84	Enter number
23-26	BKSADD	Number of Books Added in 1983-84	Enter number
27-31	BOOKS	Total number of Books in Collection at 6/84	Enter number
32-33	ENCYC83	Total Number of Encyclopedia Sets in 1983	Enter number
34-35	ENCYC84	Total Number of Encyclopedia Sets in 1984	Enter number
36-37	ENCYCLI	Number of Encyclopedia Sets in the Library	Enter number
38-39	ENCYCCL	Number of Encyclopedia Sets in Classrooms	Enter number
40-41	ENCYCMI	Number of Encyclopedia Sets Missing Volumes	Enter number
42-45	FILMS	Number of Filmstrips	Enter number
46-49	AUDTAPE	Number of Audio Tapes	Enter number
50-53	AUDREC	Number of Audio Recordings	Enter number
54-56	VIDTAPE	Number of Video Tapes	Enter number
57-59	SOFTWARE	Number of Software Programs	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
60-63	MICRO	Number of Microforms	Enter number
64-67	FICHE	Number of Microfiche	Enter number
68-72	SLIDE	Number of Slides	Enter number
73-76	TRSPAR	Number of Transparencies	Enter number
77-80	KITS	Number of Instructional Kits	Enter number
81-82	LOOPS	Number of Film Loops	Enter number
83-84	GLOBE	Number of Globes	Enter number
85-86	MODEL	Number of Models	Enter number
87-91	AV	Total A.V. Materials	Enter number
92-93	MAG	Number of Magazine Subscriptions	Enter number
94-95	NEWS	Number of Newspaper Subscriptions	Enter number
96	CERTLIB	Number of Certified Librarians	Enter number
97	LIBAST	Number of Library Assistants	Enter number
98-99	STUAID	Average Number of Student Library Aides Per Day	Enter number
100	AIDES	Number of Paid Aides	Enter number
101-103	OPENB	Number of Minutes Library is Open Before School	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
104-105	OPENL	Number of Minutes Library is Open During Lunch	Enter number
106-108	OPENA	Number of Minutes Library is Open After School	Enter number
109-112	CIRCUL	Weekly Average Circulation	Enter number
113-116	STUUSE	Weekly Average Student Use	Enter number
117-119	STUK	Number of Students in Kindergarten	Enter number
120-122	STU1	Number of Students in First Grade	Enter number
123-124	STU2	Number of Students in Second Grade	Enter number
125-127	STU3	Number of Students in Third Grade	Enter number
128-129	STU4	Number of Students in Fourth Grade	Enter number
130-131	STU5	Number of Students in Fifth Grade	Enter number
132-133	STU6	Number of Students in Sixth Grade	Enter number
134-136	STUTOT	Total Number of Students	Enter number
137-140	TEACHK	Number of Kindergarten Teachers	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
141-144	TEACH1	Number of First Grade Teachers	Enter number
145-148	TEACH2	Number of Second Grade Teachers	Enter number
149-152	TEACH3	Number of Third Grade Teachers	Enter number
153-156	TEACH4	Number of Fourth Grade Teachers	Enter number
157-160	TEACH5	Number of Fifth Grade Teachers	Enter number
161-164	TEACH6	Number of Sixth Grade Teachers	Enter number
165-169	TEACHTO	Total Number of Teachers	Enter number
170-172	ASSTK	Number of Kindergarten Aides/Assistants	Enter number
173-175	ASST1	Number of First Grade Aides/Assistants	Enter number
176-178	ASST2	Number of Second Grade Aides/Assistants	Enter number
179-181	ASST3	Number of Third Grade Aides/Assistants	Enter number
182-184	ASST4	Number of Fourth Grade Aides/Assistants	Enter number
185-187	ASST5	Number of Fifth Grade Aides/Assistants	Enter number
188-190	ASST6	Number of Sixth Grade Aides/Assistants	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
191-194	ASSTTOT	Total Number of Aides/Assistants	Enter number
195-196	SEK	Number of Special Education Students, Kindergarten	Enter number
197-198	SE1	Number of Special Education Students, First Grade	Enter number
199-200	SE2	Number of Special Education Students, Second Grade	Enter number
201-202	SE3	Number of Special Education Students, Third Grade	Enter number
203-204	SE4	Number of Special Education Students, Fourth Grade	Enter number
205-206	SE5	Number of Special Education Students, Fifth Grade	Enter number
207-208	SE6	Number of Special Education Students, Sixth Grade	Enter number
209-211	SETOT	Total Number of Special Education Students	Enter number
212-216	SETEACH	Total Number of Special Education Teachers	Enter number
217-218	ESLSTUK	Number of ESL Students, Kindergarten	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
219-220	ESLSTU1	Number of ESL Students, First Grade	Enter number
221-222	ESLSTU2	Number of ESL Students, Second Grade	Enter number
223-224	ESLSTU3	Number of ESL Students, Third Grade	Enter number
225-226	ESLSTU4	Number of ESL Students, Fourth Grade	Enter number
227-228	ESLSTU5	Number of ESL Students, Fifth Grade	Enter number
229-230	ESLSTU6	Number of ESL Students, Sixth Grade	Enter number
231-232	TOTESL	Total Number of ESL Students	Enter number
233-236	ESLTEACH	Total Number of ESL Teachers	Enter number
237-240	RESTEACH	Number of Library/ Resource Teachers	Enter number
241-244	FEDS	Number of Federal Employees	Enter number
245-248	COUNSEL	Number of Counselors	Enter number
249-253	STAFF	Total Staff	Enter number
254-255	SCHAGE	Age of School in 1984	Enter number
256-257	IMPROV	Number of Improvements	Enter number
258-259	ROOMS	Total Number of Classrooms	Enter number

VARIABLE/CATEGORY CONTENT AND CODING SYSTEM

Column Numbers	Abbreviated Variable Name Code	Variable Description	Variable Coding Description
260-267	SQFT	Total Square Footage	Enter number
268-273	ACRE	Site Acreage Size	Enter number
274-281	COST	Total Cost of School Construction	Enter number

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
PERLOST	Percentage of books lost	(BKSLOST/BKS83)*100
PERDIS	Percentage of books discarded	(BKSDIS/BKS83)*100
PERADD	Percentage of books added	(BKSADD/BKS83)*100
SCHSES	School's average median family income	COMPUTE SCHSES = -1 IF (SCHOOL EQ [ ]) SCHSES = __
ZSKLS	Standardized Word Study Skills Score	COMPUTE ZSKLS = -1 IF (TFORM EQ [ ]) ZSKLS = (SKLSR - [mean])/[SD]
ZWORD	Standardized Reading Word Study Score	COMPUTE ZWORD = -1 IF (TFORM EQ [ ]) ZWORD = (WORDR - [mean])/[SD]
ZREAD	Standardized Reading Comprehension Score	COMPUTE ZREAD = -1 IF (TFORM EQ [ ]) ZREAD = (READR - [mean])/[SD]
ZRE	Standardized Reading Score	COMPUTE ZRE = -1 IF (TFORM EQ [ ]) ZRE = (RER - [mean])/[SD]
ZREADT	Standardized Reading Test Total Score	COMPUTE ZREADT = -1 IF (TFORM EQ [ ]) ZREADT = (READTR - [mean])/[SD]
ZVOC	Standardized Vocabulary Knowledge Score	COMPUTE ZVOC = -1 IF (TFORM EQ [ ]) ZVOC = (VOCR - [mean])/[SD]
ZLIST	Standardized Listening Comprehension Score	COMPUTE ZLIST = -1 IF (TFORM EQ [ ]) ZLIST = (LISTR - [mean])/[SD]

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
ZAUDIT	Standardized Auditory Test Total Score	COMPUTE ZAUDIT = -1 IF (TFORM EQ [ ]) ZAUDIT = (AUDITR - [mean])/[SD]
ZSPELL	Standardized Spelling Score	COMPUTE ZSPELL = -1 IF (TFORM EQ [ ]) ZSPELL = (SPELLR - [mean])/[SD]
ZLANG	Standardized Language Knowledge Score	COMPUTE ZLANG = -1 IF (TFORM EQ [ ]) ZLANG = (LANGR - [mean])/[SD]
ZLASPT	Standardized Language and Spelling Total Score	COMPUTE ZLASPT = -1 IF (TFORM EQ [ ]) ZLASPT = (LASPTR - [mean])/[SD]
ZMATH	Math Concepts Score	COMPUTE ZMATH = -1 IF (TFORM EQ [ ]) ZMATH = (MATHR - [mean])/[SD]
ZCOMP	Math Comprehension Score	COMPUTE ZCOMP = -1 IF (TFORM EQ [ ]) ZCOMP = (COMPR - [mean])/[SD]
ZAPPL	Math Applications Score	COMPUTE ZAPPL = -1 IF (TFORM EQ [ ]) ZAPPL = (APPLR - [mean])/[SD]
ZCOAP	Math Comprehension and Applications Score	COMPUTE ZCOAP = -1 IF (TFORM EQ [ ]) ZCOAP = (COAPR - [mean])/[SD]
ZMATHT	Math Test Total Score	COMPUTE ZMATHT = -1 IF (TFORM EQ [ ]) ZMATHT = (MATHTR - [mean])/[SD]
ZENV	Environment Score	COMPUTE ZENV = -1 IF (TFORM EQ [ ]) ZENV = (ENVR - [mean])/[SD]

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
ZSCI	Science Knowledge Score	COMPUTE ZSCI = -1 IF (TFORM EQ [ ]) ZSCI = (SCIR - [mean])/[SD]
ZSOCS	Social Science Score	COMPUTE ZSOCS = -1 IF (TFORM EQ [ ]) ZSOCS = (SOCSR - [mean])/[SD]

ZSCIENCE	Science Knowledge Score	COMPUTE ZSCIENCE = -1
		IF (ZSCI NE-1) ZSCIENCE = ZSCI
		IF (ZENV NE-1) ZSCIENCE = ZENV

GAR84	Standard Arithmetic Grade Point in 1984	COMPUTE GA84 = -1
		IF (AR EQ 8.00) GAR84 = 4.00
		IF (AR EQ 7.60) GAR84 = 3.40
		IF (AR EQ 7.40) GAR84 = 3.60
		IF (AR EQ 7.00) GAR84 = 2.00
		IF (AR EQ 6.60) GAR84 = 1.40
		IF (AR EQ 6.40) GAR84 = 0.60
		IF (AR EQ 6.00) GAR84 = 0.00
		IF (AR LT 5.00) GAR84 = AR84
		IF (AR EQ 5.00) GAR84 = -1

GLA84	Standard Language Grade Point in 1984	See above
GRE84	Standard Reading Grade Point in 1984	See above
GSH84	Standard Science/Health Grade Point in 1984	See above
GSOC84	Standard Social Studies Grade Point in 1984	See above
GSP84	Standard Spelling Grade Point in 1984	See above
GCZ84	Standard Citizenship Grade Point in 1984	See above

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
GAR83	Standard Arithmetic Grade Point in 1984	See above
GLA83	Standard Language Grade Point in 1983	See above
GRE83	Standard Reading Grade Point in 1983	See above
GSH83	Standard Science/Health Grade Point in 1983	See above
GSOC83	Standard Social Studies Grade Point in 1983	See above
GSP83	Standard Spelling Grade Point in 1983	See above
GCZ83	Standard Citizenship Grade Point in 1983	See above
GPA84	Grade Point Average for 1983-84	COMPUTE GPA84 = (GAR84 + GLA84 + GRE84 + GSH84 + GSOC84)/5
GPA83	Grade Point Average for 1982-83	COMPUTE GPA83 = (GAR83 + GLA83 + GRE83 + GSH83 + GSOC83)/5
AGPA	Average Grade Point Average	COMPUTE AGPA = (GAR84 + GLA84 + GRE84 + GSH84 = GSOC84 + GAR83 + GLA83 + GRE83 + GSH83 + GSOC83)/10
TRANS	Did student change schools or transfer between the 1982-83 and 1983-84 school years?	COMPUTE TRANS = 0 IF ((LASTSC - SCODE) = 0) TRANS = 1
STUSES	Student' median family income level	COMPUTE STUSES = -1 IF (GRID EQ [ ]) STUSES = [ ]

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XIMPROV	Number of improvements per student	COMPUTE XIMPROV = IMPROV/SCHEN
XROOMS	Number of classrooms per student	COMPUTE XROOMS = ROOMS/SCHEN
XSQFT	Square footage per student	COMPUTE XSQFT = SQFT/SCHEN
XACRE	Site acreage size per student	COMPUTE XACRE = ACRE/SCHEN
XCOST	Cost of school construction per student	COMPUTE XCOST = COST/SCHEN
XPERLOS	Percentage of books lost per student	COMPUTE XPERLOS = PERLOST/SCHEN
XPERDIS	Percentage of books discarded per student	COMPUTE XPERDIS = PERDIS/SCHEN
XPERADD	Percentage of books added per student	COMPUTE XPERADD = PERADD/SCHEN
XOPENB	Number of minutes library is open before school per student	COMPUTE XOPENB = OPENB/SCHEN
XOPENL	Number of minutes library is open during lunch per student	COMPUTE XOPENL = OPENL/SCHEN
XOPENA	Number of minutes library is open after school per student	COMPUTE XOPENA = OPENA/SCHEN
XBKS83	Number of books inventoried in 1983 per student	COMPUTE XBKS83/SCHEN

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XBKSLOS	Number of books lost in 1983-84 per student	COMPUTE XBKSLOS = BKSLOST/SCHEN
XBKSDIS	Number of books discarded in 1983-84 per student	COMPUTE XBKSDIS = BKSDIS/SCHEN
XBKSADD	Number of books added in 1983-84 per student	COMPUTE XBKSADD = BKSADD/SCHEN
XENCY83	Number of encyclopedia sets in 1983 per student	COMPUTE XENCY83 = ENCYC83/SCHEN
XENCY84	Number of encyclopedia sets in 1984 per student	COMPUTE XENCY84 = ENCYC84/SCHEN
XENCYLI	Number of encyclopedia sets in the library per student	COMPUTE XENCYLI = ENCYCLI/SCHEN
XENCYCL	Number of encyclopedia sets in classrooms per student	COMPUTE XENCYCL = ENCYCCL/SCHEN
XBOOKS	Number of books in collection at 6/84 per student	COMPUTE XBOOKS = BOOKS/SCHEN
XENCYMI	Number of encyclopedia sets missing volumes per student	COMPUTE XENCYMI = ENCYCMI/SCHEN
XFILMS	Number of filmstrips per student	COMPUTE XFILMS = FILMS/SCHEN
XAUDTAP	Number of audio tapes per student	COMPUTE XAUDTAP = AUDTAPE/SCHEN
XAUDREC	Number of audio recordings per student	COMPUTE XAUDREC = AUDREC/SCHEN

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XVIDTAP	Number of video tapes per student	COMPUTE XVIDTAP = VIDTAPE/SCHEN
XSOFT	Number of software programs per student	COMPUTE XSOFT = SOFTWARE/SCHEN
XMICRO	Number of microforms per student	COMPUTE XMICRO = MICRO/SCHEN
XFICHE	Number of microfiche per student	COMPUTE XFICHE = FICHE/SCHEN
XSLIDE	Number of slides per student	COMPUTE XSLIDE = SLIDE/SCHEN
XTRSPAR	Number of transparencies per student	COMPUTE XTRSPAR = TRSPAR/SCHEN
XKITS	Number of instructional kits per student	COMPUTE XKITS = KITS/SCHEN
XLOOPS	Number of film loops per student	COMPUTE XLOOPS = LOOPS/SCHEN
XGLOBE	Number of globes per student	COMPUTE XGLOBE = GLOBE/SCHEN
XMODEL	Number of models per student	COMPUTE XMODEL = MODEL/SCHEN
XAV	Total A.V. materials per student	COMPUTE XAV = AV/SCHEN
XMAG	Number of magazine subscriptions per student	COMPUTE XMAG = MAG/SCHEN
XNEWS	Number of newspaper subscriptions per student	COMPUTE XNEWS = NEWS/SCHEN
XCRTLIB	Number of certified librarians per student	COMPUTE XCRTLIB = CERTLIB/SCHEN

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XLIBAST	Number of library assistants per student	COMPUTE XLIBAST = LIBAST/SCHEN
XSTUAID	Average number of student library aides per day per student	COMPUTE XSTUAID = STUAID/SCHEN
XAIDES	Number of paid aides per student	COMPUTE XAIDES = AIDES/SCHEN
XCIRCUL	Weekly average circulation per student	COMPUTE XCIRCUL = CIRCUL/SCHEN
XSTUUSE	Weekly average student use per student	COMPUTE XSTUUSE = STUUSE/SCHEN
XRATIOK	Student-teacher ratio in kindergarten	COMPUTE XRATIOK = TEACHK/STUK
XRATIO1	Student-teacher ratio in first grade	COMPUTE XRATIO1 = TEACH1/STU1
XRATIO2	Student-teacher ratio in second grade	COMPUTE XRATIO2 = TEACH2/STU2
XRATIO3	Student-teacher ratio in third grade	COMPUTE XRATIO3 = TEACH3/STU3
XRATIO4	Student-teacher ratio in fourth grade	COMPUTE XRATIO4 = TEACH4/STU4
XRATIO5	Student-teacher ratio in fifth grade	COMPUTE XRATIO5 = TEACH5/STU5
XRATIO6	Student-teacher ratio in sixth grade	COMPUTE XRATIO6 = TEACH6/STU6
XRATIOT	Overall student-teacher ratio	COMPUTE XRATIOT = TEACHTO/STUTOT

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XRATSE	Student-teacher ratio for special education students	COMPUTE XRATSE = SETEACH/SETOT
XRATESL	Student-teacher ratio for ESL students	COMPUTE XRATESL = ESLTEACH/TOTESL
XHELPK	Ratio of aides/ assistants to students in kindergarten	COMPUTE XHELPK = ASSTK/STUK
XHELPK	Ratio of aides/ assistants to students in kindergarten	COMPUTE XHELPK = ASSTK/STUK
XHELP1	Ratio of aides/ assistants to students in first grade	COMPUTE XHELP1 = ASST1/STU1
XHELP2	Ratio of aides/ assistants to students in second grade	COMPUTE XHELP2 = ASST2/STU2
XHELP3	Ratio of aides/ assistants to students in third grade	COMPUTE XHELP3 = ASST3/STU3
XHELP4	Ratio of aides/ assistants to students in fourth grade	COMPUTE XHELP4 = ASST4/STU4
XHELP5	Ratio of aides/ assistants to students in fifth grade	COMPUTE XHELP5 = ASST5/STU5
XHELP6	Ratio of aides/ assistants to students in sixth grade	COMPUTE XHELP6 = ASST6/STU6
XHELPT	Overall ratio of aides/ assistants to students	COMPUTE XHELPT = ASSTTOT/STUTOT

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XSPECK	Percentage of special education students in kindergarten	COMPUTE XSPECK = SEK/STUK
XSPEC1	Percentage of special education students in first grade	COMPUTE XSPEC1 = SE1/STU1
XSPEC2	Percentage of special education students in second grade	COMPUTE XSPEC2 = SE2/STU2
XSPEC3	Percentage of special education students in third grade	COMPUTE XSPEC3 = SE3/STU3
XSPEC4	Percentage of special education students in fourth grade	COMPUTE XSPEC4 = SE4/STU4
XSPEC5	Percentage of special education students in fifth grade	COMPUTE XSPEC5 = SE5/STU5
XSPEC6	Percentage of special education students in sixth grade	COMPUTE XSPEC6 = SE6/STU6
XSPECT	Overall percentage of special education students	COMPUTE XSPECT = SETOT/STUTOT
XESLK	Percentage of ESL students in kindergarten	COMPUTE XESLK = ESLSTUK/STUK
XESL1	Percentage of ESL students in first grade	COMPUTE XESL1 = ESLSTU1/STU1
XESL2	Percentage of ESL students in second grade	COMPUTE XESL2 = ESLSTU2/STU2

COMPUTED VARIABLES

Abbreviated Variable Name Code	Variable Description	Computation Description
XESL3	Percentage of ESL students in third grade	COMPUTE XESL3 = ESLSTU3/STU3
XESL4	Percentage of ESL students in fourth grade	COMPUTE XESL4 = ESLSTU4/STU4
XESL5	Percentage of ESL students in fifth grade	COMPUTE XESL5 = ESLSTU5/STU5
XESL6	Percentage of ESL students in sixth grade	COMPUTE XESL6 = ESLSTU6/STU6
XESLT	Overall percentage of ESL students	COMPUTE XESLT = TOTESL/STUTOT
XRESOUR	Number of library/ resource teachers per student	COMPUTE XRESOUR = RESTEACH/SCHEN
XFEDS	Number of federal employees per student	COMPUTE XFEDS = FEDS/SCHEN
XCOUNS	Number of counselors per student	COMPUTE XCOUNS = COUNSEL/SCHEN
XSTAFF	Total staff per student	COMPUTE XSTAFF = STAFF/SCHEN
COLONY	Participated in Colony Head Start program	COMPUTE COLONY = 0 IF (TYSCH = 1) COLONY = 1
RESER	Participated in Reservation Head Start program	COMPUTE RESER = 0 IF (TYSCH = 2) RESER = 1
WTFACTOR	Population weighting factor	COMPUTE WTFACTOR = 1 IF (REG EQ 0) WTFACTOR = 26.4

RECODED VARIABLES

Abbreviated Variable Name Code	Variable Description	Recoded Description
OPENB	Number of minutes library is open before school	RECODE OPENB (10 = 15)
OPENL	Number of minutes library is open during lunch	RECODE OPENL (10 = 15)
OPENA	Number of minutes library is open after school	RECODE OPENA (10 = 15)
FASTA	Father's status	RECODE FASTA (0=0) (1,2,9=1) 0 = Natural; 1 = Other
MOSTA	Mother's status	RECODE MOSTA (0=0) (1,2,9=1) 0 = Natural; 1 = Other
BIRTH	Student's birthplace	RECODE BIRTH (0,1,7 = 0) (6,8,9 = 1) 0 = Nevada; 1 = Elsewhere
FAOC	Father's occupation	RECODE FAOC (01 THRU 22 = 0) (25 = 0) (28 THRU 32 = 0) (34 THRU 36 = 0) (00 = 1) (23 THRU 24 = 1) (26 THRU 27 = 1) (33 = 1) (37 THRU 38 = 1) 0 = Working; 1 = Not Working
MOOC	Mother's occupation	RECODE MOOC (01 THRU 22 = 0) (25 = 0) (28 THRU 32 = 0) (34 THRU 36 = 0) (00 = 1) (23 THRU 24 = 1) (26 THRU 27 = 1) (33 = 1) (37 THRU 38 = 1) 0 = Working; 1 = Not Working

RECODED VARIABLES

Abbreviated Variable Name Code	Variable Description	Recoded Description
RESID	Student's residence	RECODE RESID (0,1=0) (2,3=1) 0 = Reno-Sparks/ Reno-Sparks Indian Colony (urban) 1 = Washoe County/Pyramid Lake Indian Reservation (rural)
PABSENT	Number of parents absent	RECODE PABSENT (0=0) (1,2,3=1) 0 = Both Present 1 = One or Both Absent
EMPLOY	Number of parents employed	RECODE EMPLOY (0,1=0) (2,3=1) 0 = Both or Father Only Employed 1 = Neither or Mother Only Employed
MEAL	Participation in the federal lunch program	RECODE MEAL (0=0) (1,2=1) 0 = Not in the Lunch Program 1 = In the Lunch Program
THELD	Total number of retentions in the W.C.S.D.	RECODE THELD (2=1) 0 = no; 1 = yes
REG	Racial ethnic group	RECODE REG (1=1) (2 THRU 5 = 0) 0 = Non-Indian; 1 = Indian
WHONA	Who is Native American?	RECODE WHONA (4,8=0) (1,2,3,5,6,7=1) (0=-1) 0 = Student/Parents 1 = Other
PRESCH	Preschool attendance	RECODE PRESCH (-1=0)

RECODED VARIABLES

Abbreviated Variable Name Code	Variable Description	Recoded Description
YRPRE	Number of years in preschool	RECODE YRPRE (0=0) (1=1) (2,3=2) 0 = Unknown 1 = 1 year 2 = 2 or more years

CODING SUPPLEMENTS

1 Special Education Codes (SPED)

Special Education Codes (SPED)	Actual District Codes
0 = Not in program	BLANK
1 = Mentally Handicapped (Mild)	A
2 = Learning Disabled	B
3 = Multiple Handicapped	E
4 = Emotionally Handicapped	C
5 = Physically Handicapped	5
6 = Deaf	1
7 = Speech Handicapped	7
Hard of Hearing	2
Blind	3
Partially Sighted	4
Homebound	6
Mentally Handicapped (Severe)	8
Mentally Handicapped (Moderate)	9

2 Father's Occupation (FAOC)/Mother's Occupation (MOOC)

00 NA (deceased; missing parent)
01 Pyramid Lake Inter-Tribal Offices (PLIT;PLITE)
02 Pyramid Lake Inter-Tribal Department or Agency
03 Pyramid Lake Inter-Tribal High School
04 Tribal/Colony Businesses (e.g., smokeshop)
05 Reno-Sparks Indian Colony (RSIC)
06 Reno-Sparks Indian Colony Department or Agency
07 Bureau of Indian Affairs (BIA)
08 Other Federal Department or Agency
09 Social Services/Welfare
10 Inter-Tribal Policy Board (Council)
11 Other State Department or Agency
12 City of Reno
13 City of Sparks
14 Any Other Local Government
15 Nevada Urban Indians, Inc. (NUI)
16 Headstart or Preschool Program
17 Washoe County School District (WCSD)
18 County Office or Agency
19 Medical Organization (e.g., hospital)
20 Gaming Industry (e.g., motels)
21 Volunteer Organization
22 Self Employed
23 Homemaker
24 Student
25 Other
26 Disabled
27 Unemployed/None Listed
28 University of Nevada
29 Banking Industry
30 Real Estate
31 Retail Store
32 Construction, Plumbing, etc.
33 Retired
34 Washoe Tribe of Calif and Nev
35 Power Co./Telephone Co.
36 Indian Health Service
37 Unspecified, Assumed Homemaker
38 Unspecified, Assumed Unemployed

CODING SUPPLEMENTS

3 Class Grade Conversion Chart

Non-Traditional Grades	Traditional Grades	Traditional Grades
O = 8.40	NA = 5.00	
O- = 7.60	A+ = 4.40	C = 2.00
S+ = 7.40	A = 4.00	C- = 1.60
S = 7.00	A- = 3.60	D+ = 1.40
S- = 6.60	B+ = 3.40	D = 1.00
I+ = 6.40	B = 3.00	D- = 0.60
I = 6.00	B- = 2.60	F+ = 0.40
I- = 5.60	C+ = 2.40	F = 0.00

4 Test Form Codes (TFORM)

1 = Differential Aptitude Test, Grade 8
2 = 82 Stanford Ach Test Int 1 Form E
3 = 82 Stanford Ach Test Int 2 Form E
4 = 82 Stanford Ach Test Advanced Form E
5 = 82 Stanford Ach Test Prim 1 Form E
6 = 82 Stanford Ach Test Prim 2 Form E
7 = 82 Stanford Ach Test Prim 3 Form E

5 Who Is Listed on the Form 506 as Indian for Eligibility (WHONA)

0 = NA
1 = Mother
2 = Father
3 = Both Mother and Father
4 = Student themself
5 = Grandmother
6 = Grandfather
7 = Grandparents
8 = Student and Parent
9 = Other

CODING SUPPLEMENTS

6 American Indian Nationality (Tribal) Codes (NATION)

000 None Given
001 Washoe of NV & CA
002 Ft. McDermitt Paiute
003 Washoe/Paiute
004 Haulapi/Paiute/Havasupai
005 Pyramid Lake Paiute
006 Cherokee of OK
007 Apache/Navajo
008 Yurok
009 Oglala Sioux
010 Northern Paiute
011 Paiute
012 Mewak
013 Navajo
014 Nez Perce/Paiute
015 Cheyenne
016 Choctaw
017 Western Shoshone/ Te-Moak Bands
018 Dakota Sioux
019 Mono
020 Chippewa-Cree
021 Fallon Paiute/Shoshone
022 Paiute-Shoshone
023 Tlingit
024 Blackfeet
025 Paiute/Mono
026 Shoshone
027 Shawnee
028 Ute
029 Rosebud Sioux
030 Cherokee/Winnebago
031 Yomba/Shoshone
032 Western Nevada Shoshone
033
034 Chumash
035 Ft. Bidwell Paiute
036 Walker River Paiute
037 Comanche/Cherokee
038 Cherokee/Choctaw
039 Klamath
040 Ft. Peck (MT) Sioux
041 Maricopa-Pima
042 Kickapoo
043 Duckwater Shoshone
044 Hopi/Paiute
045 Lovelock Paiute
046 Blackfoot (MT)
047 Blackfoot (OH [?])
048 Sioux/Apache
049 Modoc
050 Paiute/Navajo
051 Acoma (Pueblo)
052 Ely Shoshone
053 Cherokee/Wyandot
054 Seminole/Creek
055 Pit River
056 Yakima Confederated
057 Turtle Mt. Chippewas
058 Acoma/Shoshone
059 Karok
060 Eskimo
061 Southern Shoshone/ Paiute
062 Numlaki/Wylaki
063 Cold Lake Chippewa/ Crow
064 Ft. Hall Shoshone- Bannock
065 Shoshone/Goshute
066 Navajo/Shoshone
067 Washoe/Salt River Pima/Maricopa
068 Assiniboine/Sioux
069 Mohawk
070 Tigua
071 Ute/Wintu
072 Seminole
073 Paiute/Sioux
074 Crow
075 Chuchaasi [?]
076 Summit Lake Paiute
077 Northern Cheyenne
078 Potawatomi
079 Weott
080 Maidu
081 Klamath/Paiute
082 Hidatsa/Washoe
083 Paiute/Apache
084 Medwankton Sioux
085 Southern Paiute
086 Shoshone/Maidu
087 Athabaskin/Alaskan Native
088 Cherokee/Oneida
089 Zuni
090 Delaware/Pawnee
091 Duck Valley Shoshone/Paiute
092 Pima
093 Tule
094 Wintun
095 Kiowa
096 Cree
097 Apache
098 Taos (Pueblo)
099 NA
100 Taos/Paiute
101 Rocky Boy Chippewa-Cree
102 Goshute
103 Iroquois
104 Navajo/Paiute [same as 50?]
105 Wylike
106 Paiute/Chippewa-Cree
107 Paiute/Washoe/Miwok
108 Cheyenne River [Sioux]
109 Santee Sioux
110 Cheyenne/Arapaho
111 Chickasaw
112 Eastern Cherokee
113 Concow/Maidu [?]
114 Delaware

CODING SUPPLEMENTS

7 National (Tribal) Status Codes (NATSTA)

0 = NA
1 = Federally Recognized
2 = Eskimo/Alaskan Native
3 = Both Federally Recognized and Eskimo/Alskan Native
4 = NOT Federally Recognized
5 = Terminated
6 = Both Not Federally Recognized and Terminated
7 = State Recognized
8 = Both Federally and State Recognized
9 = Other

8 School Codes (SCODE/SCHOOL)

43 = School number 01
60 = School number 02
41 = School number 03
45 = School number 04
72 = School number 05
54 = School number 06
80 = School number 07
85 = School number 08
48 = School number 09
51 = School number 10
81 = School number 11
47 = School number 12
82 = School number 13
79 = School number 14
55 = School number 15
56 = School number 16
57 = School number 17
59 = School number 18
50 = School number 19
63 = School number 20
62 = School number 21
83 = School number 22
64 = School number 23
46 = School number 24
42 = School number 25
53 = School number 26
68 = School number 27
69 = School number 28
84 = School number 29
70 = School number 30
67 = School number 31
71 = School number 32
40 = School number 33
73 = School number 34
61 = School number 35
74 = School number 36
75 = School number 37
58 = School number 38
65 = School number 39
76 = School number 40
77 = School number 41
52 = School number 42

9 Types of Data Available (DATA)

0 = Have enrollment form, perm record, and SAT scores
1 = Have enrollment form and perm record
2 = Have enrollment form and SAT scores
3 = Have perm record and SAT scores
4 = Have enrollment form
5 = Have perm record
6 = Have SAT scores

APPENDIX C

VARIABLE LIST

Table C-1. Variables Used in Study

Dependent Variables[a]

ZSKLS (I)	ZVOC (I)	ZMATH (I)
ZREAD (I)	ZLIST (I)	ZMATHT (I)
ZREADT (I)	ZAUDIT (I)	ZSCIENCE (I)
	ZSPELL (I)	

Independent Variables

Student Achievement Variables[a]

AGPA (I)	GSOC83 (I)	GSP84 (I)
GPA83 (I)	GSP83 (I)	DP83 (I)
GPA84 (I)	GAR84 (I)	DP84 (I)
GAR83 (I)	GLA84 (I)	DA83 (I)
GLA83 (I)	GRE84 (I)	DA84 (I)
GRE83 (I)	GSH84 (I)	DNE83 (I)
GSH83 (I)	GSOC84 (I)	DNE84 (I)

Teacher Evaluation Variables[a]

GCZ83 (I)	RETAIN84 (N)
GCZ84 (I)	THELD (O)
GIFT (N)	

Personal/Background Variables[a]

AGE (I)	FORM506 (N)[b]	EMPLOY (N)
TRANS (I)	WHONA (N)[b]	FASTA (N)
MODIST83 (I)	NATION (N)[b]	FAOC (N)
MODIST84 (I)	NATSTA (N)[b]	MOSTA (N)
RESID (N)	PRESCH (N)[b]	MOOC (N)
BIRTH (N)	TYSCH (N)[b]	MEAL (O)

[a]--See Appendix B for explanation and coding procedures of variables. Letter in parentheses indicates data scale: (I)=interval data; (O)=ordinal; (N)=nominal.

[b]--Variable applicable to Native American students only.

Table C-1. (continued)

Personal/Background Variables[a]		
TELE (N)	YRPRE (N)[b]	FATHER (N)
EMERTEL (N)	REG (N)	MOTHER (N)
EMERPER (N)	STUSES (I)	
SEX (N)	PABSENT (N)	
School/Contextual Variables[a]		
SCHSES (I)	XLOOPS (I)	XHELP2 (I)
SCHEN (I)	XGLOBE (I)	XHELP3 (I)
SCHAGE (I)	XMODEL (I)	XHELP4 (I)
XIMPROV (I)	XAV (I)	XHELP5 (I)
XROOMS (I)	XMAG (I)	XHELP6 (I)
XSQFT (I)	XCERTLIB (I)	XHELPT (I)
XACRE (I)	XLIBAST (I)	XSPECK (I)
XCOST (I)	XSTUAID (I)	XSPEC1 (I)
XPERLOST (I)	XAIDES (I)	XSPEC2 (I)
XPERDIS (I)	XCIRCUL (I)	XSPEC3 (I)
XPERADD (I)	XSTUUSE (I)	XSPEC4 (I)
XOPENB (I)	XSTUK (I)	XSPEC5 (I)
XOPENL (I)	XSTU1 (I)	XSPEC6 (I)
XOPENA (I)	XSTU2 (I)	XSPECT (I)
XBKS83 (I)	XSTU3 (I)	XRATSE (I)
XBOOKS (I)	XSTU4 (I)	XESLK (I)
XENCY83 (I)	XSTU5 (I)	XESL1 (I)
XENCY84 (I)	XSTU6 (I)	XESL2 (I)
XENCYLI (I)	XSTUT (I)	XESL3 (I)
XENCYCL (I)	XRATIOK (I)	XESL4 (I)
XENCYMI (I)	XRATIO1 (I)	XESL5 (I)
XFILMS (I)	XRATIO2 (I)	XESL6 (I)
XAUDTAP (I)	XRATIO3 (I)	XESLT (I)
XAUDREC (I)	XRATIO4 (I)	XRATESL (I)
XVIDTAP (I)	XRATIO5 (I)	XRESOUR (I)
XSOFT (I)	XRATIO6 (I)	XFEDS (I)
XSLIDE (I)	XRATIOT (I)	XCOUNSEL (I)
XTRSPAR (I)	XHELPK (I)	XSTAFF (I)
XKITS (I)	XHELP1 (I)	LEVEL (O)

a--See Appendix B for explanation and coding procedures of variables. Letter in parentheses indicates data scale: (I)=interval data; (O)=ordinal; (N)=nominal.

b--Variable applicable to Native American students only.

APPENDIX D

DESCRIPTIVE STATISTICS FOR VARIABLES

Table D-1. Variable Descriptive Statistics for Population

Variable[a]	Mean	Standard Deviation	N
	Dependent Variables		
ZSKLS	.28	.86	439
ZREAD	.37	.75	441
ZREADT	.36	.76	439
ZVOC	.20	.88	436
ZLIST	.16	.87	436
ZAUDIT	.15	.96	429
ZSPELL	.20	.91	441
ZMATH	.11	.92	441
ZMATHT	.27	.90	438
ZSCIENCE	.36	.82	438
	Independent Variables		
ACRE	6.78	3.13	452
AGE	119.27	17.39	457
AGPA	2.75	.60	459
AIDES	.03	.17	452
AUDREC	143.39	151.07	452
AUDTAPE	524.58	356.34	452
AV	1962.99	996.33	452
BIRTH	.45	.50	459
BKS83	6249.78	1627.22	454
BKSADD	283.61	184.54	454
BKSDIS	219.85	285.56	454
BKSLOST	34.11	20.49	454
BOOKS	6304.75	1549.96	459
CERTLIB	.03	.17	452
CIRCUL	633.17	277.96	434
COST	568719.44	441883.71	459
COUNSEL	.45	.27	448
DA83	9.34	7.86	450
DA84	9.71	7.94	459
DNE83	4.94	21.05	447
DNE84	.35	3.22	459
DP83	163.39	24.43	452

a--See Appendix B for explanation of variable names.

Table D-1. (continued)

Variable[a]	Mean	Standard Deviation	N
DP84	169.81	8.71	459
EMPLOY	.15	.36	459
EMERTEL	.89	.31	459
EMERPER	.90	.30	459
ENCYC83	7.14	4.85	459
ENCYC84	8.22	5.90	459
ENCYCCL	6.92	4.17	459
ENCYCLI	4.71	3.45	459
ENCYCMI	1.99	2.64	459
ESLSTUS	.71	1.67	448
FAOC	.08	.27	423
FASTA	.16	.37	426
FATHER	1.00	.07	433
FEDS	.33	.63	448
FICHE	0.00	0.00	452
FILMS	730.95	321.32	452
GAR83	3.00	.75	459
GAR84	2.93	.75	459
GCZ83	3.15	.81	449
GCZ84	3.23	.77	455
GIFT	.07	.25	459
GLA83	2.88	.81	459
GLA84	2.89	.79	459
GLOBE	3.66	5.69	452
GPA83	2.73	.62	459
GPA84	2.76	.68	459
GRE83	2.86	.87	459
GRE84	2.86	.82	459
GSH83	2.48	.76	459
GSH84	2.60	.81	459
GSOC83	2.45	.79	459
GSOC84	2.54	.87	459
GSP83	3.10	.86	457
GSP84	3.22	.75	459
IMPROV	4.30	2.22	459
KITS	57.24	53.69	452
LEVEL	3.77	1.44	459
LIBAST	.93	.26	452
LOOPS	12.99	19.93	452

[a]--See Appendix B for explanation of variable names.

Table D-1. (continued)

Variable[a]	Mean	Standard Deviation	N
MAG	7.08	3.88	452
MEAL	.17	.37	459
MICRO	0.00	0.00	452
MODEL	6.43	7.70	452
MODIST83	8.67	1.27	452
MODIST84	8.99	.17	459
MOOC	.35	.48	450
MOSTA	.04	.20	443
MOTHER	1.00	.01	457
NEWS	0.00	0.00	452
OPENA	14.13	14.55	434
OPENB	13.28	17.29	434
OPENL	20.35	28.33	432
PABSENT	.20	.40	457
PERADD	5.34	4.72	454
PERDIS	3.50	4.79	454
PERLOST	.56	.32	454
REG	.03	.17	459
RESID	.35	.48	459
RETAIN84	.04	.19	459
ROOMS	18.51	4.38	459
SCHAGE	23.75	13.27	459
SCHEN	414.27	106.14	459
SCHSES	23921.70	3846.89	459
SEX	.52	.50	459
SLIDE	255.17	205.61	452
SOFTWARE	16.08	51.03	452
SQFT	31931.63	8363.08	459
STAFF	19.86	4.44	448
STUAID	1.68	2.49	452
STUSES	24200.42	4754.33	433
STUUSE	379.81	450.56	339
TELE	.94	.25	459
THELD	.12	.33	459
TRANS	.44	.50	459
TRANS84	.18	.46	444
TRSPAR	220.07	340.39	452
TTRAN84	1.07	1.38	431
VIDTAPE	.21	.64	452

[a]--See Appendix B for explanation of variable names.

Table D-2. Variable Descriptive Statistics for Indians

Variable[a]	Mean	Mode	Median	Range	Variance	N
			Dependent Variables			
ZSKLS	-.12	.14	.03	3.94	.74	193
ZREAD	-.07	-.37	.00	3.82	.67	192
ZREADT	-.08	-1.41	-.06	3.67	.58	192
ZVOC	-.39	-.83	-.44	3.82	.77	194
ZLIST	-.24	-.76	-.23	4.61	.75	194
ZAUDIT	-.33	.80	-.26	4.04	.74	193
ZSPELL	-.09	.60	-.03	3.98	.84	197
ZMATH	-.43	-.42	-.42	4.60	.79	197
ZMATHT	-.22	-1.04	-.13	4.53	.74	196
ZSCIENCE	-.05	-1.23	.05	4.13	.68	195
			Independent Variables			
ACRE	7.90	12.58	6.00	13.99	13.54	201
AGE	124.07	138.00	125.00	74.00	325.90	201
AGPA	2.40	2.38	2.44	3.30	.43	201
AIDES	.12	0.00	0.00	1.00	.11	198
AUDREC	163.75	106.00	120.00	499.00	13472.92	198
AUDTAPE	518.66	245.00	410.00	1600.00	91699.20	198
AV	2016.81	938.00	1870.00	4227.00	1150435.89	198
BIRTH	2.72	0.00	0.00	9.00	13.33	201
BKS83	6255.00	4335.00	6718.00	5500.00	2685390.50	200
BKSADD	259.65	188.00	188.00	793.00	37499.60	200
BKSDIS	183.80	68.00	68.00	1209.00	61948.89	200
BKSLOST	31.69	23.00	24.00	79.00	310.90	200
BOOKS	6350.97	4430.00	6718.00	5372.00	2745373.00	201
CERTLIB	0.00	0.00	0.00	0.00	0.00	198
CIRCUL	578.40	320.00	600.00	1000.00	64343.12	192
COST	462410.67	423650.00	423650.00	1893657.00	5.44E+10	201
DA83	11.51	3.00	9.50	50.00	78.64	198
DA84	11.89	4.00	9.00	70.50	107.50	201
DNE83	3.02	0.00	0.00	135.00	220.78	197
DNE84	1.43	0.00	0.00	113.00	108.74	201
DP83	163.59	175.00	168.50	138.00	373.14	199
DP84	166.89	176.00	171.00	119.50	190.85	201
EMPLOY	1.27	0.00	1.00	3.00	1.30	201

a--See Appendix B for explanation of variable names.

Table D-2. (continued)

Variable[a]	Mean	Mode	Median	Range	Variance	N
EMERPER	.92	1.00	1.00	1.00	.07	201
EMERTEL	.82	1.00	1.00	1.00	.15	201
ENCYC83	5.15	3.00	3.00	21.00	17.68	201
ENCYC84	5.92	2.00	4.00	25.00	22.12	201
ENCYCCL	5.98	3.00	6.00	17.00	11.87	201
ENCYCLI	4.32	3.00	3.00	14.00	7.08	201
ENCYCMI	2.19	1.00	1.00	10.00	5.93	201
ESLSTU5	.52	0.00	0.00	7.00	2.11	193
FAOC	21.59	25.00	25.00	38.00	120.67	156
FASTA	.58	0.00	0.00	9.00	3.32	169
FATHER	.96	1.00	1.00	1.00	.04	171
FEDS	.59	0.00	.50	2.70	.45	193
FICHE	0.00	0.00	0.00	0.00	0.00	198
FILMS	814.30	350.00	801.00	1285.00	160556.50	198
FORM506	.70	1.00	1.00	1.00	.21	201
GAR83	2.63	3.00	3.00	4.00	.78	201
GAR84	2.54	3.00	2.60	4.00	.72	201
GCZ83	3.00	3.00	3.00	4.00	.77	199
GCZ84	2.99	4.00	3.00	4.00	.95	196
GIFT	.03	0.00	0.00	1.00	.03	201
GLA83	2.52	3.00	2.60	4.00	.73	201
GLA84	2.49	3.00	2.60	4.00	.82	201
GLOBE	2.30	2.00	2.00	21.00	15.99	198
GPA83	2.40	2.32	2.44	4.00	.49	201
GPA84	2.41	2.12	2.48	3.88	.52	201
GRE83	2.49	2.00	2.60	4.00	.75	201
GRE84	2.42	2.00	2.60	4.00	.75	201
GSH83	2.21	2.00	2.00	4.00	.65	201
GSH84	2.27	2.00	2.00	4.00	.63	201
GSOC83	2.13	2.00	2.00	4.00	.68	201
GSOC84	2.30	2.00	2.00	4.00	.67	201
GSP83	2.88	3.00	3.00	4.00	.88	201
GSP84	2.92	3.00	3.00	4.00	.85	201
IMPROV	4.40	5.00	5.00	9.00	3.84	201
KITS	56.50	30.00	30.00	198.00	1874.10	198
LEVEL	4.10	5.00	4.00	5.00	1.93	201
LIBAST	.97	1.00	1.00	1.00	.03	198
LOOPS	19.37	0.00	9.00	92.00	482.36	198
MAG	7.13	8.00	7.00	15.00	14.05	198
MEAL	.55	0.00	0.00	2.00	.54	201

[a]--See Appendix B for explanation of variable names.

Table D-2. (continued)

Variable[a]	Mean	Mode	Median	Range	Variance	N
MICRO	0.00	0.00	0.00	0.00	0.00	198
MODEL	9.69	9.00	9.00	36.00	49.60	198
MODIST83	8.82	9.00	9.00	7.00	.66	198
MODIST84	8.92	9.00	9.00	6.00	.32	201
MOOC	24.00	37.00	25.00	37.00	90.72	191
MOSTA	.10	0.00	0.00	9.00	.51	194
MOTHER	1.00	1.00	1.00	1.00	.01	201
NATION	16.87	0.00	5.00	106.00	667.67	201
NATSTA	3.67	1.00	1.00	9.00	13.89	201
NEWS	0.00	0.00	0.00	0.00	0.00	198
OPENA	11.80	0.00	15.00	45.00	165.21	192
OPENB	7.27	0.00	0.00	60.00	230.84	192
OPENL	27.89	30.00	15.00	90.00	804.82	192
PABSENT	.47	0.00	0.00	3.00	.46	201
PERADD	4.43	4.33	4.33	17.64	12.97	200
PERDIS	2.92	1.57	1.57	20.74	14.73	200
PERLOST	.52	.53	.53	1.17	.07	200
PRESCH	1.00	1.00	1.00	1.00	0.00	62
REG	1.00	1.00	1.00	1.00	0.00	201
RESID	1.53	3.00	2.00	3.00	1.43	201
RETAIN84	.03	0.00	0.00	1.00	.02	201
ROOMS	17.70	10.00	19.00	21.00	31.14	201
SCHAGE	23.35	12.00	21.00	68.00	135.66	201
SCHEN	375.30	134.00	430.00	603.00	25595.69	201
SCHSES	20700.33	18100.00	20630.00	15990.00	8857754.48	201
SEX	.57	1.00	1.00	1.00	.25	201
SLIDE	233.31	180.00	184.00	700.00	17708.76	198
SOFTWARE	15.22	0.00	0.00	253.00	1526.88	198
SQFT	29803.19	17146.00	35800.00	34459.00	90981408.90	201
STUAID	1.00	0.00	0.00	9.00	3.50	198
STUSES	20298.61	18100.00	19614.00	20157.00	9672854.35	197
STUUSE	477.39	200.00	200.00	2000.00	436115.19	165
TELE	.75	1.00	1.00	1.00	.19	201
THELD	.17	0.00	0.00	2.00	.15	201
TRANS	.45	0.00	0.00	1.00	.25	201
TRSPAR	199.90	18.00	47.00	1450.00	97485.53	198
TYSCH	1.52	1.00	1.00	3.00	.35	62
VIDTAPE	.56	0.00	0.00	3.00	1.26	198
WHONA	4.66	4.00	4.00	8.00	6.55	201
YRPRE	1.55	2.00	2.00	2.00	.28	62

a--See Appendix B for explanation of variable names.

Table D-3. Variable Descriptive Statistics for Non-Indians

Variable[a]	Mean	Mode	Median	Range	Variance	N
			Dependent Variables			
ZSKLS	.29	1.03	.49	5.08	.74	247
ZREAD	.38	.79	.50	3.42	.56	248
ZREADT	.37	.54	.54	3.86	.56	247
ZVOC	.22	-.76	.37	4.37	.76	245
ZLIST	.17	.42	.31	5.49	.76	245
ZAUDIT	.16	1.10	.25	5.98	.93	241
ZSPELL	.21	.88	.47	4.24	.82	248
ZMATH	.13	.69	.22	4.47	.84	248
ZMATHT	.28	-.33	.45	4.33	.81	246
ZSCIENCE	.37	.78	.50	4.75	.68	246
			Independent Variables			
ACRE	6.74	10.00	6.00	14.07	9.64	254
AGE	119.13	107.00	118.00	79.00	301.60	257
AGPA	2.76	2.90	2.78	3.26	.35	25[illegible]
AIDES	.03	0.00	0.00	1.00	.03	254
AUDREC	142.79	0.00	106.00	767.00	23125.20	254
AUDTAPE	524.76	351.00	408.00	1738.00	128245.82	254
AV	1961.41	968.00	1715.00	4453.00	989722.61	254
BIRTH	3.84	0.00	1.00	8.00	15.08	258
BKS83	6249.60	2875.00	6649.00	5749.00	2651512.56	255
BKSADD	284.33	0.00	294.00	793.00	33998.18	255
BKSDIS	220.92	0.00	100.00	1209.00	82230.76	255
BKSLOST	34.18	28.00	28.00	79.00	423.63	255
BOOKS	6303.38	3369.00	6718.00	5372.00	2396495.80	258
CERTLIB	.03	0.00	0.00	1.00	.03	254
CIRCUL	634.80	1000.00	600.00	1127.00	77702.40	244
COST	571856.63	256633.00	466954.00	1893657.00	1.99E+11	258
DA83	9.27	0.00	7.00	46.50	61.25	253
DA84	9.65	5.00	8.00	42.00	61.64	258
DNE83	5.00	0.00	0.00	135.00	450.57	251
DNE84	.32	0.00	0.00	35.00	7.42	258
DP83	163.39	179.00	170.00	156.00	604.69	254
DP84	169.90	175.00	172.00	50.00	72.32	258
EMERPER	.90	1.00	1.00	1.00	.09	258

a--See Appendix B for explanation of variable names.

Table D-3. (continued)

Variable[a]	Mean	Mode	Median	Range	Variance	N
EMERTEL	.89	1.00	1.00	1.00	.10	258
EMPLOY	.64	0.00	0.00	3.00	.67	258
ENCYC83	7.19	6.00	6.00	21.00	23.60	258
ENCYC84	8.28	2.00	6.50	25.00	35.09	258
ENCYCCL	6.95	7.00	7.00	17.00	17.59	258
ENCYCLI	4.72	3.00	4.00	14.00	12.09	258
ENCYCMI	1.98	0.00	1.00	10.00	6.98	258
ESLSTU5	.72	0.00	0.00	7.00	2.81	252
FADC	23.79	25.00	25.00	38.00	45.26	239
FASTA	.22	0.00	0.00	9.00	.51	240
FATHER	.98	1.00	1.00	1.00	.02	415
FEDS	.32	0.00	0.00	2.70	.39	252
FICHE	0.00	0.00	0.00	0.00	0.00	254
FILMS	728.48	315.00	705.00	1285.00	101530.20	254
GAR83	3.01	3.00	3.00	4.00	.56	258
GAR84	2.94	3.00	3.00	3.40	.55	258
GCZ83	3.16	4.00	3.00	4.00	.65	252
GCZ84	3.24	4.00	3.60	3.00	.58	256
GIFT	.07	0.00	0.00	1.00	.06	258
GLA83	2.88	3.00	3.00	4.00	.65	258
GLA84	2.90	3.00	3.00	3.40	.61	258
GLOBE	3.70	1.00	1.00	21.00	32.84	254
GPA83	2.74	3.00	2.72	3.88	.38	258
GPA84	2.78	2.60	2.84	2.96	.46	258
GRE83	2.87	3.00	3.00	4.00	.75	258
GRE84	2.87	3.00	3.00	3.80	.66	258
GSH83	2.48	2.00	2.00	4.00	.58	258
GSH84	2.61	2.00	2.00	3.40	.65	258
GSOC83	2.46	2.00	2.00	4.00	.61	258
GSOC84	2.55	2.00	2.00	4.00	.76	258
GSP83	3.10	3.60	3.00	4.00	.74	257
GSP84	3.22	4.00	3.60	3.40	.55	258
IMPROV	4.30	5.00	5.00	9.00	4.95	258
KITS	57.26	47.00	40.00	198.00	2917.83	254
LEVEL	3.76	2.00	4.00	5.00	2.07	258
LIBAST	.93	1.00	1.00	1.00	.07	254
LOOPS	12.80	0.00	0.00	92.00	394.12	254
MAG	7.08	8.00	7.00	15.00	15.14	254
MEAL	.25	0.00	0.00	2.00	.38	258

[a]--See Appendix B for explanation of variable names.

Table D-3. (continued)

Variable[a]	Mean	Mode	Median	Range	Variance	N
MICRO	0.00	0.00	0.00	0.00	0.00	254
MODEL	6.34	0.00	4.00	36.00	59.35	254
MODIST83	8.67	9.00	9.00	7.00	1.65	254
MODIST84	8.99	9.00	9.00	2.00	.02	258
MOOC	26.00	25.00	25.00	29.00	46.60	253
MOSTA	.06	0.00	0.00	2.00	.09	249
MOTHER	1.00	1.00	1.00	1.00	0.00	458
NEWS	0.00	0.00	0.00	0.00	0.00	254
OPENA	14.20	0.00	15.00	45.00	213.25	244
OPENB	13.46	0.00	0.00	60.00	300.41	244
OPENL	20.12	0.00	0.00	90.00	802.05	243
PABSENT	.24	0.00	0.00	3.00	.27	257
PERADD	5.37	0.00	4.34	17.64	22.60	255
PERDIS	3.52	0.00	1.57	20.74	23.20	255
PERLOST	.56	.39	.46	1.37	.10	255
REG	.44	0.00	0.00	1.00	.25	459
RESID	.72	0.00	0.00	3.00	1.00	258
RETAIN84	.03	0.00	0.00	1.00	.03	459
ROOMS	18.53	21.00	19.00	23.00	18.80	258
SCHAGE	23.76	20.00	24.00	69.00	177.47	258
SCHEN	415.42	430.00	425.00	603.00	10817.61	258
SCHSES	24016.77	21689.00	24384.00	19655.00	14683638.60	258
SEX	.52	1.00	1.00	1.00	.25	258
SLIDE	255.82	0.00	221.00	849.00	43060.55	254
SOFTWARE	16.10	0.00	0.00	253.00	2640.29	254
SQFT	31994.44	36216.00	34736.00	34459.00	69307759.20	258
STUAID	1.71	0.00	0.00	9.00	6.30	254
STUSES	24320.24	24384.00	24678.00	23892.00	22559374.50	243
STUUSE	376.60	0.00	350.00	2000.00	195710.51	190
TELE	.94	1.00	1.00	1.00	.06	258
THELD	.12	0.00	0.00	1.00	.11	258
TRANS	.44	0.00	0.00	1.00	.25	258
TRSPAR	220.67	0.00	86.00	1450.00	116602.25	254
VIDTAPE	.20	0.00	0.00	3.00	.38	254

[a]--See Appendix B for explanation of variable names.

APPENDIX E

CORRELATION MATRICES

Table E-1. Correlations Between Dependent Achievement Test Score Variable and Independent Predictor Variables

Independent Variables[d]	Dependent Variables[d]									
	ZSKLS	ZREAD	ZREADT	ZVOC	ZLIST	ZAUDIT	ZSPELL	ZMATH	ZMATHT	ZSCIENCE
A. Academic Achievement										
DA83	.03	.03	.02	.10[a]	.06	.08[a]	.03	.02	-.01	-.00
GPA83	.38[c]	.50[c]	.52[c]	.46[c]	.45[c]	.40[c]	.49[c]	.51[c]	.55[c]	.46[c]
GRE83	.40[c]	.50[c]	.54[c]	.50[c]	.44[c]	.44[c]	.52[c]	.45[c]	.50[c]	.42[c]
B. Student Evaluations										
GCZ83	.13[b]	.13[b]	.16[c]	.12[b]	.14[b]	.11[b]	.23[c]	.10[a]	.14[b]	.11[b]
GIFT	.15[c]	.23[c]	.22[c]	.24[c]	.18[c]	.22[c]	.22[c]	.24[c]	.25[c]	.19[c]
THELD	-.17[c]	-.19[c]	-.23[c]	-.13[b]	-.22[c]	-.15[c]	-.20[c]	-.11[b]	-.16[c]	-.08[a]
C. Background Characteristics										
AGE	.06	-.01	.02	.03	.10[a]	-.02	.02	.15[c]	.13[b]	.24[c]
EMERTEL	.15[c]	.15[c]	.18[c]	.18[c]	.15[c]	.19[c]	.07	.14[b]	.13[b]	.10[a]
EMPLOY	-.02	-.06	-.04	-.13[b]	-.06	-.07	-.00	-.03	-.06	-.08[a]
FASTA	-.09[a]	-.09[a]	-.12[b]	.02	.01	.05	-.09[a]	-.09[a]	-.09[a]	-.12[b]
MEAL	-.04	-.16[c]	-.12[b]	-.23[c]	-.19[c]	-.17[c]	-.05	-.12[b]	-.08[a]	-.12[b]
PABSENT	-.01	-.07	-.06	-.09[a]	-.00	-.02	-.09[a]	-.04	-.00	-.02
REG	-.08[a]	-.10[a]	-.10[a]	-.12[b]	-.08[a]	-.08[a]	-.06	-.10[a]	-.09[a]	-.09[a]
RESID	-.12[b]	-.06	-.10[a]	-.03	-.10[a]	-.06	-.22[c]	-.10[a]	-.07	-.08[a]
SEX	.14[b]	.09[a]	.13[b]	-.06	.04	-.03	.18[c]	-.01	.02	-.07
TELE	.10[a]	.12[b]	.12[b]	.18[c]	.17[c]	.16[c]	.13[b]	.17[c]	.15[c]	.11[b]
TRANS	.06	.18[c]	.16[c]	.20[c]	.21[c]	.18[c]	.09[a]	.12[b]	.14[b]	.10[a]
D. School Environment and Learning Contexts										
LEVEL	.12[b]	.06	.10[a]	.10[a]	.19[c]	.04	.08[a]	.19[c]	.16[c]	.26[c]
SCHAGE	.15[c]	.02	.09[a]	.05	.04	.05	.11[b]	.09[a]	.08	.10[a]
SCHEN	.15[c]	.11[b]	.14[c]	-.02	.02	.01	.09[a]	-.03	-.00	.04
SCHSES	.12[b]	.20[c]	.21[c]	.21[c]	.17[c]	.15[c]	.20[c]	.16[c]	.14[c]	.20[c]
XACRE	-.26[c]	-.23[c]	-.28[c]	-.19[c]	-.16[c]	-.16[c]	-.30[c]	-.14[c]	-.13[b]	-.22[c]
XCIRCUL	-.08[a]	-.13[b]	-.14[b]	-.11[b]	-.11[b]	-.08[a]	-.13[b]	-.14[b]	-.14[b]	-.15[c]
XCOST	-.13[b]	-.03	-.09[a]	-.05	-.03	-.03	-.10[b]	-.07	-.08[a]	-.09[a]
XENCYC83	.15[c]	.15[c]	.18[c]	.19[c]	.16[c]	.16[c]	.19[c]	.08[a]	.09[a]	.19[c]
XMAG	-.13[b]	-.16[c]	-.18[c]	-.15[c]	-.17[c]	-.09[a]	-.16[c]	-.08[a]	-.08[a]	-.12[b]
XOPENA	.04	.10[a]	.10[a]	.11[b]	.13[b]	.07	.02	.08[a]	.08[a]	.10[a]
XPERADD	-.16[c]	-.12[b]	-.19[c]	-.10[a]	-.11[b]	-.06	-.19[c]	-.13[b]	-.14[c]	-.21[c]
XPERLOS	-.17[c]	-.12[b]	-.18[c]	-.12[b]	-.08[a]	-.08[a]	-.21[c]	-.12[b]	-.13[b]	-.06
XSPEC2	-.16[c]	-.14[b]	-.19[c]	-.13[b]	-.14[b]	-.09[a]	-.21[c]	-.16[c]	-.10[a]	-.13[b]
XSTAFF	-.20[c]	-.23[c]	-.27[c]	-.12[b]	-.10[a]	-.08[a]	-.22[c]	-.10[a]	-.09[a]	-.14[b]

[a]--$p<.05$ [b]--$p<.01$ [c]--$p<.001$

[d]--See Appendix B, Coding Manual for variable code name translations.

Table E-2. Intercorrelations for Reading Model Predictors

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
2.	-.16[c]																			
3.	-.07	.02																		
4.	.02	-.04	-.01																	
5.	.13[b]	-.13[b]	-.07	-.04																
6.	.07	.29[c]	.01	-.04	-.06															
7.	.25[c]	-.08[a]	.02	.04	.04	-.02														
8.	-.06	.51[c]	.08[a]	.04	-.05	.04	-.02													
9.	.12[b]	-.12[b]	-.09[a]	-.01	.16[c]	.09[a]	.14[c]	-.11[b]												
10.	.30[c]	-.23[c]	-.06	.35[c]	.06	-.14[b]	.01	-.06	.14[b]											
11.	-.06	.00	-.03	-.10[a]	.07	-.02	-.08[a]	-.08[a]	-.09[a]	-.12[b]										
12.	-.11[b]	.15[c]	-.03	.10[a]	.01	-.08[a]	-.07	-.07	-.12[b]	-.08[a]	.00									
13.	-.02	.02	.06	.14[c]	.04	-.02	.14[c]	-.03	.04	-.01	.07	-.01								
14.	.09[a]	-.22[c]	.00	.08[a]	.15[c]	-.09[a]	.07	-.02	.17[c]	.20[c]	.04	-.13[b]	-.00							
15.	-.07	.49[c]	.00	-.02	-.04	-.03	-.05	-.13[b]	-.09[a]	-.10[a]	-.04	.14[b]	.08[a]	-.10[b]						
16.	-.12[b]	.14[c]	-.09[a]	.01	-.08[a]	.08[a]	.02	.06	-.16[c]	-.14[c]	-.08[a]	.11[b]	.00	-.22[c]	-.01					
17.	.07	.42[c]	-.19[c]	-.07	.01	.06	-.06	.27[c]	-.03	-.12[b]	.04	-.00	.05	-.02	.15[c]	.01				
18.	.19[c]	-.11[b]	.07	-.06	.08[a]	.31[c]	.14[c]	.19[c]	.08[a]	.03	.05	-.11[b]	-.07	.09[b]	-.24[c]	-.07	-.01			
19.	-.07	.51[c]	.02	-.05	-.22[c]	.27[c]	-.04	.22[c]	-.20[c]	-.27[c]	.03	.10[a]	-.10[a]	-.17[c]	.31[c]	.15[c]	.21[c]	.13[b]		
20.	-.09[b]	.15[c]	-.10[b]	.04	-.04	.10[a]	-.07	.02	-.18[c]	-.11[b]	.06	.13[b]	.04	-.20[c]	.07	.47[c]	.08[a]	-.09[a]	.11[b]	
21.	.00	-.01	.94[c]	.02	-.02	-.00	.09[a]	.09[a]	-.06	-.06	-.02	-.02	.08[a]	.04	-.01	-.09[a]	-.20[c]	.08[a]	-.01	-.10[a]

Variable Names

1. 1983 Reading Grade	2. Acreage Per Student	3. Age in Months
4. Student's Sex	5. Emergency Telephone	6. Library Open After School Per Student
7. Gifted Program	8. Cost of School Per Student	9. Change of Schools
10. 1983 Citizenship Grade	11. Father's Status	12. Free & Reduced Lunch Program
13. Number of Days Absent in 1982-1983	14. Home Phone Listed	15. Magazine Subscriptions Per Student
16. Number of Parents Absent	17. Student's Residence	18. Encyclopedia Sets Per Student
19. Percentage of Books Lost Per Student	20. Number of Parents Employed	21. Grade Level

[a]--$p < .05$ [b]--$p < .01$ [c]--$p < .001$

Table E-3: Intercorrelations Among
Math Pool Predictors

	1983 Grade Point Average	Gifted Program	Student's Age	Percentage of Books Lost Per Student	1983 Citizenship Grade	Home Phone Listed	Student's Sex	Acreage Per Student	Library Open After School Per Student
Gifted Program	.22[c]								
Student's Age	.09[a]	.02							
Percentage of Books Lost Per Student	-.03	-.04	.02						
1983 Citizenship Grade	.38[c]	.01	-.06	-.27[c]					
Home Phone Listed	.15[c]	.07	.00	-.17[c]	.20[c]				
Student's Sex	.07	.04	-.01	-.05	.35[c]	.08[a]			
Acreage Per Student	-.12[b]	-.08[a]	.02	.51[c]	-.23[c]	-.22[c]	-.04		
Library Open After School	.06	-.02	.01	.27[c]	-.14[b]	-.09[a]	-.04	.29[c]	
Grade Level	.14[c]	.09[a]	.94[c]	-.01	-.06	.04	.02	-.01	-.00

[a]--p<.05 [b]--p<.01 [c]--p<.001

APPENDIX F

STEPWISE MULTIPLE REGRESSION RESULTS

Table F-1. Stepwise Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.394	.340	.350***	.042	13.81	Multiple R = .476
Acreage Per Student	-.254	-9.956	-.181***	.042	4.60	R^2 = .227
Sex	.134	.201	.119**	.041	1.59	Adjusted R^2 = .218
Grade Level	.119	.067	.114**	.041	1.36	SE = .745
Emergency Telephone	.148	.238	.089*	.042	1.31	
Constant		-1.079			22.67	
Reading Comprehension						
1983 Reading Grade	.492	.357	.421***	.042	20.68	Multiple R = .549
Acreage Per Student	-.225	-10.904	-.227***	.048	5.08	R^2 = .302
Library Open After School Per Student	.098	2.430	.118**	.042	1.16	Adjusted R^2 = .293; SE = .620
Gifted Program	.222	.269	.090*	.041	2.00	
Cost of School Per Student	-.031	7.8E-5	.115**	.046	-.35	
Change of Schools	.178	.134	.091*	.040	1.61	
Constant		-.727			30.18	
Reading Test Total						
1983 Reading Grade	.531	.417	.491***	.040	26.04	Multiple R = .617
Acreage Per Student	-.281	-11.387	-.236***	.040	6.63	R^2 = .380
Library Open After School Per Student	.098	2.579	.125***	.039	1.23	Adjusted R2 = .369; SE = .587
Sex	.128	.208	.141***	.040	1.81	
Emergency Telephone	.178	.264	.112**	.038	1.99	
Grade Level	.097	.044	.085*	.037	.82	
Father's Status	-.111	-.174	-.084*	.038	.93	
1983 Citizenship Grade	.153	-.088	-.095*	.043	-1.44	
Constant		-.916			38.01	
Vocabulary Knowledge						
1983 Reading Grade	.484	.411	.418***	.041	20.23	Multiple R = .554
Free & Reduced Lunch	-.227	-.370	-.162***	.040	3.67	R^2 = .307
Change of Schools	.195	.178	.104**	.040	2.03	Adjusted R^2 = .298
Emergency Telephone	.172	.281	.103**	.040	1.78	SE = .716
Grade Level	.097	.055	.093*	.039	.90	
Gifted Program	.235	.309	.089*	.041	2.09	
Constant		-1.466			30.70	

*--p<.05 **--p<.01 ***--p<.001

Table F-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.425	.384	.393***	.041	16.71	Multiple R = .531
Grade Level	.180	.113	.191***	.040	3.44	R^2 = .282
Change of Schools	.204	.258	.151***	.041	3.08	Adjusted R^2 = .271
Magazine Subscriptions						SE =
.725						
Per Student	-.160	-7.203	-.093*	.041	1.49	
Free & Reduced Lunch	-.183	-.242	-.106**	.041	1.95	
Number of Parents						
Absent	-.004	.242	.115**	.042	-.05	
Home Phone Listed	.165	.336	.097*	.042	1.60	
Constant		-1.669			28.22	
Auditory Test Total						
1983 Reading Grade	.424	.386	.361***	.043	15.28	Multiple R = .480
Emergency Telephone	.185	.365	.123**	.042	2.28	R^2 = .231
Free & Reduced Lunch	-.170	-.286	-.114**	.042	1.94	Adjusted R^2 = .222
Gifted Program	.214	.366	.097*	.043	2.08	SE = .820
Change of Schools	.174	.159	.085*	.043	1.47	
Constant		-1.325			23.05	
Spelling						
1983 Reading Grade	.511	.497	.486***	.039	24.82	Multiple R = .619
Student's Residence	-.213	-.343	-.184***	.041	3.93	R^2 = .384
Sex	.182	.273	.154***	.037	2.79	Adjusted R^2 = .374
Acreage Per Student	-.302	-5.223	-.090	.048	2.71	SE = .705
Encyclopedia Sets						
Per Student	.188	9.151	.114**	.039	2.13	
Percentage of Books						
Lost Per Student	-.201	-109.480	-.100*	.044	2.00	
Number of Parents						
Employed	-.004	.203	.082*	.038	-.03	
Constant		-1.183			38.35	

*--p<.05 **--p<.01 ***--p<.001

Table F-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.497	.720	.496***	.045	24.64	Multiple R = .551
Gifted Program	.233	.400	.109**	.040	2.54	R^2 = .304
Grade Level	.185	.057	.091*	.040	1.68	Adjusted R^2 = .295
Percentage of Books						SE = .757
Lost Per Student	-.121	-135.793	-.122**	.041	1.48	
1983 Citizenship Grade	.098	-.154	-.136**	.045	-1.34	
Home Phone Listed	.164	.313	.085*	.041	1.40	
Constant		-1.710			30.40	
Math Test Total						
1983 Grade						
Point Average	.537	.781	.551***	.043	29.60	Multiple R = .573
Gifted Program	.247	.446	.125**	.040	3.09	R^2 = .328
Percentage of Books						Adjusted R^2 = .322
Lost Per Student	-.125	-145.554	-.134***	.040	1.67	SE = .725
1983 Citizenship Grade	.129	-.132	-.119**	.044	-1.54	
Constant		-1.275			32.82	
Science Knowledge						
1983 Grade						
Point Average	.446	.497	.386***	.041	17.22	Multiple R = .545
Age in Months at						R^2 = .297
Time of Test	.235	.009	.200***	.040	4.68	Adjusted R^2 = .287
Acreage Per Student	-.214	-10.415	-.199***	.041	4.25	SE = .676
Library Open After						
School Per Student	.095	2.654	.119**	.041	1.13	
Sex	-.069	-.160	-.100**	.040	.68	
Gifted Program	.187	.295	.091*	.041	1.70	
Constant		-1.935			29.66	

*--p<.05 **--p<.01 ***--p<.001

Table F-2. Stepwise Multiple Regression Results Without Grade Level

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.394	.346	.357***	.042	14.07	Multiple R = .472
Acreage Per Student	-.254	-10.005	-.182***	.042	4.63	R^2 = .223
Sex	.134	.208	.123**	.042	1.65	Adjusted R^2 = .214
Age in Months at						SE = .747
Time of Test	.059	.005	.095*	.042	.55	
Emergency Telephone	.148	.246	.092*	.042	1.36	
Constant		-1.401			22.26	
Reading Comprehension						
1983 Reading Grade	.492	.357	.421***	.042	20.68	Multiple R = .549
Acreage Per Student	-.225	-10.904	-.227***	.048	5.08	R^2 = .302
Library Open After						Adjusted R^2 = .293
School Per Student	.098	2.430	.118**	.042	1.16	SE = .620
Gifted Program	.222	.269	.090*	.041	2.00	
Cost of School						
Per Student	-.031	7.8E-5	.115**	.046	-.35	
Change of Schools	.178	.134	.091*	.040	1.61	
Constant		-.727			30.18	
Reading Test Total						
1983 Reading Grade	.531	.419	.493***	.040	26.18	Multiple R = .611
Acreage Per Student	-.281	-11.479	-.238***	.040	6.68	R^2 = .373
Library Open After						Adjusted R^2 = .363
School Per Student	.098	2.558	.124**	.039	1.21	SE = .590
Sex	.128	.214	.145***	.040	1.86	
Emergency Telephone	.178	.260	.111**	.038	1.96	
1983 Citizenship Grade	.153	-.095	-.103*	.043	-1.56	
Father's Status	-.111	-.179	-.086*	.038	.96	
Constant		-.732			37.29	
Vocabulary Knowledge						
1983 Reading Grade	.484	.412	.420***	.041	20.31	Multiple R = .558
Free & Reduced Lunch	-.227	-.350	-.153***	.040	3.47	R^2 = .312
Change of Schools	.195	.155	.090*	.040	1.76	Adjusted R^2 = .301
Emergency Telephone	.172	.261	.096*	.040	1.66	SE = .714
Gifted Program	.235	.289	.084*	.041	1.96	
Number of Days Absent						
in 1982-1983	.094	.010	.089*	.040	.83	
Magazine Subscriptions						
Per Student	-.141	-6.536	-.084*	.040	1.19	
Constant		-1.211			31.18	

*--p<.05 **--p<.01 ***--p<.001

Table F-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.425	.401	.410***	.041	17.43	Multiple R = .524
Change of Schools	.204	.251	.147***	.042	3.00	R^2 = .275
Age in Months at						Adjusted R^2 = .262
Time of Test	.099	.006	.131**	.042	1.29	SE = .730
Magazine Subscriptions						
Per Student	-.160	-6.343	-.082*	.041	1.31	
Free & Reduced Lunch	-.183	-.240	-.105**	.041	1.93	
Number of Parents Absent	-.004	.235	.111**	.042	-.05	
Home Phone Listed	.165	.353	.102*	.042	1.68	
Student's Residence	-.101	-.155	-.087*	.042	.88	
Constant		-2.028			27.47	
Auditory Test Total						
1983 Reading Grade	.424	.386	.361***	.043	15.28	Multiple R = .480
Emergency Telephone	.185	.365	.123**	.042	2.28	R^2 = .231
Free & Reduced Lunch	-.170	-.286	-.114**	.042	1.94	Adjusted R^2 = .222
Gifted Program	.214	.366	.097*	.043	2.08	SE = .820
Change of Schools	.174	.159	.085*	.043	1.47	
Constant		-1.325			23.05	
Spelling						
1983 Reading Grade	.511	.497	.486***	.039	24.82	Multiple R = .619
Student's Residence	-.213	-.343	-.184***	.041	3.93	R^2 = .384
Sex	.182	.273	.154***	.037	2.79	Adjusted R^2 = .374
Acreage Per Student	-.302	-5.223	-.090	.048	2.71	SE = .705
Encyclopedia Sets						
Per Student	.188	9.151	.114**	.039	2.13	
Percentage of Books						
Lost Per Student	-.201	-109.480	-.100*	.044	2.00	
Number of Parents						
Employed	-.004	.203	.082*	.038	-.03	
Constant		-1.183			38.35	

*--p<.05 **--p<.01 ***--p<.001

Table F-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.497	.726	.500***	.044	24.87	Multiple R = .553
Gifted Program	.233	.418	.114**	.040	2.66	R^2 = .305
Age in Months at						Adjusted R^2 = .296
Time of Test	.147	.005	.096*	.040	1.41	SE = .757
Percentage of Books						
Lost Per Student	-.121	-139.716	-.126**	.041	1.52	
1983 Citizenship Grade	.098	-.157	-.139**	.045	-1.37	
Home Phone Listed	.164	.321	.087*	.040	1.43	
Constant		-2.102			30.52	
Math Test Total						
1983 Grade						
Point Average	.537	.781	.551***	.043	29.60	Multiple R = .573
Gifted Program	.247	.446	.125**	.040	3.09	R^2 = .328
Percentage of Books						Adjusted R^2 = .322
Lost Per Student	-.125	-145.554	-.134***	.040	1.67	SE = .725
1983 Citizenship Grade	.129	-.132	-.119**	.044	-1.54	
Constant		-1.275			32.82	
Science Knowledge						
1983 Grade						
Point Average	.446	.497	.386***	.041	17.22	Multiple R = .545
Age in Months at						R^2 = .297
Time of Test	.235	.009	.200***	.040	4.68	Adjusted R^2 = .287
Acreage Per Student	-.214	-10.415	-.199***	.041	4.25	SE = .676
Library Open After						
School Per Student	.095	2.654	.119**	.041	1.13	
Sex	-.069	-.160	-.100**	.040	.68	
Gifted Program	.187	.295	.091*	.041	1.70	
Constant		-1.935			29.66	

*--p<.05 **--p<.01 ***--p<.001

APPENDIX G

POPULATION STEPWISE AND FORCED ENTRY

MULTIPLE REGRESSION RESULTS

Population Models

Word Study Skills

In comparing the two word study skills models (Table G-1; or Table 36), it was found that father's status and student's 1983 citizenship grade had been added to the population word study skills model. All variables that had previously entered, also accounted for slightly more variance. Taken together the variables in the population model explained 2% more (or 25%) of the total variance (i.e., multiple R^2, the explained variance, increased from .227 to .248), which still left 75% of the variance yet to be explained by variables not included in this analysis.

Reading Comprehension

Student's sex, 1983 citizenship grade, participation in the federal lunch program, and whether an emergency phone number was listed were all additional predictors in the population reading comprehension model (Table G-1; or Table 36). The 1983 reading grade, however, was the only variable that explained more variance in the population model, with all other previously entered variables explaining slightly less variance than they had in the original model. Overall, 2.2% more, or 32% of the total, variance was explained, which left 68% of the variance to be explained by factors other than those included in this analysis.

Reading Test Total

As indicated above, no structural changes were made between the

Table G-1. Population Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.394	.352	.363***	.047	14.32	Multiple R = .498
Acreage Per Student	-.254	-10.579	-.192***	.058	4.89	R^2 = .248
Sex	.133	.222	.132**	.046	1.76	Adjusted R^2 = .218
Grade Level	.119	.058	.098*	.044	1.17	SE = .745
Emergency Telephone	.148	.261	.097*	.043	1.44	
Father's Status	-.086	-.154	-.065	.043	.56	
1983 Citizenship Grade	.129	-.075	-.071	.049	-.92	
Other[a]					1.62	
Constant		-1.033			24.84	
Reading Comprehension						
1983 Reading Grade	.492	.377	.444***	.045	21.85	Multiple R = .569
Acreage Per Student	-.224	-9.399	-.195***	.054	4.38	R^2 = .324
Library Open After School Per Student	.098	2.041	.099*	.043	.97	Adjusted R^2 = .298; SE = .618
Gifted Program	.222	.204	.068	.042	1.52	
Cost of School Per Student	-.031	6.3E-5	.093*	.047	-.29	
Change of Schools	.178	.127	.086*	.042	1.52	
Sex	.081	.140	.095*	.043	.77	
Emergency Telephone	.149	.179	.076	.041	1.14	
Free & Reduced Lunch	-.159	-.142	-.072	.042	1.14	
1983 Citizenship Grade	.126	-.093	-.100*	.047	-1.26	
Other[a]					.68	
Constant		-.804			32.42	
Reading Test Total						
1983 Reading Grade	.531	.412	.485***	.043	25.74	Multiple R = .626
Acreage Per Student	-.281	-8.725	-.181***	.052	5.08	R^2 = .392
Library Open After School Per Student	.098	1.977	.096*	.043	.94	Adjusted R^2 = .367; SE = .588
Sex	.128	.207	.140***	.041	1.80	
Emergency Telephone	.178	.248	.105**	.039	1.87	
Grade Level	.097	.039	.076*	.039	.73	
Father's Status	-.111	-.168	-.081*	.038	.90	
1983 Citizenship Grade	.153	-.095	-.103*	.044	-1.57	
Other[a]					3.69	
Constant		-.945			39.18	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 6-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Vocabulary Knowledge						
1983 Reading Grade	.484	.420	.428***	.044	20.70	Multiple R = .583
Free & Reduced Lunch	-.227	-.300	-.131***	.041	2.97	R^2 = .340
Change of Schools	.195	.132	.077	.042	1.50	Adjusted R^2 = .312
Emergency Telephone	.172	.229	.084*	.041	1.45	SE = .708
Grade Level	.097	.042	.072	.041	.69	
Gifted Program	.234	.241	.070	.042	1.63	
Library Open After School Per Student	.106	1.657	.070	.044	.74	
Magazine Subscriptions Per Student	-.141	-5.050	-.065	.045	.92	
Number of Days Absent in 1982-83	.094	.010	.096*	.041	.90	
Home Phone Listed	.177	.315	.090*	.042	1.59	
Other[a]					.93	
Constant		-1.537			34.02	
Listening Comprehension						
1983 Reading Grade	.425	.383	.392***	.045	16.67	Multiple R = .554
Grade Level	.180	.100	.169***	.042	3.04	R^2 = .307
Change of Schools	.204	.231	.135**	.043	2.76	Adjusted R^2 = .277
Magazine Subscriptions Per Student	-.160	-6.916	-.090*	.046	1.43	SE = .722
Free & Reduced Lunch	-.183	-.253	-.111**	.042	2.03	
Number of Parents Absent	-.004	.220	.104*	.047	-.04	
Home Phone Listed	.165	.326	.094*	.043	1.55	
Library Open After School Per Student	.121	1.801	.076	.045	.09	
Emergency Telephone	.150	.224	.083*	.042	1.24	
Student's Residence	-.100	-.160	-.090*	.045	.91	
Other[a]					1.04	
Constant		-1.875			30.72	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 6-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Auditory Test Total						
1983 Reading Grade	.424	.416	.389***	.047	16.46	Multiple R = .513
Emergency Telephone	.185	.325	.110**	.043	2.03	R^2 = .263
Free & Reduced Lunch	-.170	-.251	-.100*	.043	1.71	Adjusted R^2 = .231
Gifted Program	.214	.260	.069	.044	1.48	SE = .816
Change of Schools	.173	.167	.090*	.045	1.55	
Student's Residence	-.060	-.189	-.097*	.046	.59	
Father's Status	.046	.180	.069	.043	.32	
Number of Days Absent in 1982-83	.080	.009	.077	.043	.62	
Number of Parents Absent	-.024	.186	.080	.048	-.19	
Home Phone Listed	.154	.330	.087*	.044	1.33	
Other[a]					.39	
Constant		-1.737			26.29	
Spelling						
1983 Reading Grade	.511	.495	.484***	.042	24.72	Multiple R = .629
Student's Residence	-.213	-.335	-.180***	.043	3.84	R^2 = .396
Sex	.181	.277	.156***	.041	2.82	Adjusted R^2 = .371
Acreage Per Student	-.302	-5.611	-.097	.051	2.91	SE = .706
Encyclopedia Sets Per Student	.188	8.500	.106**	.042	1.98	
Percentage of Books Lost Per Student	-.201	-116.557	-.106*	.047	2.13	
Number of Parents Employed	-.004	.279	.112**	.043	-.04	
Other[a]					1.25	
Constant		-1.104			39.61	

*--p<.05 **--p<.01 ***--p<.001
[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 6-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.497	.697	.480***	.045	23.86	Multiple R = .558
Gifted Program	.233	.407	.111**	.040	2.59	R^2 = .312
Grade Level	.185	.059	.094*	.040	1.75	Adjusted R^2 = .298
Percentage of Books						SE = .756
Lost Per Student	-.121	-129.568	-.117**	.047	1.41	
1983 Citizenship Grade	.098	-.137	-.121**	.048	-1.19	
Home Phone Listed	.164	.302	.082*	.041	1.34	
Library Open After						
School Per Student	.077	2.106	.084*	.042	.65	
Other[a]					.75	
Constant		-1.709			31.16	
Math Test Total						
1983 Grade						
Point Average	.537	.746	.526***	.044	28.26	Multiple R = .585
Gifted Program	.247	.443	.124**	.040	3.07	R^2 = .342
Percentage of Books						Adjusted R^2 = .329
Lost Per Student	-.125	-143.137	-.132**	.046	1.65	SE = .721
1983 Citizenship Grade	.129	-.127	-.115**	.047	-1.49	
Age in Months at						
Time of Test	.124	.004	.072	.039	.89	
Library Open After						
School Per Student	.078	1.941	.079*	.041	.61	
Other[a]					1.21	
Constant		-1.864			34.20	
Science Knowledge						
1983 Grade						
Point Average	.446	.514	.399***	.045	17.80	Multiple R = .546
Age in Months at						R^2 = .298
Time of Test	.235	.009	.196***	.040	4.61	Adjusted R^2 = .284
Acreage Per Student	-.214	-10.938	-.209***	.047	4.47	SE = .677
Library Open After						
School Per Student	.095	2.526	.113**	.042	1.07	
Sex	-.068	-.140	-.088*	.042	.60	
Gifted Program	.187	.281	.087*	.041	1.62	
Other[a]					-.33	
Constant		-1.906			29.84	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

original and population reading test total models (Table G-1; or Table 36). Student's 1983 citizenship grade, however, contributed a larger suppression effect, while other previously entered variables accounted for slightly less variance (see below for discussion of this). Taken together all entered variables accounted for 39%, or 1.2% more, of the total variance, leaving 61% of the variance to be explained by factors outside of this analysis.

Vocabulary Knowledge

The comparative results (Table G-1; or Table 36) indicated that the number of minutes after school that the library was open per student, the number of magazine subscriptions per student, the number of days a student was absent in 1982-83, and whether a home telephone number was listed were all additional predictors in the new population vocabulary knowledge model. In looking at the explained variance, previous reading grades explained slightly more variance in the population than in the original model, but all other previously entered variables accounted for slightly less variance. The largest total amount of increased variance was found for the population vocabulary knowledge model, as it explained 34%, or 3.3% more, of the total variance. Thus, 66% of the total variance in vocabulary knowledge test scores was left unexplained by the factors in this analysis.

Listening Comprehension

The number of minutes that the library was open after school per student, whether an emergency telephone number was listed, and student's residence were added to the listening comprehension model (Table G-1; or Table 36). Most variables that entered the original model accounted for slightly less variance in the population model, although participation in the federal lunch program explained slightly more of the variance. Taken together, the variables in the population model explained 31%, or 2.5% more, of the total variance in listening comprehension test scores, which left 69% of the variance yet to be explained by factors not included in this analysis.

Auditory Test Total

Structurally, five additional variables were added to the population auditory test total model: student's residence, father's status, the number of days the student was absent, the number of parents absent, and whether a home telephone number was listed. While the 1983 reading grade explained slightly more variance, all other variables that had previously entered into the original model explained slightly less variance in the population model. The population model explained 26%, or 3.2% more, of the total variance in auditory test total scores, which left 74% of the variance yet to be explained by factors not included in this analysis.

Spelling

No structural changes were observed (Table G-1; or Table 36) between the original and population spelling models. Student's sex, acreage per student, percentage of books lost per student, and number of parents employed all accounted for slightly more variance in the population model, while the 1983 reading grade, student's residence, and number of encyclopedia sets per student explained slightly less variance in the population than in the original model. The population model explained 1.3% more, or 40%, of the total variance in spelling achievement test scores. Thus, factors outside this analysis accounted for 60% of the variance in spelling achievement.

Math Concepts

The number of minutes that the library was open after school per student was the only structural addition to the math concepts population model (Table G-1; or Table 36) which also had the second smallest amount of change (.8%) in explained total variance. Student's grade level and gifted program participation both explained slightly more variance in the population model, while 1983 grade point average, percentage of books lost per student, and whether a home phone was listed each explained slightly less variance in the population than in the original model. Taken together, all variables accounted for 31% of the variance in math concepts achievement, thus leaving 69% of the variance yet to be explained by variables not included in this analysis.

Math Test Total

Student's age and the number of minutes that the library was open after school per student were added to the math test total population model (Table G-1; or Table 36). The student's 1983 citizenship grade was the only variable from the original model to account for more variance in the population model. Taken together, all variables in the population math test total model explained 34%, or 1.4% more, of the total variance, which left 66% of the variance to be explained by variables not included in this analysis.

Science Knowledge

The least amount of change between the original and population models was for science knowledge (Table G-1; or Table 36). There were no structural changes, and the population model only accounted for .1% more of the variance. Internally, several moderate changes did occur as the 1983 grade point average and acreage per student variables accounted for slightly more variance and the other predictors explained slightly less variance. Taken together the population science knowledge model explained 30% of the variance, which meant that 70% of the variance in science achievement test scores was left to be explained by variables not included in this analysis.

Table G-2. Population Stepwise and Forced Entry Multiple Regression Results Without Grade Level

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.394	.359	.370***	.048	14.59	Multiple R = .495
Acreage Per Student	-.254	-10.398	-.189***	.058	4.81	R^2 = .246
Sex	.134	.230	.136**	.046	1.82	Adjusted R^2 = .215
Age in Months at						SE = .747
Time of Test	.058	.004	.080	.044	.47	
Emergency Telephone	.148	.266	.099*	.043	1.47	
Father's Status	-.086	-.153	-.065	.043	.56	
1983 Citizenship Grade	.129	-.082	-.077	.049	-1.00	
Other[a]					1.83	
Constant		-1.294			24.55	
Reading Comprehension						
1983 Reading Grade	.492	.377	.444***	.045	21.85	Multiple R = .569
Acreage Per Student	-.225	-9.399	-.195***	.054	4.38	R^2 = .324
Library Open After						Adjusted R^2 = .298
School Per Student	.098	2.041	.099*	.043	.97	SE = .618
Gifted Program	.222	.204	.068	.042	1.52	
Cost of School						
Per Student	-.031	6.3E-5	.093*	.047	-.29	
Change of Schools	.178	.127	.086*	.042	1.52	
Sex	.081	.141	.095*	.044	.77	
Emergency Telephone	.149	.179	.076	.041	1.14	
Free & Reduced Lunch	-.159	-.142	-.072	.042	1.14	
1983 Citizenship Grade	.126	-.093	-.100*	.047	-1.26	
Other					.68	
Constant		-.804			32.42	
Reading Test Total						
1983 Reading Grade	.531	.416	.490***	.043	26.00	Multiple R = .624
Acreage Per Student	-.281	-8.534	-.177***	.052	4.97	R^2 = .389
Library Open After						Adjusted R^2 = .364
School Per Student	.098	1.925	.094*	.043	.91	SE = .589
Sex	.128	.212	.144***	.041	1.84	
Emergency Telephone	.178	.250	.106**	.039	1.89	
1983 Citizenship Grade	.153	-.101	-.108**	.044	-1.66	
Father's Status	-.111	-.169	-.082*	.039	.90	
Other[a]					4.05	
Constant		-1.064			38.90	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 6-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Vocabulary Knowledge						
1983 Reading Grade	.484	.425	.432***	.044	20.92	Multiple R = .581
Free & Reduced Lunch	-.227	-.298	-.130**	.041	2.95	R^2 = .338
Change of Schools	.195	.130	.076	.042	1.48	Adjusted R^2 = .309
Emergency Telephone	.172	.230	.085*	.041	1.46	SE = .710
Gifted Program	.234	.253	.073	.042	1.71	
Number of Days Absent in 1982-83	.094	.011	.098*	.041	.92	
Library Open After School Per Student	.106	1.640	.069	.044	.74	
Home Phone Listed	.177	.322	.092*	.042	1.63	
Other[a]					1.96	
Constant		-1.658			33.77	
Listening Comprehension						
1983 Reading Grade	.425	.394	.404***	.046	17.17	Multiple R = .544
Change of Schools	.204	.230	.134**	.044	2.75	R^2 = .296
Age in Months at Time of Test	.099	.006	.127**	.042	1.25	Adjusted R^2 = .266; SE = .728
Magazine Subscriptions Per Student	-.160	-6.673	-.086	.046	1.38	
Free & Reduced Lunch	-.183	-.247	-.108**	.042	1.99	
Number of Parents Absent	-.004	.212	.101*	.047	-.04	
Home Phone Listed	.165	.341	.098*	.043	1.62	
Student's Residence	-.100	-.183	-.103*	.045	1.03	
Library Open After School Per Student	.121	1.752	.074	.045	.90	
Emergency Telephone	.150	.229	.085*	.042	1.27	
Other[a]					.30	
Constant		-2.261			29.62	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table 6-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Auditory Test Total						
1983 Reading Grade	.424	.416	.389***	.047	16.48	Multiple R = .513
Emergency Telephone	.185	.324	.109**	.043	2.02	R^2 = .263
Free & Reduced Lunch	-.170	-.251	-.100*	.043	1.71	Adjusted R^2 = .231
Gifted Program	.214	.262	.070	.044	1.49	SE = .816
Change of Schools	.173	.165	.088*	.045	1.53	
Student's Residence	-.060	-.197	-.102*	.046	.61	
Father's Status	.046	.179	.069	.043	.32	
Number of Days Absent in 1982-83	.080	.009	.079	.043	.63	
Number of Parents Absent	-.024	.182	.079	.048	-.19	
Home Phone Listed	.154	.331	.087*	.044	1.34	
Other[a]					.33	
Constant		-1.680			26.27	
Spelling						
1983 Reading Grade	.511	.497	.485***	.042	24.79	Multiple R = .629
Student's Residence	-.213	-.336	-.180***	.043	3.85	R^2 = .396
Sex	.181	.279	.156***	.041	2.84	Adjusted R^2 = .371
Acreage Per Student	-.302	-5.588	-.096	.050	2.90	SE = .706
Encyclopedia Sets Per Student	.188	8.524	.106**	.042	1.99	
Percentage of Lost Books Per Student	-.201	-117.263	-.107*	.047	2.15	
Number of Parents Employed	-.004	.280	.113**	.043	-.04	
Other[a]					1.13	
Constant		-1.175			39.61	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table G-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade Point Average	.497	.705	.486***	.045	24.14	Multiple R = .559
Gifted Program	.233	.424	.116**	.040	2.70	R^2 = .312
Age in Months at Time of Test	.147	.005	.098**	.040	1.43	Adjusted R^2 = .299; SE = .755
Percentage of Lost Books Per Student	-.121	-133.849	-.120**	.047	1.46	
1983 Citizenship Grade	.098	-.143	-.126**	.048	-1.24	
Home Phone Listed	.164	.311	.084*	.041	1.39	
Library Open After School Per Student	.077	2.076	.083*	.041	.64	
Other[a]					.73	
Constant		-2.100			31.25	
Math Test Total						
1983 Grade Point Average	.537	.746	.526***	.044	28.26	Multiple R = .585
Gifted Program	.247	.443	.124**	.040	3.07	R^2 = .342
Percentage of Books Lost Per Student	-.125	-143.137	-.132**	.046	1.65	Adjusted R^2 = .329; SE = .721
1983 Citizenship Grade	.129	-.127	-.115**	.047	-1.49	
Age in Months at Time of Test	.124	.004	.072	.039	.89	
Library Open After School Per Student	.078	1.941	.079*	.041	.61	
Other[a]					1.21	
Constant		-1.864			34.20	
Science Knowledge						
1983 Grade Point Average	.446	.514	.399***	.045	17.80	Multiple R = .546
Age in Months at Time of Test	.234	.009	.196***	.040	4.61	R^2 = .298; Adjusted R^2 = .284
Acreage Per Student	-.214	-10.938	-.209***	.047	4.47	SE = .677
Library Open After School Per Student	.095	2.526	.113**	.042	1.07	
Sex	-.068	-.140	-.088*	.042	.60	
Gifted Program	.187	.281	.087*	.041	1.62	
Other[a]					-.33	
Constant		-1.906			29.84	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

APPENDIX H

INDIAN STEPWISE AND FORCED ENTRY

MULTIPLE REGRESSION RESULTS

Indian Models

Word Study Skills

Five variables were found to enter the reading word study skills model (Table H-1; or Table 39) at or beyond the .15 level of significance, which together with all variables forced into the equation (p >.15) accounted for 33% of the explained variance in reading word study skills test scores for Indian students in the Washoe County School District. This meant that 67% of the observed variance in word study skills was yet to be accounted for by factors other than those included in this analysis. Previous grades, as expected, was the best predictor, but like previous analyses did not explain as much variance as anticipated; that is, the 1983 reading grade explained only 19% of the variance in word study skills test scores for Indian students. The next best predictors of Indian students' word study skills achievement were father's status (4%) and the number of magazine subscriptions per student (4%). Grade level (1%) and emergency telephone number (.2%) were the other two significant (p <.15) predictors.

Reading Comprehension

As expected, the previous (1983) reading grade was the best predictor (32%) of reading comprehension achievement (Table H-1; or Table 39). However, only two other variables, gifted program participation (2%) and the number of encyclopedia sets per student (3%), were significant (p <.15) predictors. Taken together all

Table H-1. Indian Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.427	.424	.437***	.074	18.67	Multiple R = .572
Father's Status	-.220	-.448	-.200**	.063	4.40	R^2 = .327
Grade Level	.075	.103	.170**	.067	1.28	Adjusted R^2 = .268
Magazine Subscriptions						SE = .720
Per Student	-.188	-10.583	-.217**	.078	4.08	
Emergency Telephone	-.018	-.221	-.102	.071	.19	
Other[a]					4.07	
Constant		-1.320			32.69	
Reading Comprehension						
1983 Reading Grade	.572	.507	.550***	.071	31.46	Multiple R = .610
Encyclopedia Sets						R^2 = .373
Per Student	.205	13.554	.148*	.065	3.05	Adjusted R^2 = .318
Gifted Program	.229	.470	.100	.063	2.30	SE = .659
Other[a]					.46	
Constant		-1.560			37.27	
Reading Test Total						
1983 Reading Grade	.610	.522	.610***	.066	37.23	Multiple R = .684
Magazine Subscriptions						R^2 = .468
Per Student	-.172	-8.090	-.188**	.069	3.23	Adjusted R^2 = .421
Grade Level	-.021	.055	.103	.060	-.22	SE = .564
Emergency Telephone	-.012	-.236	-.124*	.063	.15	
Father's Status	-.100	-.198	-.100	.056	1.01	
Gifted Program	.258	.441	.102	.058	2.61	
Other[a]					2.74	
Constant		-1.358			46.75	
Vocabulary Knowledge						
1983 Reading Grade	.434	.472	.475***	.079	20.59	Multiple R = .521
Grade Level	.027	.093	.150*	.070	.40	R^2 = .272
Encyclopedia Sets						Adjusted R^2 = .208
Per Student	.178	10.276	.104	.070	1.86	SE = .766
Other[a]					4.30	
Constant		-1.996			27.15	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table H-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.374	.387	.394***	.080	14.75	Multiple R = .496
Percentage of Books						R^2 = .246
Lost Per Student	-.131	-138.846	-.215**	.087	2.82	Adjusted R^2 = .181
Father's Status	.116	.255	.113	.067	1.31	SE = .770
Encyclopedia Sets						
Per Student	.201	11.139	.114	.071	2.30	
Student's Residence	.109	.244	.144	.075	1.55	
Other[a]					1.90	
Constant		-1.439			24.63	
Auditory Test Total						
1983 Reading Grade	.446	.461	.475***	.077	21.18	Multiple R = .552
Percentage of Books						R^2 = .305
Lost Per Student	-.143	-108.536	-.170*	.084	2.43	Adjusted R^2 = .245
Gifted Program	.260	.603	.122	.067	3.18	SE = .731
Encyclopedia Sets						
Per Student	.205	11.129	.116	.068	2.37	
Grade Level	.001	.073	.121	.068	.00	
Other[a]					1.35	
Constant		-1.807			30.51	
Spelling						
1983 Reading Grade	.483	.456	.436***	.072	21.02	Multiple R = .604
Number of Days Absent						R^2 = .365
in 1982-83	-.268	-.016	-.156**	.063	4.17	Adjusted R^2 = .310
Father's Status	-.127	-.310	-.129*	.061	1.63	SE = .754
Gifted Program	.256	.737	.139*	.063	3.55	
Number of Parents						
Absent	-.126	-.360	-.194**	.072	2.45	
Emergency Telephone	-.032	-.265	-.113	.069	.36	
Free & Reduced Lunch	-.158	-.238	-.129*	.062	2.03	
Student's Residence	-.007	-.228	-.126	.070	.08	
Number of Parents						
Employed	-.033	.346	.189*	.077	-.61	
Other[a]					1.86	
Constant		-.747			36.54	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table H-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade Point Average	.544	.707	.562***	.069	30.57	Multiple R = .613
Percentage of Books						R^2 = .376
Lost Per Student	-.187	-119.373	-.179**	.067	3.34	Adjusted R^2 = .353
Sex	-.072	-.176	-.100	.062	.71	SE = .707
Gifted Program	.274	.499	.097	.061	2.65	
Other[a]					.28	
Constant		-2.083			37.55	
Math Test Total						
1983 Grade Point Average	.570	.699	.575***	.068	32.77	Multiple R = .622
Percentage of Books						R^2 = .387
Lost Per Student	-.173	-128.319	-.199**	.067	3.46	Adjusted R^2 = .365
Gifted Program	.277	.493	.099	.060	2.75	SE = .676
Other[a]					-.30	
Constant		-1.699			38.68	
Science Knowledge						
1983 Grade Point Average	.369	.529	.455***	.074	16.81	Multiple R = .533
Percentage of Books						R^2 = .284
Lost Per Student	-.223	-159.302	-.259***	.072	5.78	Adjusted R^2 = .258
Grade Level	.121	.130	.223***	.064	2.69	SE = .698
Gifted Program	.296	.642	.135*	.065	3.99	
1983 Citizenship Grade	.134	-.110	-.118	.075	-1.58	
Other[a]					.72	
Constant		-1.285			28.41	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

variables entering the equation accounted for 37% of the total variance, thus leaving 63% of the variance to be explained by factors not included in this analysis.

Reading Test Total

A total of six variables entered into the reading test total model of achievement (Table H-1; or Table 39) at or beyond the level of significance ($p < .15$). All entering factors accounted for 47% of the explained variance, which meant that 53% of the variance in reading test total achievement for Indian students was yet to be explained by variables outside this analysis. Again, as expected, the 1983 reading grade explained the most variance (37%). The number of magazine subscriptions per student accounted for 3% of the variance, while the gifted program (3%), father's status (1%), emergency telephone number (.2%), and grade level (-.2%) variables were the other predictors.

Vocabulary Knowledge

The number of encyclopedia sets per student explained 2%, grade level accounted for .2%, and the 1983 reading grade explained 21% of the total variance in vocabulary knowledge test scores for Indian students (Table H-1; or Table 39). These predictors, along with the other variables in the equation that were not significant (i.e., $p > .15$), explained 27% of the total variance in vocabulary knowledge achievement for Indian students, meaning that 63% of the variance was left unexplained; that is, was accountable by factors not in this analysis.

<u>Listening Comprehension</u>

Taken together, all variables entering into the listening comprehension achievement model (Table H-1; or Table 39) for Indian students explained 25% of the observed variance. Thus, 75% of the variance in listening comprehension achievement for Indian students must be attributed to variables not included in this analysis. Specifically, the 1983 reading grade contributed 15% to the total variance, while student's residence accounted for 2%, percentage of books lost per student 3%, father's status 1%, and the number of encyclopedia sets per student 2% of the total variance.

<u>Auditory Test Total</u>

While the 1983 reading grade explained 21% of the total variance, gifted program participation accounted for 3%, the percentage of books lost per student 3%, and the number of encyclopedia sets per student 2% of the total variance in auditory test total scores (Table H-1; or Table 39). Interestingly, grade level entered into the equation, but contributed less than one one- hundredth of a percentage (i.e., 0%) to the total observed variance in Indian students' auditory test total scores. Taken together, all entering variables explained 30% of the auditory test total score variance for Indian students, leaving 70% of the total variance to be explained by factors not in this analysis.

<u>Spelling Knowledge</u>

While the 1983 reading grade was the best predictor (21% of the explained variance) of spelling knowledge (Table H-1; or Table 39), the number of days absent in 1982-83 was the next best predictor (4%), followed by gifted program participation (4%), number of parents absent (2%), participation in the federal lunch program (2%), father's status (2%), and emergency telephone number (.4%). All entering variables, including those that were not statistically significant (i.e., $p > .15$), explained 36% of the total variance in spelling knowledge achievement test scores for Indian students. Hence, 64% of the variance in spelling achievement test scores for Indian students must be attributed to factors not included in this analysis.

Math Concepts

Nearly 31% of the variance in math concept achievement test scores (Table H-1; or Table 39) for Indian students was accounted for by the student's 1983 grade point average. Participation in the gifted program and the percentage of books lost per student both explained 3% of the total variance, while student's sex accounted for another 1% of the variance. Taken together, all entering variables explained 38% of the Indian students' math concepts achievement, leaving 62% of the total variance to be explained by factors not in this analysis.

Math Test Total

With the exception that student's sex was not a predictor in math test total model of achievement for Indian students (Table H-1; or Table 39), the same variables entered as in the math concepts model. That is, the student's 1983 grade point average explained 33%, gifted student program participation accounted for 3%, and the percentage of books lost per student explained nearly 4% of the total observed variance in math test total achievement test scores. All predictors together explained 39% of the total variance, which meant that 61% of the variance was attributable to factors not included in this analysis.

Science Knowledge

Five predictors entered into the science knowledge model of achievement for Indian students (Table H-1; or Table 39) at or beyond the level significance (p <.15). These variables, along with those that were not significant (i.e., p >.15), accounted for 28% of the observed variance in Indian students' science knowledge achievement test scores. This meant that 72% of the total variance was yet to be explained by variables not included in this analysis. Specifically, the student's 1983 grade point average contributed 17%, gifted program participation accounted for 4%, the percentage of books lost per student explained 6%, and the student's grade level accounted for 3% of the total variance in science knowledge test scores, while the student's 1983 citizenship grade negatively influenced (-2%) the model.

Table H-2. Indian Stepwise and Forced Entry Multiple Regression Results Without Grade Level

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.427	.426	.439***	.076	18.76	Multiple R = .566
Father's Status	-.220	-.455	-.204**	.063	4.47	R^2 = .320
Magazine Subscriptions						Adjusted R^2 = .261
Per Student	-.188	-10.101	-.207**	.078	3.89	SE = .724
Age in Months at						
Time of Test	.022	.007	.144*	.068	.31	
Emergency Telephone	-.018	-.248	-.114	.071	.21	
Other[a]					4.36	
Constant		-1.738			32.00	
Reading Comprehension						
1983 Reading Grade	.572	.496	.539***	.072	30.79	Multiple R = .610
Encyclopedia Sets						R^2 = .372
Per Student	.205	13.296	.146*	.065	2.99	Adjusted R^2 = .318
Gifted Program	.229	.509	.109	.062	2.49	SE = .659
Other[a]					.96	
Constant		-1.346			37.23	
Reading Test Total						
1983 Reading Grade	.610	.514	.602***	.067	36.69	Multiple R = .679
Magazine Subscriptions						R^2 = .461
Per Student	-.172	-7.583	-.176**	.069	3.03	Adjusted R^2 = .414
Emergency Telephone	-.012	-.256	-.134*	.063	.16	SE = .568
Gifted Program	.258	.487	.112*	.058	2.89	
Father's Status	-.100	-.203	-.103	.056	1.03	
Other[a]					2.30	
Constant		-1.381			46.10	
Vocabulary Knowledge						
1983 Reading Grade	.433	.474	.478***	.080	20.72	Multiple R = .517
Gifted Program	.229	.518	.103	.068	2.35	R^2 = .267
Encyclopedia Sets						Adjusted R^2 = .204
Per Student	.178	10.476	.106	.070	1.90	SE = .768
Age in Months at						
Time of Test	-.020	.006	.133	.071	-.26	
Other[a]					2.01	
Constant		-2.405			26.72	

*--$p < .05$ **--$p < .01$ ***--$p < .001$

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table H-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.374	.387	.394***	.081	14.76	Multiple R = .494
Percentage of Books						R^2 = .244
Lost Per Student	-.131	-136.037	-.211*	.087	2.76	Adjusted R^2 = .179
Father's Status	.116	.251	.111	.067	1.29	SE = .771
Encyclopedia Sets						
Per Student	.201	11.232	.115	.071	2.32	
Student's Residence	.108	.235	.138	.075	1.49	
Other[a]					1.80	
Constant		-1.645			24.42	
Auditory Test Total						
1983 Reading Grade	.446	.461	.476***	.078	21.19	Multiple R = .549
Percentage of Books						R^2 = .301
Lost Per Student	-.143	-104.736	-.164*	.084	2.34	Adjusted R^2 = .240
Gifted Program	.260	.645	.131*	.066	3.40	SE = .733
Encyclopedia Sets						
Per Student	.205	11.254	.117	.069	2.39	
Age in Months at						
Time of Test	-.045	.005	.100	.069	.45	
Other[a]					.34	
Constant		-2.084			30.11	
Spelling						
1983 Reading Grade	.483	.443	.423***	.072	20.43	Multiple R = .606
Number of Days Absent						R^2 = .367
in 1982-83	-.268	-.016	-.157**	.063	4.20	Adjusted R^2 = .312
Father's Status	-.127	-.311	-.129*	.061	1.64	SE = .752
Gifted Program	.256	.768	.144*	.063	3.70	
Number of Parents						
Absent	-.126	-.359	-.194**	.072	2.44	
Emergency Telephone	-.032	-.276	-.118	.068	.38	
Free & Reduced Lunch	-.158	-.226	-.123*	.061	1.93	
Student's Residence	-.007	-.230	-.127	.070	.08	
Number of Parents						
Employed	-.033	.345	.188*	.076	-.61	
Other[a]					2.54	
Constant		-.412			36.73	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table H-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.544	.696	.553***	.070	30.08	Multiple R = .610
Percentage of Books						R^2 = .372
Lost Per Student	-.187	-114.889	-.172**	.067	3.22	Adjusted R^2 = .349
Student' Sex	-.072	-.175	-.099	.062	.71	SE = .709
Gifted Program	.274	.540	.105	.061	2.87	
Other[a]					.31	
Constant		-2.097			37.19	
Math Test Total						
1983 Grade						
Point Average	.570	.690	.568***	.069	32.38	Multiple R = .621
Percentage of Books						R^2 = .386
Lost Per Student	-.173	-125.431	-.195**	.066	3.38	Adjusted R^2 = .363
Gifted Program	.277	.519	.104	.060	2.90	SE = .677
Other[a]					-.11	
Constant		-1.673			38.55	
Science Knowledge						
1983 Grade						
Point Average	.369	.532	.458***	.075	16.89	Multiple R = .524
Percentage of Books						R^2 = .274
Lost Per Student	-.223	-153.796	-.250***	.072	5.58	Adjusted R^2 = .248
Age in Months at						SE = .703
Time of Test	.073	.009	.193**	.065	1.45	
Gifted Program	.296	.700	.147*	.065	4.36	
1983 Citizenship Grade	.134	-.113	-.121	.076	-1.63	
Other[a]					.76	
Constant		-1.880			27.41	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

APPENDIX I

MODIFIED INDIAN STEPWISE AND FORCED ENTRY MULTIPLE REGRESSION RESULTS

Table I-1. Indian Modified Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.427	.418	.430***	.075	18.37	Multiple R = .575
Father's Status	-.220	-.449	-.201**	.063	4.41	R^2 = .330
Grade Level	.075	.096	.158*	.069	1.19	Adjusted R^2 = .260
Magazine Subscriptions						SE = .724
Per Student	-.188	-10.014	-.205**	.079	3.86	
Other[a]					5.21	
Constant		-1.102			33.04	
Reading Comprehension						
1983 Reading Grade	.572	.508	.552***	.072	31.55	Multiple R = .613
Encyclopedia Sets						R^2 = .376
Per Student	.205	15.109	.166**	.067	3.40	Adjusted R^2 = .310
Gifted Program	.229	.467	.100	.064	2.28	SE = .663
Other[a]					.36	
Constant		-1.790			37.59	
Reading Test Total						
1983 Reading Grade	.610	.521	.609***	.067	37.16	Multiple R = .685
Magazine Subscriptions						R^2 = .469
Per Student	-.172	-8.076	-.188**	.071	3.22	Adjusted R^2 = .413
Grade Level	-.021	.055	.104	.062	-.22	SE = .568
Emergency Telephone	-.012	-.245	-.128*	.064	.15	
Father's Status	-.100	-.198	-.100	.056	1.01	
Gifted Program	.258	.440	.101	.058	2.61	
Other[a]					2.96	
Constant		-1.481			46.89	
Vocabulary Knowledge						
1983 Reading Grade	.434	.455	.458***	.078	19.87	Multiple R = .535
Reservation Head Start	-.086	-.311	-.127	.085	1.09	R^2 = .286
Encyclopedia Sets						Adjusted R^2 = .207
Per Student	.178	11.622	.118	.072	2.11	SE = .767
Grade Level	.027	.076	.122	.070	.33	
Other[a]					5.21	
Constant		-1.870			28.61	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table I-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.374	.383	.390***	.081	14.60	Multiple R = .504
Percentage of Books						R^2 = .254
Lost Per Student	-.131	-138.862	-.215**	.088	2.82	Adjusted R^2 = .175
Father's Status	.116	.257	.114	.068	1.32	SE = .773
Encyclopedia Sets						
Per Student	.201	10.792	.111	.074	2.23	
Student's Residence	.108	.241	.142	.077	1.53	
Other[a]					2.87	
Constant		-1.079			25.37	
Auditory Test Total						
1983 Reading Grade	.446	.452	.466***	.078	20.76	Multiple R = .559
Percentage of Books						R^2 = .312
Lost Per Student	-.143	-104.128	-.163*	.084	2.33	Adjusted R^2 = .240
Gifted Program	.260	.558	.113	.067	2.94	SE = .733
Grade Level	.001	.066	.109	.069	.01	
Encyclopedia Sets						
Per Student	.205	11.765	.122	.071	2.50	
Other[a]					2.60	
Constant		-1.616			31.23	
Spelling						
1983 Reading Grade	.483	.451	.431***	.073	20.79	Multiple R = .606
Number of Days Absent						R^2 = .368
in 1982-83	-.268	-.016	-.160**	.064	4.28	Adjusted R^2 = .301
Father's Status	-.127	-.309	-.128*	.061	1.63	SE = .759
Gifted Program	.256	.708	.133*	.064	3.40	
Number of Parents						
Absent	-.126	-.362	-.195**	.073	2.47	
Emergency Telephone	-.032	-.269	-.115	.070	.37	
Free & Reduced Lunch	-.158	-.240	-.130*	.062	2.05	
Student's Residence	-.007	-.228	-.126	.072	.08	
Number of Parents						
Employed	-.033	.344	.187*	.077	-.61	
Other[a]					2.31	
Constant		-.628			36.77	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table I-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade Point Average	.544	.722	.574***	.070	31.23	Multiple R = .621
Percentage of Books						R^2 = .385
Lost Per Student	-.187	-118.798	-.178**	.067	3.33	Adjusted R^2 = .353
Preschool Attendance	-.013	.184	.097	.062	-.13	SE = .707
Sex	-.072	-.169	-.096	.062	.68	
Home Phone Listed	.135	.194	.096	.065	1.30	
Other[a]					2.10	
Constant		-2.142			38.51	
Math Test Total						
1983 Grade Point Average	.570	.721	.593***	.068	33.84	Multiple R = .636
Percentage of Books						R^2 = .405
Lost Per Student	-.173	-128.320	-.199**	.066	3.46	Adjusted R^2 = .374
Preschool Attendance	.050	.256	.140*	.061	.70	SE = .672
Other[a]					2.84	
Constant		-1.803			40.48	
Science Knowledge						
1983 Grade Point Average	.369	.525	.452***	.075	16.67	Multiple R = .534
Percentage of Books						R^2 = .286
Lost Per Student	-.223	-160.837	-.262***	.073	5.84	Adjusted R^2 = .248
Grade Level	.121	.127	.218***	.066	2.63	SE = .703
Gifted Program	.296	.637	.134*	.066	3.97	
1983 Citizenship Grade	.134	-.110	-.118	.076	-1.58	
Other[a]					1.03	
Constant		-1.112			28.56	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table I-2. Indian Modified Stepwise and Forced Entry Multiple Regression Results Without Grade Level

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.427	.418	.431***	.076	18.39	Multiple R = .569
Father's Status	-.220	-.456	-.204**	.064	4.48	R^2 = .324
Magazine Subscriptions						Adjusted R^2 = .253
Per Student	-.188	-9.500	-.195**	.079	3.66	SE = .728
Age in Months at						
Time of Test	.022	.006	.131	.070	.28	
Other[a]					5.59	
Constant		-1.451			32.40	
Reading Comprehension						
1983 Reading Grade	.572	.497	.540***	.073	30.86	Multiple R = .612
Encyclopedia Sets						R^2 = .375
Per Student	.205	14.743	.162*	.068	3.32	Adjusted R^2 = .310
Gifted Program	.229	.503	.108	.063	2.46	SE = .663
Other[a]					.87	
Constant		-1.565			37.51	
Reading Test Total						
1983 Reading Grade	.610	.513	.599***	.068	36.56	Multiple R = .680
Magazine Subscriptions						R^2 = .463
Per Student	-.172	-7.500	-.174**	.071	2.99	Adjusted R^2 = .406
Emergency Telephone	-.012	-.263	-.138*	.064	.16	SE = .572
Gifted Program	.258	.481	.111	.058	2.85	
Father's Status	-.100	-.204	-.104	.057	1.04	
Other[a]					2.66	
Constant		-1.472			46.26	
Vocabulary Knowledge						
1983 Reading Grade	.434	.459	.462***	.079	20.04	Multiple R = .533
Reservation Head Start	-.086	-.315	-.129	.085	1.10	R^2 = .284
Gifted Program	.229	.506	.100	.068	2.30	Adjusted R^2 = .204
Encyclopedia Sets						SE = .768
Per Student	.178	11.763	.120	.072	2.13	
Age in Months at						
Time of Test	-.020	.005	.112	.071	-.22	
Other[a]					3.05	
Constant		-2.228			28.40	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table I-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.374	.383	.390***	.082	14.60	Multiple R = .502
Percentage of Books						R^2 = .252
Lost Per Student	-.131	-136.155	-.211*	.088	2.77	Adjusted R^2 = .174
Father's Status	.116	.253	.112	.068	1.30	SE = .774
Encyclopedia Sets						
Per Student	.201	10.902	.112	.074	2.25	
Student's Residence	.108	.232	.137	.076	1.48	
Other[a]					2.81	
Constant		-1.264			25.21	
Auditory Test Total						
1983 Reading Grade	.446	.452	.466***	.079	20.76	Multiple R = .556
Percentage of Books						R^2 = .309
Lost Per Student	-.143	-100.518	-.158	.084	2.25	Adjusted R^2 = .237
Gifted Program	.260	.592	.120	.067	3.12	SE = .735
Encyclopedia Sets						
Per Student	.205	11.909	.124	.071	2.53	
Other[a]					2.27	
Constant		-1.859			30.93	
Spelling						
1983 Reading Grade	.483	.438	.418***	.073	20.17	Multiple R = .608
Number of Days Absent						R^2 = .370
in 1982-83	-.268	-.016	-.160**	.064	4.30	Adjusted R^2 = .304
Father's Status	-.127	-.310	-.128*	.061	1.63	SE = .757
Gifted Program	.256	.735	.138*	.064	3.53	
Number of Parents						
Absent	-.126	-.362	-.195**	.073	2.46	
Emergency Telephone	-.032	-.276	-.118	.070	.38	
Free & Reduced Lunch	-.158	-.230	-.124*	.062	1.96	
Student's Residence	-.007	-.232	-.128	.072	.08	
Number of Parents						
Employed	-.033	.342	.186*	.077	-.61	
Other[a]					3.09	
Constant		-.246			36.99	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table I-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.544	.712	.566***	.071	30.79	Multiple R = .618
Percentage of Books						R^2 = .381
Lost Per Student	-.187	-114.502	-.172**	.067	3.21	Adjusted R^2 = .349
Preschool Attendance	-.013	.177	.094	.062	-.12	SE = .709
Sex	-.072	-.166	-.094	.063	.67	
Gifted Program	.274	.481	.094	.061	2.56	
Home Phone Listed	.135	.193	.096	.066	1.29	
Other[a]					-.26	
Constant		-2.184			38.14	
Math Test Total						
1983 Grade						
Point Average	.570	.716	.588***	.069	33.56	Multiple R = .635
Percentage of Books						R^2 = .403
Lost Per Student	-.173	-125.642	-.195**	.066	3.39	Adjusted R^2 = .372
Preschool Attendance	.050	.253	.138*	.061	.69	SE = .673
Gifted Program	.277	.448	.090	.060	2.50	
Other[a]					.18	
Constant		-1.945			40.32	
Science Knowledge						
1983 Grade						
Point Average	.369	.527	.453***	.076	16.73	Multiple R = .525
Percentage of Books						R^2 = .276
Lost Per Student	-.223	-155.241	-.252***	.073	5.64	Adjusted R^2 = .238
Age in Months at						SE = .708
Time of Test	.073	.009	.192**	.067	1.41	
Gifted Program	.296	.690	.145*	.066	4.29	
1983 Citizenship Grade	.134	-.112	-.121	.076	-1.62	
Other[a]					1.12	
Constant		-1.665			27.57	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

APPENDIX J

POPULATION STEPWISE AND FORCED ENTRY

MULTIPLE REGRESSION RESULTS BY GRADE LEVEL

Population Grade Level Models

Comparison of Word Study Skills Achievement by Grade Level

The results (Table J-1 to J-5; or Table 52) of the analyses of word study skills for grades two through six in the Washoe County School District clearly demonstrated that factors which contributed to such achievement varied considerably by grade level. Structurally, the models varied from as few as three in the third and fourth grade models to as many as eight predictors in the second grade model (not including the "other" variables forced into the equations). With respect to the percentage of the variance accounted for, a low of 33% was explained by three predictors in the third grade model and a high of 58% of the variance was attributed to three variables in the fourth grade model.

In contrast to previously discussed results, these results indicated that the previous (1983) reading grade was not always the best predictor of academic achievement by grade level, nor was the factor consistent in the amount of variance it explained. For example, in the second grade, both the length of time the library was open after school per student (8%) and student's sex (6%) variables accounted for more variance than previous grades (6%). Nonetheless, previous grades were the best predictor in the other grade level word study skills models, and explained nearly 44% of the variance in the fourth grade model.

In comparison to the population model of word study skills achievement (without grade level), the models by grade level were

Table J-1. Second Grade Population Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
Library Open After						
School Per Student	.294	8.608	.287**	.107	8.43	Multiple R = .612
Sex	.194	.571	.314***	.094	6.09	R^2 = .374
1983 Reading Grade	.207	.303	.268**	.099	5.54	Adjusted R^2 = .256
Change of Schools	-.103	-.674	-.371***	.104	3.81	SE = .785
Percentage of Books						
Lost Per Student	-.040	-352.033	-.259**	.104	1.03	
1983 Citizenship Grade	-.126	-.241	-.219*	.096	2.76	
Home Phone Listed	.035	.672	.164	.099	.57	
Encyclopedia Sets						
Per Student	.184	13.380	.193	.101	3.56	
Other[a]					5.62	
Constant		1.197			37.41	
Reading Comprehension						
1983 Reading Grade	.426	.359	.445***	.095	18.97	Multiple R = .647
Library Open After						R^2 = .418
School Per Student	.313	6.032	.282***	.103	8.84	Adjusted R^2 = .309
Home Phone Listed	.073	.545	.186*	.095	1.35	SE = .540
Free & Reduced Lunch	-.207	-.313	-.166	.088	3.44	
Age in Months at						
Time of Test	-.147	-.022	-.144	.088	2.12	
Number of Parents						
Employed	-.134	-.375	-.217*	.093	2.90	
Emergency Telephone	.223	.394	.167	.093	3.72	
Number of Days Absent						
in 1982-83	.093	.014	.187*	.096	1.74	
1983 Citizenship Grade	-.022	-.150	-.192*	.093	.43	
Other[a]					-1.66	
Constant		.766			41.85	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Reading Test Total						
1983 Reading Grade	.389	.366	.412***	.092	16.03	Multiple R = .674
Library Open After School Per Student	.371	8.074	.344***	.100	12.74	R^2 = .454; Adjusted R^2 = .352
Home Phone Listed	.058	.647	.201*	.092	1.18	SE = .574
Age in Months at Time of Test	-.151	-.026	-.154	.085	2.32	
Number of Days Absent in 1982-83	.090	.015	.178	.093	1.61	
Sex	.102	.314	.220**	.088	2.24	
Father's Status	-.117	-.260	-.133	.089	1.56	
1983 Citizenship Grade	-.073	-.203	-.235**	.090	1.71	
Encyclopedia Sets Per Student	.119	7.787	.143	.094	1.70	
Change of Schools	.040	-.375	-.264**	.097	-1.05	
Percentage of Books Lost Per Student	-.017	-171.987	-.161	.097	.28	
Other[a]					5.13	
Constant		1.430			45.45	
Vocabulary Knowledge						
1983 Reading Grade	.429	.477	.434***	.093	18.62	Multiple R = .668
Library Open After School Per Student	.364	10.479	.360***	.100	13.07	R^2 = .446; Adjusted R^2 = .341
Free & Reduced Lunch	-.243	-.418	-.163	.086	3.96	SE = .718
Number of Days Absent in 1982-83	.123	.024	.232**	.094	2.86	
Student's Sex	-.218	-.232	-.131	.089	2.89	
Number of Parents Employed	-.137	-.529	-.225**	.091	3.08	
Acreage Per Student	-.111	17.584	.156	.092	-1.74	
1983 Citizenship Grade	-.075	-.158	-.148	.090	1.11	
Home Phone Listed	-.050	.691	.173	.093	-.86	
Other[a]					1.58	
Constant		.748			44.57	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
Library Open After School Per Student	.438	12.807	.413***	.086	18.10	Multiple R = .718
1983 Reading Grade	.316	.308	.263**	.084	8.30	R^2 = .515
Home Phone Listed	.110	1.370	.322***	.086	3.55	Adjusted R^2 = .430
Number of Days Absent in 1982-83	.140	.019	.168*	.083	2.37	SE = .712
Number of Parents Employed	-.124	-1.013	-.404***	.096	5.02	
Number of Parents Absent	.264	.911	.410***	.102	10.84	
Magazine Subscriptions Per Student	-.123	-11.012	-.115	.080	1.41	
Other[a]					1.89	
Constant		-3.019			51.48	
Auditory Test Total						
Library Open After School Per Student	.403	10.777	.367***	.087	14.78	Multiple R = .716
1983 Reading Grade	.368	.343	.309***	.085	11.39	R^2 = .512
Number of Parents Employed	-.162	-1.072	-.451***	.096	7.29	Adjusted R^2 = .426
Number of Parents Absent	.268	.940	.446***	.102	11.98	SE = .676
Home Phone Listed	.035	1.148	.285***	.086	1.01	
Number of Days Absent in 1982-83	.122	.020	.188*	.084	2.30	
Free & Reduced Lunch	-.196	-.323	-.125	.080	2.44	
Student's Residence	.007	.262	.147	.084	.10	
Other[a]					-.08	
Constant		-.698			51.21	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Spelling						
1983 Reading Grade	.402	.341	.320***	.092	12.84	Multiple R = .679
Father's Status	-.328	-.820	-.350***	.088	11.46	R^2 = .462
Library Open After						Adjusted R^2 = .360
School Per Student	.287	5.241	.185	.096	5.32	SE = .688
Sex	.108	.314	.183*	.087	1.97	
Number of Days Absent						
in 1982-83	.072	.017	.167	.090	1.19	
Gifted Program	.309	.738	.185*	.090	5.72	
1983 Citizenship Grade	.033	-.150	-.145	.089	-.47	
Change of Schools	.152	-.248	-.145	.098	-2.21	
Encyclopedia Sets						
Per Student	.313	16.213	.248	.098	7.75	
Other[a]					2.59	
Constant		1.579			46.16	
Math Concepts						
1983 Grade						
Point Average	.318	.733	.415***	.106	13.10	Multiple R = .507
1983 Citizenship Grade	-.062	-.287	-.261**	.104	1.62	R^2 = .257
Age in Months at						Adjusted R^2 = .188
Time of Test	.189	.041	.190*	.090	3.60	SE = .819
Acreage Per Student	.071	19.018	.164	.096	1.16	
Percentage of Books						
Lost Per Student	.036	-231.966	-.171	.100	-.61	
Library Open After						
School Per Student	.199	5.540	.185	.102	3.69	
Other[a]					3.12	
Constant		-5.680			25.68	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Test Total						
1983 Grade Point Average	.424	.949	.517***	.100	21.91	Multiple R = .580
1983 Citizenship Grade	-.087	-.361	-.318**	.098	2.76	R^2 = .337
Acreage Per Student	.062	22.483	.189*	.090	1.15	Adjusted R^2 = .276
Gifted Program	.286	.652	.149	.089	4.26	SE = .802
Library Open After School Per Student	.215	4.920	.158	.096	3.41	
Other[a]					.20	
Constant		-4.256			33.69	
Science Knowledge						
Library Open After School Per Student	.420	9.602	.328***	.092	13.77	Multiple R = .625
1983 Grade Point Average	.389	.771	.446***	.096	17.31	R^2 = .390; Adjusted R^2 = .334
1983 Citizenship Grade	-.152	-.306	-.285**	.094	4.33	SE = .726
Age in Months at Time of Test	.158	.035	.165*	.082	2.60	
Home Phone Listed	.010	.543	.135	.084	.14	
Other[a]					.88	
Constant		-5.266			39.03	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-2. Third Grade Population Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.459	.456	.380***	.106	17.45	Multiple R = .574
Acreage Per Student	-.154	-14.222	-.147	.096	2.26	R^2 = .329
Age in Months at						Adjusted R^2 = .206
Time of Test	-.348	-.031	-.196	.106	6.81	SE = .821
Other[a]					6.41	
Constant		2.524			32.93	
Reading Comprehension						
1983 Reading Grade	.664	.522	.583***	.085	38.71	Multiple R = .758
Number of Parents						R^2 = .574
Absent	-.269	-.305	-.187*	.082	5.03	Adjusted R^2 = .496
Acreage Per Student	-.129	-5.361	-.115	.076	1.49	SE = .488
Father's Status	-.065	-.231	-.126	.075	.82	
Number of Days Absent						
in 1982-83	.003	.013	.119	.082	.04	
Age in Months at						
Time of Test	-.362	-.015	-.130	.084	4.72	
Other[a]					6.62	
Constant		.726			57.43	
Reading Test Total						
1983 Reading Grade	.666	.537	.569***	.084	37.94	Multiple R = .777
Acreage Per Student	-.182	-13.011	-.170*	.083	3.10	R^2 = .603
Student's Residence	.253	.295	.203*	.093	5.15	Adjusted R^2 = .525
Father's Status	-.134	-.346	-.179*	.074	2.40	SE = .500
Number of Parents						
Absent	-.180	-.249	-.145	.080	2.60	
Age in Months at						
Time of Test	-.403	-.017	-.134	.082	5.40	
Percentage of Books						
Lost Per Student	.026	-115.963	-.132	.084	-.34	
Other[a]					4.06	
Constant		1.304			60.31	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Vocabulary Knowledge						
1983 Reading Grade	.568	.588	.492***	.094	27.92	Multiple R = .704
Library Open After						R^2 = .496
School Per Student	.301	4.977	.205*	.101	6.16	Adjusted R^2 = .397
Number of Days Absent						SE = .713
in 1982-83	.097	.026	.178*	.089	1.72	
Father's Status	.136	.317	.130	.084	1.77	
Sex	-.068	-.388	-.212*	.099	1.45	
Other[a]					10.60	
Constant		-1.818			49.62	
Listening Comprehension						
1983 Reading Grade	..526	.472	.443***	.099	23.28	Multiple R = .642
Father's Status	.207	.511	.234**	.089	4.84	R^2 = .412
Encyclopedia Sets						Adjusted R^2 = .304
Per Student	.273	17.237	.208*	.101	5.66	SE = .684
Other[a]					7.41	
Constant		-1.389			41.19	
Auditory Test Total						
1983 Reading Grade	.584	.550	.488***	.094	28.51	Multiple R = .710
Library Open After						R^2 = .503
School Per Student	.296	4.754	.207*	.100	6.13	Adjusted R^2 = .405
Father's Status	.181	.455	.197*	.083	3.57	SE = .668
Sex	-.053	-.301	-.174	.098	.93	
Emergency Telephone	.246	.386	.135	.091	3.32	
Change of Schools	.118	-.253	-.145	.095	-1.72	
Other[a]					9.60	
Constant		-1.473			50.34	
Spelling						
1983 Reading Grade	.639	.749	.748***	.090	47.79	Multiple R = .739
Percentage of Books						R^2 = .546
Lost Per Student	-.088	-244.379	-.262**	.081	2.30	Adjusted R^2 = .457
1983 Citizenship Grade	.007	-.186	-.187	.100	-.13	SE = .567
Free & Reduced Lunch	-.002	.306	.151	.086	-.03	
Emergency Telephone	.037	-.481	-.190*	.088	-.71	
Other[a]					5.41	
Constant		-.612			54.63	

*--$p < .05$ **--$p < .01$ ***--$p < .001$

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.412	.828	.484***	.110	19.96	Multiple R = .556
Percentage of Books						R^2 = .310
Lost Per Student	-.075	-293.752	-.278**	.103	2.08	Adjusted R^2 = .244
1983 Citizenship Grade	-.095	-.193	-.171	.112	1.62	SE = .757
Home Phone Listed	.243	.560	.199*	.096	4.85	
Other[a]					2.46	
Constant		-2.514			30.97	
Math Test Total						
1983 Grade						
Point Average	.481	.834	.580***	.104	27.91	Multiple R = .617
Percentage of Books						R^2 = .380
Lost Per Student	-.041	-245.442	-.276**	.098	1.13	Adjusted R^2 = .321
Sex	-.126	-.331	-.227*	.099	2.88	SE = .602
Home Phone Listed	.255	.537	.229**	.091	5.81	
Acreage Per Student	-.022	14.864	.193*	.093	-.43	
Other[a]					.71	
Constant		-3.677			38.01	
Science Knowledge						
1983 Grade						
Point Average	.446	.556	.383***	.115	17.07	Multiple R = .497
Sex	-.099	-.283	-.192	.109	1.90	R^2 = .247
Other[a]					5.76	Adjusted R^2 = .175
Constant		-.207			24.73	SE = .670

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-3. Fourth Grade Population Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.631	.612	.697***	.099	43.95	Multiple R = .765
Sex	.351	.468	.274**	.090	9.64	R^2 = .585
Number of Parents						Adjusted R^2 = .492
Absent	-.202	.415	.222*	.114	-4.47	SE = .585
Other[a]					9.39	
Constant		-3.718			58.51	
Reading Comprehension						
1983 Reading Grade	.412	.334	.365***	.107	15.05	Multiple R = .698
Change of Schools	.317	.577	.320**	.099	10.16	R^2 = .487
Student's Residence	-.351	-.563	-.300**	.119	10.53	Adjusted R^2 = .372
Age in Months at						SE = .676
Time of Test	-.280	-.028	-.235*	.108	6.59	
Father's Status	-.237	-.500	-.174	.102	4.11	
1983 Citizenship Grade	.157	-.304	-.300*	.123	-4.70	
Sex	.230	.350	.197	.104	4.53	
Other[a]					2.46	
Constant		3.448			48.73	
Reading Test Total						
1983 Reading Grade	.610	.442	.516***	.096	31.49	Multiple R = .766
Student's Residence	-.421	-.333	-.190	.107	7.99	R^2 = .586
Sex	.343	.354	.213*	.094	7.30	Adjusted R^2 = .493
Change of Schools	.285	.313	.186*	.089	5.29	SE = .568
Other[a]					6.53	
Constant		-1.169			58.60	
Vocabulary Knowledge						
Change of Schools	.465	.834	.460***	.090	21.36	Multiple R = .776
1983 Reading Grade	.452	.384	.418***	.100	18.85	R^2 = .603
Emergency Telephone	.344	.922	.398***	.088	13.68	Adjusted R^2 = .513
Gifted Program	.230	.586	.173	.089	3.97	SE = .599
1983 Citizenship Grade	.181	-.323	-.317**	.111	-5.74	
Encyclopedia Sets						
Per Student	.229	16.272	.146	.094	3.34	
Sex	.178	.319	.178*	.091	3.18	
Other[a]					1.62	
Constant		-1.707			60.26	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-3. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.485	.406	.439***	.093	21.29	Multiple R = .795
Change of Schools	.396	.503	.276**	.086	10.95	R^2 = .632
Emergency Telephone	.335	.898	.386***	.088	12.93	Adjusted R^2 = .549
Magazine Subscriptions						SE = .578
Per Student	-.402	-19.685	-.298**	.108	11.60	
Cost of School						
Per Student	-.111	.000	.257**	.098	-2.85	
Number of Parents						
Employed	-.014	.483	.211*	.097	-.30	
Other[a]					9.61	
Constant		-.901			63.23	
Auditory Test Total						
1983 Reading Grade	.497	.402	.433***	.087	21.51	Multiple R = .815
Change of Schools	.460	.779	.425***	.080	19.54	R^2 = .664
Emergency Telephone	.362	.945	.404***	.082	14.61	Adjusted R^2 = .588
Gifted Program	.271	.644	.188*	.082	5.10	SE = .557
Sex	.230	.285	.158	.084	3.63	
Encyclopedia Sets						
Per Student	.249	16.310	.145	.087	3.60	
Student's Residence	-.297	-.335	-.175	.104	5.21	
1983 Citizenship Grade	.280	-.220	-.213	.104	-5.98	
Other[a]					-.87	
Constant		-2.069			66.35	
Spelling						
1983 Reading Grade	.565	.622	.523***	.095	29.58	Multiple R = .771
Student's Residence	-.533	-.873	-.357***	.106	19.04	R^2 = .595
Sex	.337	.520	.225*	.093	7.58	Adjusted R^2 = .503
Number of Parents						SE = .782
Employed	.110	.517	.175	.097	1.93	
Other[a]					1.34	
Constant		-1.502			59.47	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-3. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.689	1.158	.640***	.088	44.07	Multiple R = .760
Gifted Program	.380	1.180	.296**	.096	11.25	R^2 = .578
Percentage of Books						Adjusted R^2 = .529
Lost Per Student	-.128	-151.798	-.160	.103	2.05	SE = .694
Other[a]					.45	
Constant		-2.676			57.82	
Math Test Total						
1983 Grade						
Point Average	.581	.950	.548***	.088	31.83	Multiple R = .760
Sex	.357	.629	.311***	.088	11.10	R^2 = .577
Gifted Program	.359	1.279	.335***	.096	11.98	Adjusted R^2 = .527
Percentage of Books						SE = .666
Lost Per Student	-.240	-326.296	-.359***	.103	8.59	
1983 Citizenship Grade	.214	-.347	-.302**	.106	-6.44	
Other[a]					.64	
Constant		-2.856			57.70	
Science Knowledge						
1983 Grade						
Point Average	.575	.758	.551***	.104	31.70	Multiple R = .643
Percentage of Books						R^2 = .414
Lost Per Student	-.232	-172.678	-.240*	.121	5.57	Adjusted R^2 = .345
Other[a]					4.10	SE = .621
Constant		-1.704			41.37	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-4. Fifth Grade Population Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.591	.713	.628***	.103	37.08	Multiple R = .743
Cost of School						R^2 = .551
Per Student	-.455	.000	-.239*	.107	10.88	Adjusted R^2 = .457
Father's Status	-.169	-.401	-.186*	.088	3.14	SE = .624
Number of Days Absent						
in 1982-83	.216	.014	.152	.097	3.28	
Number of Parents						
Employed	.084	.433	.172	.098	1.44	
Gifted Program	.182	-.430	-.162	.099	-2.94	
Other[a]					2.26	
Constant		-3.430			55.14	
Reading Comprehension						
1983 Reading Grade	.668	.849	.752***	.098	50.23	Multiple R = .773
Age in Months at						R^2 = .597
Time of Test	-.074	.044	.255**	.087	-1.88	Adjusted R^2 = .512
Magazine Subscriptions						SE = .587
Per Student	-.156	-10.940	-.127	.086	1.99	
Other[a]					9.37	
Constant		-7.938			59.71	
Reading Test Total						
1983 Reading Grade	.664	.844	.744***	.096	49.42	Multiple R = .782
Cost of School						R^2 = .611
Per Student	-.408	.000	-.186	.100	7.59	Adjusted R^2 = .529
Age in Months at						SE = .580
Time of Test	-.154	.033	.187	.086	-2.88	
Father's Status	-.112	-.264	-.123	.082	1.37	
Number of Parents						
Employed	.054	.391	.156	.091	.83	
Other[a]					4.76	
Constant		-6.350			61.09	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-4. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Vocabulary Knowledge						
1983 Reading Grade	.679	.623	.562***	.090	38.13	Multiple R = .819
Acreage Per Student	-.472	-16.500	-.343***	.092	16.17	R^2 = .671
Age in Months at Time of Test	-.103	.040	.232**	.076	-2.39	Adjusted R^2 = .607 SE = .518
Father's Status	-.190	-.514	-.244***	.074	4.63	
Number of Days Absent in 1982-83	.259	.017	.182*	.081	4.71	
Number of Parents Employed	-.078	.502	.204**	.080	-1.64	
Sex	.018	-.250	-.150	.082	-.27	
Other[a]					7.79	
Constant		-6.879			67.13	
Listening Comprehension						
1983 Reading Grade	.508	.651	.578***	.093	29.36	Multiple R = .793
Student's Residence	-.284	-.682	-.386***	.079	10.98	R^2 = .629
Number of Parents Employed	.151	.816	.327***	.068	4.95	Adjusted R^2 = .551 SE = .562
Free & Reduced Lunch	-.357	-.494	-.219**	.080	7.81	
Gifted Program	.101	-.857	-.325***	.090	-3.27	
Change of Schools	.267	.258	.154	.086	4.13	
Emergency Telephone	.003	-.631	-.208**	.082	-.06	
Age in Months at Time of Test	-.138	.023	.134	.084	-1.84	
Magazine Subscriptions Per Student	.079	16.039	.187*	.085	1.47	
Percentage of Books Lost Per Student	-.271	-229.852	-.223*	.097	6.05	
Other[a]					3.32	
Constant		-4.206			62.90	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-4. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Auditory Test Total						
Library Open After						Multiple R = .700
School Per Student	-.447	-12.627	-.475***	.114	21.23	R^2 = .490
1983 Reading Grade	.421	.278	.210*	.105	8.81	Adjusted R^2 = .398
Number of Parents						SE = .767
Employed	.048	1.109	.377***	.107	1.81	
Student's Residence	-.288	-.462	-.222*	.094	6.37	
Free & Reduced Lunch	-.294	-.420	-.158	.091	4.64	
Age in Months at						
Time of Test	-.048	.037	.182	.089	-.88	
Other[a]					7.00	
Constant		-5.683			48.98	
Spelling						
1983 Reading Grade	.695	.900	.672***	.087	46.72	Multiple R = .819
Student's Residence	-.261	-.488	-.232**	.074	6.05	R^2 = .671
Number of Parents						Adjusted R^2 = .602
Absent	-.327	-.616	-.230**	.089	7.53	SE = .629
Number of Parents						
Employed	-.040	.601	.202*	.082	-.81	
Father's Status	-.019	-.303	-.120	.076	.23	
Magazine Subscriptions						
Per Student	-.189	-13.282	-.130	.080	2.46	
Free & Reduced Lunch	-.112	.302	.112	.075	-1.26	
Change of Schools	.107	-.305	-.154	.081	-1.64	
Other[a]					7.85	
Constant		-3.206			67.13	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-4. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade Point Average	.661	.703	.583***	.099	38.49	Multiple R = .692
Sex	-.068	-.272	-.177	.094	1.21	R^2 = .480
1983 Citizenship Grade	.396	.223	.199	.111	7.88	Adjusted R^2 = .430
Other[a]					.38	SE = .575
Constant		-2.792			47.96	
Math Test Total						
1983 Grade Point Average	.670	.842	.602***	.098	40.33	Multiple R = .701
Library Open After School Per Student	-.220	3.367	.142	.098	-3.12	R^2 = .491 / Adjusted R^2 = .442
1983 Citizenship Grade	.439	.315	.243	.110	10.68	SE = .658
Other[a]					1.19	
Constant		-3.645			49.08	
Science Knowledge						
1983 Grade Point Average	.570	.635	.511***	.086	29.11	Multiple R = .774
Acreage Per Student	-.454	-21.680	-.475***	.091	21.54	R^2 = .599
Age in Months at Time of Test	.047	.054	.332***	.077	1.57	Adjusted R^2 = .560 / SE = .520
Sex	-.045	-.372	-.236**	.083	1.06	
Home Phone Listed	.179	-.625	-.222**	.082	-3.97	
Library Open After School Per Student	-.294	4.174	.198*	.090	-5.83	
1983 Citizenship Grade	.475	.399	.346***	.098	16.46	
Other[a]					-.08	
Constant		-8.688			59.86	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table J-5. Sixth Grade Population Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.386	.279	.463***	.123	17.87	Multiple R = .621
Father's Status	.167	.409	.247	.127	4.11	R^2 = .386
Change of Schools	.210	.246	.218	.126	4.57	Adjusted R^2 = .229
Emergency Telephone	.233	.339	.209	.117	4.87	SE = .490
Cost of School Per Student	.023	.000	.282	.131	.66	
Other[a]					6.48	
Constant		-1.719			38.56	
Reading Comprehension						
1983 Reading Grade	.516	.271	.408***	.113	21.06	Multiple R = .718
Sex	-.124	-.232	-.186	.114	2.32	R^2 = .516
Number of Parents Employed	.053	.525	.214	.123	1.14	Adjusted R^2 = .393 SE = .480
Number of Days Absent in 1982-83	-.172	-.025	-.268**	.101	4.60	
Emergency Telephone	.238	.337	.188	.102	4.48	
Change of Schools	.168	.206	.165	.111	2.78	
Age in Months at Time of Test	-.115	-.020	-.176	.122	2.01	
Free & Reduced Lunch	-.294	-.714	-.298*	.130	8.77	
Other[a]					4.43	
Constant		2.931			51.59	
Reading Test Total						
1983 Reading Grade	.558	.325	.559***	.109	31.18	Multiple R = .738
Change of Schools	.207	.236	.216*	.107	4.48	R^2 = .545
Cost of School Per Student	.119	.000	.271*	.113	3.23	Adjusted R^2 = .429 SE = .407
Emergency Telephone	.279	.374	.238*	.099	6.65	
Number of Days Absent in 1982-83	-.180	-.018	-.219*	.098	3.93	
Other[a]					5.04	
Constant		.571			54.51	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

b--Equation is not significant; other equations are significant at or beyond the .05 level.

Table J-5. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Vocabulary Knowledge						
1983 Reading Grade	.405	.255	.338**	.125	13.71	Multiple R = .618
Free & Reduced Lunch	-.355	-.821	-.302*	.141	10.71	R^2 = .382
Sex	-.168	-.334	-.237	.130	3.97	Adjusted R^2 = .225
Other[a]					9.83	SE = .616
Constant		2.011			38.22	
Listening Comprehension						
1983 Reading Grade	.436	.231	.332**	.106	14.48	Multiple R = .742
Change of Schools	.320	.436	.334**	.103	10.67	R^2 = .551
Free & Reduced Lunch	-.432	-.855	-.340**	.120	14.69	Adjusted R^2 = .437
Age in Months at Time of Test	-.250	-.023	-.192	.112	4.78	SE = .484
Magazine Subscriptions Per Student	-.315	-10.310	-.164	.105	5.16	
Father's Status	-.186	-.320	-.167	.111	3.11	
Sex	-.063	-.300	-.230*	.111	1.46	
Other[a]					.77	
Constant		3.587			55.12	
Auditory Test Total[b]						
1983 Reading Grade	.305	.297	.255	.144	7.78	Multiple R = .453
Other[a]					12.70	R^2 = .205
Constant		-2.717			20.48	Adjusted R^2 = .002
						SE =1.078
Spelling[b]						
1983 Reading Grade	.442	.388	.571***	.135	25.23	Multiple R = .551
Number of Parents Employed	-.057	-.586	-.233	.148	1.32	R^2 = .304
Father's Status	.064	.456	.243	.140	1.55	Adjusted R^2 = .127
Free & Reduced Lunch	-.093	.613	.250	.157	2.34	SE = .589
Other[a]					-.03	
Constant		-.473			30.41	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation is not significant; other equations are significant at or beyond the .05 level.

Table J-5. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.553	.719	.694***	.107	38.37	Multiple R = .699
Sex	-.227	-.838	-.471***	.103	10.69	R^2 = .488
Other[a]					-.24	Adjusted R^2 = .430
Constant		2.140			48.82	SE = .667
Math Test Total						
1983 Grade						
Point Average	.592	.680	.730***	.108	43.22	Multiple R = .697
Sex	-.128	-.587	-.366***	.103	4.70	R^2 = .485
Acreage Per Student	.105	-13.276	-.174	.101	1.83	Adjusted R^2 = .427
Age in Months at						SE = .601
Time of Test	-.053	-.030	-.206*	.104	1.10	
Other[a]					-2.33	
Constant		3.391			48.52	
Science Knowledge						
1983 Grade						
Point Average	.425	.432	.608***	.108	25.82	Multiple R = .692
Sex	-.291	-.596	-.487***	.104	14.17	R^2 = .478
Age in Months at						Adjusted R^2 = .419
Time of Test	-.129	-.022	-.192	.102	2.49	SE = .462
Gifted Program	.330	.334	.147	.100	4.86	
Other[a]					.49	
Constant		2.495			47.83	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

b--Equation is not significant; other equations are significant at or beyond the .05 level.

quite different. The population model included seven predictors, of which no more than three appeared in the models by grade level. The largest congruency was at the third grade level where all three predictors for that grade were also predictors in the population model. The second and fifth grade models were particularly different. Moreover, all models by grade level accounted for 8% or more of the total variance in word study skills than did the population model.

Comparison of Reading Comprehension Achievement by Grade Level

The results (Table J-1 to J-5; or Table 52) indicated that between three (5th grade) and nine (2nd grade) predictors accounted for between 42% (2nd grade) and 60% (5th grade) of the observed variance in reading comprehension achievement for students in the Washoe County School District. Previous (1983) reading grades contributed the largest amount to all five grade level models, but accounted for as little as 15% in the fourth grade model and as high as 50% in the fifth grade model. Age was the next best predictor, as it also entered all five models. While a number of variables entered at several grade levels, the contributions made at each grade varied tremendously. For example, age accounted for nearly 7% of the variance in fourth grade reading comprehension model and as little as 2% in the second and sixth grade models. Moreover, age entered as a suppressor variable (-2%) in the fifth grade model.

In contrast to word study skills, there was much more overall congruence between the population model of reading comprehension achievement and the models by grade level. Five of the nine predictors in the second grade model, and five of the eight in the sixth grade model, were also part of the ten predictors of reading comprehension in the population model. On the other hand, while greater than for word study skills, the similarities between the population and grade level models for reading comprehension were still very minimal. Additionally, all grade level models of reading comprehension achievement accounted for 9% to 27% more of the total variance than did the population model.

<u>Comparison of Reading Test Total Achievement by Grade Level</u>

The results (Table J-1 to J-5; or Table 52) indicate that eleven predictors, of which five were also in the population model, accounted for 45% of the variance in second grade reading test total scores, while four antecedents, of which two were also in the population model, explained 59% of the total fourth grade reading test total variance. The largest amount of variance, 61%, was accounted for by the fifth grade model. While being the most structurally consistent predictor, 1983 reading grades accounted for between 16% and 49% of the total variance. Thus, as with the first two measures of achievement, the results demonstrated very little congruence between the population model of reading test total achievement and the models by grade level. Considerable diversity between grade levels was also evident both in terms of accountability and structures. All grade level models, moreover, accounted for between 7% and 22% more of the total observed variance in reading test total achievement test scores.

Comparison of Vocabulary Knowledge Achievement by Grade Level

The amount of variance accounted for by the five grade level vocabulary knowledge models (Table J-1 to J-5; or Table 52) ranged from a low of 38% for the sixth grade model to a high of 67% for the fifth grade model. Structurally, the models included between three (6th grade) and nine (2nd grade) predictors. While entering as a predictor at all grade levels, the 1983 reading grade did not always account for the most variance. That is, in the fourth grade, if a student had changed schools was found to account for more vocabulary achievement variance. Moreover, the length of time the library was open per student, emergency telephone number listing and acreage per student variables all explained nearly as much variance as previous grades.

Overall, in comparison to the population model of vocabulary knowledge, the models by grade level were found to be quite different, with the least congruence being with the fifth grade models and the most with the sixth grade models. All grade level models accounted for between 4% and 33% more of the total variance than the population model of vocabulary knowledge.

Comparison of Listening Comprehension Achievement by Grade Level

Comparatively, there was greater congruence between the listening comprehension models (Table J-1 to J-5; or Table 52) by grade level and the Washoe County School District population model, than for any of the previously discussed areas of achievement. There was, however, considerable variability between the grade level models, both structurally and in terms of accountability. The smallest amount of total variance explained (41%), which was for the third grade model, also involved the fewest (three) predictors, but had nearly 12% more accountability than the population model. In comparison, the largest amount of explained variance (63%), in both the fourth and fifth grade models that were composed of six and ten predictors respectively, was almost 34% more (or more than twice as much) than the population model.

Unlike other achievement areas, the 1983 reading grade never accounted for more than 29% of the total variance in listening comprehension. Indeed, at all grade levels, except third grade, previous grades contributed less than half of the total variance in listening comprehension achievement. Moreover, how long the library was open after school accounted for more than twice the variance accounted for by previous grades in the second grade, while participation in the federal lunch program also explained slightly more variance than the 1983 reading grade in the sixth grade. Other than the 1983 reading grade, however, no variable was predictive of listening comprehension at all grade level.

Comparison of Auditory Test Total Achievement by Grade Level

Perhaps the most intriguing result for the auditory test total analyses by grade level (Table J-1 to J-5; or Table 52) was that the predictors, taken together, could account for no more than 20% of the variance at the sixth grades level, yet explained 66% of the variance at the fourth grade level. The obvious conclusion of this result was that auditory test total achievement for sixth graders was caused by factors not included in this study. Indeed, the only predictor to enter the sixth grade model at or beyond the .15 level was the 1983 reading grade, and it accounted for only 8% of the variance.

Almost as interesting, how long the library was open after school per student was a better predictor than previous grades for both second and fifth grade students. Indeed, the number of parents absent was a better predictor than the 1983 reading grade in the second grade too. As such, the congruency between the grade level models themselves, as well as with the population model, was minimal, with most grade level models having accounted for more variance and included fewer predictors than the population model. Indeed, the fourth grade model (66%) explained 40% more of the variance than did the population model (26%) for auditory test total achievement.

Comparison of Spelling Achievement by Grade Level

The spelling models of achievement by grade level (Table J-1 to J-5; or Table 52) exhibited tremendous structural and explanatory variability, both between grade levels and in comparison with the population model. The sixth grade spelling model accounted for only 30% of the total variance, which was 9% less than explained by the population model. In comparison, the fifth grade model accounted for 67%, or 28% more, of the total variance than the population model. The previous reading grade was clearly the best predictor, although father's status explained almost as much variance for second graders. Structurally, all four of the predictors in the fourth grade model were also part of the population model, but only three of the nine predictors in the second grade were in the population spelling model.

Comparison of Math Concepts Achievement by Grade Level

Both the second (26%) and third (31%) grade models (Table J-1 to J-5; or Table 52) accounted for less variance than the Washoe County School District population model (40%) for math concepts, while the fourth grade model explained 58%, or 18% more, of the total variance than the population model. Structurally, however, the models exhibited good congruency with the population model. Five of the six predictors for the second grade model, all four for the third grade model, all three for the fourth grade model, two of the three for the fifth grade model, and one of the two for the sixth grade model were also part of the population model.

Although it did not always account for the largest percentages of the total variance, the 1983 grade point average was the best predictor at all grade levels, contributing half or more of the explained variance. Indeed, the more variance explained by previous grades, the greater was the percentage of total variance that was accounted for by the model.

Comparison of Math Test Total Achievement by Grade Level

The math test total models by grade level (Table J-1 to J-5; or Table 52) were less congruent with the population model than for the math concept models, but more so than with the reading oriented measures of achievement. With respect to accountability of the variance, the models were quite different, with the second grade model (34%) explaining about the same amount of variance as the population model (34%) while the fourth grade model (58%) accounted for almost 24% more of the total variance than the population math test total model. In contrast to all other models, the 1983 grade point average (or previous grades) was found to be progressively more important for each successive grade level. Previous grades, besides being the only predictor to be included in all grade level models, also contributed three times as much to the explained variance as any other factor. Overall, then, there was considerable variability between models, and no one variable was really the next best predictor after previous grades.

Comparison of Science Knowledge Achievement by Grade Level

With only two predictors entering, both of which were part of the population model, the third grade model (Table J-1 to J-5; or Table 52) was found to account for 5% less of the variance in science knowledge achievement than the population model. In contrast, the fifth grade model (60%) explained 30% more of the total variance than the population model, with five of its seven predictors also having been included in the population model. Additionally, three of the five predictors in the second grade model, one of the two in the third grade model, and all four predictors in the sixth grade model were part of the population model of science knowledge achievement. Thus, a fairly high degree of congruency was found between the grade level and population models, but a number of differences existed between the grade level models themselves.

The 1983 grade point average entered into all the science knowledge models by grade level and did account for the greatest percentage of variance, but several other predictors also explained nearly as much of the total variance. That is, in the second grade model how long the library was open per student accounted for 14% (or 3% less than previous grades) of the total variance, and acreage per student explained 22% (versus 29% for previous grades) of the variance in science knowledge achievement. Additionally, the 1983 citizenship grade was found to contribute 16% to the total variance in the fifth grade model, and student's sex explained 14% of the variance in the sixth grade model of science knowledge achievement.

APPENDIX K

INDIAN STEPWISE AND FORCED ENTRY

MULTIPLE REGRESSION RESULTS BY GRADE LEVEL

Indian Grade Level Models

Comparison of Word Study Skills Achievement by Grade Level

The results (Tables K-1 to K-5; or Table 53) of the analyses of word study skills for Indian students in the second through sixth grades in the Washoe County School District demonstrated that factors contributing to such achievement varied by grade level. Structurally, the models varied from two (in the second grade model) to four (in the fifth grade model) predictors, not including the "other" variables forced into the equations. With respect to the percentage of variance accounted for, the second grade model explained a low of 42% (or 10% more than the Indian model without grade level), while the fourth grade model explained a high of 66% (or 34% more than the Indian model) of the total variance in word study skills achievement.

In comparison to all previously discussed models of achievement, no one variable was predictive of word study skills achievement at all grade levels for Indian students. That is, in all the results thus far analyzed, previous grades had always been a predictor. Such was not the case for the second grade word study skills model. Instead, the 1983 citizenship grade, which was the best predictor, and the number of transfers were the only predictors of word study skills achievement in the second grade. It should be noted, however, that the 1983 reading grade was one of the "other" predictors forced into the equation, but explained only 5% ($p = .29$) of the total variance. Moreover, it must be recalled that the overall equation (second grade model) was not statistically significant ($p = .48$). Father's status

Table K-1. Second Grade Indian Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills[a]						
1983 Citizenship Grade	.426	.540	.476	.240	20.28	Multiple R = .650
Change of Schools	-.076	-.575	-.348	.213	2.65	R^2 = .422
Other[b]					19.03	Adjusted R^2 = .005
Constant		1.219			42.23	SE = .822
Reading Comprehension[a]						
1983 Reading Grade	.376	.520	.509*	.201	19.13	Multiple R = .662
Cost of School						R^2 = .438
Per Student	.275	.000	.365	.202	10.05	Adjusted R^2 = .032
Other[b]					14.60	SE = .790
Constant		-1.968			43.78	
Reading Test Total[a]						
1983 Reading Grade	.378	.468	.522**	.194	19.74	Multiple R = .692
Age in Months at						R^2 = .479
Time of Test	-.344	-.037	-.316	.210	10.88	Adjusted R^2 = .102
Number of Days Absent						SE = .667
in 1982-83	.116	.030	.387	.215	4.50	
Other[b]					12.75	
Constant		1.430			47.87	
Vocabulary Knowledge[a]						
1983 Reading Grade	.566	.731	.649**	.202	36.74	Multiple R = .660
Other[b]					6.83	R^2 = .436
Constant		-3.907			43.57	Adjusted R^2 = .028
						SE = .873
Listening Comprehension[a]						
1983 Reading Grade	.503	.777	.646**	.187	32.47	Multiple R = .718
Number of Parents						R^2 = .515
Absent	.118	.595	.304	.181	3.57	Adjusted R^2 = .165
Other[b]					15.46	SE = .864
Constant		-6.012			51.50	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Equation is not significant; other equations are significant at or beyond the .05 level.

[b]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-1. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Auditory Test Total[a]						
1983 Reading Grade	.555	.758	.670**	.203	37.18	Multiple R = .655
Other[b]					5.71	R^2 = .429
Constant		-5.158			42.89	Adjusted R^2 = .016
						SE = .883
Spelling[a]						
1983 Reading Grade	.407	.569	.426*	.189	17.33	Multiple R = .712
Magazine Subscriptions						R^2 = .506
Per Student	.286	28.830	.340	.180	9.74	Adjusted R^2 = .150
Student's Residence	-.180	-.752	-.361	.211	6.49	SE = .968
Other[b]					17.06	
Constant		-1.516			50.62	
Math Concepts[a]						
1983 Grade						
Point Average	.389	.727	.300	.204	11.66	Multiple R = .491
Other[b]					12.44	R^2 = .241
Constant		-2.534			24.10	Adjusted R^2 = .020
						SE = .883
Math Test Total[a]						
1983 Grade						
Point Average	.426	1.232	.520**	.187	22.18	Multiple R = .581
Percentage of Books						R^2 = .338
Lost Per Student	-.268	-422.319	-.415	.224	11.11	Adjusted R^2 = .144
Other[b]					.46	SE = .805
Constant		-3.974			33.75	
Science Knowledge[a]						
Age in Months at						
Time of Test	.157	.041	.311	.199	4.89	Multiple R = .513
Home Phone Listed	.196	.645	.300	.192	5.87	R^2 = .263
Other[b]					15.56	Adjusted R^2 = .048
Constant		-6.208			26.32	SE = .776

*--p<.05 **--p<.01 ***--p<.001

[a]--Equation is not significant; other equations are significant at or beyond the .05 level.

[b]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-2. Third Grade Indian Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
Father's Status	-.476	-.666	-.331*	.147	15.79	Multiple R = .765
1983 Reading Grade	.320	.456	.415**	.148	13.29	R^2 = .586
Emergency Telephone	-.124	-.773	-.297	.173	3.67	Adjusted R^2 = .378
Other[b]					25.81	SE = .647
Constant		-.739			58.56	
Reading Comprehension						
1983 Reading Grade	.558	.295	.353*	.154	19.73	Multiple R = .808
Number of Days Absent						R^2 = .653
in 1982-83	-.361	-.023	-.389**	.140	14.03	Adjusted R^2 = .457
Number of Parents						SE = .460
Absent	.280	.352	.285	.161	7.98	
Age in Months at						
Time of Test	-.337	-.025	-.207	.136	6.98	
Other[b]					16.58	
Constant		2.020			65.30	
Reading Test Total						
Number of Days Absent						
in 1982-83	-.523	-.026	-.454**	.144	23.76	Multiple R = .798
1983 Reading Grade	.508	.308	.387*	.158	19.67	R^2 = .636
Emergency Telephone	-.221	-.672	-.356*	.159	7.87	Adjusted R^2 = .430
Free & Reduced Lunch	-.107	-.377	-.276	.171	2.95	SE = .448
Other[b]					9.36	
Constant		2.090			63.61	
Vocabulary Knowledge[a]						
Encyclopedia Sets						
Per Student	.374	45.125	.570**	.185	21.34	Multiple R = .715
Cost of School						R^2 = .511
Per Student	.245	.000	.488*	.199	11.93	Adjusted R^2 = .267
Free & Reduced Lunch	-.290	-.469	-.270	.159	7.85	SE = .646
Other[b]					10.00	
Constant		-1.394			51.12	

*--$p < .05$ **--$p < .01$ ***--$p < .001$

[a]--Equation is not significant; other equations are significant at or beyond the .05 level.

[b]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-2. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension[a]						
Encyclopedia Sets						
Per Student	.341	31.319	.393	.218	13.40	Multiple R = .568
Number of Parents						R^2 = .323
Employed	.122	.498	.331	.197	4.03	Adjusted R^2 =-.015
Other[b]					14.92	SE = .765
Constant		-1.797			32.35	
Auditory Test Total[a]						
Encyclopedia Sets						
Per Student	.394	37.619	.491*	.211	19.33	Multiple R = .606
Number of Parents						R^2 = .367
Employed	.108	.476	.329	.190	3.56	Adjusted R^2 = .050
Other[b]					13.80	SE = .712
Constant		-1.171			36.69	
Spelling[a]						
Number of Days Absent						
in 1982-83	-.376	-.020	-.268	.174	10.10	Multiple R = .626
Gifted Program	.295	1.279	.266	.167	7.85	R^2 = .392
Other[b]					21.22	Adjusted R2 = .088
Constant		4.400			39.17	SE = .755
Math Concepts[a]						
Library Open After						
School Per Student	.263	5.375	.378	.189	9.94	Multiple R = .400
Sex	-.078	-.602	-.368	.232	2.88	R^2 = .160
Other[b]					3.22	Adjusted R^2 =-.042
Constant		-.290			16.04	SE = .727
Math Test Total[a]						
Library Open After						
School Per Student	.300	4.648	.356	.190	10.68	Multiple R = .390
Other[b]					4.56	R^2 = .152
Constant		.581			15.24	Adjusted R^2 =-.052
						SE = .671
Science Knowledge[a]						
Gifted Program	.327	1.370	.329	.173	10.73	Multiple R = .429
Other[b]					7.64	R2 = .184
Constant		-1.077			18.37	Adjusted R2 =-.013
						SE = .690

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Equation is not significant; other equations are significant at or beyond the .05 level.

[b]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-3. Fourth Grade Indian Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.718	1.005	.855***	.152	61.35	Multiple R = .811
Father's Status	-.024	-.661	-.272*	.134	.67	R^2 = .657
Sex	-.001	-.487	-.251	.136	.01	Adjusted R^2 = .473
Other[a]					3.70	SE = .695
Constant		-.339			65.73	
Reading Comprehension						
1983 Reading Grade	.623	.696	.619***	.147	38.53	Multiple R = .810
Magazine Subscriptions						R^2 = .656
Per Student	-.498	-23.663	-.388*	.158	19.29	Adjusted R^2 = .491
Other[a]					7.80	SE = .653
Constant		2.663			65.62	
Reading Test Total						
1983 Reading Grade	.776	.961	.854***	.121	66.25	Multiple R = .884
Acreage Per Student	-.236	-9.194	-.308*	.126	7.27	R^2 = .781
Age in Months at						Adjusted R^2 = .676
Time of Test	-.255	-.035	-.189	.115	4.81	SE = .521
Other[a]					-0.22	
Constant		1.882			78.11	
Vocabulary Knowledge						
Magazine Subscriptions						
Per Student	-.608	-33.086	-.509***	.124	30.92	Multiple R = .861
1983 Reading Grade	.452	.687	.574***	.128	25.96	R^2 = .742
Free & Reduced Lunch	.252	.365	.185	.113	4.67	Adjusted R^2 = .644
1983 Citizenship Grade	.103	-.243	-.250*	.124	-2.58	SE = .582
Library Open After						
School Per Student	-.297	-6.097	-.265	.133	7.85	
Number of Parents						
Absent	-.346	-.396	-.155	.101	5.36	
Other[a]					1.99	
Constant		-.678			74.17	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-3. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.475	.562	.474**	.150	22.53	Multiple R = .802
Free & Reduced Lunch	.312	.749	.383**	.138	11.94	R^2 = .643
Age in Months at						Adjusted R^2 = .471
Time of Test	-.412	-.048	-.245	.134	2.47	SE = .702
Magazine Subscriptions						
Per Student	-.354	-27.204	-.423**	.161	14.94	
Other[a]					12.43	
Constant		4.689			64.31	
Auditory Test Total						
Magazine Subscriptions						
Per Student	-.544	-35.263	-.536***	.138	29.14	Multiple R = .860
1983 Reading Grade	.490	.629	.519***	.129	25.40	R^2 = .739
Free & Reduced Lunch	.284	.615	.307**	.118	8.75	Adjusted R^2 = .613
Age in Months at						SE = .614
Time of Test	-.394	-.042	-.211	.114	8.30	
Other[a]					2.29	
Constant		4.066			73.88	
Spelling						
1983 Reading Grade	.605	.748	.632***	.160	38.24	Multiple R = .767
Student's Residence	-.181	-.527	-.275	.152	4.98	R^2 = .588
Father's Status	-.066	-.574	-.235	.140	1.56	Adjusted R^2 = .389
1983 Citizenship Grade	.392	.279	.289	.163	11.32	SE = .753
Other[a]					2.67	
Constant		.949			58.77	

*--p<.05 **--p<.01 ***--p<.001
a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-3. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade Point Average	.713	1.312	.831***	.088	59.28	Multiple R = .883
Home Phone Listed	.181	.843	.356***	.094	6.43	R^2 = .780
Percentage of Books Lost Per Student	-.150	-182.145	-.216*	.093	3.25	Adjusted R^2 = .741; SE = .524
Age in Months at Time of Test	-.268	-.046	-.223**	.081	5.99	
Gifted Program	.243	.916	.139	.089	3.38	
Other[a]					-0.31	
Constant		1.777			78.02	
Math Test Total						
1983 Grade Point Average	.684	1.037	.762***	.113	52.13	Multiple R = .797
Percentage of Books Lost Per Student	-.102	-153.977	-.212	.120	2.16	R^2 = .635; Adjusted R^2 = .570
Age in Months at Time of Test	-.238	-.033	-.183	.105	4.37	SE = .582
Other[a]					4.81	
Constant		1.507			63.47	
Science Knowledge						
1983 Grade Point Average	.519	.850	.715***	.134	37.12	Multiple R = .771
Age in Months at Time of Test	-.371	-.038	-.245	.123	9.10	R^2 = .595; Adjusted R^2 = .509
Acreage Per Student	-.198	-7.172	-.283*	.139	5.62	SE = .544
Home Phone Listed	.143	.501	.281*	.137	4.01	
1983 Citizenship Grade	.026	-.191	-.246	.153	-.65	
Other[a]					4.30	
Constant		3.327			59.50	

*--p<.05 **--p<.01 ***--p<.001

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-4. Fifth Grade Indian Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.538	.379	.394**	.152	21.18	Multiple R = .736
Father's Status	-.430	-.897	-.392**	.124	16.87	R^2 = .542
Magazine Subscriptions						Adjusted R^2 = .377
Per Student	-.232	-16.278	-.310*	.130	7.19	SE = .681
Free & Reduced Lunch	-.287	-.391	-.226	.119	6.48	
Other[a]					2.49	
Constant		.817			54.21	
Reading Comprehension						
1983 Reading Grade	.560	.413	.426**	.160	23.86	Multiple R = .705
Home Phone Listed	-.088	-.495	-.258	.151	2.27	R^2 = .497
Encyclopedia Sets						Adjusted R^2 = .315
Per Student	.217	26.764	.260	.141	5.64	SE = .721
Other[a]					17.89	
Constant		2.839			49.66	
Reading Test Total						
1983 Reading Grade	.660	.470	.537***	.138	35.14	Multiple R = .792
Father's Status	-.325	-.516	-.248*	.113	8.05	R^2 = .627
Percentage of Books						Adjusted R^2 = .492
Lost Per Student	-.197	-149.511	-.256*	.128	5.04	SE = .560
Encyclopedia Sets						
Per Student	.149	19.137	.206	.122	3.05	
Other[a]					11.38	
Constant		1.334			62.66	
Vocabulary Knowledge[b]						
1983 Reading Grade	.428	.498	.527**	.180	22.54	Multiple R = .608
Sex	-.166	-.497	-.295*	.148	4.91	R^2 = .370
Other[a]					9.57	Adjusted R^2 = .143
Constant		-2.251			37.02	SE = .786
Listening Comprehension[b]						
1983 Reading Grade	.400	.320	.349	.189	13.97	Multiple R = .551
Sex	-.152	-.373	-.229	.156	3.48	R^2 = .304
Other[a]					12.93	Adjusted R^2 = .052
Constant		.369			30.38	SE = .801

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

b--Equation is not significant; other equations are significant at or beyond the .05 level.

Table K-4. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Auditory Test Total[b]						
1983 Reading Grade	.487	.502	.557**	.176	27.13	Multiple R = .627
Sex	-.197	-.427	-.266	.146	5.25	R^2 = .393
Other[a]					6.90	Adjusted R^2 = .174
Constant		-.995			39.28	SE = .736
Spelling						
1983 Reading Grade	.553	.420	.421**	.130	23.25	Multiple R = .822
Free & Reduced Lunch	-.439	-.674	-.375***	.099	16.47	R^2 = .676
Number of Parents						Adjusted R^2 = .559
Employed	.038	.583	.328**	.127	1.25	SE = .595
Magazine Subscriptions						
Per Student	-.185	-21.207	-.389***	.110	7.19	
Father's Status	-.269	-.390	-.164	.104	4.41	
Gifted Program	.350	.943	.208	.114	7.30	
Other[a]					7.74	
Constant		1.183			67.61	
Math Concepts						
1983 Grade						
Point Average	.598	.547	.561***	.114	33.55	Multiple R = .749
Sex	-.204	-.368	-.241*	.110	4.91	R^2 = .561
Acreage Per Student	-.342	-5.320	-.230	.131	7.88	Adjusted R^2 = .499
Gifted Program	.463	.747	.192	.115	8.87	SE = .546
Other[a]					0.85	
Constant		-1.221			56.06	
Math Test Total						
1983 Grade						
Point Average	.678	.664	.626***	.110	42.47	Multiple R = .768
Acreage Per Student	-.330	-8.289	-.329**	.127	10.85	R^2 = .589
Other[a]					5.61	Adjusted R^2 = .532
Constant		.368			58.93	SE = .575
Science Knowledge						
1983 Grade						
Point Average	.460	.510	.450**	.137	20.66	Multiple R = .604
Acreage Per Student	-.333	-6.990	-.260	.157	8.66	R^2 = .365
Sex	-.184	-.379	-.213	.132	3.91	Adjusted R^2 = .276
Other[a]					3.24	SE = .764
Constant		-.951			36.47	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

b--Equation is not significant; other equations are significant at or beyond the .05 level.

Table K-5. Sixth Grade Indian Stepwise and Forced Entry Multiple Regression Results

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Word Study Skills						
1983 Reading Grade	.533	.320	.429*	.169	22.84	Multiple R = .718
Free & Reduced Lunch	.296	.476	.352	.185	10.41	R^2 = .515
Number of Days Absent						Adjusted R^2 = .292
in 1982-83	-.322	-.020	-.268	.183	8.62	SE = .572
Other[a]					9.65	
Constant		-2.766			51.52	
Reading Comprehension						
1983 Reading Grade	.695	.547	.707***	.123	49.16	Multiple R = .856
Home Phone Listed	-.137	-.684	-.443**	.126	6.08	R^2 = .732
Encyclopedia Sets						Adjusted R^2 = .623
Per Student	.192	24.137	.309*	.124	5.92	SE = .432
Number of Parents						
Absent	-.030	.286	.202	.120	-0.61	
Sex	-.105	-.336	-.241*	.110	2.52	
Other[a]					10.17	
Constant		1.364			73.24	
Reading Test Total						
1983 Reading Grade	.727	.531	.739***	.141	53.72	Multiple R = .805
Home Phone Listed	-.098	-.473	-.330*	.144	3.21	R^2 = .648
Other[a]					7.85	Adjusted R^2 = .504
Constant		-.271			64.78	SE = .461
Vocabulary Knowledge						
1983 Reading Grade	.529	.384	.405*	.165	21.43	Multiple R = .732
Free & Reduced Lunch	.269	.875	.510**	.181	13.73	R^2 = .535
Sex	-.201	-.463	-.271	.150	5.46	Adjusted R^2 = .321
Gifted Program	.377	1.382	.358*	.159	13.50	SE = .710
Other[a]					-0.60	
Constant		-4.538			53.52	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-5. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Listening Comprehension						
1983 Reading Grade	.472	.287	.343*	.153	16.20	Multiple R = .771
Sex	-.312	-.425	-.282*	.134	8.79	R^2 = .594
Percentage of Books						Adjusted R^2 = .429
Lost Per Student	-.323	-220.095	-.419**	.160	13.52	SE = .575
Father's Status	.200	.515	.227	.134	4.53	
Age in Months at						
Time of Test	-.238	-.039	-.352*	.162	8.36	
Gifted Program	.427	.828	.243	.141	10.38	
Number of Days Absent						
in 1982-83	-.132	.030	.354*	.170	-4.67	
Other[a]					2.34	
Constant		5.337			59.45	
Auditory Test Total						
1983 Reading Grade	.560	.616	.360*	.158	20.16	Multiple R = .758
Free & Reduced Lunch	.200	.690	.433*	.173	8.66	R^2 = .574
Sex	-.266	-.506	-.319*	.144	8.49	Adjusted R^2 = .378
Gifted Program	.436	1.392	.388*	.152	16.94	SE = .632
Other[a]					3.19	
Constant		-.671			57.44	
Spelling						
1983 Reading Grade	.625	.501	.531***	.127	33.18	Multiple R = .847
Number of Days Absent						R^2 = .718
in 1982-83	-.507	-.021	-.218	.139	11.04	Adjusted R^2 = .603
Number of Parents						SE = .541
Absent	-.356	-.658	-.382**	.130	13.61	
Number of Parents						
Employed	-.098	.488	.287*	.130	-2.80	
Age in Months at						
Time of Test	-.447	-.028	-.222	.135	9.90	
Father's Status	-.154	-.439	-.171	.113	2.64	
Other[a]					4.23	
Constant		3.028			71.80	

*--p<.05 **--p<.01 ***--p<.001

a--Predictors forced into equation, but not significant at or beyond the .15 level.

Table K-5. (continued)

DEPENDENT VARIABLES/ PREDICTORS	Corr	B	BETA	SE BETA	% OF TABLE VARIANCE	
Math Concepts						
1983 Grade						
Point Average	.674	.840	.760***	.155	51.23	Multiple R = .765
Acreage Per Student	-.170	-5.388	-.208	.122	3.53	R^2 = .584
Age in Months at						Adjusted R^2 = .507
Time of Test	-.342	-.039	-.270*	.121	9.21	SE = .700
1983 Citizenship Grade	.286	-.328	-.300	.157	-8.59	
Other[a]					3.07	
Constant		4.714			58.45	
Math Test Total						
1983 Grade						
Point Average	.695	.736	.710***	.161	49.39	Multiple R = .741
Other[a]					5.48	R^2 = .549
Constant		2.006			54.87	Adjusted R^2 = .464
						SE = .685
Science Knowledge						
1983 Grade						
Point Average	.565	.400	.470**	.136	26.56	Multiple R = .719
Percentage of Books						R^2 = .517
Lost Per Student	-.352	-211.086	-.398*	.169	14.00	Adjusted R^2 = .427
Age in Months at						SE = .582
Time of Test	-.360	-.026	-.234	.130	8.42	
Other[a]					2.73	
Constant		3.645			51.71	

*--$p<.05$ **--$p<.01$ ***--$p<.001$

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

also accounted for more variance (16%) than previous grades (13%) in the third grade model, and almost as much variance (17%) as previous grades (21%) in the fifth grade model.

In contrast to the lack of predictability by previous grades for second grade Indian students, the 1983 reading grade accounted for nearly two-thirds (61%) of the variance in word study skills for fourth grade Indian students. Indeed, previous grades alone accounted for almost twice as much variance as all variables in the Indian model (32%). Thus, in comparison to each other and to the Indian models of achievement, the models of Indian student word study skills achievement by grade level were all very different.

Comparison of Reading Comprehension Achievement by Grade Level

In comparison to the Indian model, as well as to each other, the grade level models of reading comprehension (Tables K-1 to K-5; or Table 53) for Indian students exhibited little continuity or congruency. Indeed, except for the 1983 reading grade having been predictive for each grade, and the number of encyclopedia sets per student having been predictive of fifth and sixth grade Indian achievement, there was no similarity of predictors with the Indian model of reading comprehension achievement. Moreover, the cost of the school per student was found to account for 10% of the variance in second grade reading comprehension, which was the only Indian student model that variable had entered thus far. It was also noted that participation in the gifted program, the third best contributor to the

Indian reading comprehension model, did not even statistically enter any of the grade level models.

Taken together, all variables, including those forced into the equation, accounted for between 44% (or 6% more than the Indian model) and 73% (or 36% more than the Indian model) of the total variance in reading comprehension achievement. Structurally, between two and five predictors statistically entered into the equations.

Comparison of Reading Test Total Achievement by Grade Level

Once again, very little congruency was found between the Indian model and the grade level models of reading test total achievement (Tables K-1 to K-5, or Table 53). Indeed, only one of three variables in the second grade model, two of four in the third grade model, one of three in the fourth grade model, and one of two in the sixth grade model were also part of the Indian model. Neither the number of magazine subscriptions per student nor participation in the gifted program, which had entered into the Indian model, were predictive of reading test total achievement by grade level for Indian students.

All grade level models accounted for more variance in reading test total achievement than the Indian model, but the lowest amount, 48% for second grade, was only 2% more, while the largest, 78% for fourth grade, was 32% more. The 1983 reading grade was the best predictor for four of the grades, but it was less predictive (20%) than the number of days absent in 1982-83 (24%) in the third grade model. In contrast, the 1983 reading grade accounted for two-thirds (66%) of the total variance in fourth grade reading comprehension for Indian students.

Comparison of Vocabulary Knowledge Achievement by Grade Level

Anywhere between one and six variables statistically entered into the grade level models of vocabulary knowledge for Indian students (Tables K-1 to K-5; or Table 53), but only in the sixth grade model was more than one of the predictors also part of the Indian model. Despite this, the grade level models for Indian students accounted for between 10% (in the fifth grade model) and 47% (in the fourth grade model) more of the total variance. Thus, the grade level models for vocabulary achievement had hardly any congruency with each other or with the aggregate Indian vocabulary model.

With respect to the predictors themselves, no variable entered all five grade models (including the 1983 reading grade, and the number of magazine subscriptions per student explained more variance than previous grades in the third grade model of vocabulary achievement. Age, which was a predictor in the Indian model, did not enter any of the grade level models, and school cost per student entered, once again, into the third grade model.

Comparison of Listening Comprehension Achievement by Grade Level

Despite the fact that the second, third, and fifth grade listening comprehension models (Tables K-1 to K-5; or Table 53) were not, overall, statistically significant, enough variables entered (both statistically and analytically by force) into each model so that the least amount of variance accounted for, 30% by the fifth grade model, was still 6% more than in the Indian model. The largest amount of variance explained by a grade level model of Indian listening comprehension was 64% in the fourth grade model, which was 40% more of the total variance (or twice as much) as explained by the Indian model. Structurally, the sixth grade model was the most similar to the Indian model, but only three of six variables were common to both.

Once again, the 1983 reading grade did not enter into the third grade model, where the number of encyclopedia sets per student was the best predictor. In the sixth grade model, the percentage of books lost (14%) explained almost as much of the total variance as previous grades (16%). The 1983 reading grade was not as large a contributor, except for second grade, in comparison to either its overall contribution or to other measures of achievement. Moreover, the contribution of the 1983 reading grade was actually less in the fifth grade model (14%) than in the Indian model (15%). It was also noted that student's residence, which had entered the Indian listening comprehension achievement model, was not a predictor for Indian students by grade level.

Comparison of Auditory Test Total Achievement by Grade Level

As with the listening comprehension models (Tables K-1 to K-5; or Table 53), the second, third, and fifth grade auditory test total models were not overall statistically significant. Structurally, only between one and four variables statistically entered into each grade level model for Indian student auditory test total achievement, but all models still accounted for between 7% (third grade) and 44% (fourth grade) more of the total variance than the Indian auditory test total model. In contrast to previously discussed models of Indian achievement by grade level, half or all of the statistically entering factors were also part of the Indian model of auditory test total achievement. However, this was probably more of an artifact of how few predictors entered.

Encyclopedia sets was once more the best predictor (19%) in the third grade model, and the 1983 reading grade entered only when forced into the model with the "other" variables. Magazine subscriptions per students was also a stronger predictor than the 1983 reading grade in the fourth grade model. More importantly, all predictors taken together, accounted for nearly three-fourths (74%) of the total variance in fourth grade auditory test total achievement for Indian students.

Comparison of Spelling Achievement by Grade Level

Results of the regression analyses of Indian student spelling achievement by grade level (Tables K-1 to K-5; or Table 53) indicated good congruence between them and the Indian model of spelling achievement, although large differences between grades were found. That is, at most only one of the variables that had entered into the grade level models of spelling achievement for Indian students was not also a predictor of spelling achievement in the Indian model. In contrast to the Indian model, which had nine predictors, the grade level models contained only two (third grade) to six (fifth and sixth grades) predictors.

In comparison to the Indian model, all grade level models accounted for between 2% (third grade) and 35% (sixth grade) more of the total observed variance in spelling achievement. As with a number of the other achievement areas, the 1983 reading grade was not statistically predictive of third grade spelling achievement. For third graders, the best predictor was 1982-83 absenteeism; although in the other grade level models, previous grades was the best predictor. Additionally, it was found that many of the other predictors explained considerably more variance in the grade level models than in the Indian model of spelling.

Comparison of Math Concepts Achievement by Grade Level

Neither the second (24%) nor third (16%) grade models of math concepts achievement for Indian students (Tables K-1 to K-5; or Table 53) accounted for as much variance as the Indian model (37%), but the other grade level models accounted for 19% (fifth grade), 21% (sixth grade), and 41% (fourth grade) more of the total variance. In the second grade model, the 1983 grade point average was the only predictor to statistically enter, while in the third grade model how long the library was open after school per student and student's sex were the only statistical ($p < .15$) predictors. In contrast, the fourth grade model involved five predictors, three of which were also part of the Indian model. In both the fourth and sixth grade models, the 1983 grade point average accounted for over one half of the total.

Comparison of Math Test Total Achievement by Grade Level

In contrast to other models of Indian achievement by grade level discussed so far, fewer variables statistically entered the math test total grade level models (Tables K-1 to K-5; or Table 53), but participation in the gifted program, which was part of the Indian math test total model was not part of any grade level models. As in other models, previous grades were not found to be predictive of third grade math test total achievement. Like the math concepts grade level models, the 1983 grade point average accounted for considerably more of the variance than the other factors or than in the Indian math test total model. Moreover, as with math concepts achievement, both the second (34%) and third (15%) grade models of math test total achievement accounted for less variance than the Indian model (38%). In contrast, the other models accounted for 16% (sixth grade), 20% (fifth grade), and 25% (fourth grade) more of the total variance.

Structurally, the math test total achievement models by grade level were often very similar to the Indian model, probably because so few variables were involved. Thus, both statistically significant predictors of the second grade model, two of the three fourth grade predictors, one of the two fifth grade predictors, and one of the sixth grade predictors were also part of the Indian model. More importantly, participation in the gifted program never entered, while the one predictor in the third grade model, library hours, was not part of the Indian model.

Comparison of Science Knowledge Achievement by Grade Level

As in the two math models, both the second (26%) and third (18%) grade models of science achievement for Indian students by grade level (Tables K-1 to K-5; or Table 53) failed to explain as much of the total variance as the Indian models (27%). The 1983 grade point average failed to statistically enter either of these models as well. Instead, the home telephone listing variable (6%) in the second grade, and the gifted program variable (11%) (which was the only predictor) in the third grade, were the best predictors in those models. The other grade level science knowledge models, in which previous grades were the best predictors, the models accounted for 9% (fifth grade), 24% (sixth grade), and 32% (fourth grade) more of the total observed variance in science knowledge achievement. Structurally, the grade level models exhibited very little congruence to either the Indian model or with each each other.

APPENDIX L: MANIPULABLE AND NON-MANIPULABLE PREDICTORS AND VARIANCES BY GRADE LEVEL

Table L-1. Percentages of Manipulable and Non-Manipulable Predictors and Total Variance by Grade Level for the Population

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
Word Study Skills															
Manipulable	5	62	21.32	2	67	19.71	1	33	43.95	4	67	48.30	3	60	23.40
Non-Manipulable	3	38	10.47	1	33	6.81	2	67	5.17	2	33	4.58	2	40	8.68
Other[a]			5.62			6.41			9.39			2.26			6.48
Total			37.41			32.93			58.51			55.14			38.56
Reading Comprehension															
Manipulable	6	67	35.05	3	50	40.24	2	29	10.35	2	67	52.22	3	38	30.14
Non-Manipulable	3	33	8.46	3	50	10.57	5	71	35.92	1	33	-1.88	5	62	17.02
Other[a]			-1.66			6.62			2.46			9.37			4.43
Total			41.85			57.43			48.73			59.71			51.59
Reading Test Total															
Manipulable	6	55	34.07	3	43	40.70	1	25	31.49	2	40	57.01	4	80	44.99
Non-Manipulable	5	45	6.25	4	57	15.55	3	75	20.58	3	60	-.68	1	20	4.48
Other[a]			5.13			4.06			6.53			4.76			5.04
Total			45.45			60.31			58.60			61.09			54.51

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-1. (Continued)

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
Vocabulary Knowledge															
Manipulable	5	55	33.92	3	60	35.80	5	71	34.10	3	43	59.01	1	33	13.71
Non-Manipulable	4	45	9.07	2	40	3.22	2	29	24.54	4	57	.33	2	67	14.68
Other[a]			1.58			10.60			1.62			7.79			9.83
Total			44.57			49.62			60.26			67.13			38.22
Listening Comprehension															
Manipulable	4	57	30.18	2	67	28.94	4	67	42.97	5	50	33.55	2	29	19.64
Non-Manipulable	3	43	19.41	1	33	4.84	2	33	10.65	5	50	26.03	5	71	34.71
Other[a]			1.89			7.41			9.61			3.32			.77
Total			51.48			41.19			63.23			62.90			55.12
Auditory Test Total															
Manipulable	3	38	28.47	3	50	37.96	5	62	38.84	2	33	30.04	1	100	7.78
Non-Manipulable	5	62	22.82	3	50	2.78	3	38	28.38	4	67	11.94	0	0	0.00
Other[a]			-.08			9.60			-.87			7.00			12.70
Total			51.21			50.34			66.35			48.98			20.48[b]

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-1. (Continued)

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
							Spelling								
Manipulable	6	67	32.35	4	80	49.25	1	25	29.58	2	25	49.18	1	25	25.23
Non-Manipulable	3	33	11.22	1	20	-.03	3	75	28.55	6	75	10.10	3	75	5.21
Other[a]			2.59			5.41			1.34			7.85			-.03
Total			46.16			54.63			59.47			67.13			30.41[b]
							Math Concepts								
Manipulable	5	83	18.96	3	75	23.66	3	100	57.37	2	67	46.37	1	50	38.37
Non-Manipulable	1	17	3.60	1	25	4.85	0	0	0.00	1	33	1.21	1	50	10.69
Other[a]			3.12			2.46			0.45			0.38			-.24
Total			25.68			30.97			57.82			47.96			48.82

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-1. (Continued)

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
							Math Test Total								
Manipulable	5	100	33.49	3	60	28.61	4	80	45.96	3	100	47.89	2	50	45.05
Non-Manipulable	0	0	0.00	2	40	8.69	1	20	11.10	0	0	0.00	2	50	5.80
Other[a]			.20			.71			.64			1.19			-2.33
Total			33.69			38.01			57.70			49.08			48.52
							Science Knowledge								
Manipulable	3	60	35.41	1	50	17.07	2	100	37.27	4	57	61.28	2	50	30.68
Non-Manipulable	2	40	2.74	1	50	1.90	0	0	0.00	3	43	-1.34	2	50	16.66
Other[a]			.86			5.67			4.10			-.08			.49
Total			39.03			24.73			41.37			59.86			47.83

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-2. Percentages of Manipulable and Non-Manipulable Predictors and Total Variance by Grade Level for Indian Students

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
Word Study Skills															
Manipulable	1	50	20.28	2	67	16.96	1	33	61.35	2	50	28.37	2	67	31.46
Non-Manipulable	1	50	2.65	1	33	15.79	2	67	.68	2	50	23.35	1	33	10.41
Other[a]			19.03			25.81			3.70			2.49			9.65
Total			42.23[b]			58.56			65.73			54.21			51.52
Reading Comprehension															
Manipulable	2	100	29.18	2	50	33.76	2	100	57.82	2	67	29.50	2	40	55.08
Non-Manipulable	0	0	0.00	2	50	14.96	0	0	0.00	1	33	2.27	3	60	7.99
Other[a]			14.60			16.58			7.80			17.89			10.17
Total			43.78[b]			65.30			65.62			49.66			73.24
Reading Test Total															
Manipulable	2	67	24.24	3	75	51.30	2	67	73.52	3	75	43.23	1	50	53.72
Non-Manipulable	1	33	10.88	1	25	2.95	1	33	4.81	1	25	8.05	1	50	3.21
Other[a]			12.75			9.36			-.22			11.38			7.85
Total			47.87[b]			63.61			78.11			62.66			64.78

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-2. (Continued)

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
Vocabulary Knowledge															
Manipulable	1	100	36.74	2	67	33.27	4	67	62.15	1	50	22.54	2	50	34.93
Non-Manipulable	0	0	0.00	1	33	7.85	2	33	10.03	1	50	4.91	2	50	19.19
Other[a]			6.83			10.00			1.99			9.57			-.60
Total			43.57[b]			51.12[b]			74.17			37.02[b]			53.52
Listening Comprehension															
Manipulable	1	50	32.47	1	50	13.40	2	50	37.47	1	50	13.97	4	57	35.43
Non-Manipulable	1	50	3.57	1	50	4.03	2	50	14.41	1	50	3.48	3	43	21.68
Other[a]			15.46			14.92			12.43			12.93			2.34
Total			51.50[b]			32.35[b]			64.31			30.38[b]			59.45
Auditory Test Total															
Manipulable	1	100	37.18	1	50	19.33	2	50	54.54	1	50	27.13	2	50	37.10
Non-Manipulable	0	0	0.00	1	50	3.56	2	50	17.05	1	50	5.25	2	50	17.15
Other[a]			5.71			13.80			2.29			6.90			3.19
Total			42.89[b]			36.69[b]			73.88			39.28[b]			57.44

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-2. (Continued)

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
Spelling															
Manipulable	2	67	27.07	2	100	17.95	2	50	49.56	3	50	37.74	2	33	44.22
Non-Manipulable	1	33	6.49	0	0	0.00	2	50	6.54	3	50	22.13	4	67	23.35
Other[a]			17.06			21.22			2.67			7.74			4.23
Total			50.62[b]			39.17[b]			58.77			67.61			71.80
Math Concepts															
Manipulable	1	100	11.66	1	50	9.94	3	60	65.91	3	75	52.30	3	75	46.17
Non-Manipulable	0	0	0.00	1	50	2.88	2	40	12.42	1	25	4.91	1	25	9.21
Other[a]			12.44			3.22			-.31			0.85			3.07
Total			24.10[b]			16.04[b]			78.02			56.06			58.45

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.

[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.

Table L-2. (Continued)

	2nd Grade			3rd Grade			4th Grade			5th Grade			6th Grade		
	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance	Predictors		Variance
	n	%	%	n	%	%	n	%	%	n	%	%	n	%	%
Math Test Total															
Manipulable	2	100	33.29	1	100	10.68	2	67	54.29	2	100	53.32	1	100	49.39
Non-Manipulable	0	0	0.00	0	0	0.00	1	33	4.37	0	0	0.00	0	0	0.00
Other[a]			.46			4.56			4.81			5.61			5.48
Total			33.75[b]			15.24[b]			63.47			58.93			54.87
Science Knowledge															
Manipulable	0	0	0.00	1	100	10.73	3	60	42.09	2	67	29.32	2	67	40.56
Non-Manipulable	2	100	10.76	0	0	0.00	2	40	13.11	1	33	3.91	1	33	8.42
Other[a]			15.56			7.64			4.30			3.24			2.73
Total			26.32[b]			18.37[b]			59.50			36.47			51.71

[a]--Predictors forced into equation, but not significant at or beyond the .15 level.
[b]--Equation was not significant; all other equation were significant at or beyond the .05 level.