THREE ORDERED SETS OF FACTORS
AND THEIR RELATIONSHIP TO ACT SCORES

by

Thomas J. Russo

A dissertation submitted in partial fulfillment
of the requirements for the degree
of
DOCTOR OF PHILOSOPHY
in
Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1977
ACKNOWLEDGMENTS

I would like to express my sincere gratitude to Dr. Keith T. Checketts for his encouragement and aid while preparing and writing this dissertation. His comments and suggestions have been invaluable. I would also like to thank Dr. William Dobson, Dr. Michael Bertoch, Dr. E. Wayne Wright, and Dr. Richley Crapo for serving as committee members.

In a more personal sense, I would like to express sincere appreciation to my wife, Bonnie, who has been an on-going source of support. I must also thank my parents for their continual encouragement and support throughout my entire education. In addition, I would like to express gratitude to many friends and fellow graduate students who have been of great help while here in Logan.

Thomas J. Russo
### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS.</td>
<td>ii</td>
</tr>
<tr>
<td>LIST OF TABLES.</td>
<td>v</td>
</tr>
<tr>
<td>ABSTRACT.</td>
<td>vi</td>
</tr>
</tbody>
</table>

### CHAPTER

I. INTRODUCTION .................................. 1
   - Problem Statement. .......................... 1
   - Purpose and Objectives ........................ 4

II. REVIEW OF LITERATURE ....................... 8
    - Facts and Figures of Test Score Declines .... 13
    - Composition of Test Takers .................. 17
    - Test-Related Explanations .................... 19
    - Context Rather Than Cause ................... 21
    - School-Related Issues ....................... 22
      - Class Size. ............................... 22
      - Quantity of Schooling ................... 24
      - School Size ................................ 26
    - Student-Related Variables ................... 27
      - Television Viewing and Academic Achievement .... 27
      - Student Absenteeism ...................... 30
      - Level of Educational Aspiration ........... 31
      - Academic Course Enrollment ............... 32
    - Family Structure Variables .................. 34
      - Summary. ................................. 38

III. METHODOLOGY ................................ 40
    - Sample and Population ...................... 40
    - Research Design ................................ 42
    - Measures .................................... 44
    - Procedures ................................... 47
    - Analysis .................................... 49
    - Hypotheses ................................... 51
IV. RESULTS.

Means, Standard Deviations and Number of Cases
Intercorrelations
Stepwise Regression Analysis
Increment to Prediction
Contribution of Sets
Summary

V. DISCUSSION

Purpose and Objectives
Evaluation of Findings
Implications
Limitations
Recommendations for Future Research
Summary

BIBLIOGRAPHY

APPENDICES

Appendix A: Questionnaire
Appendix B: Student Letter
Appendix C: School Letter
Appendix D: Letter of Introduction
Appendix E: Release of Information

VITA
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Means, Standard Deviations, and Number of Cases for Each Independent Variable</td>
</tr>
<tr>
<td>2</td>
<td>Correlations Among the Independent Variable and Between the Independent Variables and the Dependent Variable</td>
</tr>
<tr>
<td>3</td>
<td>Selected Statistics for Stepwise Multiple Regression: Step 1</td>
</tr>
<tr>
<td>4</td>
<td>Selected Statistics for Stepwise Multiple Regression: Step 2</td>
</tr>
<tr>
<td>5</td>
<td>Selected Statistics for Stepwise Multiple Regression: Step 3</td>
</tr>
<tr>
<td>6</td>
<td>Selected Statistics for Stepwise Multiple Regression: Step 4</td>
</tr>
<tr>
<td>7</td>
<td>Selected Statistics for Stepwise Multiple Regression: Step 5</td>
</tr>
<tr>
<td>8</td>
<td>Selected Statistics for Stepwise Multiple Regression: Steps 6, 7, 8</td>
</tr>
<tr>
<td>9</td>
<td>Summary of Results</td>
</tr>
<tr>
<td>10</td>
<td>Contribution of Each Independent Variable to the Variance Explained</td>
</tr>
<tr>
<td>11</td>
<td>School-Related Factors for Bivariate Regression</td>
</tr>
<tr>
<td>12</td>
<td>School-Related Factors for Hierarchical Regression</td>
</tr>
<tr>
<td>13</td>
<td>Family-Structure Variables for Hierarchical Regression</td>
</tr>
</tbody>
</table>
ABSTRACT

Three Ordered Sets of Factors and Their Relationship to ACT Scores

by

Thomas J. Russo, Doctor of Philosophy

Utah State University, 1977

Major Professor: Dr. Keith T. Checketts
Department: Psychology

There has been in recent years a marked decline in college entrance examination test scores. Declines have been documented both on the Scholastic Aptitude Test (SAT) and the American College Testing Program (ACT). In turn there has been an increasing interest concerning the test score declines as well as possible sources of influence on test scores. These sources or factors seem to be functions of three main "contexts." These contexts are: (a) school-related factors, (b) student-related factors and (c) family-structure related factors. It was of interest to attempt to explain the relative association of each variable to composite ACT scores and of each "context" to composite ACT scores. In turn, it was of interest to attempt to assess the extent to which combinations of two, or all three sets of variables aid in explaining the variance on composite ACT scores.

The sample population consisted of entering college freshmen at Utah State University for the fall quarter of 1976. All Ss were
from one of the six major feeder high schools to Utah State University. Information was gathered through the use of a questionnaire distributed at freshmen registration and by mail. Other sources of information included school principals and official student ACT transcripts and school records. Using composite ACT scores as the dependent variable both stepwise and hierarchical multiple regression analyses were done.

As a result of stepwise multiple regression using all ten factors, it was found that academic course taking had the greatest partial regression coefficient. Next in predictive power was the level of educational aspiration of the student. Size of school entered the prediction equation on Step 3 and was negatively associated with composite ACT scores.

Student-related factors helped to explain 38 percent of the total variance on composite ACT scores and as such comprises the most significant "context" of association. More modest support has been demonstrated for school-related factors. Family-structure factors do not appear significantly related to composite ACT scores. Recommendations were made for a larger sample size from a more diverse geographic region.
CHAPTER I

Introduction

Problem Statement

There has been in recent years a marked and dramatic decline in standardized achievement test scores (Harnischfeger and Wiley, 1975). Among the standardized achievement tests demonstrating declines in scores are the two most widely used college entrance examinations in the United States. These are the Scholastic Aptitude Test (SAT) declining in both verbal and mathematical scores and the American College Testing Program (ACT) also showing a marked overall progressive decline in scores over the past decade. Declines on the ACT have been documented in English, Mathematics, and Social Sciences subtests with the Natural Sciences subtest remaining at the same average level over the past ten years. Other tests showing similar declines to that of the SAT and the ACT are the Minnesota Scholastic Aptitude Test (MSAT) which is administered to 90% of the high school juniors in the state of Minnesota, and the Iowa Tests of Educational Development (ITED), a widely used test in grades 9 through 12 throughout most of the United States. On the ITED declines are most prominent at the 12th grade level.

This among other interests have led researchers to become increasingly interested in variables associated with scores on college entrance examinations. A wide variety of variables have been investigated, such as financial need (Vanderwall, 1971), personality
characteristics (Honn, 1968), experimental versus traditional school systems (O'Connell, 1971) anxiety (Shepherd, 1971), background and vocational plans (Maxey, Wimpey, Ferguson, and Hanson, 1976). Largely the investigators have been interested in attempting to predict college entrance examination scores without any particular regard to the way in which variables might be placed in "contexts" or sets so as to improve both prediction and explanation of variables associated with college entrance examination scores. Consequently the question remains as to the degree each variable contributes to scores on college entrance examinations when such variables are contained within theoretically and empirically based sets or contexts of variables.

It would then appear important to assess student achievement test scores in "contexts" rather than separately or in terms of attempting to assign "causes." The contexts can then in turn be ordered on a theoretical and empirical basis in terms of the proximal versus distal or cohesive versus less cohesive nature of the respective "contexts." While it also appears that no single context is responsible for the total variance of scores on college entrance examinations, it becomes of considerable explanatory interest to ascertain the potential association of individual factors and sets of factors as they are potentially related to college entrance examination scores.

Among sets of variables that researchers and educators (Edson, 1976; Harnischfeger and Wiley, 1975) speculate may be associated with SAT and ACT scores are: (a) school-related variables, (b) student-related variables, and (c) family-structure variables.
School-related variables that have been mentioned in the literature (Edson, 1976) include: (a) the size of the school, (b) the average number of students in academic classrooms, and (c) the quantity of schooling for that particular school (length of school year minus any instructional losses due to parental boycotts, teacher strikes, etc.).

The second set of variables possibly associated with scores on college entrance examinations are more student-related in nature. This set of student-specific variables attempt to include both the relevant in-and-out-of-school experiences of the student. For example, time spent viewing regular television programming is a student-specific variable that is thought to be related to achievement in a negative fashion (Edson, 1976; Bowers, 1973). Other student-specific variables possibly associated with college entrance examination scores are student absentee rate (Harnischfeger and Wiley, 1975) and the educational aspirations of the particular student (Maxey, et al., 1976). An additional variable that has been mentioned in regard to achievement test score declines is the relative decline in the incidence of traditional academic course taking among students (Harris, 1976; IDEA, 1976).

The third context or set of variables has to do with family characteristics. Variables that are included within the context of the structure of the family of the test-taking students are: (a) the birth order of the student within the nuclear family, (b) the number of siblings of the student, and (c) the closeness in
the age of the siblings in the immediate family of the test-taking
student. Breland (1974) has asserted that there is a strong associa-
tion between the factors mentioned above and the dependent measure
of scores on standardized achievement tests.

While there is some evidence available regarding the association
of separate individual variables (already mentioned in the brief
discussion of the three sets of variables) to college entrance
examination scores, there is a lack of empirical evidence concerning
the contribution of each variable to explaining the dependent variable,
composite ACT scores, when such variables are included in sets
(ordered as to relevant contexts). It is also of interest to attempt
to explain the relative association of each set or context to the
outcome measure of composite ACT scores. The problem is therefore
the lack of evidence as to: (a) the extent to which each variable
in a set is associated with the composite ACT scores of beginning
college freshmen, (b) the extent to which each set of variables
accounts for the variance of ACT scores and (c) the extent to which
combinations of two, or all three sets of variables will help explain
the amount of variance in ACT scores that is accounted for by those
variables.

Purpose and Objectives

The purpose of this study was to answer the following questions:
(a) Are variables, selected as to their inclusion in relevant "contexts,"
associated with the dependent variable, composite ACT scores? and
(b) To what extent does each "context" of variables account for the total variance of composite ACT scores? While it is of interest to investigate the association of individual, selected variables to composite ACT scores, a further area of interest concerns the influence of each set of variables on the outcome measure of composite ACT scores. There is at present a lack of substantial information regarding the association of "contexts" to composite ACT scores. Therefore, it is of interest to attempt to ascertain the variance accounted on the dependent variable by each set of variables.

As mentioned previously, in order to accomplish this variables relevant to "contexts" potentially related to composite ACT scores where chosen both on theoretical grounds and empirical evidence. The sets themselves and individual variables that serve to make up the contextual sets are as follows.

Set A variables are designated as being comprised of school-related variables:

A. 1 The size of the secondary school, i.e., the total number of students enrolled.

A. 2 The average number of students in high school academic classrooms.

A. 3 The quantity of schooling received, i.e., the length of the school year minus any instructional losses due to teacher strikes, parental boycotts, etc.

Set B variables are designated as being student-related in nature. That is, these variables included under student-related factors are
within the "context" of student interest and choice and more generally student-specific circumstances. Set B variables are comprised of:

B. 1 The number of hours spent per week watching regular television as high school seniors as reported by the students.

B. 2 Students absenteeism from scheduled academic time during their senior year in high school as reported by the students.

B. 3 Student level of educational aspiration as measured by reports of the highest level expected to be completed by that student.

B. 4 The number of traditional academic courses taken (see Review of Literature for a listing and definition of traditional academic courses) by that particular student.

Set C variables are those that are most concerned with the context of family configuration factors. Family configuration factors that are included in Set C are birth order, closeness in the age of siblings and number of siblings in the family.

C. 1 Birth order of the test-taking student.

C. 2 Closeness in the age of the siblings in the family.

C. 3 Total number of siblings in the immediate family.

Following in Chapter II is a review of relevant literature relating information concerning recent documentation of test score declines as well as empirical research findings concerning contextual
variables possibly associated with college entrance examination scores. Emphasis is on the American College Testing Program as the outcome or predictor measure. Chapter III is a presentation of the methodological procedures of the study. Results as related to the hypotheses are reported in Chapter IV and Chapter V contains a discussion of evaluation of findings, limitations of the study, and recommendations for future research in this area.
CHAPTER II

Review of Literature

The search for variables associated with college entrance examination scores has led researchers to suggest basic sets of variables (Harnischfeger and Wiley, 1975, 1976; Edson, 1976; and IDEA, 1976). These three basic sets of variables are (a) school-related variables, (b) student-specific variables, and (c) family structure variables.

One set of variables that has been theorized as being associated with college entrance examination scores is made up of variables of the school setting. Wiley (1974) and Wiley and Harnischfeger (1975) have speculated that large school sizes and larger academic class sizes may be related in a negative fashion to college entrance examination scores of high school seniors taking the tests. However, in a recent review of the research on the association of school size and class size with achievement, Gajewski (1974) remarked that the evidence is far from conclusive, although there does seem to be some impact of school size and class size on academic achievement. There does not, however, appear to be at this time any substantial empirical evidence as to the association of school size and class size to the college entrance examination scores of high school seniors.

Another school-related variable currently receiving considerable attention is the quantity of schooling received by the student (IDEA,
At a recent seminar twenty-one top educators explored the question of what factors might be associated with scores on college entrance examinations. It was concluded that among other factors, length of school day and length of year minus any instructional losses due to teacher strikes or parental boycotts were inversely related to college entrance examination scores.

A second set of variables are more student-specific than are the school-related variables mentioned above. While school-related variables seem to have "commanded the most attention" (Edson, 1976, p. 11), student-specific variables are also possibly related to college entrance examination scores of high school seniors (Harnischfeger and Wiley, 1975).

One student-specific variable is the number of traditional academic courses taken by the student while in high school. Traditional academic course offerings are defined for the purposes of this study as those courses including: History (U.S. History, State History, and World History), English (General English, Literature, Speech and Drama), Mathematics (Algebra, Geometry, Trigonometry and Calculus), Foreign Languages (French, Latin, Spanish, German, etc.), and Natural Sciences (General Science, Biology, Chemistry, and Physics). This definition of traditional academic course work is based on the information concerning course offerings and enrollment trends as reported in Gertler, D., and Barker, A., Patterns of Course Offerings and Enrollment Trends in Public Secondary Schools. Washington, D.C., U.S. Government Printing Office, 1972.
Katanick (1975) has recently compared students who had elected or been assigned to high school English courses. She compared the subjects on standardized achievement test scores in English usage. It was found that there was no significant difference between the scores of subjects electing or assigned to the English coursework; but there was a significant difference between the scores of subjects who took the four or more English courses versus the scores of subjects who took fewer than the four English courses.

Another student-specific variable that is included in this study is the quantity of television viewing (Bowers, 1973; Edson, 1976; and IDEA, 1976). Bowers (1973) has suggested that television viewing is in part responsible for the declines in achievement among school-aged children. Starkey and Swinford (1974) after investigating 226 fifth and sixth grade males and females, reported that there was a negative relationship between the quantity of television viewing and reading scores. It was concluded that those subjects who viewed less television appeared to better readers. Arafat (1974) investigated the academic achievement of college students to television viewing and found that lower grades were associated with greater amounts of television viewing. The concern among both investigators and educators seems to be, "Is the amount of time students spend viewing television programming negatively associated with standardized achievement test scores?"

Other student-specific variables include the level of educational aspiration (Maxey, Wimpey, Ferguson, and Hanson, 1976) and student
absentee rate from scheduled academic class time (Harnischfeger and Wiley, 1975). Maxey, et al. (1976) have investigated the association of composite ACT scores with the reported educational aspirations of the students taking the test. It was found that the higher the student's reported level of educational aspiration (number of years of expected higher education), the higher was his/her scores on the ACT. Student absentee rate from scheduled academic class time has also been mentioned as possibly being negatively related to scores on college entrance examinations (IDEA, 1976; Harnischfeger and Wiley, 1975). To date, there is no empirical evidence of any possible association of this factor to college entrance examination scores.

There is yet a third set of variables that has been investigated in terms of their possible association with achievement. These are family characteristics such as: (a) birth order, (b) number of siblings (see Breland, 1974). There has been recently a number of studies suggesting that the above mentioned factors are associated with achievement (Breland, 1974; Record, McKeown, and Edwards, 1969; Eysenck and Cookson, 1969; and Belmont and Corolla, 1973). Breland (1974) attempted to control for differences in father's education, mother's education, family income and mother's age. With these variables supposedly accounted for, it was found that firstborns in small families scored significantly higher than did last borns from large families on the National Scholarship Test.

Despite the studies mentioned above, there remains considerable controversy in this area. Schooler (1972, 1973) insisted that although
Breland (1974) probably made a "reasonable case," birth order and family at most assert only "minimal effects" on both intellectual functioning and achievement. Breland (1974) has maintained that his findings are both statistically and practically significant. However, questions remain as to the extent to which birth order, number of siblings, and closeness in age of siblings are associated with college entrance examination scores.

Research concerning three sets of variables, i.e., (a) school-related variables, (b) student-specific variables and (c) family structure variables has been briefly reviewed here in order to present current information about the extent of the possible association to college entrance examination scores. At this time, there is a lack of substantial information as to the extent to which variables grouped as to relevant sets contextually are associated with ACT scores. In addition there is a lack of evidence as to the extent to which each set of variables accounts for the variance of ACT scores both singularly and in combination with other sets or "contexts."

It is the intent of this study to assess the association of the above-mentioned variables ordered as to sets with the dependent measure, composite ACT scores. It is also of interest to determine their relative association with composite ACT scores in terms of their possible contribution within ordered sets of variables and their contribution as members of the full compliment of variables included.
Facts and Figures of Test Score Declines

An overall look at achievement test scores demonstrates that since the mid-1960's a number of aptitude tests have shown a steady and dramatic decline (Harnischfeger and Wiley, 1975, 1976). Among the tests that have shown declining scores are:

1. **Scholastic Aptitude Test (SAT)**. SAT scores had declined for both males and females on both the verbal and mathematical subtests.

2. **American College Testing (ACT) Program**. The same decline evidenced on the SAT is found as well on three of the four subtests of the ACT, i.e., Social Studies, English, and Mathematics. Only the Natural Sciences subtest scores have not shown a decline over recent years.

3. **Minnesota Scholastic Aptitude Test (MSAT)**. This test presents the same trend in decline demonstrated by the SAT and ACT. Like the SAT and ACT, MSAT scores have declined steadily since about 1963.

4. **Iowa Tests of Educational Development (ITED)**. Harnischfeger and Wiley (1975) examined scores only for the state of Iowa and have reported similar trends in decline as already mentioned in the SAT, ACT, and MSAT. The most dramatic declines for the grade 9-12 group taking the ITED was for 12th graders.

5. **Comprehensive Tests of Basic Skills (CTBS)**. This test is
administered to students in grades 2 through 10. While Harnischfeger and Wiley (1975) reported slight increases in grades 2, 3, 4, student scores in grades 5 through 8 demonstrated a steady decline.

Examining the SAT more closely it is first necessary to say something about the test itself. The SAT was constructed in 1948 by the Educational Testing Service and has grown to be the most widely used college admissions test in the United States. It is comprised of two sections, Mathematics and Verbals. Scaled scores on the SAT range from 200 - 800 and separate subtest scores for Verbal and Mathematics are also reported (range here is 200-800 as well).

Beginning with 1963, Harris (1976) reports that the SAT score averages have decreased for each of the 12 years. The overall decline from 1962-63 testing to 1974-75 testing is a total of 41 points for the verbal and a total of 29 points for the mathematics over the same period of time. Three drops of greatest decrease in verbal scores occurred from 1966-67, 1972-73, and 1974-75. In addition the percentage of verbal scores in the upper ranges (600 to 800) decreased as well (Harnischfeger and Wiley, 1975). The declines in mathematics and verbal scores for the testing year of 1974-75 showed the most dramatic decline of any single year since records have been kept on SAT scores. For the first time, female scores of the verbal subtest fall below those of male on verbal scores for the testing year of 1972-73 (Harris, 1976).
The mathematics portion of the SAT shows similar decline to the verbal section. While the verbal scores dropped 10 points in the testing year 1974-75, the mathematics scores showed a decrease of 9 points (Silver, 1976). Overall the mathematics section has declined by 29 points since the 1962-63 testing year.

The American College Testing (ACT) Program is the second most widely used college admissions test in the United States at this time. It is comprised of four college admissions tests: (a) English, (b) Mathematics, (c) Social Studies, and (d) Natural Sciences. Each year approximately one million college-bound students complete the ACT battery. The test yields a composite score as well as four subtest scores. The range of scores on the ACT is 1 to 36 (Ferguson, 1976).

Both Ferguson (1976) and Munday (1976) report that the ACT shows similar declines to the SAT. Tolman (1976) reports that the composite scores of college-bound seniors taking the ACT have declined about 1.6 standard scores. This figure represents one-third of a standard deviation (Ferguson, 1976). For the testing year 1963-64 the score average composite of ACT scores was 19.9. Average composite scores on the ACT have declined gradually but steadily until composite score average had declined to 18.7 in 1973-74 (Munday, 1976) and 18.3 in 1974-75 (Tolman, 1976). Like the SAT, the testing year 1974-75 represented the most dramatic decline in overall scores.

The social studies subject shows the greatest decline. Tolman (1976) reports the decline ranging from 20.6 to 17.1 over the 10-year
period from 1964-65 to 1974-75. Mathematics scores declined as well decreasing from 20.4 in 1964-65 to 17.3 in 1974-75. This decline in the Mathematics usage test represents a decrease of 1.5 standard scores. The natural sciences actually showed a slight increase from 20.4 in 1964-65 to 20.8 in 1974-75 representing an increase of .5 standard scores (Munday, 1976).

In summary, there are a number of statements in regards to both the SAT and ACT trends over the past decade (Ferguson, 1976):

1. During the past 10 years both the ACT and the SAT show similar declines. In any particular subtest the extent of the decline is small but this decline is steady and is evidenced in each succeeding year.

2. The decline on the ACT test is great in social studies followed by English. These tests are comparable to the verbal section of SAT (Munday, 1976). The decline on the Mathematics Usage Test of the ACT is comparable in extent and magnitude to the decline on the SAT mathematics section.

3. The decline in scores on both the ACT and SAT has been more dramatic and pronounced for females than for males (Ferguson, 1976).

4. The proportion of high-scoring students has declined for both the ACT and SAT (Hechinger, 1974, and Munday, 1976).

5. Declines in test scores on the SAT and ACT appears to be a natural phenomenon and is not isolated to any geographical region within the United States.
6. The declines in scores on the SAT and ACT over the past decade have been well documented (Harnischfeger and Wiley, 1975, 1976).

Composition of Test Takers

There have been numerous speculations concerning the nature of contributing factors to test score declines. One such speculation concerns changes in the pool of test-takers (IDEA, 1976; Munday, 1976; Ferguson, 1976; Harris, 1976; Harnischfeger and Wiley, 1975, 1976; and Edson, 1976).

There are certain changes in the pool of test-takers that have taken place in recent years. First, there is an increase in the number of women taking both the SAT (Harris, 1976) and the ACT (Ferguson, 1976; Munday, 1976). Munday (1976) reports that declines in the scores of females especially in verbal areas may be at least in part due to the less academically-minded females now entering colleges. Ferguson (1976) reports that the percentage of women taking the ACT has increased from 45% in 1964-65 to 53% in 1974-75. However, as the percentage of women taking both the SAT and ACT has increased it is not likely that this factor accounts for any appreciable amount of the total variance of ACT and SAT scores (Harnischfeger and Wiley, 1976).

A second change in the test population is that more minority students are taking both the SAT and ACT. The speculation here is that as the "mood of egalitarianism" spreads across the country and
more colleges form commitments to open admissions policies, minority students who are seen as lacking in traditional academic skills will be taking college entrance examinations. However, Edson (1976) in a review of declining achievement test scores stated; "Furthermore, theory attributing the score decline to increased numbers of minority students taking the test is not supported by the evidence" (p. 7). Some evidence supporting Edson's statement is presented by Harris (1976) and concerns factors contributing to SAT score declines. Harris (1976) states that in public colleges across the United States there has been an increase in black and American Indian admissions to college from 10.8% of the freshmen class in the fall of 1966 to 15.9% by the fall of 1972. In private colleges and universities across the country there has been an increase of black and American Indians from 2.4% of the freshmen class in 1966 to 5.4% in 1972. Harris further reports that there was no significant increase in the proportion of minority students entering college since 1972. This is of particular interest as the period of greatest test score decline for both the ACT and the SAT was for the testing year of 1974-75.

There are numerous other speculations concerning the changes in the pool of test takers that could potentially contribute to the test scores themselves. One concerns changes in the socioeconomic backgrounds of families of ACT and SAT tested students. However, Munday (1976) states that there has been relatively little change in the
family incomes of ACT-test takers over the last five years. Other speculations concerning changes in the test population, including new programs in colleges in areas such as hotel management, recreation and other non-traditional, non-academic areas of endeavor, may contribute to test score declines as the students entering these fields may not reflect traditional academic preparatory background. However, there is generally inconclusive data available to support that changes in the pool of test-takers are related in any significant fashion to changes in the test scores themselves.

Test-Related Explanations

One of the first places to examine was the test itself. Critics of standardized testing procedures claim that achievement tests such as the ACT and SAT lack instructional validity. Feldhusen, Hynes, and Ames (1976), using the concept of instructional validity, have asserted that while historically we have assumed that achievement tests like the ACT and SAT have instructional validity we can no longer do this. That is, we have assumed too long that the "performance domain" reflected the instructional processes and experiences of the individuals taking the test. Shoemaker (1975) states that the instructional program exists "inseparable conceptually" from the item universe and the related item universe should be isomorphic. It is then the speculation that as the performance domain shifts in terms of changing emphases in instruction validity, the SAT and ACT are failing to appropriately reflect those shifts and
consequently demonstrate a progressive decline (Felhusen, Hynes, and Ames, 1976).

However, Tolman (1976) reviews such evidence and states emphatically, "The SAT and ACT are clearly not instructionally valid and they were never meant to be. Again, they are designed to predict success in college, not assess the quality of education at the high school level" (p. 7).

Harris (1976) gives support to the idea that test changes are not responsible for changes in test scores. He states:

The psychometric quality of the SAT is, and has always been, under scrutiny by ETS, working on behalf of the college board. Internally, techniques are and always have been routinely used to ensure that various forms of the SAT are comparable in difficulty, from administration to administration, and from year to year. The efforts of our research convinces us that the score decline is not evidence of some technical factor in constructing, scoring, or calibrating the tests prior to reporting the scores (p. 17).

In turn, the SAT is as predictive of success in college as it was 10 years ago (Harris, 1976).

In a similar sense to Harris (1976), Ferguson (1976) refutes the notion that changes in the ACT tests might contribute to changing the test scores. He reports that changes in the ACT over the recent years have not been of any sufficient scope or extent that could possibly account for any aspect of changing scores on the ACT. In as much as thousands of high school and college teachers throughout the country work on the ACT test materials each year that the accusation that the ACT is no longer measuring important instructional processes "appears to be a highly improbable explanation" (p. 25).
It would then seem that changes in the student population of test-takers and changes in the tests themselves do not adequately account for changes in the test scores. Harnischfeger and Wiley (1975) assert that speculation and research into the area of contributing factors to achievement test scores should first examine "contexts" rather than "cause." It is of interest to first know the importance of a variety of factors that may be related to achievement test scores prior to attempting to assess potential causal relationships. In turn different contributing factors will also be more cohesive or less cohesive in their relationship to standardized achievement test scores. That is, certain factors will be more important or significant in determining achievement test scores.

Context Rather Than Cause

There are a large number of factors that educators and researchers speculate as being related in a positive fashion to achievement test scores (IDEA, 1976, Edson, 1976, Harnischfeger and Wiley, 1975 and 1976). These variables can be ordered primarily as to three basic "contexts," (a) school-related variables, (b) student-specific variables and (c) family structure variables.

The major school-related variables are comprised of (a) the size of the school, (b) the average number of students in academic classrooms and (c) the quantity of schooling for the particular school (Harnischfeger and Wiley, 1975).

The third "context" that will be reviewed in terms of its potential association to achievement test scores is related to family
structure variables. These variables as postulated by both educators and the relevant research include: (a) birth order of the test-taking student, (b) the number of siblings of the test-taking student and (c) the closeness in the age of siblings in the immediate family constellation of the test-taking student (Breland, 1974).

School-Related Issues

**Class-size.** In their extensive documentation of achievement test score declines Harnischfeger and Wiley (1975) have suggested that one possible area negatively associated with achievement test scores is large academic class size. There is some evidence available that attempts to associate class size with achievement (McKenna and Olson, 1975). In a recent review of literature relating to this issue McKenna and Olson (1975) state quite emphatically that "fewer is unquestionably better" (p. 29). The authors make a number of generalizations all of which have some relevance to the question of association to achievement test scores. First, elementary and secondary teachers are potentially more productive with specific learning strategies and methods when there are fewer students in a classroom. Secondly, individualized instruction is more available to the student. Thirdly, there is more opportunity for creative work on the part of students. Next, more subject content can be mastered as there is greater classroom discipline, more positive student-teacher attitudes and generally better morale.

However, the research on this issue is far from conclusive. In a study by Flinker (1972) he found that larger class size actually
had a more substantial effect on testing results than did the smaller class groups among seventh graders. He concludes that the theory that smaller class size means an increase in the likelihood of individualized instruction is theoretically based and "unfortunately" not a practically based notion.

In a review of literature in this area Shane (1961) reported that no significant generalizations can be made regarding the effects of class size on academic achievement. However, Mitchell (1969) asserts that small class sizes are necessary if teachers want to implement either innovative teaching methods and practices and individualize the instructional content of the course to any extent.

In a more recent study (Moody, Bausell, and Jenkins, 1973) it was found that there is a significant relationship between small class size and achievement among fourth-grade children in a mathematics class. Small class groups performed significantly better when compared by analysis of covariance on posttest scores using pretest scores as the covariate. While there were certain weaknesses in this study, i.e., three different teachers were used and the treatment (differing class sizes) took place over only a three-day period, the authors conclude, "Why should students learn better in small groups than in large groups when the curriculum and the instructional time is held constant? The obvious answer is that instruction is increased by individualization" (Moody, Bausell, and Jenkins, 1973, p. 174).

There are other components that are associated with achievement other than the recall of knowledge. One such component is academic
motivation. Bolander (1973) found that the smaller the class on a college level the greater the motivation of the students. This was true for intragroup lateral and vertical motivation as well as individual motivation. Information concerning motivational level was collected from questionnaires and personal interviews.

In another study on affective (ordering and restructuring of attitudes and values) and cognitive (recall of knowledge) learning among college freshmen (Hoover, Bauman, and Shafer, 1970), absences of significant differences were found for class-size variations.

In summary then, it would appear that while most teachers and educators would be in general agreement that smaller class sizes are more conducive to achievement, the research literature is far from conclusive.

Quantity of schooling and achievement. Harnischfeger and Wiley (1975) reported that students enrolled in secondary schools received the greatest amount of education in 1966. It is also reported here that the nation's length of the school yearly term while being relatively stable (approximately 180 day per school term) has had instructional losses due to teacher strikes, budget cutbacks resulting in shorter school years and a decreased quantity of schooling for a large number of students. While it must be acknowledged that such factors as student retention and drop out rates and absenteeism affect the quantity of schooling received by that student, average trends in the quantity of instruction offered to students in
particular schools in respect to achievement might offer us important information regarding future educational policy.

There are numerous studies that assert that the quantity of instruction has a direct and profound effect on the achievement of students (Wiley and Harnischfeger, 1974). Educators have summarily taken appropriate steps to insure that students across the country have greater access to both quality and quantity of educational instruction. However, the question remains as to the effect of the quantity of schooling on the educational achievement of students.

In a review article Husen (1972) states:

So far only limited empirical evidence has become available to serve those who make decisions about the length of the school year and the time allotted to individual subject areas. . . very little analysis has been done on the factors affecting student achievement, the "outputs" of education (p. 32, 34).

While direct empirical evidence is generally lacking in this area, it is probably unwarranted to assert that schooling has no effect on measures of achievement such as the ACT or SAT. It is probably true as some educators state that students would learn to read or do mathematics even if they did not attend school (Wiley and Harnischfeger, 1974). It is probably true as well that students exposed to 50% more schooling would not result in 50% more learning. While Coleman (1966) has demonstrated that much learning takes place outside the traditional classroom or the school building altogether, it is obvious that in developed countries schooling occupies a major proportion of a child's time and energy
and attention is needed to the effects of its variation on achievement. In a study reported by Wiley and Harnischfeger (1974) dependent variables of verbal ability, reading comprehension, and mathematics achievement were employed. Prior student characteristics of race, number of possessions in the child's home, and number of children in the child's home were used. Exposure to schooling included the variables, attendance (student-specific), length of school day and length of school year (both school-related variables). The authors found that

...schools where students receive 25% more schooling, they will increase their average gain in reading comprehension by two-thirds and their gains in mathematics and verbal skills by more than one third. These tremendous effects indicate that the amount of schooling a child receives is a highly relevant factor for his achievement (Wiley and Harnischfeger, 1974, p. 10)

School size. There has been in recent years significant changes in the organization of public schools in America, both elementary as well as secondary schools. Unfortunately, at the present time there is no national systematic data available concerning the effects of changes in school size (Harnischfeger and Wiley, 1975). However, it is apparent that schools have had to handle increasingly larger numbers of students since the mid 1960's and on into the 1970's. Not only have academic class sizes increased over recent years, with double sessions in some instances the overall quantity of available schooling has gradually decreased. The most pertinent question relevant to this phenomenon becomes: "How, if at all, does the
increasing size of schools affect student achievement as measured by standardized achievement test scores? Is school size as a possible 'contextual effect' of school-related factors associated with student academic achievement again as measured by standardized achievement test scores?" At this time these questions remain essentially unanswered.

Student-Related Variables

School-related issues have recently received a good deal of attention among educators. Harnischfeger and Wiley (1975) state that "The school is the first agent to be blamed for declining achievement test scores (p.77)." However, there is another set of potential "contextual effects" about which educators are currently speculating as being related to the decline in college entrance examination test scores (IDEA, 1976; Edson, 1976). This "context" concerns factors that are more specifically related to student choice and interest in academic-cognitive activities.

Television viewing and academic achievement. One such student specific issue concerns the potential effects of regular television viewing on the academic achievement of both children and adolescents. There appears to be a general consensus among educators and teachers alike that time spent viewing regular television programming may exert a detrimental effect on the cognitive skills and interests of the current achievement test-taking population (Edson, 1976). Psychology Today (1973, pp. 14-16) reports that by the time a student
is 18 years old he has viewed approximately two full years of television programming. This accounts for most likely more time spent viewing television than any other single activity with the exception of sleeping. The question concerning educators becomes, "Does viewing regular television programming detract from the time and effort that students might be spending in cognitive-academic pursuits that are in turn potentially associated with standardized test scores?"

Opinion of those in the area would appear to lend affirmation to this question. Gotz in a recent article (Gotz, 1975) stated quite emphatically that "... television is a powerful medium because it is an active medium constantly bombarding our senses, continually massaging them, rendering the viewer more passive and lethargic, just as a good enjoyable massage" (p. 416). However, most of the empirical research in this area has focused on the potential harmful effects of television violence especially on younger children. There is surprisingly little empirical research that attempts to address the complex relationship that potentially exists between regular television viewing and various measures of academic achievement.

In a study done by Stern (1973) using 250 mentally gifted fourth, fifth, and sixth graders, the effects of commercial television programming was investigated in regards to the outcome measure of divergent thinking abilities. Divergent thinking abilities were measured on a pretest-posttest measure of Guilford's tests of creativity. The independent variables were sex, grade, and type of
commercial television programming watched such as comedies, dramas, TV sports, cartoons, etc. Sex and grade effects were not significant but all types of commercial television programming significantly decreased posttest scores as compared to the control group. The author concluded that the greatest decreases in posttest scores were evidenced by students decreases in the flexibility of thought patterns. While this study is far from conclusive in determining the effects of television viewing on the academic achievement, it does appear that there is a potential influence in this area. Moreover, it would appear that the potential relationship of television viewing to intelligence and subsequent academic progress would be an inverse one.

In a study of some interest to this area (Wiegel and Jessor, 1973) it was found that high involvement with television viewing among both high school students was associated with such attitudinal attributes as "... different aspects of conventionality across values, attitudes, and reported behaviors" (p. 87). This finding held constant across age, sex, and both high school and college populations. The question most pertinent to this review appears to be, "Will students more intolerant to attitude change be at a disadvantage in terms of certain indices of academic achievement as a result of greater psychological involvement with television viewing?" The empirical research has not adequately addressed itself to this question in terms of the complex relationship potentially involved in this area. The question also remains, "If, indeed, television
viewing is detrimental to academic achievement to what extent does this phenomenon occur?"

The concern that has arisen over the potential effects of regular television viewing and academic achievement is one of which there is considerable opinion but very little substantial data. More research is indicated in this area especially in regards to the dependent measure of academic achievement being more adequately specified before any conclusions can be made.

**Student absenteeism.** Another student-related factor is the amount of time spent in academic-cognitive pursuits. Levanto (1975) in a recent article in the NASSP Bulletin states that "high school absenteeism has been increasing in recent years and it has become a matter of serious concern to many administrators" (p. 100). While there is a lack of substantial data on the potential effects of school absenteeism some research as well as pertinent educational assumptions are available. Some of these include:

1. School absenteeism increases with age and grade.
2. College preparatory students seem to have lower absentee rates than non-college preparatory students.
3. Students with higher IQ scores have overall lower absentee rates.
4. For seniors in secondary schools absentee rates are the lowest among those with the highest class rankings.
5. Students participating in school-related activities have lower overall absentee rates (Levanto, 1975).
While it soon becomes readily apparent that such a factor as student absentee rate has several sources of naturally occurring influences, it would appear that if a student is absent from school he cannot avail himself of the academic-cognitive activities presented at that time. Moreover, he misses the continuity of classwork which may be crucial for higher academic achievement (Morgan, 1976).

Level of educational aspiration. It is at this point in time still somewhat unclear just how the educational aspiration of the student affects their respective level of academic achievement. However, it has become generally accepted that an adolescent's ability to delineate career and/or academic goals may exert an influential effect on future academic achievement (Erikson, 1964; Chickering, 1969). By implication if a student is organizing clear-cut objectives that require college or beyond it would appear that he/she may be more academically motivated.

In a research study by Abel (1966) utilizing freshmen college students at Cornell University, the relationship between scholastic aspiration and semester academic achievement was explored. Those students who were found to be low in grades and low in their certainty of vocational and academic aspiration tended not to graduate. It was summarily reported that 75% of this group did not graduate from college while the average rate of loss from the other groups was only 37.1%, about one-half of the low-uncertain group.
In a more recent study by Baird (1967) college-bound youths were requested to choose what was their most important goal in college. The choices included:

1. To learn how to enjoy life.
2. To develop my mind and intellect.
3. To secure professional and vocational training.
4. To make a desirable marriage.
5. To earn a higher income.

It was reported that students choosing the category "To learn how to enjoy life" had low to average high school GPA's and average composite ACT scores. The group choosing the category "high income" had low mean ACT scores as well as low high school GPA's. This was also true of students (in this case both men and women) who chose marriage as their primary objective in attending college. The author reported that a full one-third of the sample surveyed chose the intellectual goal orientation. This group most frequently planned to pursue advanced degrees. It was reported that among this group high school grades as well as composite ACT scores were the highest of those across the entire sample used by the investigator.

Academic course enrollment. In the past decade there has been a documented decline in academic course taking (Harnischfeger and Wiley, 1975). It is also reported that while there has been a general trend to less traditional course selection among students,
there has been no increase in enrollment in certain non-academic but related areas like vocational or business courses (Harnischfeger and Wiley, 1975).

Among the declines in academic course taking it is reported by Harnischfeger and Wiley (1975) and Gertler and Brown (1972) that there has been a drop in regular course taking from 88.7% to 75.2%. In addition there is a reported drop in the selection of English courses of 11 percent over the period of 1970-71 to the school year 1972-73. It has been found in the same survey that foreign language trends have apparently followed suit with the decline in enrollment in both general regular course taking and English enrollment.

Regular history course selection has also recently declined. Drops in history enrollment have been observed most dramatically in U.S. History and State History. These declines have been reported as being -7% for U.S. History enrollment nationally and -14.5% for State History enrollments nationally. The enrollments for World History courses has remained relatively stable.

Curricula declines in mathematics and natural sciences have also been evident in recent years although not as pronounced as in English, foreign languages and the social sciences. However, Harnischfeger and Wiley (1975) report an overall decline of 7% in physical science enrollment.

Since there is no apparent increase in non-academic course taking, the question arises as to what new activities students are
currently engaging in. One possibility is the recent implementation of work-study programs in the secondary schools. The implementation of such programs may potentially detract from the possible academic-cognitive pursuits and instructional activities of the student. If this is true it may be in turn reflected in the scores received on college entrance examination scores. Whatever the reasons might be for the recently documented decline in regular academic course taking by secondary school students, the question remains, "What potential effect does a varying regular academic course load exert on the academic achievement of the student?" At this time there does not appear to be any systematic data that directly attacks or attempts to answer this question.

**Family Structure Variables**

Thus far, school-related factors and student-related factors have been reviewed in terms of their relevance to scholastic achievement and more specifically composite ACT scores. Family structure variables serve to constitute the least proximal set of factors potentially associated with standardized achievement test scores. That is, the family structure context appears to be most removed from the outcome measure of achievement test scores. However, in recent years there has been considerable interest in the area of family configuration and intelligence and achievement. In as much as the variables included under family structure variables appear related (as they are in the research literature) the variables of
birth order, closeness in spanning of siblings and number of siblings in the family will be reviewed together in an attempt to elucidate this "context" of variables in regards to achievement and achievement testing.

Birth order characteristics have been of interest for some time (Adler, 1928) but recent years have seen a renewed interest in this area. Altus (1965) attempted to determine if first born college students would perform better on the Math Aptitude Test (MAT) and the Verbal Aptitude Test (VAT). He found that first born college students performed better on the VAT but there were no significant differences among differing birth order on the MAT.

In another study concerning college matriculation, Bradley (1968) attempted to test the "intuitive notion" of differential treatment due to ordinal position in the family. Bradley (1968) states that first borns attempted college in greater numbers than could be theoretically expected. He further concludes that it appears that first borns respond to school situations with greater facility than do later borns. Altus cites an unpublished study by Nichols (1964) that would seem to support these findings. Nichols (1964) suggests that there appears to be levels of scholastic aptitude related to both birth order as well as family size.

Because birth order and family size have been confounded in studies in this area, Record, McKeown, and Edwards (1969) attempted to assess the effects of birth order on intelligence of children
within the same sibships. It was found that the association of intelligence to sibship size was largely a function of between family differences rather than within family differences. This finding would appear to reflect possible environmental experiences of the siblings.

Birth order and family size in relation to intelligence was studied on a population of 400,000 19 year-old men in the Netherlands (Belmont and Marolla, 1973). Using a complete population born in close conjunction, the authors hoped to avoid using families that are not yet complete and the problem of bias potentially due to changing fertility patterns. Using the Raven Progressive Matrices it was found that birth order and family size had independent effects on intelligence. Both were inversely related to intelligence as measured by the Raven Progressive Matrices.

In a more recent study by Breland (1974) birth order and family configuration was related to verbal achievement. Breland (1974) examined the entire population of National Merit Scholarship participants for 1962 and 1965 (n = 800,000). It was found when mother's age and socio-economic background was held constant, that first borns from smaller families tended to score higher than later borns from larger families. The more verbal the subtest the greater the difference was found to be. It was also found that none of the differences of sibling spacing effects were significant for 2 and 3 child families. However, there is very little direct empirical
information concerning age-spanning. Larger families were not included in this category. Breland (1974) speculates that socio-psychological theories "would seem to offer the most promise" (p. 1015).

While these studies seem to support that birth order (ordinal position) and family size are related to measures of intelligence and achievement the possible explanations are quite unclear. Kammeyer (1967) states that "Birth order (or ordinal position) in the nuclear family, when it is used as a research variable, is only an indicator of some other phenomenon" (p. 72). It would then appear that at least part of the recent popularity in using birth order data is due to its accessibility. It then becomes necessary for the researcher to provide an inferential or interpretive link between the independent measures of birth order, etc. and the outcome measure of intelligence and achievement tests. At the present time it appears from a review of relevant literature that such interpretive links are largely unattended to (Zajonc, 1976).

Not only are the interpretation of such data in confusion, but Schooler (1972, 1973) questions the findings of the above-reported studies. He asserts:

The general conclusion is that for people living in the United States in the middle 1960s there is almost no evidence of any birth order effects among men, and that these effects are only marginal when restrictions on time, place, and sex are examined in these ways... This conclusion is based on data from both psychiatric and normal populations examined by comparing (a) the prevalence of particular ranks in relevant populations, (b) the
characteristics of individuals of different birth ranks, (c) the parents reports of treatment of children of different ranks (Schooler, 1972, p. 171).

Although there is a relatively large body of literature one can find very few replicable studies. Schooler (1973) goes on to state that birth order analyses are a potentially highly complex phenomena resulting in an overall lack of consistent findings. Other questions are raised as to studies concerned with family configuration and intelligence: "Are the positive findings worth the expenditure in terms of their potential impact? Are the relationships of family configuration factors to achievement test scores persistent in adulthood?"

The lack of data in this rather complex area remains confusing and inconsistent. However, the influence of family configuration variables relation to other contexts potentially related to achievement test scores has yet to be examined.

Summary

The concern that has surrounded the recently documented decline in standardized achievement test scores appears to be quite widespread. The first part of this review was devoted to providing documentation of the recent decline in test scores. While educators and distinguished commissions (see Edson, 1976; IDEA, 1976) have speculated as to some possible sources of the decline, much of the current consideration in this area comes from opinions and diffused and unsystematic data (Harnischfeger and Wiley, 1975).
A number of potential sources of variability were explored in this review. Among them were (a) the nature of the tests themselves, (b) composition of the test-taking population, and (c) the instructional validity of college entrance examinations. Changes in the above areas do not seem to qualify as possible explanatory influences on the decline in test scores.

The search then is shifted to "contextual effects" rather than "causes." While it is readily acknowledged that any complex phenomenon such as achievement test scores will have potentially many "causes" in terms of affecting future educational policy it would appear that an assessment of "contextual effects" would be of greatest relevance.

Three distinct "contexts" were explored in connection with achievement and achievement test scores. They were (a) school-related factors, (b) student-related factors, and (c) family structure factors. In turn, pertinent factors in each context were discussed. These "contexts" are related to achievement test scores in a proximal-distal fashion and are thusly amenable to educational intervention in much the same manner (this point is discussed in greater detail in Discussion). In summary then it was the intention of the reviewer to explore relevant "contextual effects" and as a result attempt to integrate much of the diffuse and sometimes divergent opinion and data in this area.
CHAPTER III

Methodology

Following an assessment of the overall nature of the research problem, the proposed purpose and objectives of the study, it then became necessary to implement a strategy to attempt to answer relevant research questions that have been raised in this area and lie within the scope of this study. First of all the sample was chosen. Following this a rationale is given for the chosen research design that attempts to address itself to the problem as outlined in the Problem Statement. Next follows a discussion and presentation of the measures employed in this study in order to collect the relevant research data. The procedure by which the study was conducted is discussed followed by the means by which the data was prepared and analyzed in order to facilitate efficient interpretation.

Sample and Population

The accessible population is the beginning freshmen at Utah State University who: (a) have been graduated from one of the major feeder high schools to Utah State University, (b) are between the ages of 17-21 years of age, and (c) have taken the ACT test within three months of enrolling in college for the first time. This accessible population includes all those freshmen at Utah State with the above qualifications for the fall quarter of 1976.
The target population are those students throughout the United States that meet the above requirements and are beginning college students using the American College Testing Program (ACT).

High schools for this study included Skyview High School, Smithfield, Utah; Logan High School, Logan, Utah; Box Elder High School, Brigham City, Utah; Bountiful High School, Bountiful, Utah; Viewmont High School, Bountiful, Utah; and Bear River High School in Garland, Utah. These were the six major feeder high schools to Utah State University in terms of new freshmen students entering the university for the academic year beginning the fall of 1976 (this information was made available by the Testing Office, Utah State University).

There was a total of 276 subjects on which data was available for this study. However, total data was not available for each subject. There was a full compliment of data (N of case = 276) available for the school-related variables (A. 1, school size; A. 2, average academic classroom size; and A. 3, quantity of schooling) as well as the dependent variable, composite ACT scores (referred to as variable D. 1). Family structure characteristics, variables C. 1 (birth order), C. 2 (closeness in the age of the student's siblings) and variable C. 3 (number of siblings in the family) had available 275, 276, and 274 cases respectively. Student-specific variables B. 1 (hours per week spent viewing regular television programming), B. 2 (absenteeism from scheduled academic time), B. 3 (level of educational aspiration) and B. 4 (number of
traditional academic courses elected during high school) had available an N of cases of 275, 257, 247, and 239 respectively.

A large sample of over 200 students was desirable in as much as this will help insure that certain uncontrolled factors such as social class, intelligence, sex, and GPA's will be operating in a random fashion throughout the sample and will thereby assert no systematic influence on the final results.

Research Design

This study is considered to be a relationship study designed with the intent of identifying variables that have been selected in terms of relevant sets or "contexts" and then tested for their significance of contribution to the dependent variable, composite ACT scores of beginning freshmen at Utah State University for the academic year commencing fall, 1976. This study is therefore considered to be an "explanatory" study. As mentioned earlier the variables have been ordered as to contextually relevant sets, i.e., Set A variables include school-related factors, Set B includes student-specific factors of experiences both in-and-out-of-school, and Set C are made up of family structure factors.

The method of multiple regression analysis has been selected in order to permit the investigator to study in a systematic manner the relationship between the dependent variable, composite ACT scores, and a relatively large number of possibly associated independent variables grouped as to sets. However, it must be at the same time
acknowledged that the inclusion of a large number of variables reduces statistical power thereby rendering any possible conclusions less efficient and perhaps obscuring those factors that have the greatest magnitude of relationship to the dependent variable. Each added variable results in the ensuing loss of one degree of freedom from the multiple regression analysis employed. To circumvent this apparent problem, it is then proposed that three sets of independent variables be used. This would allow for three separate multiple regression analyses to be used thus preserving the power of the analysis by limiting the number of variables in each set. Moreover, it would allow the inclusion of more distal factors such as family structure factors. Each set can then be combined in an additive fashion to determine if these more distal factors are related to or increase the amount of variance explained on the dependent variable to any significant extent.

Multiple regression analysis was chosen as the statistical method of choice as the "complex" phenomenon as scores on college entrance examinations appear to have several sources of variation. While multiple regression analysis appears to be well suited to predictive analysis it is even more fundamentally suited to explanatory analysis. While prediction can be seen as a special case of explanation, in research concerning complex phenomena with multiple sources of variation it is not enough.
Measures

The dependent variable is composite scores on the ACT test battery obtained during the Ss' senior year in high school. The American College Testing Program has been developed for use in the admission, placement, and counseling of students. It is the second most widely used college admissions test in the United States. It consists of four separate subtests, English, Mathematics, Natural Sciences, and Social Studies. The odd-even reliability coefficients obtained from a sample of over 900 students was .90 (English), .89 (Mathematics), .83 (Natural Sciences) and .86 (Social Studies).

While four separate subtest reliability scores are reported, an overall reliability score is reported as well. The reliability of the composite score was reported to be .95 (Buros, 1965). While it is acknowledged that by using a composite score the relationship of the subtests will be obscured, an overall score is desirable as it is a more generally employed criteria for admission decisions on high school seniors applying to college. Moreover, an overall, composite score on the ACT can be more readily compared to overall scores on other college entrance examinations.

The American College Testing Program is unique in that it provides extensive research services for its individual member institutions. The ACT program offers class profiles including correlational data relating ACT subtest and composite scores with separate high school GPA's in the four subtest areas as well as an overall GPA. In addition, frequency tables are included showing
the percents of students who are expected to earn particular college GPA's.

In summary, the American College Testing Program offers a secure testing service which incorporates well-conceived and well-designed tests. The ACT program also offers an extensive research service which is highly valuable for its member institutions (Maxey, 1975).

The independent variables were collected directly from the individual high school transcript of the students and from the use of a student self-report questionnaire (see Appendix A). Set A variables concerning the size of the school, average academic class size, and quantity of schooling was collected using a cover letter and questionnaire distributed by mail to the presiding principal of each school involved in the study. The cover letter emphasized the importance of the requested information to the delivery of college admission services and was signed by the Vice President for Student Services (see Appendix C). Follow-ups were to include a second letter and lastly telephone contact but proved to be unnecessary.

Variable B. 1 and B. 2 (television viewing and absenteeism) were reported on the student self-report questionnaire. Variable B. 3 (level of educational aspiration) was collected from the official ACT transcript on file at the Counseling and Testing Center, Utah State University. Variable B. 4 (academic course taking) was collected directly from student high school transcripts by the researcher at the various high schools employed in the study.

The dependent variable D. 1, composite ACT scores was collected
from the official ACT transcript on file at the Counseling and Testing Center. To obtain the necessary data for Set C variables, C. 1, C. 2, and C. 3 (family structure factors, birth order, age-spanning and number of siblings respectively) were also collected from the student self-report questionnaire mentioned above.

The student self-report questionnaire was made up of multiple choice responses. For example, the question concerning birth order in the family read: What is the order of your birth in your family (among your brothers and sisters)? Circle One. 1st 2nd 3rd 4th 5th 6th Other (specify) ______. Prior to administering the questionnaire to the students comprising the sample population the questionnaire was administered to students similar in age and education to the sample population. Any questions or potential responses that may have proven misleading or ambiguous were determined and appropriately changed.

There is some question concerning the accuracy of self-report measures. Maxey and Ormsby (1971) used a sample of 5,775 students from 134 different high schools. All subjects included in the sample had taken the full ACT battery of tests. It was found that the correlation between self-reported and actual grades ranged from .81 to .86. This finding held across ability, sex, class rank, parents' level of income, S's level of educational aspiration, and class size. In this study students also tended to report non-academic information with comparable accuracy.
Procedures

In order to collect data concerning the size of the secondary school attended, average number of students enrolled in high school classrooms, and the quantity of schooling received by the student at that particular high school (length of school year minus any instructional losses due to teacher strikes, parental boycotts, etc.) a letter was sent to the presiding principal of each Utah "major feeder" high school used in the study (see Measures section for the names and locations of those particular high schools used in the study). These high schools were chosen as they represented the "major feeder" high schools to Utah State University for the fall quarter of 1975 (ACT Class Profile Report: Enrolled 1975-76 Freshmen).

Set B variables are student-specific variables. Variable B.1 (number of hours spent viewing regular television programming per week), variable B.2 (absenteeism from scheduled academic time during the senior year in high school) and variable B.3 (level of educational aspiration) were all collected from the student self-report questionnaire (see Appendix A).

Set C variables, family structure factors, were also collected through the employment of the student self-report questionnaire. Variables C.1, C.2, and C.3 were concerned with the birth order, closeness in the age of siblings, and the number of siblings in the immediate family respectively.

The student self-report questionnaire was administered by two means. First, during the fall registration for all beginning
freshmen (September 19, 1976) a table was set up in the Nelson Fieldhouse. This was done with the authorization of the Office of Admissions and Records. At that time students having attended one of the six "major feeder" high schools to Utah State University were requested to fill out the questionnaire. Attached to the questionnaire was a request for release of educational information form (see Appendix E) that requested permission for the investigator to have access to the official high school transcripts of the student. It was stated that the information was needed for research purposes only. Following this data collection procedure carried out during registration, a general mailing was sent out requesting beginning freshmen to fill out the questionnaire and return it in the self-addressed envelope. The mailing included a letter stating the nature and importance of the research being conducted and was signed by the Vice President of Student Services (see Appendix B).

The dependent variable, composite ACT scores and coded as variable D. 1, and the level of educational aspiration, variable B. 3, was collected from the ACT files of official ACT transcripts which are kept on microfiche records at the Counseling and Testing Center, Utah State University.

Following collection of the above-mentioned data the investigator visited the six "major feeder" high schools mentioned earlier. Prior to the visitations the area superintendents of the three respective school districts were contacted by telephone. At this time the superintendents involved were informed about the need for
certain pertinent data and their consent to have access to the relevant educational data and official transcripts was granted where students had signed appropriate release of information forms. Upon visiting each high school employed in the study, the investigator submitted a letter of introduction to the respective school principals. This letter of introduction was from Dr. Keith T. Checketts, Committee Chairman and Director of Testing, Counseling and Testing Center, Utah State University. At the time of collecting pertinent information from student educational transcripts release of information forms were left with appropriate school personnel. Variable B. 4, number of traditional academic courses taken during high school, was collected at this time.

The data for each student in the sample was then compiled and keypunched on computer data cards and arranged with the appropriate data control cards corresponding with the SPSS multiple regression subprogram.

Analysis

As previously mentioned independent variables were organized in sets of: (a) school-related variables, (b) student-related variables, and (c) family structure variables. In order to determine the extent to which variables in all three sets help to explain the variance on D. 1, the independent variable (composite ACT scores) a stepwise multiple regression analysis was performed using all ten independent variables. In order to determine the extent to which each set of
variables is associated with the dependent variable, three separate multiple regression analyses were done; one MR for Set A variables, i.e., those variables included under school-related variables, a second MR for Set B variables, i.e., those variables including student-specific variables, and a third MR for those variables contained under Set C, family structure variables (see Purpose and Objectives section for the explicit variables). Should any separate set of variables account for a significant amount of the variance on the dependent variable then single independent variables can be tested for significance of contribution to that set. This allowed the researcher to test for the hypotheses concerning single independent variables contained in each set.

In order to perform the complex computations necessary for multiple regression analysis, the Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, and Bent, 1975) computer program was used. The SPSS multiple regression subprogram was employed. The input to the regression subprogram was in the form of raw data cases. Options available from the SPSS multiple regression subprogram and used for this study were Option 1, the inclusion of missing data and Option 3, suppression of variable labels, and Option 15, output of means and standard deviations. Statistics available and employed in this study were Statistic 1, printout of the correlation matrix and Statistic 2, means, standard deviations, and number of valid cases.
Hypotheses

In order to attempt to answer pertinent research questions previously stated (see Chapter One, Purpose and Objectives), null hypotheses were constructed in order to allow for statistical testing.

**Question.** What is the relationship of school-related variables to composite ACT scores?

**Hypothesis 1.** Set A variables, school-related variables, are not related to composite ACT scores.

**Hypothesis 2.** The size of the secondary school, i.e., the total number of students enrolled in that school, is not related to composite ACT scores.

**Hypothesis 3.** The average number of students in high school academic classrooms is not related to composite ACT scores.

**Hypothesis 4.** The quantity of schooling, i.e., length of school year minus any instructional losses due to teacher strikes, parental boycotts, etc. is not related to composite ACT scores.

**Question.** What is the relationship of student-related variables to composite ACT scores?

**Hypothesis 5.** Set B variables, student-related variables are not related to composite ACT scores.

**Hypothesis 6.** The number of hours spent watching regular television programming as high school seniors as reported by students is not related to composite ACT scores.

**Hypothesis 7.** Students' absenteeism from scheduled academic time as reported by the students is not related to composite ACT scores.
Hypothesis 8. Student level of educational aspiration as reported by reports of the highest level of education expected to be completed by the student is not related to composite ACT scores.

Hypothesis 9. The number of traditional academic courses taken by the student is not related to composite ACT scores.

Question. Are family structure factors related to composite ACT scores?

Hypothesis 10. Set C variables, family-structure factors are not related to composite ACT scores.

Hypothesis 11. Closeness in the age of siblings in the family is not related to composite ACT scores.

Hypothesis 12. Birth order of the student is not related to composite ACT scores.

Hypothesis 13. Number of siblings in the family is not related to composite ACT scores.

Question. In terms of predicting composite ACT scores which independent variables explain the most variance on the dependent variable?
CHAPTER IV

Results

The preceding chapter discussed the basic methodology of the study which included a description of the sample employed, research design of the study, measures utilized as well as the procedures of the study and the analysis of the data collected. In addition the hypotheses were stated in null form. In this Chapter the results are presented in an attempt to answer the questions as presented in Chapter One.

First the means and standard deviations and number of cases for each of the ten independent variables are presented in tabular form. This is followed by the presentation again in tabular form of the intercorrelations of the nine independent variables that were computed. Next, the individual variables entering the stepwise regression equation are discussed in terms of the variance explained on the dependent variable, composite ACT scores. This is accomplished in respect to the step on which each independent variable enters the regression equation. Following this, the significance of the contribution of each set or "context" of independent variables is reviewed in terms of their respective explanatory influence on composite ACT scores. This is done in regards to the hierarchical multiple regression analysis performed on each of the three sets of contextual variables.
Means, Standard Deviations and Number of Cases. The means, standard deviations, and number of cases for each independent variable was computed and is summarized in Table 1 and is presented below.

Table 1

Means, Standard Deviations, and Number of Cases
for each Independent Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 1, School Size</td>
<td>1439.42</td>
<td>464.58</td>
<td>276</td>
</tr>
<tr>
<td>A. 2, Class Size</td>
<td>27.29</td>
<td>2.71</td>
<td>276</td>
</tr>
<tr>
<td>A. 3, Length of School Year</td>
<td>180.00</td>
<td>0.00*</td>
<td>276</td>
</tr>
<tr>
<td>B. 1, Television Viewing</td>
<td>8.78</td>
<td>8.64</td>
<td>272</td>
</tr>
<tr>
<td>B. 2, Student Absenteeism</td>
<td>11.24</td>
<td>9.45</td>
<td>257</td>
</tr>
<tr>
<td>B. 3, Educational Aspiration</td>
<td>4.24</td>
<td>1.40</td>
<td>240</td>
</tr>
<tr>
<td>B. 4, Academic Course Taking</td>
<td>10.11</td>
<td>3.11</td>
<td>249</td>
</tr>
<tr>
<td>C. 1, Birth Order</td>
<td>3.00</td>
<td>1.83</td>
<td>275</td>
</tr>
<tr>
<td>C. 2, Age-Spanning</td>
<td>2.79</td>
<td>1.52</td>
<td>276</td>
</tr>
<tr>
<td>C. 3, Number of Siblings</td>
<td>4.87</td>
<td>1.88</td>
<td>274</td>
</tr>
<tr>
<td>D. 1, Composite ACT Score</td>
<td>19.33</td>
<td>5.62</td>
<td>276</td>
</tr>
</tbody>
</table>

*There was no variation as quantity of schooling (A. 3) did not vary among the 6 Utah high schools employed in the study.
Intercorrelations. Next the correlation coefficients were computed. These correlation coefficients are among and between the independent variables and with the dependent variable. The intercorrelations are summarized in Table 2.

Table 2
Correlations Among the Independent Variables
and Between the Independent Variables and the Dependent Variable

<table>
<thead>
<tr>
<th>Variables (see Table 1 for variable labels)</th>
<th>A. 1</th>
<th>A. 2</th>
<th>A. 3</th>
<th>B. 1</th>
<th>B. 2</th>
<th>B. 3</th>
<th>B. 4</th>
<th>C. 1</th>
<th>C. 2</th>
<th>C. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. 2</td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. 3</td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. 1</td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>C. 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
</tr>
<tr>
<td>D. 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Stepwise Regression Analysis. A stepwise multiple regression analysis was performed on all variables. The variable entering the regression on Step 1 was variable B. 4, number of traditional academic courses taken by the student during high school. A correlation of .50 was obtained for the regression of variable B. 4 (traditional course taking) on the dependent variable, composite ACT scores (variable D. 1). Relevant statistics for Step 1 of the stepwise regression analysis is presented below.

### Table 3
Selected Statistics for Stepwise Multiple Regression: Step 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>BETA</th>
<th>Standard Error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. 4 (Academic Course Taking)</td>
<td>.91</td>
<td>.50</td>
<td>.11</td>
<td>71.43</td>
</tr>
<tr>
<td>Constant</td>
<td>10.16</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The relationship between number of academic courses taken by the student and composite ACT scores is in a positive direction.
Twenty-five percent of the total variance on composite ACT scores is explained by the linear regression on the dependent variable by variable B. 4 (academic course taking). With degrees of freedom of 1 and 212 the linear regression of variable B. 4 on D. 1 is significant at the .01 level.

The variable to enter the overall regression equation on Step 2 of the stepwise regression analysis was variable B. 3 (the educational aspiration of the student as measured by the expected number of years of higher education). A bivariate regression coefficient of .39 was obtained for variable B. 3 (educational aspiration) and the composite ACT scores. When the effects of variable B. 4 (traditional course taking) are held constant a standardized regression coefficient of .32 was obtained for the linear regression of variable B. 3 (educational aspiration) on the dependent variable.

There is an intercorrelation between variable B. 3, expected level of educational aspiration and variable B. 4, traditional academic course taking of .15. While this is in a positive direction, it would appear that at least to a modest extent those students who choose traditional academic courses would also tend to have a higher expected level of educational aspiration. However, as only 2% of the variance is explained in regards to the effects of variable B. 3 on variable B. 4 any interpretation of this intercorrelation should be made with caution. The summary of pertinent statistics for Step 2 of the stepwise regression analysis is summarized in Table 4.
### Table 4

**Selected Statistics for Stepwise Multiple Regression: Step 2**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>BETA</th>
<th>Standard Error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Course Taking</td>
<td>.82</td>
<td>.45</td>
<td>.10</td>
<td>65.57</td>
</tr>
<tr>
<td>Educational Aspiration</td>
<td>1.27</td>
<td>.32</td>
<td>.22</td>
<td>32.17</td>
</tr>
<tr>
<td>Constant</td>
<td>5.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The relationship between variable B. 3 (educational aspiration) and the dependent variable, D. 1 (composite ACT scores) is in a positive direction and the partial regression coefficient obtained was .32 when controlled for the influence of confounding effects on D. 1 (composite ACT scores). This means that variable B. 3 accounts of 13% of the total variance on composite ACT scores. With 2 and 211 degrees of freedom the linear regression of variable B. 3 (educational aspiration) on the dependent variable is significant at the .01 level.
The multiple correlation (R) of .59 was obtained for the combined effects of variable B. 4 (traditional course taking) and variable B. 3 (educational aspiration) on the dependent variable. This in turn yielded a coefficient of multiple determination of .35 which explains 35% of the variance on composite ACT scores. With 2 and 211 degrees of freedom an R of .59 is significant beyond the .01 level.

On Step 3 of the stepwise multiple regression analysis variable A. 1, size of school, entered the regression equation. Variable A. 1 has a simple correlation coefficient of -.21 with the dependent variable, composite ACT scores. Variable A. 1 (size of school) explains 4% of the total variance on composite ACT scores. When the influence of the independent variables are held constant a standardized partial regression coefficient of -.15 was obtained. With degrees of freedom of 3 and 210 the obtained F ratio of 7.78 is significant at the .01 level. As hypothesized variable A. 1, size of school attended, is related in a significant fashion to composite ACT scores. The obtained association is a negative relationship. The addition of variable A. 1 to the regression equation produces a $R^2$ change of .02 thus producing an overall coefficient of multiple correlation of .61 yielding an F ratio of 34.99. This F ratio (34.99) with degrees of freedom of 3 and 210 is significant at the .01 level. The pertinent statistical data for Step 3 of the regression analysis thus far is summarized in Table 5.
Variable A. 2, average academic class size, entered the regression equation on Step 4 of the regression analysis. The simple correlation coefficient of variable A. 2 with the dependent variable was .03. When variables B. 4 (traditional course taking), B. 3 (educational aspiration), and A. 1 (class size) are held constant variable A. 2 yields a standardized regression of coefficient of .20. An F ratio of 9.39 was obtained for the standardized regression coefficient and with degrees of freedom of 4 and 209 is significant at the .01 level. The multiple correlation coefficient becomes .63 with a multiple coefficient of determination of .40. Therefore it can be stated

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>BETA</th>
<th>Standard Error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Course Taking</td>
<td>.77</td>
<td>.44</td>
<td>.10</td>
<td>61.22</td>
</tr>
<tr>
<td>Educational Aspiration</td>
<td>1.28</td>
<td>.32</td>
<td>.22</td>
<td>33.36</td>
</tr>
<tr>
<td>Size of School</td>
<td>-.001</td>
<td>-.15</td>
<td>.001</td>
<td>7.78</td>
</tr>
<tr>
<td>Constant</td>
<td>8.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
that the effects of variables B. 4, B. 3, A. 1, and A. 2 help in an additive fashion to explain 40\% of the total variance on composite ACT scores. This is an $R^2$ change of .03.

Table 6

Selected Statistics for Stepwise Multiple Regression: Step 4

<table>
<thead>
<tr>
<th>Multiple R</th>
<th>.63</th>
<th>Analysis of Variance</th>
<th>DF</th>
<th>SS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>R Square</td>
<td>.40</td>
<td>Regression</td>
<td>4</td>
<td>2695.55</td>
<td>34.99</td>
</tr>
<tr>
<td>Stand. Error</td>
<td>4.38</td>
<td>Residual</td>
<td>209</td>
<td>4025.44</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>BETA</th>
<th>Standard Error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Course Taking</td>
<td>.78</td>
<td>.43</td>
<td>.10</td>
<td>63.22</td>
</tr>
<tr>
<td>Educational Aspiration</td>
<td>1.25</td>
<td>.31</td>
<td>.21</td>
<td>33.25</td>
</tr>
<tr>
<td>Size of School</td>
<td>-.003</td>
<td>-.27</td>
<td>.0008</td>
<td>16.77</td>
</tr>
<tr>
<td>Class Size</td>
<td>.41</td>
<td>.20</td>
<td>.14</td>
<td>9.39</td>
</tr>
<tr>
<td>Constant</td>
<td>-.59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On Step 5 of the regression analysis variable C. 3, number of siblings in the family, entered the equation. Variable C. 3 had a simple correlation coefficient of .08 and thusly explains only .6 percent of the variance on the dependent variable. The standardized
regression coefficient of C. 3 (number of siblings) was .16 and increased the coefficient of multiple determination from .40 to .41. This represented an increase in the explanation of the total variance on the dependent variable of 1%. The multiple correlation for effects of variables B. 4 (traditional course taking), B. 3 (educational aspiration), A. 1 (size of school), A. 2 (class size), and C. 3 (number of siblings) is .64. The summary of the stepwise regression analysis through Step 5 is presented in Table 7.

Table 7
Selected Statistics for Stepwise Multiple Regression: Step 5

<table>
<thead>
<tr>
<th>Multiple R</th>
<th>Analysis of Variance</th>
<th>DF</th>
<th>SS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>.64</td>
<td>Regression</td>
<td>5</td>
<td>2779.63</td>
<td>29.34</td>
</tr>
<tr>
<td>R Square</td>
<td></td>
<td></td>
<td>208</td>
<td>3941.36</td>
</tr>
<tr>
<td>.41</td>
<td>Residual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stand.Error</td>
<td></td>
<td>4.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>BETA</th>
<th>Standard Error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Course Taking</td>
<td>.78</td>
<td>.41</td>
<td>.09</td>
<td>63.81</td>
</tr>
<tr>
<td>Educational Aspirations</td>
<td>1.25</td>
<td>.31</td>
<td>.21</td>
<td>33.71</td>
</tr>
<tr>
<td>School Size</td>
<td>-.003</td>
<td>-.28</td>
<td>.001</td>
<td>19.03</td>
</tr>
<tr>
<td>Class Size</td>
<td>.46</td>
<td>.22</td>
<td>.14</td>
<td>11.44</td>
</tr>
<tr>
<td>Number of Siblings</td>
<td>.33</td>
<td>.11</td>
<td>.16</td>
<td>4.44</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The final three variables to enter the regression equation were variables, C. 1, birth order of the student, B. 2, student absenteeism, and C. 2, age-spanning of the siblings. The simple correlation coefficients were -.05, -.06, and -.03 respectively. When the influences of the other correlated independent variables were held constant the respective standardized regression coefficients were -.08, -.01, and -.01. The increase to the explained variance on the dependent variable, composite ACT scores is relatively small. For example, for variable C. 1 (birth order) it is .0046; for variable B. 2 (absenteeism) it was found to be .0003; for variable C. 2 (age-spanning) the increase to the explained variance of composite ACT scores was found to be .00004. Variables reaching significance at the .01 level are B. 4, academic course taking, B. 3, level of educational aspiration, and A. 1, school size, A. 2, class size. Reaching the .05 level of significance is variable C. 3, number of siblings in the immediate family.

After steps 6, 7, 8 were completed of the stepwise multiple regression equation there was an obtained multiple R of .65. This, in turn, yielded a multiple coefficient of determination of .42. Thus, with all eight steps of the regression equation now completed 42% of the variance on the dependent variable, i.e., composite ACT scores can be explained by the variables having entered the regression equation up to this point. With an F of 18.44 and 8 and 205 degrees of freedom R of .65 is significant at the .01 level. The summary for all eight steps of the stepwise regression is summarized in Table 8.
Table 8
Selected Statistics for Stepwise Multiple Regression: Steps 6, 7, 8

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>BETA</th>
<th>Standard Error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Course</td>
<td>.76</td>
<td>.42</td>
<td>.10</td>
<td>58.43*</td>
</tr>
<tr>
<td>Taking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational</td>
<td>1.25</td>
<td>.31</td>
<td>.22</td>
<td>32.78*</td>
</tr>
<tr>
<td>Aspiration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Size</td>
<td>-.003</td>
<td>-.29</td>
<td>.001</td>
<td>19.54*</td>
</tr>
<tr>
<td>Class Size</td>
<td>.47</td>
<td>.22</td>
<td>.13</td>
<td>11.64*</td>
</tr>
<tr>
<td>Number of</td>
<td>-.29</td>
<td>.16</td>
<td>.20</td>
<td>5.61**</td>
</tr>
<tr>
<td>Siblings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Order</td>
<td>-.01</td>
<td>-.08</td>
<td>.22</td>
<td>1.58</td>
</tr>
<tr>
<td>Absenteeism</td>
<td>-.02</td>
<td>-.01</td>
<td>.03</td>
<td>.10</td>
</tr>
<tr>
<td>Age-Spanning</td>
<td>-2.65</td>
<td>-.01</td>
<td>.20</td>
<td>.01</td>
</tr>
</tbody>
</table>

*significant at .01
**significant at .05

Variable A. 3, quantity of schooling, could not be computed as there was no loss of instructional time among any of the six "major feeder" high schools to Utah State University for the academic
year 1975-76. Variable 1, time viewing regular television programming, did not enter the equation as the F level was insufficient for inclusion.

Increment to Prediction. Of further interest for presenting the explanation of independent variables on composite ACT scores is the data that is presented in Table 9. Here each variable's contribution to the variance on the dependent variable is summarized. The change in the coefficient of multiple determination allows for the interpretation of the relative contribution of each independent variable to the total amount of variance explained on the dependent variable, composite ACT scores.

Table 9
Summary of Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R^2</th>
<th>R^2 Change</th>
<th>r</th>
<th>B</th>
<th>BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Course Taking</td>
<td>.50</td>
<td>.25</td>
<td>.25</td>
<td>.50</td>
<td>.75</td>
<td>.42</td>
</tr>
<tr>
<td>Educational Aspiration</td>
<td>.59</td>
<td>.35</td>
<td>.09</td>
<td>.39</td>
<td>1.24</td>
<td>.31</td>
</tr>
<tr>
<td>School Size</td>
<td>.61</td>
<td>.37</td>
<td>.02</td>
<td>-.21</td>
<td>-.004</td>
<td>-.29</td>
</tr>
<tr>
<td>Class Size</td>
<td>.63</td>
<td>.40</td>
<td>.03</td>
<td>.02</td>
<td>.47</td>
<td>.22</td>
</tr>
<tr>
<td>Number of Siblings</td>
<td>.64</td>
<td>.41</td>
<td>.01</td>
<td>.08</td>
<td>.48</td>
<td>.16</td>
</tr>
<tr>
<td>Birth Order</td>
<td>.65</td>
<td>.42</td>
<td>.0046</td>
<td>-.05</td>
<td>-.28</td>
<td>-.08</td>
</tr>
<tr>
<td>Absenteeism</td>
<td>.65</td>
<td>.42</td>
<td>.0003</td>
<td>-.06</td>
<td>-.01</td>
<td>-.01</td>
</tr>
<tr>
<td>Age-Spanning</td>
<td>.65</td>
<td>.42</td>
<td>.0004</td>
<td>-.03</td>
<td>-.02</td>
<td>-.006</td>
</tr>
</tbody>
</table>
In order to determine if variable B. 3, educational aspiration, contributes significantly to the variance explained additively by variables B. 4, traditional course taking, and B. 3, educational aspiration, an F ratio was computed. An F ratio of 38.14 was obtained. With 1 and 237 degrees of freedom this is significant at the .01 level.

The contribution of variable A. 1, school size, was tested for statistical significance of its contribution to the regression equation. The obtained F ratio was 8.74 and with 1 and 235 degrees of freedom it is significant at the .01 level. Variable A. 2, class size, was the next variable to enter the regression equation. Its contribution to the coefficient of multiple determination \( R^2 \) on the dependent variable was .269. The obtained F ratio for this increment to prediction is 10.35 which with 1 and 234 degrees of freedom is significant at the .01 level.

Variable C. 3, number of siblings in the family, entered the regression equation on the fifth step and was tested for its potential significance of contribution to the variance accounted for on composite ACT scores. The obtained F ratio of 5.01 with 1 and 233 degrees of freedom was found to be significant at the .05 level of significance. The simple correlation is .08 for variable C. 3 and the contribution to the variance explained by this variable is less than 1%. The magnitude of the relation of variable C. 3, number of siblings, to composite ACT scores is apparently quite small.

The remaining variables in the regression equation are C. 1, birth order, B. 2, absenteeism, and C. 2, age-spanning of siblings.
Because their contribution to the coefficient of multiple determination is only .0046, .0003, and .00004 respectively their additive contribution to $R^2$ was tested in combination of all three variables. The F ratio obtained was .65 which with 3 and 231 degrees of freedom is not significant at the .05 level of significance. The summary for the contribution of single independent variables to the linear regression on composite ACT scores is presented below.

**Table 10**

<table>
<thead>
<tr>
<th>Variable</th>
<th>$R^2$</th>
<th>$R^2$ Change</th>
<th>$F$</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Aspiration</td>
<td>.35</td>
<td>.10</td>
<td>38.14</td>
<td>$p &lt; .01$</td>
</tr>
<tr>
<td>School Size</td>
<td>.37</td>
<td>.02</td>
<td>8.74</td>
<td>$p &lt; .01$</td>
</tr>
<tr>
<td>Class Size</td>
<td>.40</td>
<td>.03</td>
<td>10.35</td>
<td>$p &lt; .01$</td>
</tr>
<tr>
<td>Number of Siblings</td>
<td>.41</td>
<td>.01</td>
<td>5.01</td>
<td>$p &lt; .05$</td>
</tr>
<tr>
<td>Birth Order, Absenteeism Age</td>
<td>.42</td>
<td>.0049</td>
<td>.65</td>
<td>$p &lt; .05$</td>
</tr>
<tr>
<td>Spanning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Contribution of sets.** As stated previously it is of further interest and importance to ascertain the contribution of each set or "context" of variables to explaining the dependent variable, composite ACT scores. In order to accomplish this three separate
hierarchical multiple regression analyses (MR) were performed; one MR for Set A, school-related factors, a second MR for Set B, student-related variables, and lastly a third MR for Set C, family-related factors.

For Set A, school-related factors, variable A. 3, quantity of schooling, could not be computed as there was no loss of instructional time in the high schools used in this study. Variable A. 3 was concerned with the quantity of schooling received by the student. The multiple correlation coefficient for variables A. 1, school size, and A. 2, class size, combined was .28. These two school-related variables when considered additively explained 8 percent of the total variance on composite ACT scores. With 2 and 273 degrees of freedom the multiple correlation coefficient was significant at the .01 level of significance (F = 11.58). The summary for the MR of school-related variables on composite ACT scores is presented below in Table 11.

Table 11
School-related Variables for Bivariate Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>$R^2$</th>
<th>$R^2_{\text{Change}}$</th>
<th>r</th>
<th>B</th>
<th>BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Size</td>
<td>.21</td>
<td>.04</td>
<td>.04</td>
<td>-.21</td>
<td>.004</td>
<td>-.34</td>
</tr>
<tr>
<td>Class Size</td>
<td>.28</td>
<td>.08</td>
<td>.04</td>
<td>.03</td>
<td>.47</td>
<td>.23</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12.56</td>
<td></td>
</tr>
</tbody>
</table>
Set B, student-specific factors, apparently accounted for the greatest amount of variance on the dependent variable. However, variables B. 1, television viewing, and B. 2, absenteeism, had no relationship to composite ACT scores. The F ratios for both variables were not significant at the .05 level of significance. Both variable B. 3, educational aspiration level, and B. 4, course taking, were highly significant yielding a multiple correlation coefficient of .62 and a coefficient of multiple determination of .38 thus variables B. 3, educational aspiration, and B. 4, academic course taking, explain 38% of the total variance of composite ACT scores. The F ratio for the multiple correlation of .62 was 31.99 and is significant at the .01 level of significance. The summary for the information of the hierarchical regression of Set B variables is presented below in Table 12.

Table 12

Student-related Variables for Hierarchical Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>$R^2$</th>
<th>$R^2$ Change</th>
<th>$r$</th>
<th>B</th>
<th>BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television Viewing</td>
<td>.11</td>
<td>.01</td>
<td>.01</td>
<td>-.11</td>
<td>-.005</td>
<td>-.008</td>
</tr>
<tr>
<td>Absenteeism</td>
<td>.11</td>
<td>.01</td>
<td>.002</td>
<td>-.05</td>
<td>-.0002</td>
<td>-.00003</td>
</tr>
<tr>
<td>Educational Aspiration</td>
<td>.41</td>
<td>.17</td>
<td>.16</td>
<td>.41</td>
<td>1.27</td>
<td>.34</td>
</tr>
<tr>
<td>Academic Course Taking</td>
<td>.62</td>
<td>.38</td>
<td>.21</td>
<td>.52</td>
<td>.77</td>
<td>.47</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.21</td>
<td></td>
</tr>
</tbody>
</table>
Set C variables, family-related factors, yielded a multiple correlation of .16 and a coefficient of multiple determination of .02 thus helping to explain only 2% of the total variance on the dependent variable, composite ACT scores. With 3 and 270 degrees of freedom an F ratio of 2.23 was obtained for the hierarchical MR of family factors on composite ACT scores. This is not significant at the .05 level of significance and the null hypothesis must be accepted. Since any correlation at all might be due to sampling fluctuation when not reaching significance, no further analysis of independent variables in this set is warranted by the results as presented here. A summary of Set C results are presented in Table 13.

Table 13
Family-structure Variables for Hierarchical Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R^2</th>
<th>R^2 Change</th>
<th>r</th>
<th>B</th>
<th>BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Order</td>
<td>.04</td>
<td>.002</td>
<td>.002</td>
<td>-.04</td>
<td>-.47</td>
<td>-.14</td>
</tr>
<tr>
<td>Age-Spanning</td>
<td>.06</td>
<td>.004</td>
<td>.002</td>
<td>-.04</td>
<td>-.01</td>
<td>-.01</td>
</tr>
<tr>
<td>Number of Siblings</td>
<td>.16</td>
<td>.02</td>
<td>.02</td>
<td>.10</td>
<td>.50</td>
<td>.17</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18.64</td>
</tr>
</tbody>
</table>
Summary

First a stepwise multiple regression analysis was performed. Eight independent variables were "stepped" in the equation according to relative F tolerances. The summary for all eight steps of the stepwise regression analysis is summarized in Table 8.

Next it was of interest to determine the extent of each independent variable's contribution to the variance on composite ACT scores. In order to do so the contribution of each independent variable to the multiple coefficient of determination was tested for significance. Summary of each variable's contribution is summarized in Table 9. The significance of contribution is summarized and their respective significance levels are presented in Table 10.

Finally the contribution of sets or "contexts" of variables was examined. A hierarchical multiple regression analysis was performed for each "context" of variables. Set B variables, student-related factors accounted for the greatest amount of variance on composite ACT scores (see Table 12) with variables B. 4, academic course taking and B. 3, educational aspiration, accounting for the greater part of $R^2$ for Set B. School-related variables and family-structure variables yielded as sets multiple coefficients of determination of .08 and .02 respectively (see Table 11 and 13).
CHAPTER V

Discussion

Purpose and objectives. There has been considerable interest in factors associated with achievement scores. The Review of Literature has already addressed the documentation of college achievement test score declines in recent years. This has become a concern for both educators and researchers alike (Harnischfeger and Wiley, 1975). In order to attempt to answer some of the questions concerning relevant factors associated with standardized test scores, this study was undertaken.

It has already been discussed that there have been a variety of attempts to describe the relationship of selected variables to achievement and achievement test scores. However, there is no systematic data available that has assessed "contextual effects" and their relevance to achievement test scores. It would seem that there are three basic contexts of factors that appear to be related to achievement test scores in a proximal to distal manner. That is, "contexts" were established in accordance with their proximity to the dependent variable, composite ACT scores. These "sets" or "contexts" of variables are (a) school-related factors, (b) student-related factors, and (c) family-related factors (see Methodology for specific variables).

The objectives of the study concern primary questions that have been raised in regard to the relationship of variables contained in each "context" to composite ACT scores. To begin with the question
was asked, "To what extent is each variable between all three sets associated with composite ACT scores?" Next it was of interest and primary concern to the study to attempt to answer, "How much comparative variance does each 'context' of variables account for on the dependent variable?" In turn once knowing this it became possible to ask the question, "Does any particular 'context' or combination of more than one context explain significantly more variance than other contexts of variables?"

It should also be mentioned that no attempt was made to assign "causes" to composite ACT scores. Rather, it was the concern of the researcher to attempt to explain possible sources of variance in terms of both single independent variables and relevant "contexts" of variables on composite ACT scores. It was considered that as a phenomenon such as standardized achievement test scores has many naturally occurring sources of variance. Therefore it became of primary interest to attempt to explain the variability of composite ACT scores. In order to do so multiple regression analysis was chosen as the statistical method of choice (see Analysis).

**Evaluation of findings.** Question one asked, "In terms of predicting composite ACT scores which independent variables explain the greatest amount of variance on the dependent variable?" In order to test this question a stepwise multiple regression analysis was performed. It was found that variable B. 4, academic course taking, entered the prediction equation first thus having the greatest partial regression coefficient. It appears that the greater the
number of "regular" or traditional academic courses taken by the student the higher their composite ACT scores. In as much as students have more flexible scheduling procedures than in past years, it would seem that one possible relevant source of variation on composite ACT scores is academic course taking. It should also be mentioned that it is not particularly surprising that this variable accounted for the most variance as the ACT test is geared to tap academic information in traditional areas of knowledge.

The variable to account for the second largest magnitude of variance on composite ACT scores and thus enter the prediction equation on Step 2 was variable B. 3, the level of educational aspiration of the student. This variable can be potentially seen as a possible diffuse measure of student interest in academic cognitive pursuits. It appears from the results of this study that students who are motivated to attain educational levels beyond the scope of a four-year degree are likely to achieve higher composite scores on the ACT. It should also be mentioned that as expected the intercorrelation between academic course taking and level of educational aspiration is in a positive direction, although not of great magnitude (r = .15) It would seem likely that a student sufficiently motivated to aspire to greater number of years of academic training would at the same time select a greater number of regular academic courses. It is also of interest to note that these two variables cumulatively account for 35% of the variance on composite ACT scores.
Size of the school attended by the student was correlated with composite ACT scores in a negative fashion. This would seem to indicate that the larger the size of the school the lower the predicted ACT score. However, it should be mentioned that the range of school sizes is somewhat limited (this is discussed in more detail under limitations).

The remaining variables entering the regression equation were academic class size ($r = .02$), birth order of the student ($r = .08$), age-spanning of siblings in student's family ($r = .05$), student absenteeism ($r = -.06$) and number of siblings in the student's family ($r = -.03$). Although these variables produced an increase of explained variance on composite ACT scores of 5 percent and did meet F tolerance levels in order to be included in the prediction equation, their individual magnitude of practical significance appears minimal and thusly are discussed in terms of their relative contribution within the "contextual effects."

As mentioned previously one of the primary concerns of this study was to assess the relevance of contexts of variables. The contexts were (a) school-related variables, (b) student-related variables and (c) family-related variables.

School-related factors included (a) size of the school, (b) academic class size and (c) length of school term. Both size of school and academic class size helped to explain 8 percent of the variance on composite ACT scores. Size of school is negatively related as indicated by the negative standard regression coefficient.
Class size is positively correlated with the dependent variable but the size of the correlation coefficient is such that we can have little confidence that it is different from zero. It appears that the school-related variables measured account for a small percentage of the overall variability in composite ACT scores.

Student-related factors helped to explain 38 percent of the total variance on composite ACT scores. The combination of academic course taking and level of educational aspiration account for 37 percent of that total being both highly significant in a positive fashion. Television viewing and absenteeism from scheduled academic class time depart from zero correlation to such a small extent that we must assume them to be zero. It appears that variability in aspiration in education and selection of regular academic courses are important factors in predicting a student's composite score on the ACT.

Family structure variables included (a) birth order, (b) age-spanning and (c) number of siblings in the family. The "contextual effects" of family variables when tested in a hierarchical multiple regression was not significant. This would seem to indicate that family structure as a context is of relatively little explanatory interest in terms of composite ACT scores. Because the "context" itself is nonsignificant, independent variables contained therein will not be discussed.

Implications. The variables were ordered in sets as to their proximity to the dependent variable, composite ACT scores. If reordered as to their explanatory influence, Set B, student-related
variables become most prominent. In turn, it is academic course
taking that is most significant. However, although this is seen
largely as a student-related factor inasmuch as students have
increased course-taking options, the schools themselves play a
significant role in this factor. It may well be that both students
and schools in recent years have been de-emphasizing skills in
traditional academic areas. While some educators would use this
premise for a "back-to-basics" (Edson, 1976) movement, this does
not necessarily follow. However, if it is true that students today
are less well prepared in academic knowledge necessary to perform
well on the ACT, it may well benefit those students planning to
attend college to engage in a more academic secondary school program.
The implication for secondary schools is that they will in the future
probably be expected to provide a dual function for its students.
That is, schools will be expected to provide pragmatic career and
work related experiences as well as maintain traditional academic
courses for students preparing for college. The more immediate
implication for colleges and universities is that they may have to
provide more remedial services for students lacking in neccessary
basic academic skills and knowledge.

The other important student-related factor is the expected
level of educational aspiration as expressed by the test taking
student. This can be construed as a measure to some extent of the
student's motivation and interest in professional careers. For
example, if students view education as having less important
consequences in our society they are less likely to engage in activities that are related to success in higher education.

Lending some support to this notion is the recent Gallup poll that reports an increase in a value of education with age (Elam, 1973). Should this finding be consistent with respondents over time, it would appear that schooling is becoming perceived as less important. While just what changes may have taken place in student motivation over the last decade is unclear, it does appear that the more education the student desires (and perhaps the more certain of areas of professional study) the higher the score becomes on the composite ACT.

The school is quite often the first agent to be singled out as being responsible for student achievement. The two school-related factors tested in this study seem to have little influence on the outcome achievement measure employed. Perhaps policy action is often supported or questioned on the basis of its relationship to the potential achievement of the students involved. However, the policy-related factors used in this study, i.e., class size and school size, do not seem to influence achievement test scores to any large extent.

Family-structure factors have received considerable attention recently (see Zajonc, 1976). However, the results of this study do not support the claim that such factors as birth order, age-spanning of siblings or family size have any particular influence on achievement test scores. Moreover, even in those studies which claim to
have discovered significant relationships it remains unclear to a considerable extent just what such factors might mean. It may be as Kammeyer (1967) has earlier claimed that researchers' fascination for birth order and such family structure factors might lie largely in the accessibility of the data. Moreover, family-structure variables as measured in the study do not account for any appreciable amount of the variance. Inasmuch as this possible "contextual effect" is the least amenable to changes in educational policy, it would seem that family-structure variables are "less important" than student- and school-related variables.

Limitations. In order to assess school variables, it would have been desirable to expand the scope of the study to greater geographical area thusly investigating more schools. This would probably have increased the range of both class sizes and school sizes. For both variables the lower and upper ranges of the sample are somewhat truncated. For example, while it appears that large school size is negatively related to achievement test scores it would be interesting to include "very large" schools and "very small" schools. This would also seem to apply to academic class size. Also larger geographical range may have allowed for interpretation of variable A. 3, quantity of schooling.

Recommendations for further research. As stated above it would be of interest to make comparisons across schools and geographical locations. This would allow for greater generalization of results.
Also, it would be of interest to assess the relationship of areas of academic course taking that might pertain to subtest scores on the ACT. Inasmuch as academic-course taking appears to be the most significant factor relating to composite ACT, a breakdown in the manner might serve to illuminate the factor more explicitly. This would hopefully lead to more specific implications for educational policy making.

The question of level of educational aspiration appears to be important in terms of student academic achievement. What are students' current attitudes toward education? How are variations in such attitudes toward education related to achievement? These are questions that could possibly be addressed in future research.

Finally, it is cautioned that the dependent variable under study here is a complex variable that needs continued exploration both over time and across factors and test-taking populations. It is then recommended that future research avoid the "trap" of attempting to assign "causes" and expand instead the description of a process, i.e., achievement, and an event, achievement test-taking.

Summary. This chapter has provided the purposes and objectives, outlined the findings, described limitations and made recommendations for future research in this area. In general, support has been demonstrated for certain student-related variables, i.e., academic course taking and levels of educational aspiration. More modest
support has been gained for school-related factors. However, there is no apparent support in this study for family-related factors. Recommendations have been made for an expanded sample potentially taken over a larger geographical region.
BIBLIOGRAPHY


Angoff, W. H. Why the SAT scores are going down. English Journal, 1975, 10-11.


Babcock, B. B. Should we really wonder why SAT scores are going down. English Journal, 1975, 64(3), 10-11.

Baird, L. L. The educational goals of college-bound youths. ACT Research Reports, No. 19, Iowa City, Iowa, April 1967.


The decline in achievement. IDEA, Edison Foundation, 1976.


Husen, T. Does more time in school make a difference? Saturday Review, April 29, 1972, 32-35.


Levanto, J. High school absenteeism. NASSP Bulletin, October, 1975, 100-104.


Schooler, C. Birth-order effects: not here, not now! Psychological Bulletin, 1972, 78, 161-175.


Tolman, R. R. A look at achievement test score declines. BSCS Newsletter, Biological Sciences Curriculum Study, 1976.

Throne, J. M. Has the key to the mystery in standardized tests been discovered? Educational Technology, July 1976, 17-18.


APPENDIX A

QUESTIONNAIRE
Name_____________________________ Age____ Sex Male Female

Date of ACT testing______________ High School Attended _______

1. Please check any extracurricular activities (those noncoursework activities that are school sponsored) which you participated in during your senior year in high school.
   a. Interscholastic Sports
   b. Student Government
   c. Music/Instrumental
   d. Art
   e. Debate
   f. School Religious
   g. Music/Vocal
   h. Ski/Interest groups
      (ski club, drill team, etc.)
   i. Vocational Club (please name)
   j. School Political Organizations
   k. Drama
   l. Writing for school newspaper, yearbook, etc.
   m. Intramurals
   n. Other, specify______

2. How many hours per week were spent engaged in these extracurricular activities?
   ______hours

3. How many school days did you miss during your senior year in high school?
   ______days

4. Estimate the average number of hours of television you watched during a school week of your senior year in high school.
   ______hours

5. How many members are in your immediate family (father, mother, brothers and sisters).
   ______members

6. Circle below the order of your birth in your family (among your brothers and sisters).
   1st  2nd  3rd  4th  5th  6th  Other Specify_____

7. Are both parents currently residing in your home? Circle one.
   Yes  No

8. Please list the ages of the brothers and sisters in the family.
   (Example: 3, 5, 8, 12, 18)
APPENDIX B

STUDENT LETTER
September 1, 1976

Dear

The attached questionnaire is concerned with your experiences prior to attending Utah State University and is part of a large scale study to be carried on by the Counseling and Testing Center at Utah State University. The results of this study will help us to provide preliminary information to be used for developing better services for the new student at Utah State.

We are particularly desirous of obtaining your responses because your experience could contribute significantly toward solving some of the problems we face in this important area of education. The enclosed questionnaire has been devised in order to make it possible for us to obtain necessary data while requiring a minimum of your time. The average time required for students filling out the questionnaire is less than 10 minutes.

It will be appreciated if you will complete the questionnaire prior to September 14th and return it in the stamped self-addressed envelope enclosed. Other phases of this research cannot be carried out until we complete analysis of the questionnaire data. Thank you for your cooperation in this important endeavor.

Sincerely yours,

Claude J. Burtenshaw
Vice President of Student Affairs
January 4, 1977

Dear Sir:

Thank you for your assistance in collecting data for the research being conducted concerning the ACT scores of new freshmen at Utah State University. I am pleased to tell you that we have collected over 90% of the necessary data. This project is concerned with enabling educators to determine some of the possible areas of contribution to ACT scores of students and the results should help us provide more efficient placement and remedial services of new students.

In order to complete our data we are particularly desirous of obtaining your responses concerning three areas:

(1) Length of school year (1975-76), i.e., number of academic days minus instructional losses due to strikes, parental boycotts, etc.

(2) Average academic class size in terms of number of pupils.

(3) Total number of students enrolled in your high school.

Your school has been selected as it is one of the six major "feeder" high schools to Utah State University thus making your input for this project invaluable. It will be appreciated if you will reply to the three areas mentioned above prior to January 12th and return it in the stamped, self-addressed envelope enclosed. Other phases of this research cannot be carried out until we complete collection of all data. We will be pleased to send you a summary of the project results if you desire. Thank you again for your cooperation.

Sincerely,

Keith T. Checketts
Assistant Director
Counseling and Testing

Thomas J. Russo
Graduate Research Assistant
APPENDIX D

LETTER OF INTRODUCTION
December 17, 1976

To Whom It May Concern:

Mr. Thomas J. Russo is authorized as my graduate research assistant to obtain pertinent information from the academic transcripts of students for educational research.

Sincerely,

Keith T. Checketts
Assistant Director
Counseling and Testing
APPENDIX E

RELEASE OF INFORMATION
RELEASE OF INFORMATION

Permission is given to ____________________________ to provide
(name of high school)

Dr. Keith Checketts and/or his graduate assistant, Thomas Russo,
with my high school educational records and transcripts for research
purposes.

NAME

(signature)

ADDRESS (HOME)

__________________________
VITA

Thomas J. Russo

Candidate for the Degree of
Doctor of Philosophy

Dissertation: Three Ordered Sets of Factors and Their Relationship to ACT Scores

Major Field: Combined Professional/Scientific Psychology

Biographical Data:

Personal: Born in Paterson, NJ, March 10, 1947, son of Mr. & Mrs. Leonard Russo.

Education: Graduated from Pompton Lakes High School in Pompton Lakes, NJ, 1965; received Bachelor of Science Degree from Drew University with a major in Psychology in 1969; received Master of Science Degree from Ball State University with a major in Pre-Clinical Psychology, 1975.

Professional Experience: 1973-75, Graduate Teaching Assistant, Ball State University, Muncie, Indiana; 1974-75, Graduate Intern at Delaware County Community Mental Health Center, Muncie, Indiana; 1975-1977, Graduate Research Assistant, Counseling and Testing Center, Utah State University, Logan, Utah.