



Educational achievement in rural Montana high schools
by John Wesley Kimble

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Applied Economics
Montana State University
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Abstract:

This study attempts to look at Montana's educational system and its impact on rural and urban students. It has two major objectives: first, to analyze the effects of school size on student achievement and, second, to analyze the factors determining achievement and their variation in different size schools. In order to accomplish this, a sample of sophomore and senior students was taken and they were administered an achievement test. The data collected was analyzed in light of project objectives. The study concluded that school size was not a significant factor in student achievement and that the factors that contribute to student achievement vary for schools of different sizes.

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Date

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JOHN WESLEY KIMBLE

A thesis submitted in partial fulfillment
of the requirements for the degree

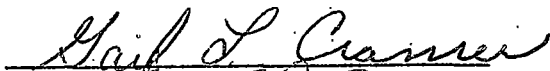
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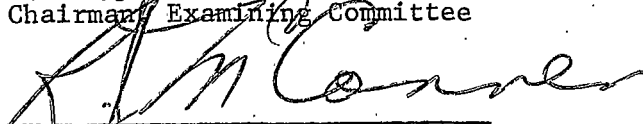
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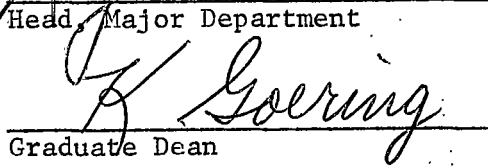
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ABSTRACT

This study attempts to look at Montana's educational system and its impact on rural and urban students. It has two major objectives: first, to analyze the effects of school size on student achievement and, second, to analyze the factors determining achievement and their variation in different size schools. In order to accomplish this, a sample of sophomore and senior students was taken and they were administered an achievement test. The data collected was analyzed in light of project objectives. The study concluded that school size was not a significant factor in student achievement and that the factors that contribute to student achievement vary for schools of different sizes.

Chapter I

INTRODUCTION

The purpose of this study is to analyze how the resources used by a school system relate to educational achievement. This research is especially relevant to Montana because of the problem caused both by the low population density and the rural nature of the state.

The Census of Population defines rural residents as those who live in the open country or in communities of less than 2,500 people. Montana is a large state which encompasses 147,138 square miles or more than 94 million acres. According to the 1970 census, its population numbers 694,409 people. The census lists 135 cities, of which 32 have a population of 2,500 or more and are considered urban. Slightly more than 53 percent of the population live in these 32 communities. The other 323,733 people or 47 percent of the population are rural. In 1960, 49 percent of the population was considered rural which shows a slight rural to urban migration.

Figures which represent the education of the population show that the urban population is better schooled than the rural portion, especially at the post secondary level. The 1970 Montana census showed the median number of school years completed for urban persons 25 years and older to 12.4 years, 12.1 years for the rural nonfarm

population, and 12.2 years for the rural farm population. Of the urban people, 13.6 percent have four years of college or more while only 6.4 percent of the rural farm population has four or more years of college. These figures compare favorably with the national medians. The national median of school years completed for persons over 25 are 12.2 years for the urban population and 11.1 years for the rural population. The percentage of persons with four years of college or more in the United States is 10.7 while nationally the rural percentage is 6.7 [Commerce, 1970].

The educational system has historically shortchanged rural people. Low levels of educational achievement by rural youth are indicative of the poor quality of education [Coleman, 1966]. While data indicates that rural youth are getting a better education than their parents it still lags behind that of their urban counterparts. Rural students drop out of school at an earlier age and fewer rural students go to college. Those who do go on to school have a hard time competing with the urban student [U.S. Commission on Rural Poverty, 1967: 41-44].

The various components of an educational system which include teachers, buildings, facilities, curriculum, and programs are usually of less quality in rural districts than in urban schools. Low teacher salaries in rural schools do not attract or retain the better

teachers. Poor facilities also contribute to the lack of better teachers. In general, small schools lack the equipment that the large urban schools can afford. Furthermore, students who live in rural areas are hampered by geographic isolation and what is called "small town milieu" [Sweeney, 1971: 4-8]. These limitations may inhibit them from learning new behaviors for coping with urban living. The Coleman Report (a recent study which hypothesizes that rural students are getting short-changed educationally) concluded that the low educational level of the parents and a combination of community factors place rural students at a disadvantage even when they enter school.

The majority of Montana's high schools, about 65 percent, have less than 180 students. These schools account for 20 percent of the total number of high school students in the state. Sixteen of Montana's largest urban high schools have approximately 50 percent of the student enrollment. In 1964 Montana's expenditures were about \$570 per pupil in average daily attendance. In comparison, New York spent \$790 per pupil in average daily attendance for the same period. In 1972, Montana spent 52.18 cents of every tax dollar on education [Montana, 1972: I,1,V.1]. In Fiscal Year 70-71, 73 percent of school funds came from the local level, 21 percent from the state, and 6 percent from the U. S. government [Montana Schools, 1972:I.1]. These figures have not varied by more than 2 percent in the past ten years.

This large tax burden carried by the local taxpayer can cause inequities in school quality. Because of the spillover of educational benefits to areas outside the local school district, emphasis has been placed on supporting school systems through a broader tax base.

The problems of rural schools, and the costs of schooling, have made the issues of school efficiency, school quality, and educational quality of interest to nearly every citizen. In the last decade, rising costs and increasing taxes have aroused the public's interest in the economics of schools. Accountability and efficiency have become key educational issues. The problems of education require much knowledge about the educational process and educational outcomes.

Economics is the science that deals with the allocation of scarce resources among unlimited wants. Education is not a free good and it does have a price. The resources used in its production could be used to produce other goods. Education must be considered an economic good. It is the efficiency in combining resources and comparing the benefits derived from education to alternative resources that interest the economist. Essentially, educational outcomes consist of two major economic components. The investment component refers to future years of increased earning power. The consumption component includes the immediate utility and long-run satisfaction of education for the individual. These are personal outcomes since the benefits are accrued directly by the student and his family. The

amount a student or his parents spend on education is determined by his estimated benefits from increased productivity and enjoyment. Thus, the student will spend an amount on education that will equate private marginal benefits to private marginal costs.

As an economic good education contributes to society as well as to those directly involved. This spillover effect has two important implications. One is that the costs should be borne by those who benefit from education; another is that efficiency in resource allocation suggests that the amount of education provided will be less than optimal if the external benefits are not considered. Making education socially efficient and equitable requires that the cost burden be adjusted. Expenditures must be extended beyond the point where private marginal costs equal private marginal benefits so that ultimately private marginal costs plus external marginal costs equal private marginal benefits plus external marginal benefits; also some means of allocating the costs to the proper private and public beneficiaries must be considered.

Educational costs can be further divided into private and public costs. Private or individual costs include indirect costs such as earnings foregone while in school and direct costs such as tuition, books, and supplies. Public cost includes the cost of building and operating schools.

The relationship that links educational achievement and educational

resources can be analyzed by using the logical constructs of economics. In this analysis, we can assume that the school functions somewhat like a firm in the sense that it tends to maximize output within its resource limitations. In order to accomplish this, it is necessary to consider an educational production function. Educational production can be depicted as a functional relationship which illustrates the maximum amount of educational output that could be produced by each and every set of inputs. In order to achieve the greatest output for a given budget restriction, the decision maker must determine the combination of resources that will maximize output within the budget constraint. This condition is satisfied by purchasing and utilizing each of the inputs in such a combination that the last dollar expended on each of the inputs yields the same effect on output. The flow then from budget to output is as follows: dollar budgets are used to purchase school inputs in resource markets (which include markets for personnel, equipment, and so on); these resources are combined by the school administrator in some fashion; finally, the relationship between input and output and how they are combined can be represented by a production function.

This study will consider two important areas in Montana's educational system. First, school quality and how it varies according to school size will be investigated. If the student in the larger, more urban schools is getting a better education than the rural student

then a possible shift of funding priorities may be in order. Second, those factors that determine educational achievement will be investigated. Determining factors in differently sized schools may well indicate where to place educational resources. The study then has two major objectives:

- 1) To analyze whether or not school size is important in determining student achievement, and
- 2) To analyze factors that affect student achievement and to determine whether or not these factors vary in different size schools.

The procedure followed for achieving these objectives is as follows:

- 1) A survey of the literature relevant to the subject area of the study to help give direction and purpose to the project,
- 2) Instruments were either identified or designed to collect the data,
- 3) A sample of schools was drawn and permission was obtained to perform the required testing and data collection,
- 4) Testing and data collection was accomplished by two data collectors who were hired to visit each school as scheduled. The time to collect the data took about three months.
- 5) The data was coded and verified and processed on the Sigma-7 computer at Montana State University to allow statistical interpretation of the data and a thorough examination of what had been collected,

and

6) The analysis of the data and the results are presented in Chapters IV and V.

Chapter II

REVIEW OF LITERATURE

Since nearly a quarter of this nation's population is enrolled in schools, it is important to determine what effect the schools have on what a student learns. Many educators, laymen, and researchers have contended that schools make little difference [Coleman, 1966]. Their contention is that academic performance is dependent on social and economic conditions outside the school. The impact of such thought, if true, would mean a great deal of tax money is being inefficiently used.

For many years, educators and the general public have endeavored to make education more efficient. Early studies were conducted for the most part by professional educators. The main idea of these studies was to use per pupil expenditures to measure school quality. Many determinants were used and they ranged from student performance measures to a measure of how well the administration adopted innovative procedures. A fairly consistent conclusion was reached: more money means more effective schools. These analyses provided a strong incentive to increase spending for better student performance, but one thing was lacking: a measurement of the student's capabilities upon entering school and the influence of extracurricular activities upon student achievement. More recent studies have emphasized the

importance of social environment and have discounted the effects of schooling. It seems that in order to assess achievement, adequate account must be taken of both the social and school services to which the student is exposed. In order to do this accurately, it must be known what the status of the student is upon entering school, upon completion of school, and then how much of his achievement is attributable to the school. The controls that would be necessary to complete such a study would make it impossible. Nevertheless, many studies (attempting to measure this achievement) have been undertaken. The Coleman Report mentioned in Chapter I best illustrates this new line of inquiry. It, like others, tends to emphasize the importance of the socio-economic environment of the student in determining his performance.

The Coleman Report

The Coleman Report (1966) has been the most widely discussed of all the studies. It was carried out as the result of the Civil Rights Act of 1964, Section 402, by the National Center for Educational Statistics of the U.S. Office of Education. James Coleman of Johns Hopkins University was responsible for the design, administration and analysis of the study. It is probably the most extensive attempt made to assess the quality of American education. Approximately 660,000 students, their teachers, and their schools were surveyed. Other

questions were also asked, including those on the diversity of the curricula and the qualifications of the administrators. The report reveals that several of those factors are positively correlated with the performance of the pupil.

The most significant school service variable in determining student achievement was the verbal ability of the teacher. This might be construed as a proxy of the teachers' intelligence and thus their ability to motivate and communicate in a manner that makes the subject understandable. The report showed a strong relationship of socio-economic status to student achievement and in fact stated that most achievement was related to socio-economic factors. The report also found that a pupil's achievement is strongly related to the educational backgrounds and aspirations of the other students in the school. Expenditures per student were not significantly related to school achievement.

The Coleman Report generated considerable criticism. Criticism by James W. Guthrie in Do Teachers Make A Difference [1970:25] challenges the statistical methodology and claims that the measurements utilized are inadequate. Bowles and Levin [Winter, 1968:3-24] criticize poor sample response. They suggest that a better measurement of facilities with less aggregation of data might show a better relationship between expenditures and student performance.

Summary of Other Research Studies

The results of other studies cannot be summarized concisely partly because of the large variety of measurements used and partly due to their diversity. The remainder of this survey provides a brief description of a selection of these studies and the conclusions that were drawn by each one.

A study by Kiesling [1967:356-357] sampled 97 high schools out of 1,400 in New York. The measure of output was an achievement test. The input variables used were: pupil intelligence, socio-economic attributes of the community, per student expenditures, school size, and school growth rate. Kiesling discovered that school size was negatively related to achievement if at all, and that high expenditure districts do a poorer job of educating pupils from low socio-economic backgrounds than do low expenditure districts.

A study in 1962 by Street, Hamblin and Powell [261-266], tried to relate school size to achievement. The study was done in East Kentucky and used the Stanford Achievement Test as a measure of school output. They classified the schools by categories of 0 to 100 students, 100 to 300 students, and 300 students and over. The conclusion reached was that the student in the larger school was likely to out-perform the student in the small school. They did warn, however, that factors other than size could have been responsible

for their findings.

In 1957, a study by Shelly [1957] attempted to correlate eight factors with the quality of 39 South Carolina secondary schools. The eight factors used were teacher salary, teacher certification, scope of educational program, school size, quality of administration, facilities, socio-economic status of the community, and the amount of money spent for instruction per teacher. These factors also accounted for 69 percent of the variation in quality. The scope of the educational program and the quality of administration seemed the most important factors. Little relationship between socio-economic status and quality was revealed, possibly because most of the school funding came from the state.

A study completed at the University of Arkansas in 1962 [Treadway, 1962:513] tried to link school quality to student achievement. Eight of the 39 factors used were deemed significant to student achievement. They were size of school district, financial support, supervisory services, class size, teacher turnover, high school expenditures, dual education programs, and teacher qualifications. A similar study by Simpson [1961:3499] found that six key factors explained student achievement. They were school size, rate of growth, expenditures, effort and capacity, program, and socio-economic status. It was not immediately clear what other variables he examined in his research.

A study by John Riew [1966:280-287] reviewed some works that showed variable results. In one study, he found that there was little or no relationship between quality and school size. Riew's own study chose Wisconsin high schools and used information from the State Department of Public Instruction. He found that per pupil expenditures decline as enrollment rises to 700 pupils. Expenditures rose when schools reached an enrollment of 701-900 pupils and then fell after that point. This fiscal study excluded capital expenditures. Riew concluded that a larger sample of schools should have been used to strengthen his results.

A study by J. Alan Thomas [1962] employed data from project TALENT at the University of Pittsburgh. Thomas used more than 20 variables to analyze student achievement. Even after home and community factors were taken into account, the variables that seemed most related to achievement were: teachers' salaries, teachers' experience, and the number of library books in the school. He used scores on 18 different achievement tests and his sample was composed of 206 high schools in communities of 2,500 to 250,000 in 46 states. Other variables he found significant in influencing test scores were the size of class the student was in and the number of days a student spent in school.

Samuel Bowles [1969] in a report to the U.S. Office of Education presented the econometric problems involved in estimating educational

production functions. Bowles focused on the meaning of such a function, output measurement, initial measurement, and the dimensions of the learning environment. He used data from the University of Pittsburgh's project TALENT and the Coleman Report to estimate educational production functions. He found that teacher quality was an important ingredient in student achievement. Bowles also explored four major characteristics of the home which affect achievement. The first factor was the verbal interaction and communication with adults. Secondly, he assessed the quality of such interaction and communication, using family size and education of the parents as criteria. Thirdly, Bowles looked at what motivates achievement, by examining the parents' attitude toward education. Fourth, he analyzed the degree of opportunity a student has to explore the physical environment in the home and measured it both by how often reading material was used in the home and by parents' income. The school environment was also measured by the educational level or verbal efficiency of teachers, school policies, extracurricular activities, class size, community support of education, and school facilities. Bowles found that in no instance was per pupil expenditure significantly related to achievement but found that most of the factors that were purchased by such expenditures showed a strong relationship. The results of his study showed several important factors including that parents' income better explained achievement than did parents' education.

There have been studies that measure educational quality through methods other than the use of achievement tests. One by Welch appeared in the American Economic Review [1966:379]. The basis of this study was that the quality of schooling was considered a principal contributor to productivity. The study excluded from its population those who had attended college. The sample population was rural farm males older than 25 years. The study compared the income of the schooled representative to the income of a representative with no schooling. The percentage of students who returned to school was estimated for each year. It appeared that teacher quality did enhance school productivity. The validity of this study might be questioned because that part of the population that was rural schooled but was forced to move to the city for employment was excluded. The study also aggregated data on a statewide basis, and less aggregation might have provided more explicit data.

The concept of investment in human capital set forth in the study by Welch has also been investigated by Theodore W. Schultz [1971]. The major economic benefit of education is the increased productivity of the person receiving it. The assumption that the wage a person is paid is equal to his contribution to output (marginal product) is important to this theory. It follows then that the increased productivity derived from investing in educational will have a positive effect on earnings. Schultz's studies conclude that education is an

important factor in influencing economic growth. The discrepancy between the growth rates of national income and national resources leave an unexplained area that might be explained in part by the increased investment in human capital.

Summary of Achievement Tests Used

Bowles [1969] chose three measures of output: reading comprehension, mathematics competence, and a composite score based on reasoning, creativity, vocabulary, and English. Each achievement test measured different levels of achievement. The Coleman Report [1966] used a test series designed and administered by Educational Testing Service, Princeton, New Jersey. Other studies used a variety of tests ranging from unspecified aptitude and achievement tests to specific tests. Some studies used complete batteries of achievement tests, others only an individual test. Those studies that were based on data collected by the Coleman Report or by project TALENT had specific tests. Street, Powell, and Hamblin [1962:261-266], in their study in Kentucky, used the Stanford Achievement Test. Nearly as many different achievement tests as studies were used. A few of the studies reviewed used whatever scores were available and then converted them to a standard norm for analysis. Administering a specific test is costly and time consuming but does allow for data control and for more convenient collection of other data on the social background of

the student.

The Seventh Mental Measurement Yearbook [Buros, 1972] lists 36 achievement batteries, plus various tests in specific areas. The choice of test or tests would depend on the areas to be tested. Measuring achievement is by no means an exact science, but there are at least six good general achievement tests that should be adequate.

Conclusion

Ten studies and their research techniques have been reviewed in this chapter. Nine of these used achievement tests as a measure of school output. Two looked at the productivity of the subject in determining the effects of schools. School size was a variable in seven of the ten studies and was not significant in four, possibly significant in one, and significant in only two cases. The variable that seemed consistently significant in the studies that used it was socio-economic status. In no instance did per student expenditures show a positive relationship to achievement, yet the items that the money bought, such as facilities, teachers, and extracurricular activities, did show a relationship in some of the studies. Each study used some unique variable that showed a significant relationship to achievement.

Chapter III

ECONOMIC THEORY AND METHODOLOGY

The Economic Model

Production is the process of combining inputs to create outputs of a specified form. An input is simply anything which a firm buys for use in its production or other processes and an output is any commodity which a firm produces or processes for sale. Production is assumed to occur only if the outputs are of more value to society than the inputs. This relationship between the input and output variables is often referred to as a production function. The educational production function relates school and student inputs to a measure of school output. Representation of the educational production process in this form is of interest in studies of human capital formation as well as studies in optimum resource allocation in education. There are certain complexities in applying a production function to education. The most complex of these is the student. Each student is an individual with traits and characteristics not homogeneous to the group. The teacher, laws and regulations, and the community's educational concept add to the complexity of the situation.

The production function is based on the idea that output depends on the inputs used and that there is a unique output for each possible

combination of inputs. Symbolically, the production function can be represented by:

$$Y = f(X)$$

where output Y is dependent on the amount of input X used given the existing technology. In order to present a more accurate picture of the model, more than a single input is necessary. The production function would then take the form

$$Y = f(X_1, X_2, X_3, \dots, X_n)$$

where Y again represents the output and the inputs are represented by $X_1, X_2, X_3, \dots, X_n$. The output can be varied by using different amounts of X_1, X_2 , etc. or by using a different quantity of one input and holding the others constant. This can also be stated in terms of obtaining a fixed output Y and by looking at the different possible combinations of the input variables that it would take to obtain a fixed output of Y [Doll, 1968: 39-60].

The optimum combination of the input factors can be determined by calculation of the marginal product of the input variables. The marginal product of an input factor can be defined as the addition to output of the last unit of the input factor added. If we assume that the primary objective of a firm is to produce as efficiently as possible then the cost outlay should be as low as possible for the determined level of output. In order to accomplish this the marginal

product of a dollar's worth of one output must equal the marginal product of a dollar's worth of every other input used.

The model in this particular application involves one dependent variable and several independent variables. The basic production function will take the form:

$$A_i = f_0 + f_1 X_{2i} + f_2 X_{2i} + \dots + f_n X_{ni} + U_i$$

where: A_i = the achievement score (Dependent Variables);

f_0 through f_n = the parameters of the production function;

X_{ni} = the amount of input n devoted to observation of student i 's education and $n - 1$ through n (Independent Variables); and

U_i = a disturbance term.

The school input factors are dependent on a system of simultaneous equations representing the school administrator's social welfare function, the budget constraints, and the educational production function. Because of this, any estimation of the parameters in this model will lead to inconsistencies. One way around this problem is to assume that school administrators probably do not select school inputs as if they were maximizing a well-defined production function. This assumption has some basis in actual practice as the administrator lacks perfect knowledge and is subject to political and legal constraints. This assumption causes another problem in that

if the school administrators do not conform to any systematic optimizing model, then the observations of the data are not technically efficient. Thus we get some sort of an average production function [Bowles, 1969: 10].

The knowledge available on learning relationships makes the specification of an educational production function difficult at best. The concept of the margin and diminishing return is not well established in the industry. Therefore, a linear function would seem somewhat superior for the purposes of this study. Possible positive interactions of our inputs would be another reason for using a linear form. The restrictions for a linear form are many and severe, but for reasons of simplicity, the linear additive form presented above will be used.

This study focuses primarily on the economic consequences of schooling. Ideally, the output measures would include income and social adjustments of the individual after schooling. Lacking the opportunity to measure post school adjustments, a proxy, in the form of an achievement test score, will be used. Policy making is primarily concerned with the parameters of the production function and the marginal products of the inputs for movement toward optimal input combinations. It is doubtful that the marginal product of the same input for different groups of students can be compared.

The score on an achievement test is an ordinal measurement. There is no zero point and no well-defined unit of measurement. This has implications in the area of the marginal rate of substitution. Although the marginal rate of substitution is valid theoretically, the absoluteness of the measure of marginal product is not. Among students scoring at different parts of the measurement scale, equal units of increase in scores are not comparable [Gardner, 1965: 24].

Some assumptions must be made before we can begin this analysis. First we must assume that the variables used represent quantities observed without error. Although the data are subject to some degree of error in measurement, it seems prudent to consider these errors negligible in light of the unobservable elements (the U_{i1} terms). The error term (U_{i1}) must be assumed to be normally distributed with mean zero and variance sigma squared [Malinvaud, 1966: 172-175].

Another of the purposes of this study is to attempt to determine those factors that affect student achievement. After all the data are collected, a linear regression program [Nie, 1970: 174] will be used to obtain the necessary statistics. Four dependent variables and 18 independent variables will appear in the model. Table III-1 shows the variables to be used in the regression. A more definitive description of each variable will be included in Chapter IV.

For purposes of analysis, the sample will be examined in two

TABLE III-1. VARIABLES TO BE USED IN THE REGRESSION ANALYSIS.

Variable Description	
<u>Dependent Variables:</u>	
English test score - Standardized	
Numerical competency score - Standardized	
Reading test score - Standardized	
Total test score	
 <u>Independent Variables:</u>	
Student's view of school	
Average daily preparation per teacher	
Per student expenditure	
Student-teacher ratio	
Beginning teacher salary	
Year school facility was built	
School size	
Father's highest grade level attained	
Items in the home (TV, radio, phonograph, paper)	
Number of yearly books and monthly magazines	
Number of automobiles in the family	
Student's own room and car	
Student's college plans	
Community size	
Student's involvement in school activities	
Hours student works outside school	
Amount of travel the student has done	
High school grade point average	

different ways. First, each of the 27 schools will be placed in 1 of 4 categories, broken down according to student size. A description of these categories is shown in Table III-2 and the number of schools in each is indicated. This will isolate the effects the variables have on achievement in schools of a different size. Second, all students will be analyzed collectively. As mentioned, the production process of schools is complex. About the most that can be expected from estimation is a discovery of some of the relationships of the educational process.

The Variables

The intent of this study is to examine the effects of variables representing student socio-economic status and the school and their relationship to selected dependent variables represented by achievement test scores. Three sections, reading, English, numerical competency, of the Stanford Achievement Test, High School Battery will be used as dependent variables. There are several reasons for choosing a less extensive testing regimen: 1) The cost of administering the complete 6-hour battery would be prohibitive; 2) remaining sections of the test may have favored schools with broader curriculums; and 3) most cooperating schools would be disrupted less by an abbreviated testing program. The complete test battery was given in any school

TABLE III-2. SCHOOL SIZE BREAKDOWNS FOR ANALYSIS PURPOSES.

Size	Student Per School	No. of Schools
1	0 to 117	7
2	118 to 261	7
3	262 to 1,040	7
4	1,041 and Larger	<u>6</u>
TOTAL SCHOOLS		27

that requested it. The SAT Battery was chosen based on Buros [1972]. This review of the tests rates it of high quality overall. Both the numerical competency and reading tests ranked high. The English test was not well ranked but rated high enough for use in this study.

A number of independent variables were collected for the study. Since the projected model needed proxy values for student socioeconomic status and school influence factors, the following information was collected by questionnaire for each twelfth grade student (see the appendix for a copy of the questionnaire):

1. Father's occupation;
2. Father's highest educational level;
3. Mother's occupation;
4. Mother's highest educational level;
5. Major provider;
6. Family size;
7. Number of cars in family;
8. Whether they have television, telephone, newspaper, and radio;
9. Number of magazine subscriptions;
10. Number of books purchased per year;
11. Whether the student has their own room and car;
12. Location of residence;

13. Part-time work;
14. Hours per week spent on studies outside school;
15. Travel in Montana, U.S., world;
16. School activities;
17. Favorite subject;
18. After school plans;
19. Time in community;
20. High school grade point average.

The data used to represent school inputs were collected at the school site and from the trustees' report to the Superintendent of Public Instruction. The expenditures and revenues for each school district were also collected from the State Superintendent's Office. In multi-school districts, the chief accounting officer of the district aided in determining the funds allocated to each school. Other school data included information on teachers and school facilities. Data on the teachers in the system included degree level, experience, and daily preparations. Data on the school facilities including building age, number of classrooms, full-time non-teaching staff, starting salary level for teachers, students bussed daily, and community population was gathered. All of these data were added to the information on each student. Data was also collected on student attitudes. One of the questions asked, for example, was whether the

student liked school. Another question asked the student was who had influenced their plans greatest after schooling was completed.

The Student Sample

The process below describes how the schools and the individual students were chosen. All public high schools in Montana were listed from largest to smallest according to size of the school. Statistics [Montana, 1972] from the Office of the Superintendent of Public Instruction for 1972 showed 47,045 high school students in 167 operating high schools. These students were then broken into 10 groups with 10 percent of the total students in each. Then the list of schools was broken into 10 groups each containing about 10 percent of the students. Table III-3 shows the final groups and the sizes of the schools included. Five percent of all high school students were to be tested. The method of selection varied because of the number of schools in each of the size categories. Schools that fell in the first three size categories were chosen at random until the approximate predetermined number of sample students was obtained. In size categories four, five, six, seven, and eight, not only were the sample schools chosen at random but in most cases the sample of students within schools were picked at random. In the largest categories, a sample of students was taken from all the schools to obtain the

TABLE III-3. SAMPLING BREAKDOWN OF MONTANA SCHOOLS BY SIZE.

Size			No. of Schools	No. of Students	Approx. No. of Students to Test	No. of Schools	% of School to test
1.	0-	117	74	4,952	260	7	100
2.	119-	180	33	4,867	270	4	100
3.	181-	261	23	4,890	340	3	100
4.	272-	470	12	4,373	300	3	50
5.	473-	621	9	4,694	260	3	30
6.	639-	1,040	6	4,748	260	2	30
7.	1,207-	1,677	3	4,452	260	2	16
8.	1,815-	1,905	3	5,575	240	2	9
9.	1,936-	2,271	2	3,976	300	2	12
10.	2,247-	2,271	2	4,518	330	3	11
			167	47,045	2,820	30	

desired number of students. This procedure left 30 schools. Three of the 30 schools would not participate in this survey. The size of these schools placed them in a category which allowed no substitutes so 27 schools were used in the project.

Testing dates were set with each of the schools. Table III-4 shows a breakdown of students tested. Discrepancies appear because in some cases the total population, rather than a sample, were tested upon request. Absences and limitations set by the school administrators also contributed to the discrepancies. Other schools asked that the total school population (grades nine and eleven) be tested at the same time as the tenth and twelfth grades. The figures of the ninth and eleventh grades tested were not included in Table III-4. Table III-4 shows the total number tested in the school as well as the breakdown for the sophomores (grade 10) and the seniors (grade 12).

The protection of student anonymity was a slight problem during data collection. In order to return the test results to the schools, the project agreed to supply to each school a label with student identification and the test scores. Each test answer sheet was pre-numbered before the project began. The respondents in grade twelve transferred this number to the questionnaire and it was the only item entered into the project data files as a means of student identification.

TABLE III-4. ACTUAL STUDENT SAMPLE FOR GRADES 10 AND 12.

	Size	Total No. Tested	Grade 10 Tested	Grade 12 Tested
1.	0- 117	356	132	124
2.	119- 180	193	127	66
3.	181- 261	237	138	99
4.	272- 470	548	348	200
5.	473- 621 ^a	182	104	78
6.	639-1,040	240	132	108
7.	1,207-1,677	197	128	69
8.	1,815-1,905	164	97	67
9.	1,936-2,040	169	105	64
10.	2,247-2,271 ^b			
	TOTALS	2,186	1,311	875

^a One school declined to participate.

^b Both schools declined to participate.

The method of selecting a sample of students in individual schools varied. In some cases, particular classes thought to be representative of the students were chosen. In some schools, the sample was taken from alphabetical lists or by random selection from another file source. Two schools utilized a computer to draw their sample. One school agreed to participate in the project on the condition that student participation be on a volunteer basis. In this instance, project personnel met with the students, explained the project and asked for their participation. Another school agreed to participate only on the condition that school personnel administer the test. In addition, a small part of the student data had to be eliminated because of responses that did not make sense. These responses numbered less than 10.

Standardizing the Test Score

Each student was given three tests from the Stanford Achievement Test, High School Battery. The result was a raw score for each student and each test. The raw score alone does not have much meaning and must usually be related to other scores achieved. In order to make this kind of comparison, the scores must be translated to means and standard deviations of a standard value. The conversion formula used for this process was:

$$\text{Standard Score} = 50 + 10 \left[\frac{\text{raw score} - \text{mean raw score}}{\text{standard deviation}} \right].$$

This resulted in a standard score with a mean of 50 and a standard deviation of 10 [Roscoe, 1969: 53-57]. The mean raw score and the standard deviation were obtained from the Stanford Achievement Test Manual [Gardner, 1965: 13-14]. The specific formulas used for each test for each senior tested were as follows:

$$\text{standard reading score} = 50 + 10 \left[\frac{\text{raw score} - 41.8}{11.18} \right]$$

$$\text{standard numerical competency score} = 50 + 10 \left[\frac{\text{raw score} - 30.2}{8.88} \right]$$

$$\text{standard English score} = 50 + 10 \left[\frac{\text{raw score} - 59.5}{14.25} \right].$$

The specific formulas used in the case of the sophomores tested were as follows:

$$\text{standard reading score} = 50 + 10 \left[\frac{\text{raw score} - 35.7}{11.39} \right]$$

$$\text{standard numerical competency score} = 50 + 10 \left[\frac{\text{raw score} - 26.8}{8.66} \right]$$

$$\text{standard English score} = 50 + 10 \left[\frac{\text{raw score} - 51.5}{14.25} \right].$$

The score transformation does not change the shape of the distribution of the raw scores, it changes only the mean and standard deviation. The scores received on tests from different subject areas are not comparable and cannot be combined. Standard scores have the same mean and standard deviation and can usually be combined without objection.

Chapter IV

DATA DESCRIPTION

The results of the data collection and a discussion of the dependent and independent variables used in the regression analysis are contained in this chapter. The results of the test scores for the sophomores and seniors are presented and then analyzed separately. Each of the independent variables are briefly described.

Overview of Testing

The achievement test used in the study was the Stanford Achievement Test (SAT), High School Battery. Three of the tests were used--English, numerical competency, and reading. Two individuals were hired to administer the tests. One was certified to teach mathematics at the secondary school level but had no teaching experience. The second was a certified elementary teacher with eight years teaching experience and a master's degree in education. The tests were administered according to the instructions provided by the test company and were scored by the Test Scoring Service Department at Montana State University.

The tests are designed to measure the educational achievement of students in school. It takes 40 minutes to administer each of the three tests. The English test consisted of three parts; the numerical

competence and reading tests were a single section each. In order to establish norms and a basis for standardization, the test was administered to 22,699 students on a regional basis. For each student the raw scores must be converted to a standard score which can in turn be translated to either a percentile rank or stanine or both. The Stanford Achievement Test people provide the necessary information for this process of standardization. The standard score they provide has a median of 50 and a standard deviation of 10 with a normal distribution. This standardization process is different for each grade, or class. Percentile rank allows the student's performance to be compared with the norm group. For example, a percentile score of 60 would mean the student was equal to or greater than 60 percent of the other students in his group. The stanine is a value which is represented on a simple nine-point scale of normalized scores. The scores range from a low of 1 to a high of 9 with the value 5 always representing the average performance for students in the norm group. Specific information on the tests may be obtained from the SAT manual [Gardner, 1965].

Summary of Test Results for Seniors and Sophomores

Tables IV-1 and IV-2 show by school the mean scores which sophomores and seniors achieved for each test. The scores are standardized by the process presented in Chapter III of this study and not according to the description in the SAT manual. The means are listed in four

TABLE IV-1. MEAN STANDARD SCORES FOR SENIOR STUDENTS BY SCHOOL.

School Number	English Mean	Reading Mean	Numerical Mean	Total Mean
1	46.39	44.56	46.60	137.56
2	49.96	50.47	52.77	153.21
3	56.55	55.21	56.11	167.88
4	49.64	48.50	50.33	148.48
5	40.37	50.35	49.47	150.20
6	52.78	51.40	57.89	162.08
7	45.53	42.00	45.43	132.97
8	55.63	52.35	52.13	160.11
9	57.83	57.63	56.90	172.37
10	44.57	44.07	44.54	133.18
11	56.76	57.37	53.66	167.80
12	50.81	53.39	53.36	157.56
13	46.25	48.80	47.10	142.15
14	50.71	48.10	47.61	146.43
15	50.73	50.51	51.78	153.03
16	48.29	45.33	47.83	141.46
17	51.46	51.46	53.07	156.01
18	54.28	55.18	57.88	167.35
19	46.15	47.28	49.67	143.11
20	48.25	29.12	52.02	149.40
21	48.76	51.78	51.24	151.78
22	46.93	47.36	46.85	141.14
23	52.87	54.97	52.04	160.79
24	51.16	51.12	48.60	150.99
25	48.80	40.75	49.77	148.32
26	53.33	54.04	54.24	161.62
27	<u>48.65</u>	<u>48.60</u>	<u>49.60</u>	<u>146.86</u>

TABLE IV-2. MEAN STANDARD SCORES FOR SOPHOMORE STUDENTS BY SCHOOL.

School Number	English Mean	Reading Mean	Numerical Mean	Total Mean
1	46.99	48.04	53.61	148.6
2	47.53	47.19	49.85	144.6
3	54.37	55.99	55.84	166.2
4	51.69	51.67	54.15	157.5
5	47.64	47.99	48.18	143.8
6	54.84	51.06	53.70	159.6
7	48.36	46.17	49.31	143.8
8	50.60	46.10	48.63	145.3
9	50.40	49.78	50.79	151.0
10	48.89	46.33	50.31	145.5
11	51.46	53.93	54.48	159.9
12	52.52	53.22	55.35	161.1
13	47.66	49.62	50.25	147.5
14	55.13	52.96	54.74	162.6
15	47.71	48.10	47.84	143.7
16	51.68	49.79	50.48	151.9
17	51.69	51.86	52.04	155.6
18	54.81	54.40	56.42	165.6
19	49.66	50.72	51.22	151.6
20	48.55	46.82	50.16	145.5
21	51.79	49.95	52.03	153.8
22	53.14	51.73	50.85	155.7
23	55.61	56.26	55.79	167.7
24	52.29	52.51	51.19	156.0
25	52.87	50.28	51.82	155.0
26	57.24	57.73	57.02	172.0
27	<u>49.33</u>	<u>50.77</u>	<u>50.15</u>	<u>150.2</u>

columns by school number. The four columns represent the three subject areas which were tested and a total mean, which is a composite of the first three means.

The same scores are ranked from high to low in tables IV-3 and IV-4. According to the data, the schools perform fairly consistently across the three subject areas. The schools are numbered from 1 to 27 according to their size (1 is small and 27 is large), and the pattern in these tables does not indicate that the largest school achieved the highest means or that the lowest means was achieved by the smallest school.

After the raw test scores were converted to standardized scores, the means were compared for each test. Tables IV-5 and IV-6 show the results of an analysis of variance procedure which was used to test the hypothesis of equal means. Each table includes the overall mean for the test, the calculated F-value, and the within mean square, for both seniors and sophomores. As shown on the table, the F-value in each case has a significance level of .01 which indicates that the hypothesis that all means are equal does not hold true here. The results were further analyzed to determine the differences among individual means. The method used was the Scheffe-test for all possible comparisons [Roscoe, 1969: 238-242]. The Scheffe formula appears below:

$$F = \frac{(\bar{X}_{n1} - \bar{X}_{n2})^2}{S_w (1/N_{n1} + 1/N_{n2}) (K-1)}$$

TABLE IV-3. STANDARDIZED TEST MEANS RANKED FROM HIGHEST TO LOWEST FOR SENIOR STUDENTS SHOWING SCHOOL NUMBER.

English		Reading		Num. Comp.		Total	
Mean School #		Mean School #		Mean School #		Mean School #	
57.837	9	57.633	9	57.895	6	172.376	9
56.762	11	57.375	11	57.883	18	167.888	3
46.556	3	55.216	3	56.907	9	167.802	11
55.631	8	55.188	18	56.177	3	167.351	18
54.281	18	54.976	23	54.243	26	162.086	6
53.339	26	54.045	26	53.665	11	161.627	26
52.871	23	53.393	12	53.364	12	160.796	23
52.788	6	52.351	8	53.079	17	160.116	8
51.467	17	51.782	21	52.948	23	157.569	12
51.169	24	51.469	17	52.778	2	155.014	17
50.811	12	51.403	6	52.134	8	153.216	2
50.730	15	51.129	24	52.072	20	153.030	15
50.712	14	50.517	15	51.783	15	151.784	21
50.378	5	50.477	2	51.241	21	150.993	24
49.961	2	50.351	5	50.338	4	150.200	5
49.649	4	49.755	25	49.775	25	149.406	20
48.800	25	49.122	20	49.670	19	148.489	4
48.762	21	48.809	13	49.604	27	148.329	25
48.650	27	48.607	27	49.471	5	146.860	27
48.299	16	48.502	4	48.695	24	146.439	14
48.258	20	48.109	14	47.834	16	143.113	19
46.932	22	47.362	22	47.619	14	142.159	13
46.395	1	47.287	19	47.100	13	141.468	16
46.250	13	45.335	16	46.852	22	141.145	22
46.157	19	44.568	1	46.601	1	137.565	1
45.539	7	33.075	10	45.431	7	133.189	10
44.572	10	42.001	7	44.542	10	132.971	7

TABLE IV-4. STANDARDIZED TEST MEANS RANKED FROM HIGHEST TO LOWEST FOR SOPHOMORES SHOWING SCHOOL NUMBER.

English		Reading		Num. Comp.		Total	
Mean	School #	Mean	School #	Mean	School #	Mean	School #
57.24	26	57.73	26	57.02	26	172.0	26
55.61	23	56.26	23	56.42	18	167.7	23
55.13	13	55.99	3	55.84	3	166.2	3
54.84	6	54.40	18	55.79	23	165.6	18
54.81	18	53.93	11	55.35	12	162.6	14
54.37	3	53.22	12	54.74	14	161.1	12
53.14	22	52.96	14	54.48	11	159.9	11
52.87	25	52.51	24	54.15	4	159.6	6
52.52	12	51.86	17	53.70	6	157.5	4
52.29	24	51.73	22	53.61	1	156.0	24
51.79	21	51.67	4	52.04	17	155.7	22
51.69	4	51.06	6	52.03	21	155.6	17
51.69	17	50.77	27	51.82	25	155.0	25
51.68	16	50.72	19	51.22	19	153.8	21
51.46	11	50.28	25	51.19	24	151.9	16
50.60	8	49.95	21	50.85	22	151.6	19
50.40	9	49.79	16	50.79	9	151.0	9
49.66	19	49.78	9	50.48	16	150.2	27
49.33	27	49.62	13	50.31	10	148.6	1
48.89	10	48.10	15	50.25	13	147.5	13
48.55	20	48.04	1	50.16	20	145.5	10
48.36	7	47.99	5	50.15	27	145.5	20
47.71	15	47.19	2	49.85	2	145.3	8
47.66	13	46.82	20	49.31	7	144.6	2
47.64	5	46.33	10	48.63	8	143.8	5
47.53	2	46.17	7	48.18	5	143.8	7
46.99	1	46.10	8	47.84	15	143.7	15

TABLE IV-5. SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE TESTING MEAN DIFFERENCES OF STANDARDIZED TEST SCORES FOR SOPHOMORES.

	Mean	F-Value	Within M.S.
English	51.21	4.94184	77.4907
Reading	50.82	4.73768	91.7132
Numerical Competency	51.65	4.51740	80.3804
TOTAL SCORE	153.7	5.49332	482.778

TABLE IV-6 SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE TESTING MEAN DIFFERENCES OF STANDARDIZED TEST SCORES FOR SENIORS.

	Mean	F-Value	Within M.S.
English	50.15	3.42452	81.6572
Reading	50.23	3.47331	96.1116
Numerical Competency	50.95	4.03208	80.5644
TOTAL SCORE	151.3	4.0661	602.563

The components of this formula are broken down as follows:

$\bar{X}_n$ = mean of group n;

S_w = within mean square;

N_n = number in group n; and

k - number of groups.

After being calculated, this F-value is then compared to the tabled F-value with (k-1) and [(N_n)-k] degrees of freedom. The results indicate that there was no significant difference among the individual means [Roscoe, 1969: 238-242]. This contradicts the results of the analysis of variance test for significance. The analysis of variance test is affected by non-normality and heterogeneity of variances when sample sizes differ. The Scheffe' method is considered very conservative and more rigorous than other multiple comparison methods [Snedecor, 1967: 278], and it is also quite insensitive to departures from normality and homogeneity of variance. When all of the above facts are considered, the possibility of the analysis of variance method, showing different results than the Scheffe' method, becomes quite apparent [Ferguson, 1966: 269-297]. The analysis of variance does provide a more powerful test and it is reasonable to conclude that there is some significant difference between the largest and smallest means. There may be other differences, but these cannot be proven with the methods used.

Summary of Results by School Size

Tables IV-7 and IV-8 show the mean scores for each school as categorized by size. As described in Chapter III, the 27 schools in which the achievement tests were administered were broken into 4 categories according to the number of students attending. Table III-2 shows this breakdown and the number of schools represented in each classification. Tables IV-7 and IV-8 show the mean score that the seniors and sophomores obtained on each test. It also lists the composite mean and the number of schools that were included in each size classification. The results of an analysis of variance test among the mean differences for the seniors appears in table IV-9 by test area. Table IV-10 contains the same information for the sophomores.

The means shown in Table IV-7 are very closely grouped. The results of the analysis of variance run with a calculated F-value indicate that the F-value for the numerical competency test was significant at the 0.1 level (Table IV-9). The Scheffe' test of multiple comparisons showed no significant difference between the largest and smallest means. No difference is apparent in the achievement levels of seniors from different size schools. The seven smallest schools had the highest mean of all the schools in the numerical competency test and in the total mean score. The six largest schools,

TABLE IV-7. STANDARDIZED TEST MEANS FOR SENIORS BY SCHOOL SIZE.

Size	School Numbers Included	English Mean	Reading Mean	Numerical Mean	Total Mean
1	1 through 7	50.87	49.93	51.95	152.7
2	8 through 14	50.93	50.98	50.03	151.9
3	15 through 21	49.63	49.83	51.60	151.1
4	22 through 27	50.06	50.57	49.84	150.5

TABLE IV-8. STANDARDIZED TEST MEANS FOR SOPHOMORES BY SCHOOL SIZE.

Size	School Numbers Included	English Mean	Reading Mean	Numerical Mean	Total Mean
1	1 through 7	50.20	49.73	52.09	152.01
2	8 through 14	50.95	50.24	52.08	153.27
3	15 through 21	50.84	50.23	51.45	152.53
4	22 through 27	53.41	53.21	53.80	159.43

TABLE IV-9. SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE TESTING MEAN DIFFERENCES BY SCHOOL SIZE FOR SENIORS.

	Mean	F-Value
English	50.15	1.02760
Reading	50.23	0.603653
Numerical Competency	50.95	2.55672
TOTAL SCORE	151.3	0.244799

TABLE IV-10. SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE TESTING MEAN DIFFERENCES BY SCHOOL SIZE FOR SOPHOMORES.

	Mean	F-Value
English	51.21	1.604833
Reading	50.82	1.83860
Numerical Competency	51.65	0.62460
TOTAL SCORE	153.7	2.47970

size class four, had the lowest total score. Size class two had the high mean score in English and reading while size class three ranked lowest in these two areas. These results also show that the mean scores in the numerical competency area differ. Other differences are not evident.

Table IV-8 shows that in size class four, sophomores in the six largest schools scored highest in all of the three areas tested and in total score. The seven smallest schools ranked low in English and reading and class three schools scored low in numerical competency. Analysis of variance revealed a significant F-value only in the total score (Table IV-10); however, the Scheffe' test showed no significant difference in this case. Again, data suggests that there is some significant difference between the largest total score mean and the smallest total score mean, but that no other valid conclusions can be drawn.

Comparing Scores to SAT Norms

Tables IV-11 and IV-12 compare the mean scores of the students to the percentile and stanine rankings provided by the Stanford Achievement Test (SAT). Table IV-11 shows the raw mean in each test converted to the SAT standard score, which can be placed in stanine and percentile rankings. All of the mean scores are in the fifth stanine which indicates average performance. Whereas the mean achieved

TABLE IV-11. AVERAGE RAW SCORES FOR SOPHOMORES AND SENIORS (ALL STUDENTS).

	Raw Mean	SAT Conversion		
		Standard	Stanine	Percentile
<u>Sophomore</u>				
English	53.346	49	5	50
Numerical Competency	28.229	50	5	52
Reading	36.633	50	5	50
<u>Senior</u>				
English	59.707	53	5	44
Numerical Competency	31.046	53	5	48
Reading	42.1059	54	5	54

TABLE IV-12. PERCENTAGE OF STUDENTS BELOW THE FIFTH STANINE ON EACH TEST BY SIZE AND TOTAL.

		Students				
Size Class	1	2	3	4	all	
		<u>Percent</u>				
<u>English</u>						
Sophomores	23	23	27	12	21	
Seniors	33	38	43	38	39	
<u>Numerical Competency</u>						
Sophomores	19	20	25	17	21	
Seniors	37	42	39	47	41	
<u>Reading</u>						
Sophomores	31	28	29	16	25	
Seniors	54	49	47	44	48	

by the sophomores placed them equal to or greater than 50 percent of other students in their group in each test area, the seniors ranked at the forty-fourth percentile in English, the forty-eighth percentile in numerical competency, and fifty-fourth percentile in reading. This is not quite as high as the sophomores.

Table IV-12 shows the percentage of sophomores and seniors whose scores fell below the fifth stanine. It is broken down according to subject area and grade level. The smallest schools ranked highest in English and numerical competency and lowest in reading for seniors. Class three schools ranked worst in English and class four schools performed lowest in numerical competency and highest in reading for seniors. The sophomores ranked fairly well in all areas, as the largest size class ranked best in all tests. The smallest schools ranked lowest in reading and class three schools ranked lowest in English and numerical competency.

In every case, the sophomores outscored the seniors. A couple of contributing factors are 1) that the material in the test was basic and the sophomores were probably closer to actual course work in each area, and 2) that the students in the last two years of high school have a tendency to take course work somewhat removed from the basic reading, English and numerical competency courses. The sophomores in the large school systems do seem to rank better than those in the other three size classifications, but at the senior level there doesn't

seem to be a significant difference in the ranking by school size.

The Independent Variables

The study group collected a large number of variables for possible inclusion into the regression analysis. From this pool, the final 12 variables used were chosen on a basis of the study objectives and a review of other studies. This portion of the report will cover the variables collected but not used in the study first and then will give a brief description of those variables chosen.

Variables were collected from three sources, the student, the school, and the State Superintendent of Public Instruction. The variables were examined in light of their relationship to the student, the school, and to one another. On this basis, the final list of 12 variables representing the student, the socio-economic status of the student and the school were picked. Table IV-13 shows each selected variable accompanied by the mean and standard deviation for the seniors tested.

The occupation of the student's mother and father was one variable rejected for use in the study. In order to make this data usable, a conversion process had to be used to convert the occupation to a factor representing socio-economic status. The conversion process used was based upon a list of occupations published by the National Opinion Research Center in a study by North and Hatt. Each occupation was

TABLE IV-13. INDEPENDENT VARIABLES USED IN THE STUDY.

Variable Description	Mean	Standard Deviation
Student view of school	.6594	.4742
Per student expenditures	3045.0837	919.4023
School size	615.3920	610.9244
Father's educational level	11.3326	4.1516
TV, phonograph, phone, paper	.9689	.0999
Books and magazines	12.9154	7.5022
Autos in family	2.8971	1.4105
Own room and car	.6423	.3332
College	.4965	.4389
School activities	.4112	.3035
Hours worked on job	13.9883	12.3509
Grade point average	2.4935	.7315

assigned a socio-economic index that was based on prestige, education, desirability, and salary level of each occupation [Reiss, 1961: 263-270]. Two problems resulted. First, the out-dated list was based on the 1950 census. Second, many Montana occupations did not relate very well to the list of occupations given.

Many other variables showed a strong relationship to each other. Such things as teacher starting salary, per student expenditure, student-teacher ratio, degree level of the teachers, and teacher experience were all related. Other variables, such as community size, the age of the school, and school size, has similar problems.

The following describes each of the variables used in the regression analysis. Each variable is described as to its source and how its value was calculated.

Student's View of School

This variable is calculated as a simple yes or no response to the question, "Do you like school?" which appears on the questionnaire (see Appendix A). Yes and no were coded as 1 and 0 respectively. A positive relationship to achievement was anticipated.

Per Student Expenditures

From the Office of the Superintendent of Public Instruction, records of the general fund expenditures for the last three years (70-71, 71-72, and 72-73) were obtained. The yearly costs were added

together and divided by three to give the average yearly expenditure, and this was then divided by the number of students to give the expenditure per student. This variable was predicted to have a positive relationship to achievement.

School Size

This variable represents the total number of students in each school in all grades. This item was expected to have no effect on achievement.

Father's Educational Level

A variable which is represented by the highest grade level the father of the student attained. It was felt that this item would relate positively to achievement.

TV, Phonograph, Telephone, Paper

This was a weighted item composed by asking each student which items were in the home. The responses were added and divided by four. It was predicted that this variable would be positively correlated to achievement.

Books and Magazines

Each student was asked the number of books purchased yearly and magazines purchased monthly by the family. These two totals were then added to give a composite. This variable should be positively related to student achievement.

Autos in Family

The number of automobiles the family owned comprise this variable. A positive relationship was anticipated.

Own Room and Car

Whether or not the student had his own room and own car was predicted to have a positive relationship. Each student was asked this question and rated 1 or 0 then divided by two to give a composite total.

College

Students were asked whether or not they planned to attend college. This did not include business schools, trade schools, or community colleges, but only major four-year schools. The anticipated relationship to achievement on this item was positive.

School Activities

Each student was asked to specify in which school activities he participated. The categories he could respond to were: government, athletics, class plays, student organizations, and other. Each answer asked for a yes or no response. These were totaled and divided by five to give the composite score. It was thought that a positive relationship between this and achievement existed.

Hours Worked on the Job

If the student had a part-time job outside of school, he was asked how many hours were spent per week working. This was predicted to have

a negative effect on achievement.

Grade Point Average

This variable represents the grade point average of the student on a four-point scale. Some of the schools gave a simple letter grade and others used a score based on a 100 point scale. Each score was treated separately and was translated to the 4.0 scale at the school. GPA was anticipated to have a positive relationship to achievement.

Chapter V

RESULTS OF STATISTICAL ANALYSIS

The study looked at four dependent variables using multiple regression: English, reading and numerical competency scores and composite score. Each of these variables is a standardized score and this process, as well as a statistical description of the results is provided in previous chapters of this thesis. Table V-1 summarizes the data obtained in the regression analysis for the seniors who were tested. Each dependent variable is listed with its R^2 value and an F-value. These figures are all senior students only. Table V-2 shows the same information broken down according to the school categories. The square of the multiple correlation coefficient (R^2) shows the proportion of the variance of the dependent variable accounted for by the independent variables. The R^2 varies by school size, suggesting different production functions exist for different size schools.

The variables in this study seem to be better predictors for the two intermediate school sizes which range from 118 to 1,040 students than for the largest and smallest schools. Most of the variance can be attributed to factors other than those represented in the production function equation. Data indicates that the independent variables used do affect student achievement. The largest R^2 value was obtained by schools with 262-1,040 students. Schools of less than 117 students achieved the smallest R^2 value. When grade point average was included

TABLE V-1. DEPENDENT VARIABLES SUMMARY ALL STUDENTS.

Dependent Variable	R^2	F-Value
Reading: with GPA	.38905	45.74249
without GPA as an independent variable	.23331	23.87464
English: with GPA	.38719	45.38680
without GPA as an independent variable	.21445	21.41803
Numerical Competency: with GPA	.36805	41.83678
without GPA as an independent variable	.19891	19.48079
Total: with GPA	.47275	64.40821
without GPA as an independent variable	.26271	27.95540

TABLE V-2. DEPENDENT VARIABLE SUMMARY BY SIZE.

Class Size	With GPA		Without GPA	
	R ²	F-Value	R ²	F-Value
<u>0-117</u>				
Reading	.33806	4.72407	.24444	3.29402
English	.35948	5.19146	.20822	2.67763
Numerical Competency	.36763	5.37744	.20866	2.68481
Total	.42914	6.95350	.25909	3.56045
<u>188-261</u>				
Reading	.44339	10.09017	.27256	5.21141
English	.44993	10.36087	.30156	6.00541
Numerical Competency	.42926	9.52671	.25837	4.84567
Total	.53659	14.66676	.32950	6.83535
<u>262-1,040</u>				
Reading	.48843	29.67770	.30964	15.24968
English	.49170	30.06809	.27406	12.83561
Numerical Competency	.40500	40.34411	.24638	11.11548
Total	.56483	40.34411	.33247	16.93422
<u>1,040 and Up</u>				
Reading	.46196	13.37995	.26237	6.07897
English	.45175	12.84053	.23459	5.23812
Numerical Competency	.42838	11.67834	.18265	3.81936
Total	.52943	17.53228	.25577	5.87365

as an independent variable in the equation, it showed the highest correlation of all the variables to achievement in each instance, the F-value calculated was significant at the .05 level [Snedecor, 1967: 561].

Regression Analysis for All Students

The regression equations shown in this section are those representing each school size and representing only senior students. Each equation will first be presented with the pertinent data on each variable; then, each variable will be analyzed individually. The regression equations using the individual test scores as the dependent variable appear in the appendix in Tables I through XXX. The correlation matrix for the variables in the equations appears in Table XXXI.

Tables V-3 through V-12 show the equations for the total score achieved by all senior students. The same information is included for each school size with GPA and without GPA as an independent variable. The tables in the appendix contain the same breakdown for each of the tests administered. Each table shows the F statistic testing the hypothesis of the regression coefficient being zero. The variables have been marked if they are significant at the 5 percent and 10 percent probability levels based on the F-value. In each equation the Beta value is used to describe the significant variables. The

regression coefficient represents numerically the effect that one unit increase in the independent variable has upon the dependent variable. The Beta coefficient shows the results of one standard deviation increase in the independent variable on the dependent variable. For example, if the Beta coefficient was .5 then an increase of one standard deviation in the independent variable would cause the dependent variable to increase .5 of its standard deviation.

The results of the regression of the total score for all students appear in Table V-3. Grade point average is included in this equation, and has the largest Beta value significant at the .05 level. From the data higher GPA correlates positively with higher achievement. The student's plans for college has the next highest Beta value. This also correlated positively with achievement. This was expected since the student with college intentions probably has a more positive attitude towards learning and school. The third highest Beta value was for per student expenditures. The negative relationship indicates that the more spent per student the lower achievement. This is probably a result of the high per student costs of small schools.

The students involvement in school activities, such as student government and athletics, had the next highest Beta value and also revealed a positive relationship to achievement. This was closely followed by high Beta values related to school attitude and reading material in the home. Both also had positive relationships to

TABLE V-3. TOTAL SCORE EQUATION FOR ALL STUDENTS WITH GPA AS AN INDEPENDENT VARIABLE.

Dependent	Independent	Regression	F-Value
Total Score	GPA	18.40740	343.388*
	School attitude	2.89286	3.935*
	Per student expenditure	-0.00238	11.034*
	School size	-0.00082	0.455
	Father's education	0.29627	3.419**
	Items at home	8.89239	1.856
	Reading material	0.08537	5.238*
	Cars in family	0.83606	2.131
	Own room and car	-2.82010	1.910
	College intention	8.25217	30.921*
	School activities	5.85408	5.265*
	Hours worked	-0.04515	0.902
	Constant	92.21983	
	$R^2 = .47275$	F-value - 64.40821*	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

achievement. This was closely followed by high Beta values related to school attitude and reading material in the home. Both also had positive relationships to achievement. All of the above variables were significant at the .05 level. Two other variables were significant at the .05 level. Two other variables were significant at the .10 level. They were father's educational level and the number of cars in the family; both of which showed positive relationships to achievement. They were school size, items in the home, whether or not the student had their own room and car, and hours working on an outside job.

Table V-4 is the total score equation for all students without grade point average as an independent variable. The highest Beta value was for college intentions which had a positive relationship to achievement. The next highest Beta value was related to involvement in school activities and this also revealed a positive relationship. The third highest Beta value was obtained by the school attitude variable, followed in order by: per student expenditures, student's own room and car, father's educational level, reading material in the home, and hours worked on a job outside of school. Three of the variables had a negative relationship to achievement. These were per student expenditures, own room and car, and hours spent on an outside job. All of the variables mentioned here were significant at the .05 level. Three variables in the equation were not significant; these were school size, items in the home, and cars in the family.

TABLE V-4. TOTAL SCORE EQUATION FOR ALL STUDENTS WITHOUT GPA AS AN INDEPENDENT VARIABLE.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	School attitude	6.89409	16.358*
	Per student expenditure	-0.00285	11.309*
	School size	0.00049	0.115
	Father's education	0.41821	4.885*
	Items at home	10.58202	1.882
	Reading material	0.08751	3.941*
	Cars in family	0.83606	2.131
	Own room and car	-5.18910	4.649*
	College intentions	15.80306	87.807*
	School activities	14.51858	23.989*
	Hours worked	-0.14737	6.975*
	Constant	128.84119	
	$R^2 = .26271$	F-value - 27.9554*	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

Regression By School Size

Tables V-5 and V-6 show the regression equations for schools with 0-117 students. Table V-5 represents the equation which includes grade point average as an independent variable. Only two variables were significant at the .05 level, GPA, which has the higher Beta value, and the number of cars in the family. Two other variables were significant at the .10 level. The highest Beta value of these was for own room and own car followed by the student's involvement in school activities. Grade point average, cars in the family, and school activities all demonstrated a positive relationship to achievement. If the student has his own room and car it showed a negative relationship. All other variables - school attitude, per student expenditure, school size, father's educational level, items at home, home reading material, college intentions, and hours worked - showed no significant relationship to achievement. When GPA was dropped from the equation the student's college intentions, participation in school activities, and the number of cars in the family had the highest Beta values respectively. College intentions and involvement in school activities were both significant at the .05 level. Only cars in the family was significant at the .10 level. School activities are important in a small school probably because of the student population; therefore, the number of activities one is involved in should reflect positively

TABLE V-5. TOTAL SCORE EQUATION FOR SCHOOL SIZE 0-117 STUDENTS.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	GPA	16.95502	33.064*
	School attitude	1.04790	0.062
	Per student expenditures	0.00165	0.220
	School size	0.13213	0.484
	Father's education	-0.25710	0.234
	Items at home	-5.78317	0.100
	Reading material	0.01395	0.026
	Cars in family	2.73050	4.972*
	Own room and car	-11.53994	3.813**
	College intention	4.45649	1.089
	School activities	11.99985	2.814**
	Hours worked	-0.02264	0.033
	Constant	92.08910	
	$R^2 = .42914$	F-value - 6.95350*	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

TABLE V-6. TOTAL SCORE EQUATION FOR SCHOOL SIZE 0-117 WITHOUT GPA.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	School attitude	5.05201	1.154
	Per student expenditures	-0.00039	0.010
	School size	0.15929	0.547
	Father's education	-0.31326	0.247
	Items at home	-7.87460	0.144
	Reading material	0.02000	0.041
	Cars in family	2.47930	3.191**
	Own room and car	-6.38240	0.928
	College intention	13.82656	9.538*
	School activities	17.04811	4.483*
	Hours worked	-0.12536	0.794
	Constant	129.26440	
	$R^2 = .25909$		F-value - 3.56045*

*Significant at the 5 percent level.

**Significant at the 10 percent level.

on school attitude.

Schools with 118-261 students are represented in Tables V-7 and V-8. Table V-7 includes GPA as an independent variable. Three variables showed significance and all were significant at the .05 level. GPA was the only one of these which showed a positive relationship. It also had the highest Beta value. Per student expenditures had the next highest relationship to achievement. When GPA was dropped as an independent variable (Table V-8) four variables showed significance at the .05 level and one at the .10 level. The highest Beta value was school size, it was followed by per student expenditures. Both of these variables correlated negatively with achievement. College intentions had the third highest Beta value and school attitude the fourth highest. Both of these showed a positive relationship to achievement and both were significant at the .05 level. The single variable significant at the .10 level was the students involvement in school activities. It was also positively related to school achievement.

Tables V-9 and V-10 show the equations for schools with 262-1,040 students. Table V-9 has grade point average as an independent variable and in Table V-10 it does not appear in the equation. In the equation shown with GPA four variables are significant at the .05 level. The highest Beta value is for GPA. This is followed by college intentions, and reading material in the home. All three of these variables showed

TABLE V-7. TOTAL SCORE EQUATION FOR SCHOOL SIZE 118-261 STUDENTS.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	GPA	17.486.55	67.924*
	School attitude	4.32618	1.814
	Per student expenditures	-0.00728	28.443*
	School size	-0.18469	17.822*
	Father's education	-0.60583	2.416
	Items at home	2.33934	0.038
	Reading material	-0.01980	0.083
	Cars in family	0.53841	0.196
	Owens room and car	3.56811	0.673
	College intention	4.50904	1.592
	School activities	-1.93290	0.120
	Hours worked	0.07519	0.458
	Constant	147.93963	
	$R^2 = .53659$	F-value - 14.66676*	

*Significant at the 5 percent level.

TABLE V-8. TOTAL SCORE EQUATION FOR SCHOOL SIZE 118-261 WITHOUT GPA.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	School attitude	9.02812	5.676*
	Per student expenditure	-0.00600	13.637*
	School size	-0.19363	13.636*
	Father's education	0.63353	1.838
	Items at home	6.71801	0.216
	Reading material	0.03826	0.217
	Cars in family	0.47610	0.107
	Own room and car	1.47132	0.080
	College intention	15.75625	15.873*
	School activities	11.31572	3.129**
	Hours worked	-0.07364	0.314
	Constant	171.92228	
	$R^2 = .32950$		F-value - 6.83535*

*Significant at the 5 percent level.

**Significant at the 10 percent level.

TABLE V-9. TOTAL SCORE EQUATION FOR SCHOOL SIZE 262-1,040 STUDENTS.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	GPA	21.97017	199.158*
	School attitude	1.59499	0.549
	Per student expenditure	0.00410	1.882
	School size	0.00755	2.205
	Father's education	0.26865	1.551
	Items at home	17.67634	3.646**
	Reading material	0.24809	16.967*
	Cars in family	0.46048	0.477
	Own room and car	-4.93454	2.890**
	College intention	10.64080	27.062*
	School activities	4.12334	1.189
	Hours worked	-0.16747	5.637*
	Constant	52.93562	
	R^2 - .56483	F-value - 40.34411*	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

TABLE V-10. TOTAL SCORE EQUATION FOR SCHOOL SIZE 262-1,040 WITHOUT GPA.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	School attitude	8.35189	10.353*
	Per student expenditure	0.00244	0.437
	School size	0.01033	2.705**
	Father's education	0.50986	3.674**
	Items at home	20.39174	3.173**
	Reading material	0.23532	9.980*
	Cars in family	0.08604	0.011
	Own car and room	-10.53170	8.768*
	College intention	15.05602	36.263*
	School activities	16.75660	13.595*
	Hours worked	-0.24154	7.707*
	Constant	102.02085	
$R^2 = .33247$		F-value - 16.93422*	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

a positive relationship to achievement. The number of hours worked had a negative relationship to achievement and the fourth highest Beta value. The next two highest Beta values were for variables that were significant at the .10 level. Items in the home had the highest Beta value and was positive in its relationship to achievement. If the student had his own room and car, the correlation to achievement was negative. All other variables showed no significant relationship. Table V-10 had only two variables not significant at the .05 or .10 level. School attitude, reading material in the home, if the student had their own room and car, college intentions, involvement in school activities, and hours worked were all significant at the .05 level. Two variables, school size and father's educational level, were significant at the .10 level. The highest Beta value was for the college intentions of the student. The variables seemed to show the most reliable relationship to achievement in schools of this size.

The equations for schools with an enrollment over 1,040 students enrollment is contained in Tables V-11 and V-12. The equation with grade point average as a variable (Table V-11) had only four significant variables all at the .05 level. GPA had the highest Beta value and a positive relationship to achievement. The second highest Beta was for the negatively related per student expenditures. Items in the home and college intentions, both with a positive relationship to achievement, had the next highest Beta values. No other variables in

TABLE V-11. TOTAL SCORE EQUATION FOR SCHOOL SIZE OVER 1,040.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	GPA	21.12409	108.747*
	School attitude	-2.78054	0.790
	Per student expenditure	-0.00577	9.864*
	School size	0.00932	2.199
	Father's education	0.40655	1.493
	Items at home	74.29762	9.381*
	Reading material	-0.05678	0.364
	Cars in family	-1.09659	0.909
	Own room and car	4.53840	1.018
	College intention	7.87742	6.212*
	School activities	0.03460	0.000
	Hours worked	0.01500	0.023
	Constant	18.77307	
$R^2 = .52943$		F-value - 17.53228*	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

TABLE V-12. TOTAL SCORE EQUATION FOR SCHOOL SIZE 1,040 AND UP
WITHOUT GPA.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	School attitude	-1.03101	0.069
	Per student expenditure	-0.00508	4.877*
	School size	0.00233	0.089
	Father's education	0.80128	3.736**
	Items at home	60.56828	3.975*
	Reading material	-0.11956	1.030
	Cars in family	-0.09141	0.004
	Own room and car	-0.60048	0.011
	College intention	16.87547	19.580*
	School activities	9.24075	1.371
	Hours worked	-0.08679	0.493
	Constant	84.46571	
	$R^2 = .25577$		F-value = 5.87365*

*Significant at the 5 percent level.

**Significant at the 10 percent level.

this equation showed a significant relationship to achievement. When GPA is not a variable, the equation (Table V-12) shows that college intentions had the highest Beta value and is positively related to achievement. The second highest Beta was for per student expenditures, a negatively related variable. The Beta value for items in the home ranked third, and this was a positive relationship to achievement. These three variables were significant at the .05 level. One variable, father's education, was significant at the .10 level and it showed a positive relationship to achievement. No other variables revealed any significant relationship to achievement.

Summary

Grade point average is significant in every equation and it correlates positively with achievement. The GPA may be dependent on many different items such as student motivation, student's intelligence, and parental attitudes. Table V-13 shows the correlation coefficients of grade point average and the English, numerical competency, and total scores. Although the relationships are high it is felt that GPA is important [Draper, 1966: 147-150]. Using the data collected in this study, regression analysis was run with GPA as the dependent variable and the same independent variables as before. The equation is shown in Table V-14. Four of the variables with the highest Beta values from high to low were college intentions, school attitude, involvement

TABLE V-13. GPA CORRELATION COEFFICIENTS WITH THE DEPENDENT VARIABLES.

	English	Numerical Competency	Reading	Total
GPA	.65	.56	.61	.68

TABLE V-14. THE EQUATION WITH GPA AS THE DEPENDENT VARIABLE.

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
GPA	School attitude	0.21737	19.342*
	College intentions	0.41021	70.369*
	School activities	0.47071	29.991*
	Hours worked	-0.00555	11.779*
	Own room and car	-0.12870	3.402**
	School size	0.00007	2.912**
	Per student expenditure	-0.00003	1.064
	Father's education	0.00662	1.458
	Home items	0.09179	0.168
	Reading material	0.00012	0.008
	Cars in family	0.00128	0.006
$R^2 = .23831$		F-value - 24.5457	

*Significant at the 5 percent level.

**Significant at the 10 percent level.

in school activities, and hours worked. Two variables were significant at the .10 level. These were own room and car, which had a negative relationship, and school size which was positively related. No other variables showed significance. The variables only explain 23 percent of the variation in R^2 .

The student's attitude toward school shows a positive relationship for all students. In cases where it is related to achievement by school size, its relationship varies in that it is not always a significant variable. This seems to show a different production function for different size schools.

Per student expenditure again is not always a significant variable and when significant it shows a negative relationship to achievement. Its relationship in those cases is small as its regression coefficient is never larger than a negative .01.

School size is not significant in most cases either. It shows significance only in the schools of size 118-1,040 student population and then only if GPA is not an independent variable. Its relationship in these cases is positive.

Father's education shows significance only when viewed for all students and in larger schools. This may be a result of lower education levels in rural areas. Its relationship is positive. Father's educational level is used as a proxy for the socio-economic status of the family. It was felt to be the best predictor based on

other studies and upon its relationship in these equations when compared to a socio-economic index on the mother's education level.

Items in the home shows significance only in some of the size classifications. It is a positive relationship to achievement.

Reading material has a positive relationship in all cases where it shows significance. It does not seem related in the smaller more rural schools.

Cars in the family was used as an indicator of economic status. It is significantly related in only three cases and two of those are at the 10 percent level of significance. Its relationship, when significant, is positive.

Whether the student has his own room and car or not shows significance in some cases. The relationship to achievement is negative in these cases.

The college intentions of the students is significant in most cases. Only in the two smallest school size classifications does it not show significance and then only if GPA is not an independent variable. Its relationship in each case is positive.

The student's involvement in school activities is important in most cases. It shows a positive relationship to achievement where it is significant. In the larger school classes it is not as consistently significant.

The amount of the time a student spends working at an outside job is significant in three cases when looking at the total score equations. This relationship in all instances is negative.

The equations do show marked differences of significant variables by school size. The importance of the common variables in these cases shows some variation as well. In all equations the only items that show up consistently are GPA, home items, and per student expenditures. Not in all cases is per student expenditures a positive relationship for the individual tests. This also varies by school size.

Chapter VI

SUMMARY AND CONCLUSIONS

This study has attempted to look at Montana's educational system and its impact on the student, both rural and urban. The researcher has tried to make a determination of the educational quality in Montana schools. This chapter will first summarize the study and secondly present those conclusions that can be made from the study.

Summary

The study had two major objectives:

- 1) to analyze whether or not school size is important in determining student achievement; and
- 2) to analyze factors that affect student achievement and to determine whether or not these factors vary in different size schools.

The major steps in accomplishing the objectives were as follows: First, samples of schools and students were taken with the aid of the Mathematics Department at Montana State University. Time and money limited the sample to about 10 percent of the sophomores (grade 10) and 10 percent of the seniors (grade 12) in the state. Out of approximately 50,000 high school students in Montana, 2,186 were tested, including 1,311 sophomores and 7 percent of the seniors. The second step was to design the necessary collection instruments and select an

achievement test. The Stanford Achievement Test (SAT) was chosen on a basis of price availability and a recommendation by Buros [1972]. Third, each school was visited and the students were tested by the data collectors hired for the project. In the fourth step the data were verified, checked and coded for input into the computer. The analysis utilized packages by Lund [1973] and a system called SPSS [Nie, 1970]. Analysis of variance and regression analysis were the two major statistical techniques used in the analysis. Finally, the data collected were analyzed in light of the project objectives.

Conclusions

The first of the objectives was to analyze whether or not school size is important in determining student achievement. The results of the statistical analysis in Chapter IV of this study address this objective. The mean score of each test was calculated for each school. This score was standardized so that a composite total score might also be calculated. This procedure was the same for both sophomores and seniors.

The means for the seniors were ranked from highest to lowest and an analysis of variance procedure was used to test mean differences. The range of the means was about 13 points for English, 15 points for reading, 13 points for numerical competency, and 20 points for the composite total score. The analysis of variance procedure

showed a significant difference at the .05 level of significance. The Scheffe test was used to compare the individual means. A comparison of the highest to lowest indicated no significant difference. This left the conclusion that a significant difference does exist between the highest and lowest mean but no other comparison could be made with the methods used in the study. A comparison of the means was also made by school size. In this case the analysis of variance procedure showed a significant difference only in the case of numerical competency. Again the Scheffe test was used and no significant difference was found between the means. The ranges of means in all test scores by school size was less than three points. On the basis of the statistical analysis applied, no significant difference could be determined.

The same procedures were used on the mean scores of the sophomores. The analysis of variance showed a difference in mean scores at the .05 level of significance but the Scheffe test showed no significant difference between the highest and lowest test scores. When the mean scores were ranked from highest to lowest the ranges of the means were 11 points for the English test and the reading test, 10 points on the numerical competency test, and 18 points for the total score. A comparison of the means for each size classification showed significant differences in the means among total score, English, and reading. In each of these cases the

highest mean was for large schools and the lowest mean was for small schools. The Scheffe test showed no significant difference between the highest and lowest means.

Based on these results it seems reasonable to conclude that at the senior level in high school no significant differences exist in the mean test scores based on size of the school. This is not true at the sophomore level of high school. The sophomores of the larger high schools do seem to score better on achievement tests than do those from the smaller rural schools. When the means of the individual schools are compared, the seniors' achievement is fairly evenly interspersed throughout rural and urban schools. The ranking of the schools by sophomore mean score seems to place more urban schools than rural schools at the top of the scale.

A comparison of the test scores to SAT norms reveals interesting results. The means of the seniors and sophomores in every test fell in the fifth stanine ranking which is average for all students taking the test. The percentages of students below the fifth stanine by school size showed only one group with more than 50 percent of the students at the fourth stanine or below. In schools with less than 118 students in size, 54 percent of the seniors tested fell at the fourth stanine or below. In each test administered and for each school size the seniors placed a larger percentage of students below the fifth stanine than did the

sophomores. In general the sophomores did much better than seniors. This might be a result of the sophomores being closer to actual course work in the subject areas tested. From the results, however, it seems that Montana students on the whole do fairly well when compared to the national performance statistics on this particular achievement test. The sophomores show up very well on such a comparison and the seniors place about average. The sophomores in the largest schools place better than do the sophomores in the other three size classifications. The seniors do not seem to vary much from one size class to another.

The second objective was to analyze factors that affect student achievement and to determine whether or not these factors vary in different size schools. Regression analysis was used to analyze the data for this objective. Twelve variables were chosen to represent the school, the student, and socio-economic status. The independent variables were regressed against each of the dependent variables for each of the four school size categories and for all students sampled.

The regressions for all students as a group show GPA, school attitude, per student expenditure, reading material in the home, college intentions, and extracurricular school activities to be the most important variables in determining student achievement. School size was not a significant variable. When GPA was dropped as a

variable three other variables, father's education, own room and car, and number of hours the student worked at a job became significant. In both cases per student expenditures had a negative effect on achievement. It appears that student measures such as GPA, school attitude, and socio-economic measures such as reading material and college intentions have the strongest effect on student achievement.

When looking at the equations as they apply to the different size schools it is obvious that the factors differ in their relationship to student achievement. In the smallest rural schools only two variables are strongly significant, GPA and cars in the family. When GPA is omitted as a variable, college intentions and extracurricular school activities become significant. The largest size class equation shows four significant variables, GPA, per student expenditures, items in the home, and college intentions. Omitting GPA changes the influence of the father's educational level. Per student expenditure has a negative effect on achievement in both equations. The other two size classes show much stronger relationships to the variables. Only in schools of size 118-261 students is school size a significant variable. In schools of 262-1,040 students neither school size nor per student expenditures are significant. Hours worked at an outside job show a negative relationship to achievement in this size school.

The variables do seem to vary in their relationship according to school size. The rural schools seem to have different variables influencing student achievement than the large urban schools. Socio-economic backgrounds of the students seem to have the most influence on achievement. There does seem to be a relationship between school inputs and socio-economic status. Both affect achievement.

This study does not provide an answer to the problems of school productivity. It does suggest that there is something more to increasing output quality than increasing funding. It does support some ideas that different schools of the same size may have to spend different amounts to maintain achievement at a consistent level. There are variables beyond the control of the school system that effect student achievement which must be taken into consideration in estimating a school production function.

The findings highlight the need for continuous efforts to specify the relevant outputs of the educational system as well as the optimum input levels. Such information is crucial to good decision making with respect to human resource development.

The findings of this study suggest additional research which lies beyond the capabilities of the present data. The affects of school inputs on social backgrounds and the production functions of school administrators with emphasis on budget constraints and legal

responsibilities warrant further investigation. A definitive measure of achievement might be gained by testing the student on entrance and exit from the school to obtain the differences in achievement. Other measures of achievement should be considered; student self-concept and physical development are examples. A more definitive view of the effects of schools in the education process is needed. A number of production functions should be considered simultaneously rather than a single equation.

In conclusion, the rural student seems to do about as well as the urban student, yet the variables influencing achievement differ for the rural student. The results may indicate possible policy implications. The data seems to conclude that most high school students are disadvantaged by attending the last two years of high school. In terms of our measures of achievement the sophomores show generally higher levels of achievement than do the seniors. Based on this it is possible that students should be channeled into university or other vocational training at the end of the tenth grade. This also casts doubt on aid to schools from the State or Federal governments for grades eleven and twelve. The lack of differences in achievement between large and small schools also opens areas for school consolidation. If no significant difference in achievement is evident then economies of scale might be accomplished through school consolidation. The acceptance of the

idea that different combinations of inputs are required for different schools may have implications in the area of school finance. If a school, to achieve a desired level achievement must use input factors that are more capital intensive than a school of equal size then equal educational opportunity is not achieved through equal expenditures.

APPENDIX

TABLE I

Reading Equation For All Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Total Score	GPA	6.27895	219.727 **
	School Attitude	1.31948	4.502 **
	Per Student Expend.	- .00096	9.787 **
	School Size	.00016	.093
	Father's Education	.13445	3.872 **
	Items at Home	1.36068	.239
	Reading Material	.02373	2.226
	Cars in Family	.36131	3.058
	Own Room and Car	- .47539	.299
	College Intention	3.31108	27.376 **
	School Activities	1.38259	1.615
	Hours Worked	- .06959	11.785
	Constant	31.46214	
$R^2 = .38905$		F-value = 45.74249 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE II

Numerical Competency Equation For All Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	GPA	6.03722	230.713 **
	School Attitude	1.08709	3.401 *
	Per Student Expend.	- .00080	7.840 **
	School Size	.00078	2.539
	Father's Education	.06293	.964
	Items at Home	4.27690	2.682 *
	Reading Material	.02315	2.406
	Cars in Family	.52933	7.454 **
	Own Room and Car	- .34111	.175
	College Intention	2.68008	20.371 **
	School Activities	1.75554	2.957 *
	Hours Worked	.04442	5.454 **
	Constant	29.22282	
$R^2 = .36805$		F-value = 41.83678 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE III

English Equation For All Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	GPA	6.09124	242.982 **
	School Attitude	.49729	.751
	Per Student Expend.	- .00062	4.862 **
	School Size	- .00020	.182
	Father's Education	.09889	2.461
	Items at Home	3.25481	1.607
	Reading Material	.03849	6.882 **
	Cars in Family	- .07808	.168
	Own Room and Car	-2.00360	6.232 **
	College Intention	2.26101	15.000 **
	School Activities	2.71594	7.322 **
	Hours Worked	- .01998	1.142
	Constant	31.53488	
$R^2 = .38719$		F-value = 45.38680 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE IV

Reading Score For All Students Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	School Attitude	2.68434	15.197 **
	Per Student Expend. -	.00112	10.633 **
	School Size	.00060	1.087
	Father's Education	.17604	5.304 **
	Items at Home	1.93703	.387
	Reading Material	.02446	1.887
	Cars in Family	.36933	2.549
	Own Room and Car	-1.28348	1.743
	College Intention	5.88676	74.665 **
	School Activities	4.33814	13.125 **
	Hours Worked -	.10446	21.473 **
	Constant	43.95415	
$R^2 = .23331$		F-value = 23.87464 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE V

Numerical Competency Equation For All Students Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	School Attitude	2.38840	13.527 **
	Per Student Expend.	- .00096	8.784 **
	School Size	- .00035	.403
	Father's Education	.10293	2.039
	Items at Home	4.83106	2.703 *
	Reading Material	.02385	2.017
	Cars in Family	.53704	6.059 **
	Own Room and Car	-1.11809	1.487
	College Intention	5.15661	64.416 **
	School Activities	4.59731	16.573 **
	Hours Worked	.01089	.263
	Constant	41.23390	
$R^2 = .19891$		F-value = 19.48079 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE VI

English Equation For All Students Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	School Attitude	1.82135	8.048 **
	Per Student Expend.	- .00078	5.922 **
	School Size	.00023	.179
	Father's Education	.13924	3.818 *
	Items at Home	3.81393	1.724
	Reading Material	.03920	5.575 **
	Cars in Family	- .07031	.106
	Own Room and Car	-2.78753	9.458 **
	College Intention	4.75969	56.148 **
	School Activities	5.58313	25.007 **
	Hours Worked	- .05381	6.555 **
	Constant	43.65343	
$R^2 = .21445$		F-value = 21.41803 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE VII

Reading Equations For School Size 0-117 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	GPA	5.07472	15.699 **
	School Attitude	- .69939	.147
	Per Student Expend.	.00079	.269
	School Size	.07846	.904
	Father's Education	- .18537	.645
	Items at Home	-3.51020	.195
	Reading Material	.01059	.078
	Cars in Family	.91400	2.953 *
	Own Room and Car	-3.48222	1.840
	College Intention	2.99685	2.610
	School Activities	5.50394	3.138 *
	Hours Worked	- .02273	.174
	Constant	28.82238	
$R^2 = .33806$		F-value = 4.72407 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE VIII

Numerical Competency Equation For School Size 0-117 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	GPA	6.03663	27.903 **
	School Attitude	1.96311	1.451
	Per Student Expend.	.00109	.647
	School Size	.02715	.136
	Father's Education	.03795	.034
	Items at Home	.33672	.002
	Reading Material	-.01471	.189
	Cars in Family	1.37295	8.369 **
	Own Room and Car	-2.29986	1.008
	College Intention	.31120	.035
	School Activities	3.68368	1.765
	Hours Worked	.02759	.322
	Constant	23.56233	
$R^2 = .36763$		F-value = 5.37744 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE IX

English Equation For School Size 0-117 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	GPA	5.84367	26.213 **
	School Attitude	- .21581	.018
	Per Student Expend.	- .00024	.031
	School Size	.02651	.130
	Father's Education	- .10968	.284
	Items at Home	-2.60970	.136
	Reading Material	.01807	.286
	Cars in Family	.44355	.876
	Own Room and Car	-5.75785	6.336 **
	College Intention	1.14844	.483
	School Activities	2.81224	1.031
	Hours Worked	- .02750	.321
	Constant	39.70439	
$R^2 = .35948$		F-value = 5.19146 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE X

Reading Equation For School Size 118-261 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	GPA	6.08486	46.652 **
	School Attitude	2.31358	2.943 *
	Per Student Expend.	- .00258	20.263 **
	School Size	- .06277	11.675 **
	Father's Education	.20299	1.539
	Items at Home	1.88895	.139
	Reading Material	- .02260	.610
	Cars in Family	.72472	2.019
	Own Room and Car	1.19526	.429
	College Intention	.72644	.234
	School Activities	-2.01628	.743
	Hours Worked	- .03825	.673
	Constant	48.42904	

$$R^2 = .44339$$

$$F\text{-value} = 10.09017 **$$

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XI

Numerical Competency For School Size 118-261 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	GPA	5.83205	45.511 **
	School Attitude	.95142	.529
	Per Student Expend.	- .00207	13.902 **
	School Size	- .03582	4.038 **
	Father's Education	.14944	.886
	Items at Home	-2.78007	.319
	Reading Material	- .01592	.322
	Cars in Family	.31401	.403
	Own Room and Car	1.73788	.962
	College Intention	2.71106	3.467 *
	School Activities	- .71768	.100
	Hours Worked	.07344	2.634
Constant		45.66785	
$R^2 = .42926$		F-value = 9.52671	

* = Significant at the 10% level.

** - Significant at the 5% level.

TABLE XII

English Equation For School Size 118-261 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	GPA	5.56964	41.000 **
	School Attitude	1.06118	.650
	Per Student Expend.	- .00263	22.026 **
	School Size	- .08611	23.047 **
	Father's Education	.25340	2.515
	Items at Home	3.23046	.426
	Reading Material	.01871	.439
	Cars in Family	- .50032	1.009
	Own Room and Car	.63497	.127
	College Intention	1.07154	.535
	School Activities	.80105	.123
	Hours Worked	.04001	.772
Constant		53.84273	
$R^2 = .44993$		F-value = 10.36087 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XIII

Reading Equation For School Size 262-1040 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	GPA	7.66077	130.364 **
	School Attitude	1.09628	1.396
	Per School Expend.	.00137	1.133
	School Size	.00600	7.499 **
	Father's Education	.07915	.725
	Items at Home	5.00911	1.576
	Reading Material	.10519	16.421 **
	Cars in Family	.14576	.257
	Own Room and Car	-1.14422	.837
	College Intention	4.09884	21.618 **
	School Activities	.40427	.062
	Hours Worked	- .12572	17.104 **
	Constant	15.55957	

$$R^2 = .48843$$

$$F\text{-value} = 29.67770 **$$

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XIV

Numerical Competency Equation for School Size 262-1040 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	GPA	6.61242	99.439 **
	School Attitude	.23532	.066
	Per Student Expend.	.00058	.206
	School Size	.00233	1.160
	Father's Education	.11384	1.535
	Items at Home	8.62496	4.785 **
	Reading Material	.08188	10.186
	Cars in Family	.34934	1.513
	Own Room and Car	-1.85082	2.241
	College Intention	3.22754	13.723 **
	School Activities	2.51048	2.429
	Hours Worked	.02409	.643
	Constant	18.60088	
	$R^2 = .40500$	F-value = 21.15768 **	

* = Significant at the 10% level.

** - Significant at the 5% level.

TABLE XV

English Equation For School Size 262-1040 Students

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	GPA	7.69698	159.710 **
	School Attitude	.26339	.098
	Per Student Expend.	.00215	3.386 *
	School Size	- .00078	.155
	Father's Education	.07566	.804
	Items at Home	4.04227	1.246
	Reading Material	.06102	6.707 **
	Cars in Family	.03461	.018
	Own Room and Car	-1.93949	2.917 *
	College Intention	3.31442	17.155 **
	School Activities	1.20858	.667
	Hours Worked	- .06583	5.691 **
	Constant	18.77517	
$R^2 = .49170$		F-value = 30.06809 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XVI

Reading Equation For School Size Over 1040

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	GPA	7.19306	69.372 **
	School Attitude	- .98970	.551
	Per Student Expend.	- .00183	5.454 **
	School Size	.00206	.593
	Father's Education	.39162	7.624 **
	Items at Home	14.40200	1.939
	Reading Material	- .08142	4.117 **
	Cars in Family	- .20852	.181
	Own Room and Car	2.34830	1.499
	College Intention	3.45569	6.577 **
	School Activities	- .59717	.049
	Hours Worked	- .04973	1.387
	Constant	15.00769	
$R^2 = .46196$		F-Value = 13.37995 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XVII

Numerical Competency For School Size Over 1040

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	GPA	7.18061	80.386 **
	School Attitude	- .06345	.003
	Per Student Expend.	- .00221	9.247 **
	School Size	.00423	2.901 *
	Father's Education	- .11043	.705
	Items at Home	21.91025	5.219 **
	Reading Material	.00997	.072
	Cars in Family	.16358	.129
	Own Room and Car	2.52569	2.017
	College Intention	2.80872	5.052 **
	School Activities	- .11500	.002
	Hours Worked	.04391	1.258
	Constant	6.79256	
$R^2 = .42838$		F-value = 11.67834 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XVIII

English Equation For School Size Over 1040

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	GPA	6.75043	74.072 **
	School Attitude	-1.72739	2.035
	Per Student Expend.	- .00173	5.929 **
	School Size	.00302	1.544
	Father's Education	.12535	.947
	Items at Home	37.98537	16.355 **
	Reading Material	.01467	.162
	Cars in Family	-1.05166	5.576 **
	Own Room and Car	- .33559	.037
	College Intention	1.61302	1.737
	School Activities	.74678	.092
	Hours Worked	.02082	.295
	Constant	-3.02717	

 $R^2 = .45175$

F-value = 12.84053 **

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XIX

Reading Equation for School Size 0-117 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	School Attitude	.49906	.068
	Per Student Expend.	.00018	.012
	School Size	.08659	.974
	Father's Education	- .20218	.678
	Items at Home	-4.13617	.239
	Reading Material	.01240	.095
	Cars in Family	.83882	2.201
	Own Room and Car	-1.93855	.516
	College Intention	5.80135	10.119 **
	School Activities	7.01490	4.574 **
	Hours Worked	- .05347	.870
	Constant	39.94913	
$R^2 = .24444$		F-value = 3.29402 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XX

Numerical Competency Equation for School Size 0-117 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	School Attitude	3.38872	3.583 *
	Per Student Expend.	.00037	.059
	School Size	.03682	.202
	Father's Education	.01796	.006
	Items at Home	- .40790	.003
	Reading Material	- .01255	.111
	Cars in Family	1.28351	5.905 **
	Own Room and Car	- .46359	.034
	College Intention	3.64730	4.582 **
	School Activities	5.48105	3.199 *
	Hours Worked	- .00898	.028
	Constant	36.79815	
$R^2 = .20866$		F-value = 2.68481 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXI

English Equation For School Size 0-117 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	School Attitude	1.16423	.429
	Per Student Expent.	- .00094	.396
	School Size	.03587	.194
	Father's Education	- .12903	.321
	Items at Home	-3.33052	.180
	Reading Material	.02015	.290
	Cars in Family	.35698	.464
	Own Room and Car	-3.98027	2.530
	College Intention	4.37790	6.700 **
	School Activities	4.55216	2.240
	Hours Worked	- .06291	1.400
	Constant	52.51712	
$R^2 = .20822$		F-value = 2.67763 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXII

Reading Equation For School Size 118-261 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	School Attitude	3.94973	6.823 **
	Per Student Expend.	- .00214	10.838 **
	School Size	- .06588	9.911 **
	Father's Education	.21263	1.300
	Items at Home	3.41261	.350
	Reading Material	- .00239	.005
	Cars in Family	.70304	1.463
	Own Room and Car	.46563	.050
	College Intention	4.64017	8.625 **
	School Activities	2.59389	1.032
	Hours Worked	- .09004	2.950 *
	Constant	56.77437	
$R^2 = .27256$		F-value = 5.21141 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXIII

Numerical Competency Equation For
School Size 118-261 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	School Attitude	2.51959	2.965 *
	Per Student Expend.	- .00165	6.893 **
	School Size	- .03880	3.673 *
	Father's Education	.15868	.773
	Items at Home	-1.31971	.056
	Reading Material	.00345	.012
	Cars in Family	.29323	.272
	Own Room and Car	1.3857	.267
	College Intention	6.46219	17.867 **
	School Activities	3.70095	2.245
	Hours Worked	.07380	.220
Constant			
$R^2 = .25837$		F-value = 4.84567 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXIV

English Equation For School Size 118-261 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	School Attitude	2.55879	3.092 *
	Per Student Expend.	- .00222	12.640 **
	School Size	- .08895	19.511 **
	Father's Education	.26222	2.135
	Items at Home	4.62512	.694
	Reading Material	.03720	1.391
	Cars in Family	- .52017	.865
	Own Room and Car	- .03288	.000
	College Intention	4.65389	9.367 **
	School Activities	5.02088	4.177 **
	Hours Worked	- .00740	.022
	Constant	61.48145	
$R^2 = .30156$		F-value = 6.00541 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXV

Reading Equation For School Size 262-1040 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	School Attitude	3.45234	10.825 **
	Per Student Expend.	.0079	.282
	School Size	.00697	7.531 **
	Father's Education	.16325	2.305
	Items at Home	5.95594	1.657
	Reading Material	.10074	11.193 **
	Cars in Family	.01519	.00
	Own Room and Car	-3.09590	4.637 **
	College Intention	5.63838	31.122 **
	School Activities	4.80936	6.853 **
	Hours Worked	- .15155	18.568 **
	Constant	32.67509	
$R^2 = .30964$		F-value = 15.24968 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXVI

Numerical Competency Equation For
School Size 262-1040 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	School Attitude	2.26896	5.101 **
	Per Student Expend.	.00008	.003
	School Size	.00317	1.699
	Father's Education	.18644	3.279 *
	Items at Home	9.44222	4.542 **
	Reading Material	.07803	7.326 **
	Cars in Family	.23664	.551
	Own Room and Car	-3.53542	6.596 **
	College Intention	4.55640	22.170 **
	School Activities	6.31275	12.880 **
	Hours Worked	.00179	.003
	Constant	33.37419	
$R^2 = .24638$		F-value = 11.11548 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXVII

English Equation For School Size 262-1040 Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	School Attitude	2.63059	7.207 **
	Per Student Expend.	.00157	1.268
	School Size	.00019	.007
	Father's Education	.16017	2.544
	Items at Home	4.99358	1.335
	Reading Material	.05655	4.045 **
	Cars in Family	- .16570	.284
	Own Room and Car	-3.90038	8.439 **
	College Intention	4.86124	26.529 **
	School Activities	5.63449	10.787 **
	Hours Worked	- .09178	7.809 **
	Constant	35.97157	
$R^2 = .27406$		F-value = 12.83561 **	

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXVIII

Reading Equation For School Size 1040
and Greater Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Reading	School Attitude	- .39396	.064
	Per Student Expend.	- .00160	3.049 *
	School Size	- .00031	.010
	Father's Education	.52604	10.220 **
	Items at Home	9.73697	.651
	Reading Material	- .10280	4.832 **
	Cars in Family	.13376	.055
	Own Room and Car	.59844	.072
	College Intention	6.51965	18.548 **
	School Activities	2.53765	.656
	Hours Worked	- .08439	2.959 *
	Constant	37.37697	

 $R^2 = .26237$
 $F\text{-value} = 6.07897 **$

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXIX

Numerical Competency Equation For School Size 1041
And Greater Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
Numerical Competency	School Attitude	.53126	.130
	Per Student Expend.	- .00198	5.120 **
	School Size	.00186	.397
	Father's Education	.02375	.023
	Items at Home	17.24330	2.279
	Reading Material	- .01137	.066
	Cars in Family	.50527	.874
	Own Room and Car	.77885	.136
	College Intention	5.86738	16.749 **
	School Activities	3.01440	1.033
	Hours Worked	.00931	.040
	Constant	29.12314	

$$R^2 = .1866475 \quad F\text{-value} = 3.81936 **$$

* = Significant at the 10% level.

** = Significant at the 5% level.

TABLE XXX

English Equation For School Size 1040
and Greater Without GPA

Dependent Variable	Independent Variable	Regression Coefficient	F-Value
English	School Attitude	-1.16831	.672
	Per Student Expend.	- .00151	3.263 *
	School Size	.00079	.077
	Father's Education	.25149	2.781 *
	Items at Home	33.59801	9.241 **
	Reading Material	- .00539	.016
	Cars in Family	- .73044	1.951
	Own Room and Car	-1.97778	.940
	College Intention	4.48844	10.466 **
	School Activities	3.68870	1.651
	Hours Worked	- .01171	.068
	Constant	17.96560	
$R^2 = .23459$		F-value = 5.23812 **	

* = Significant at the 10% level.

** - Significant at the 5% level.

APPENDIX A

Please answer each question as correctly as possible.

School _____

Student Number _____
(from test sheet)

Who is the major provider in your family? Father _____
Mother _____
Other _____

What is the occupation of your father? _____

What is the occupation of your mother? _____

Is your father self-employed? Yes _____
No _____

Is your mother self-employed? Yes _____
No _____

Circle your father's highest educational level.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Grade								High School				College				Post-Grad			

Circle your mother's highest educational level.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Grade								High School				College				Post-Grad			

Do you live at home with both of your parents? Yes _____
No _____

How many children are in your family, including yourself? _____

How many cars are in your immediate family? _____

Circle those items you have in your home.

telephone television newspaper radio

What is the number of magazines to which your family subscribes? _____

Do your parents purchase books? Yes _____
No _____

If yes, about how many a year for general family reading? _____

Do you have your own room? Yes _____
No _____

Do you have your own car? Yes _____
No _____

Circle the location that best describes where you live?

Farm or Ranch	In Town	Out of Town	Other
1			
2			
3			
4			
5			
6			
7			
8			
9			
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11			
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100			

How many hours a week do you spend on school studies outside of school hours?

Do you have a part time job (include farm chores) during the school year? Yes
 No

If yes, how many hours per week? _____

Have you traveled: _____ outside Montana
 _____ outside the U.S.
 _____ outside North America

Does one of your parents attend parent-teacher conferences
or school open-houses? _____ Yes
_____ No

Do you take part in: _____ Student Government
(Check if Yes) _____ Athletics
_____ Class Plays
_____ Student Organisations
_____ Other School Organisations

What is your favorite subject? _____

What do you plan to do when you graduate from high school? (Check one)

_____ Colleges (All)
 _____ Vocational-Technical School
 _____ Community College
 _____ Private Trade School
 _____ Armed Forces
 _____ Employment

Who influenced you to do the above? (Check one)

_____ Another Student
_____ Teacher or Counselor
_____ Mother
_____ Father
_____ Relative
_____ Other

Do you like school? _____ Yes
_____ No

How long have you lived in this community? _____

APPENDIX B

TABLE XXXI

Correlation Matrix

	Eng.	Read.	Num.	School	Per Student	Beginning	School	Father's	Items in	Reading	Family	Own Room	College	School	Hours	Grade
	Eng.	Read.	Comp.	Attitude	Expenditure	Salary	Size	Education	Home	Material	Autos	and Car	Intent.	Activities	Work.	Point
Total Score	.889	.910	.860	.278	-.105	.041	-.025	.165	.079	.096	-.009	-.183	.425	.298	-.122	.643
English		.742	.631	.237	-.077	.047	-.034	.143	.065	.098	-.066	-.124	.367	.286	-.132	.582
Reading			.667	.261	-.117	.020	-.014	.157	.063	.073	-.013	-.070	.395	.240	-.175	.572
Numerical Competency				.240	-.083	.043	-.052	.138	.085	.087	.055	-.028	.367	.271	-.012	.557
School Attitude					-.089	-.123	-.007	.076	-.018	.013	-.124	-.098	.290	.242	-.064	.286
Per Student Expenditure						.215	-.238	-.036	-.045	.061	.035	.012	-.004	.101	.063	-.049
Beginning Salary							.287	.058	.084	-.006	-.002	-.055	.035	-.117	-.062	.033
School Size								.112	.116	-.101	-.061	.053	.036	-.408	.019	-.003
Father's Education									.071	.125	.033	.056	.216	.087	.082	.122
Items in the Home										-.035	.111	.094	.079	.039	-.029	.148
Reading Material											.118	.105	.064	.115	.024	.032
Family Autos												.294	-.040	-.007	.196	-.067
Own Room and Car													-.045	-.006	.193	-.100
College Intention														.304	-.070	.400
School Activities															-.044	.296
Hours Worked																-.152

TABLE XXXI

Correlation Matrix

	Eng.	Read.	Num.	School	Per Student	Beginning	School	Father's	Items in	Reading	Family	Own Room	College	School	Hours	Grade
	Eng.	Read.	Comp.	Attitude	Expenditure	Salary	Size	Education	Home	Material	Autos	and Car	Intent.	Activities	Work.	Point
Total Score	.889	.910	.860	.278	-.105	.041	-.025	.165	.079	.096	-.009	-.183	.425	.298	-.122	.643
English		.742	.631	.237	-.077	.047	-.034	.143	.065	.098	-.066	-.124	.367	.286	-.132	.582
Reading			.667	.261	-.117	.020	-.014	.157	.063	.073	-.013	-.070	.395	.240	-.175	.572
Numerical Competency				.240	-.083	.043	-.052	.138	.085	.087	.055	-.028	.367	.271	-.012	.557
School Attitude					-.089	-.123	-.007	.076	-.018	.013	-.124	-.098	.290	.242	-.064	.286
Per Student Expenditure						.215	-.238	-.036	-.045	.061	.035	.012	-.004	.101	.063	-.049
Beginning Salary							.287	.058	.084	-.006	-.002	-.055	.035	-.117	-.062	.033
School Size								.112	.116	-.101	-.061	.053	.036	-.408	-.019	-.003
Father's Education									.071	.125	.033	.056	.216	.087	.082	.122
Items in the Home										-.035	.111	.094	.079	.039	-.029	.148
Reading Material											.118	.105	.064	.115	.024	.032
Family Autos												.294	-.040	-.007	.196	-.067
Own Room and Car													-.045	-.006	.193	-.100
College Intention														.304	-.070	.400
School Activities															-.044	.296
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Correlation Matrix

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	Eng.	Read.	Comp.	Attitude	Expenditure	Salary	Size	Education	Home	Material	Autos	and Car	Intent.	Activities	Work.	Point
Total Score	.889	.910	.860	.278	-.105	.041	-.025	.165	.079	.096	-.009	-.183	.425	.298	-.122	.643
English		.742	.631	.237	-.077	.047	-.034	.143	.065	.098	-.066	-.124	.367	.286	-.132	.582
Reading			.667	.261	-.117	.020	-.014	.157	.063	.073	-.013	-.070	.395	.240	-.175	.572
Numerical Competency				.240	-.083	.043	-.052	.138	.085	.087	.055	-.028	.367	.271	-.012	.557
School Attitude					-.089	-.123	-.007	.076	-.018	.013	-.124	-.098	.290	.242	-.064	.286
Per Student Expenditure						.215	-.238	-.036	-.045	.061	.035	.012	-.004	.101	.063	-.049
Beginning Salary							.287	.058	.084	-.006	-.002	-.055	.035	-.117	-.062	.033
School Size								.112	.116	-.101	-.061	.053	.036	-.408	.019	-.003
Father's Education									.071	.125	.033	.056	.216	.087	.082	.122
Items in the Home										-.035	.111	.094	.079	.039	-.029	.148
Reading Material											.118	.105	.064	.115	.024	.032
Family Autos												.294	-.040	-.007	.196	-.067
Own Room and Car													-.045	-.006	.193	-.100
College Intention														.304	-.070	.400
School Activities															-.044	.296
Hours Worked																-.152

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