



Variability of student achievement attributed to school district wealth
by Joyce Jeanne Ley

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
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Abstract:

The major problem of this study was to determine if there was a statistically significant amount of variability in normal curve equivalents of mean scores of third and sixth grade student reading and mathematics achievement tests attributed to school district taxable valuation per student and total instruction-related expenditures per student. The secondary problem of this study was to determine if there was a statistically significant amount of variability in the dependent variables of normal curve equivalents of mean scores on third and sixth grade student reading and mathematics achievement tests attributed to each of the following independent variables: beginning teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district student enrollment, and teacher-student ratio.

For both the major and secondary studies, multiple regression procedures were used to determine if the independent variables contributed significantly to the variability of third and sixth grade student reading and mathematics achievement. The F-test was applied to determine if the R² was significant, and forward stepwise procedures were applied when the R² was significant.

The conclusions of the major problem of this study suggested that taxable valuation and instruction-related expenditures do not contribute significantly to the variability of student achievement. Students from the poorer school districts scored as well on reading and mathematics achievement tests as did students from the wealthier districts. The conclusions of the secondary problem suggested that third grade student reading achievement was influenced by the percentage of students eligible for free and reduced lunch and beginning teacher salaries, particularly in Class 3 school districts, and that student achievement in third and sixth grade mathematics, and sixth grade reading was influenced by maximum teacher salaries.

The major recommendations for further study include: (1) a determination of enhancement/enrichment opportunities for preschool children in Class 3 school districts, (2) school district-community partnerships to provide enhancement programs for primary-level students, (3) investigation of statewide programs for continued staff development and improved salaries for experienced teachers, and (4) a determination of the relationship between school district wealth and achievement of high school students.

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TO SCHOOL DISTRICT WEALTH**

by

Joyce Jeanne Ley

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

of

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APPROVAL

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This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ABSTRACT

The major problem of this study was to determine if there was a statistically significant amount of variability in normal curve equivalents of mean scores of third and sixth grade student reading and mathematics achievement tests attributed to school district taxable valuation per student and total instruction-related expenditures per student. The secondary problem of this study was to determine if there was a statistically significant amount of variability in the dependent variables of normal curve equivalents of mean scores on third and sixth grade student reading and mathematics achievement tests attributed to each of the following independent variables: beginning teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district student enrollment, and teacher-student ratio.

For both the major and secondary studies, multiple regression procedures were used to determine if the independent variables contributed significantly to the variability of third and sixth grade student reading and mathematics achievement. The F-test was applied to determine if the R^2 was significant, and forward stepwise procedures were applied when the R^2 was significant.

The conclusions of the major problem of this study suggested that taxable valuation and instruction-related expenditures do not contribute significantly to the variability of student achievement. Students from the poorer school districts scored as well on reading and mathematics achievement tests as did students from the wealthier districts. The conclusions of the secondary problem suggested that third grade student reading achievement was influenced by the percentage of students eligible for free and reduced lunch and beginning teacher salaries, particularly in Class 3 school districts, and that student achievement in third and sixth grade mathematics, and sixth grade reading was influenced by maximum teacher salaries.

The major recommendations for further study include: (1) a determination of enhancement/enrichment opportunities for preschool children in Class 3 school districts, (2) school district-community partnerships to provide enhancement programs for primary-level students, (3) investigation of statewide programs for continued staff development and improved salaries for experienced teachers, and (4) a determination of the relationship between school district wealth and achievement of high school students.

CHAPTER 1

INTRODUCTION

Equality of educational opportunity has been a goal of American education since the earliest days of U.S. history (Rossmiller, 1986a). The initial goal was expanded beyond access to elementary education to include secondary education in the 1820s (Wood, Nicholson, & Findley, 1985). Prior to the 1970s, the general attitude of the American public was that the financing of public education was a state obligation mandated by the provisions of the 10th Amendment to the U.S. Constitution (Hack, 1978). This attitude was also held by state and federal courts. The U.S. Supreme Court ruled that segregation in public schools was unconstitutional in *Brown v. Board of Education of Topeka, Kansas* in 1954, but there was no specific mention of the financing of public education (Reutter, 1985). Disparities in educational revenues, expenditures, and opportunities existed, and challengers to systems that allowed disparities received only limited hearings and no resolution to their claims.

In *Rodriguez v. San Antonio Independent School District* (1973), the U.S. Supreme Court reaffirmed that education was a function reserved for the states under the 10th Amendment to the U.S. Constitution (Ornstein, 1978), and the

Court suggested that this issue be brought forth in state courts since most state constitutions mention education (Odden, McGuire, & Belschos-Simmons, 1983). The first case to successfully challenge a state's structure of school finance was that of *Serrano v. Priest* in California in 1971 (Hack, 1978). *Serrano* alleged that the existing structure of school finance was in violation of the California State Constitution because the state's school finance formula did not provide equality in terms of educational opportunity, educational expenditures per student, or tax burden; thus, it violated the equal protection clause of the state's constitution (Hack, 1978). *Serrano* was eventually heard by the California Supreme Court which held that financing of public education must not be based on the wealth of a school district (Friedman & Wiseman, 1978).

The political issue of school finance reform became a salient one during the 1970s and 1980s, and over half of the states have legislated reforms in the methods of financing public education (Alexander & Salmon, 1982). Montana's structure of financing public education was challenged in state district court by several Montana school districts in 1987. These districts contended that the existing school finance system denied equal protection to a basic system of quality education to many students (*Helena Elementary School District #1 et al. v. State of Montana*, 1988). The challenge was brought before Judge Henry Loble, and trial proceedings began in May 1987. Judge Loble issued his decision for the school districts on January 13, 1988. His decision was later upheld by the Montana Supreme Court (*Montana Supreme Court*, #88-381).

Judge Loble's decision focused on the equity of students' educational opportunities. The allegation of the plaintiff school districts was that Montana's school funding structure allowed for different levels of per-pupil expenditures. Testimony presented in the district court trial proceedings did not address student achievement. The relationship between school district expenditure levels and student achievement was not a consideration in Loble's decision.

The question of the correlation between school district wealth and expenditures with student achievement is particularly relevant and pertinent in the State of Montana. Because of the large number of students affected by disparities in school district wealth, it was appropriate that the data be examined to determine the correlation between school district wealth and expenditures and student achievement in Montana.

Statement of the Problem

The major problem addressed by this study was to determine if there was a statistically significant amount of variability in normal curve equivalents of mean scores of student reading and mathematics achievement tests which could be attributed to school district wealth.

The solution to this major problem allowed the researcher to determine if there was a statistically significant amount of variability in normal curve equivalents of mean scores of students' reading and mathematics achievement tests attributed to the independent variables of school districts' taxable valuation per

student and instruction-related expenditures per student. The dependent variables were normal curve equivalents of student reading and mathematics achievement mean test scores of third graders and sixth graders in Montana elementary school districts.

A secondary problem addressed by this study was to determine if there was a statistically significant amount of variability in the dependent variables of normal curve equivalents of mean scores of reading and mathematics achievement tests of third and sixth grade students attributed by each of the following selected independent variables.

- (1) Beginning (base) teacher salaries in the districts
- (2) Maximum teacher salaries in the districts
- (3) Percentage of students eligible for free and/or reduced lunch
- (4) District enrollment sizes, commonly referred to as average number belonging (ANB)
- (5) Teacher-student ratios in the districts

The results of statistical analyses allowed the researcher to determine if there was a statistically significant amount of variability in the normal curve equivalents of mean scores of student reading and mathematics achievement tests for third and sixth grade students in Montana school districts attributed to each independent variable.

Need for the Study

The following research supports the need to expand upon the current body of literature:

- (1) There were conflicting reports that student achievement was affected by school district wealth (Guthrie, Kleindorfer, Levin, & Stout, 1971). Mort, Reusser and Polley (1960) concluded that student achievement was greater when expenditure levels per student were higher. Coleman et al. (1966) found that student achievement was more affected by socioeconomic status and family backgrounds than by characteristics of school district wealth.
- (2) A statistically significant relationship between beginning teacher salaries and student achievement was found in a study conducted by J.A. Thomas (Guthrie et al., 1971).
- (3) There was an implication that there should be more centralized control of educational policy and educational spending at the state level to ensure equality of educational achievement (McGuire, 1983).
- (4) Accountability was demanded by taxpayers and legislators. With increased educational revenues, controls and assessments were expected to ensure that money was being used for intended purposes. Testing for minimal competencies became a national norm, and anxiety increased because of nationwide evidence of falling pupil achievement. This raised the question as to whether money could produce quality education (Fuhrman, 1978).

- (5) Programs of compensatory education carried out under Title I of the Elementary and Secondary Education Act of 1965 were unable to demonstrate a significant relationship between improved test scores and increased resources for schools (Levin, 1976).
- (6) Over one-half of the chairpersons of state legislature education committees believed that student achievement tests were an adequate measure of learning in mathematics and reading, and two-thirds of those surveyed indicated that accountability of a school district was measured by good student achievement (President's Commission on School Finance, 1972).
- (7) Bandy (1980) recommended that the Montana Foundation Program (the basis for Montana's system of school finance) be carefully reviewed with regard to the question of whether it would meet the test of equality of educational opportunity for students. Bandy stated, "Substantial increases in Foundation Program schedules would reduce vulnerability on questions of equity and equalization [of tax effort]" (Bandy, 1980, p. 77).
- (8) Although some economically stressed school districts produced excellent students, Judge Henry Loble wrote in his 1988 state district court decision (*Helena Elementary School District #1 et al. v. State of Montana*):

There can be no doubt that many students in the State . . . are not being provided with the educational opportunities that other students who reside in wealthier school districts receive as a matter of course.

Questions to Be Answered

The following research questions were answered in this study:

- (1) Major Problem: Was there a statistically significant amount of variability in normal curve equivalents of school district mean scores on student reading and mathematics achievement tests at the third and sixth grade levels attributed to school district taxable valuation per student and instructional related expenditures per student?
- (2) Secondary Problem: Was there a statistically significant amount of variability in normal curve equivalents of mean scores on student reading and mathematics achievement tests at the third and sixth grade levels attributed by the independent variables of beginning (base) teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district ANB, and teacher-student ratios?

General Procedure

The sample for both the major and secondary problems of this study was the population of all public elementary school districts operating in Montana during the 1986-87, 1987-88, and 1988-89 school years with enrollment (ANB) of more than 50 students.

School districts in Montana did not use one standardized achievement test (Olson, 1987). For that reason, this study used normal curve equivalents of the mean test scores rather than the mean scores.

This study was conducted in 1989 using data from the 1986-87 school year. Information relative to the taxable valuations of school districts was obtained from the Application for Tax Levies and State Equalization (see Appendix D) for budget years of 1986-87, 1987-88, and 1988-89 and Trustees' Financial Summary for 1986-87. Data from 1986-87 was used because it was the most complete, current data available. The "Application" was the school district budget document reported by every school district to the respective County Superintendent of Public Instruction and to the Montana Office of Public Instruction. The Trustees' Financial Summary was the official record of expenditures made by a school district and was also reported to County Superintendents and the Montana Office of Public Instruction.

Budget items that were used to determine the instruction related expenditures per student were the following categories from school districts' general fund budgets:

- (1) Item 1.10 -- Instructional Services, Regular Programs
- (2) Item 1.20 -- Supportive Services - Instructional
- (3) Item 1.22 -- Educational Media Services
- (4) Item 2.10 -- Instructional Services, Special Programs
- (5) Item 2.20 -- Transportation Services, Special Programs
- (6) Item 3.10 -- Instructional Services, Vocational Programs

These six categories represented a minimum of 71 separate line items of the general fund budget. Data from school district budget documents were collected from records on file with the Montana Office of Public Instruction.

The amount of expenditures per student was based on actual expenditures for the 1986-87 school year as indicated in the 1988-89 general fund budgets and 1986-87 Trustees' Financial Summaries. The amounts for each category were added to determine the total amount of instruction-related expenditures for a school district. The total amount was divided by school districts' student enrollment (ANB) to determine the amount of instruction-related expenditures per student. ANB data were included in budget documents filed by school districts with County Superintendents and verified with the Montana Office of Public Instruction.

The following information was obtained from school districts, County Superintendents, Montana School Boards' Association (MSBA), Montana Education Association (MEA), and Montana Office of Public Instruction (OPI):

- (1) Beginning (base) teacher salaries
- (2) Maximum teacher salaries
- (3) Percentage of students eligible for free and/or reduced lunch
- (4) Normal curve equivalents of mean scores of reading and mathematics achievement tests for third and sixth grade students

One-way analysis of variance (ANOVA) statistical procedures were used to determine if there were statistically significant differences between school districts with achievement test and salary data and those without these data.

Multiple regression analysis was the statistical procedure applied to the data to determine the amount of variability each independent variable identified had on the dependent variables of normal curve equivalents of mean scores of third and sixth grade students' reading and mathematics achievement tests. The F test was applied to test the statistical significance of the multiple correlation coefficient (R^2). When the F-value was statistically significant, forward stepwise regression analysis was conducted to determine how much of the variability in student achievement was determined by each respective independent variable.

Limitations and Delimitations of the Study

Limitations

- (1) The only socioeconomic variable included in this study was the percentage of students eligible for free and/or reduced lunch.
- (2) No single standardized test was used by all school districts in Montana to measure student reading and mathematics achievement.
- (3) Accuracy of instruction-related expenditures was limited to the accuracy of school districts' reporting of expenditures in the Trustees' Financial Summaries.

Delimitations

- (1) This study was limited to the relationship between the wealth of school districts and student achievement.
- (2) This study was concerned only with the correlation between the identified independent and dependent variables as they relate to Montana public elementary school districts in the defined population.
- (3) This study was concerned only with the normal curve equivalents of mean scores of third and sixth grade students' reading and mathematics achievement tests.
- (4) Teacher-student ratio reported in this study was not indicative of class size, but limited to the ratio of teachers to student enrollment as documented in the Application(s) for Tax Levies and State Equalization (school district budget documents).
- (5) Instruction related expenditures included the total of all line items reported in each of the following general fund budget categories:
 - (a) Item 1.10 -- Instructional Services, Regular Programs
 - (b) Item 1.20 -- Supportive Services - Instructional
 - (c) Item 1.22 -- Educational Media Services
 - (d) Item 2.10 -- Instructional Services, Special Programs
 - (e) Item 2.20 -- Transportation Services, Special Programs
 - (f) Item 3.10 -- Instructional Services, Vocational Programs

- (6) This study was limited to Montana public elementary school districts with a student enrollment of more than 50 students.

CHAPTER 2

REVIEW OF RELATED LITERATURE

On May 11, 1987, a case challenging the constitutionality of the present structure for the financing of education in Montana began trial proceedings before the First Judicial District Court of Montana, Lewis and Clark County, in Helena, Montana. Sixty-five Montana school districts and eight individuals joined in a suit against the State of Montana, the Montana Board of Public Education, and the State Superintendent of Public Instruction alleging that the State's school finance system denied equal protection to a basic system of quality education to many students. The allegation contended that the existing structure allowed for school districts to have different levels of expenditures per student, and the plaintiffs charged that the practice denied equal opportunities for student achievement. The District Court decision, issued by Judge Henry Loble on January 13, 1988, ruled in favor of the school districts with an order to the Montana State Legislature to restructure the system of educational funding. Judge Loble's decision stated, "Infringement, burden and denial [of equal opportunity] clearly exists," and he instructed the Montana Legislature to "search for and present an equitable system of school financing" (*Helena Elementary School District #1 et al. v. State of*

Montana, 1988). This case, like similar cases in other states, has brought attention to the question: What is the relationship between school district wealth and student achievement? This question was the focus of this study.

The review of literature on this subject has been grouped into two categories:

- (1) Historical and legal issues related to the problem.
- (2) Research which discussed a relationship between achievement and expenditure level per student.

History of the Problem

The concept of access to equal educational opportunity has been the basis for legal challenges in school finance cases focusing on unequal distribution of public resources used for education. In 1971, a case involving the issue of equal educational opportunities was heard in a federal district court in Texas. *Rodriquez v. San Antonio Independent School District* was based on the equal protection provisions of the 14th Amendment to the U.S. Constitution. However, the district court decision which held in favor of *Rodriquez*, was appealed and ultimately heard by the U.S. Supreme Court in 1973 (Ornstein, 1978).

The U.S. Supreme Court opinion in *Rodriquez* clarified that cases of this nature were a matter of states' rights and not a federal issue (Hack, 1978). In the Court's five-to-four decision, the lower federal district court ruling was

overturned on the basis that the U.S. Constitution made no explicit guarantee to the right of education, and that education was a function reserved for the states under the 10th Amendment to the U.S. Constitution (Burrup & Brimley, 1982; Odden et al., 1983). The 10th Amendment provides that powers not delegated to the federal government are reserved for the states (as long as the power is not prohibited for the states). This amendment is the source of "states' rights" (Reutter, 1985). The majority opinion of the U.S. Supreme Court in *Rodriquez* included the following four points:

- (1) No group, because of poverty or property tax or income, was absolutely deprived of public education.
- (2) The presence of relative deprivation was not sufficient to identify a suspected discriminated group.
- (3) Low-income people lived in both rich and poor school districts.
- (4) The importance of a service (in this case, public education) did not raise it to the level of a constitutionally protected right. (Ornstein, 1978)

John Coons (1978) presented the argument that education represented a fundamental human right in that public education played a vital role in maintaining the system of American democracy. He advocated that schools were the identified institutions designed to educate children, holding that education was a planned, continuous service that must be provided by the state, and society has the responsibility to see that children are given the educational services they need.

Since *Rodriguez*, over half of the states have had cases seeking reforms in the methods of financing public education argued before their high courts (Alexander & Salmon, 1982). The most publicized case has been that of *Serrano v. Priest* in California in 1971. *Serrano* alleged that the educational finance system, based on local property taxes, did not provide equal education because wealth in the various districts of California was unequal. *Serrano* resulted in three court rulings which all stated that financing of public education must not be based on the wealth of a school district. The decisions held that children in property-poor districts had been injured because lower expenditures per student resulted in disparities when compared to expenditures per student of property-rich districts. These disparities made the quality of a child's education a function of the wealth of his parents and his neighborhood. Consequently, there were disparities in the availability of educational opportunities (Friedman & Wiseman, 1978).

The various state court cases challenging the constitutionality of systems of school finance stemmed from equal protection clauses of state constitutions and/or state constitutional provisions for thorough and efficient educational systems (Hack, 1978). Equal protection related to equal access of students to educational resources, and efficient educational systems related to the just use of resources provided for education (Rossmiller, 1986a). State high courts used three primary standards in evaluating a school finance system to determine if it met constitutional requirements (Odden et al., 1983). These standards were fiscal neutrality, equal inputs, and equal outcomes. The principle of fiscal neutrality was that

expenditures per student should not systematically be related to school district property wealth per student. Equal inputs mandated that levels of spending were created to reflect the wealth of the state as a whole and not that of individual school districts. Equal outcomes mandated that preparation of students by the educational system provides adequate achievement (Odden et al., 1983).

Modern school finance reformers took the position that equality of educational opportunity must be defined as equality of outcomes (Rossmiller, 1986b). This was a shift from the attitudes that prevailed in the early part of this century when minimum standards were equated to resource inputs in monetary terms. The emergence of recent equity issues focused on educational processes rather than the previous exclusive concern with educational inputs (Rossmiller, 1986b).

Relationship Between Achievement and Expenditure Level

The relationship between student achievement and expenditures per student by school districts has been the object of continued research. Mort et al. (1960) concluded that the expenditure level of a school district is a highly important factor in achieving quality education. They noted that prior to 1950 there was general acceptance of a strong relationship between the expenditure level of school districts and the achievement level of students. The practice of increasing expenditure levels by school districts was viewed as a reflection of effort to improve the quality of education. Early beliefs held that expenditure levels

revealed more about the type of education a school system provided than any other factor (Mort et al., 1960).

In the studies by Mort et al. (1960) of school district expenditure levels, it was found that the concept that student achievement was greater when expenditure levels per student were higher was taken for granted. This cost-quality relationship was also assumed by Strayer and Haig as they conducted studies to determine an actuarial basis for determining cost levels of state foundation programs for education finance systems (Mort et al., 1960).

A study conducted by Thomas (1962), using stepwise multiple regression techniques, found a statistically significant relationship between student achievement and beginning teachers' salaries. This was supported by the study of Benson (1965) wherein per-pupil instruction related expenditures and teachers' salaries were related to student achievement. Cohn (1968) found that higher teacher salaries were related to higher gains in scores on achievement tests of high school students.

In 1966, the report on *Equality of Educational Opportunity*, commonly referred to as the Coleman Report, was presented to the U.S. Congress. The study consisted of a sample of 645,000 students from 4,000 public schools in the United States. Data were gathered in September and October of 1965 from third, sixth, ninth, and twelfth grades in all schools in the sample. Data were also collected from the first grade in one-half of the schools in the sample. The study

was sponsored by the U.S. Office of Education and mandated by Section 402 of the Civil Rights Act of 1964 (Coleman et al., 1966).

Coleman et al. (1966) found that variations in socioeconomic status and the family backgrounds of students accounted for more variation in student achievement than did variations in school characteristics. School characteristics included in the study were facilities, teachers, curriculum, and student body traits. Schools were found to be similar in their relationship to student achievement when the socioeconomic status of students was taken into account. Coleman et al. indicated that precautions should be taken with respect to interpretation of assessing the effects of school characteristics on student achievement. The analysis of this study found that when a relationship existed between school characteristics and achievement, it did not prove that the school characteristics caused the variations in student achievement. Coleman et al. suggested that it might be more preferable to study the effects of school characteristics through examination of educational growth over a period of time. Educational growth was defined as change in student achievement. The criterion of achievement in the study by Coleman et al. was a student's score on a verbal ability test that measured verbal skills through a vocabulary test. Conclusions offered by this study were as follows:

- (1) The largest part of variation in student achievement was within the same school and not between schools.

- (2) Only a small part of achievement variations resulted from school characteristics.
- (3) There was indirect evidence to show that school characteristics affected the achievement of minority students more than non-minority students. (Coleman et al., 1966)

The findings of the Coleman Report were substantiated through evaluations of programs of compensatory education that were carried out under Title I of the Elementary and Secondary Education Act. The evaluations done in 1965 were unable to demonstrate a significant relationship between improved achievement test scores and increased resources for schools (Levin, 1976).

When Jencks et al. (1972) studied the relationship between student achievement and the percentage of students eligible for free lunch, they found that there was no relationship to verbal achievement after taking into account students' relationship to school social class. Although there was a slight relationship to reading scores, there was none indicated with mathematics scores.

In the evaluation of the Coleman Report by Jencks et al. (1972), they attributed the positive relationship between student achievement and school district expenditures to pupil-teacher ratio rather than a relationship between achievement and teacher salaries. Smith (1972) supported the analysis of Coleman et al. with respect to the existence of a weak relationship between student achievement and size of school and per-pupil expenditures. He added that reducing the

pupil-teacher ratio "may make no difference until instruction can be really individualized, which might require a pupil-teacher ratio of less than 10:1" (p. 283). Smith indicated that the Coleman Report had few schools with a ratio lower than 10-to-1; thus the effect of the ratio went unnoticed.

Rossmiller's (1986b) research on effective schools, conducted at the University of Wisconsin, addressed the issue of educational equity in terms of student achievement and expenditure levels per student. Variables included in his study were school administrative leadership, classroom management and discipline, student use of time while in school, expenditures per student, and home environment of students. The majority of these variables related to the way resources were used (processes) rather than to what resources were available. The research supported processes as being more important than the amount of resources; resources were not sufficient *per se* to guarantee better student achievement. Rossmiller concluded that research offers no proof that spending more money will bring forth better or more effective schools. Money was essential to purchase necessary equipment, supplies, and services for education, but abundance of these did not imply that better student achievement would result. More important than abundance of resources was how the resources were used.

Frohreich's (1986) research on effective elementary schools studied the issue of student access to monetary resources and its relationship to student academic achievement. Access to monetary resources was measured in expenditures per student, and student academic achievement was measured by performance on

standardized achievement tests. Cross-sectional and longitudinal analyses were completed on relationship and interaction on variables of student, teacher, and school district characteristics. The sample consisted of four public elementary schools located in four different school districts in Wisconsin. Approximately 240 students were included in the sample. The students in the sample were third graders in the 1979-80 school year, and they were part of the study through the fifth grade in the 1981-82 school year. Data collected for achievement variables consisted of reading and mathematics achievement test scaled scores on the Stanford Achievement Test. Differences between the scores from spring of 1980, spring of 1981, and spring of 1982 were used to determine gains or losses in scaled scores of each student. The progress of each student was used as a measure of effectiveness rather than mean scores of each group of students.

Instruction related costs were independent variables and achievement variables were the dependent variables. A regression analysis was run for each possible combination of cost and achievement variables. The correlations between all cost variables and all achievement variables were negative. As costs increased, student achievement scores declined when all students were grouped together. When students in special education programs were included, the F-values were statistically significant; when they were excluded, there was no significance. This study indicated that when more resources were spent on students with special needs, there were increases in student achievement. Frohreich did not make generalizations about these findings but indicated that most micro-analyses had not

found significant relationships between costs (expenditure levels) and student achievement (Frohreich, 1986).

The emphasis of research has been on who paid for education and who received it, but limited knowledge has been revealed about the benefits of the expenditures. The focus of recent research has been on how schools and individuals reacted to various financing plans, but there was little evidence that available research was being used to alter existing policies that affected resource distribution systems (Frohreich, 1986).

Jencks (1972) made a similar observation with respect to use of resources. "If schools continue to use their resources as they now do, giving them more resources will not change children's test scores" (Jencks, 1972, p. 97). Although resource allocation produced increased achievement of students in some communities, this was not universally true; thus, "Legislators, school boards, and school superintendents cannot expect that any general policy which simply provides more school resources will raise children's test scores" (Jencks, 1972, p. 97).

CHAPTER 3

PROCEDURES AND METHODOLOGY

The major problem of this study was to determine if there was a statistically significant amount of variability in student achievement attributed to school district wealth expressed in terms of taxable valuation and instruction-related expenditures. For the secondary problem of this study the researcher determined if there was a statistically significant amount of variability in the dependent variables of student reading and mathematics achievement contributed to by each of the following selected independent variables:

- (1) Beginning (base) teacher salaries
- (2) Maximum teacher salaries
- (3) Percentage of students eligible for free and/or reduced lunch
- (4) School district enrollment sizes, commonly referred to as average number belonging (ANB)
- (5) Teacher-student ratio

This chapter includes a description of the population, the data collection process, the hypotheses and questions, and the statistical procedures applied in the analyses of the data.

Population of the Major and Secondary Problems

The population identified for both the major and secondary problems was made up of 219 public elementary school districts with student enrollment (ANB) of more than 50 students and which operated in Montana during the 1986-87, 1987-88, and 1988-89 academic years.

The following class categories, established by Montana law (20-6-201 MCA) were used:

Class 1 -- Community population of 6,500 or more

Class 2 -- Community population less than 6,500 but more than 1,000

Class 3 -- Community population less than 1,000

The researcher included all Class 1 and Class 2 districts and all Class 3 districts that had more than 50 students (ANB) during the 1987-88 school year. School districts with less than 50 students were not included in the study because of a limited number of student achievement test scores in those districts. In many of those districts, the mean scores were based on achievement test results of one or two students. To have included these districts in the study would have introduced data that would have produced large errors resulting in a broad scatter that would be too broad for conclusions. Table 1 shows the number of school districts included in each classification as established by this researcher and the number of districts listed in the *Directory of Montana Schools, 1987-1988*.

Table 1. Classification of elementary school districts.

Stratum	Number of Schools in Strata (1987)	Number of Schools Operating (1987)
Class 1	17	17
Class 2	100	100
Class 3	<u>102**</u>	<u>261</u>
Total	219	378*

*Five school districts held non-operating status during 1988-89, two school districts were new districts during 1987-88, and one school district held non-operating status during 1986-87 and changed to operating status in 1987-88.

**Only Class 3 school districts with more than 50 students were included in the study.

Data Collection

The data used in this study was obtained from various sources: elementary school districts, the Montana Office of Public Instruction, County Superintendents of Public Instruction, the Montana School Boards' Association, and the Montana Education Association.

The superintendent of each school district was initially informed of the study to be conducted by this researcher by letter and was requested to provide information needed for the study. They were advised that all test data used in the study would be confidential and would be used only by this researcher. Other data obtained from school districts were public in nature and were available on request. The mailing included an instrument (see Appendix C) wherein the following data from the 1986-87 academic year were requested:

- (1) Name of norm referenced achievement test used by the district for third and sixth grades
- (2) Normal curve equivalents of the mean score on third grade student reading achievement tests
- (3) Normal curve equivalents of the mean score on third grade student mathematics achievement tests
- (4) Normal curve equivalents of the mean score on sixth grade student reading achievement tests
- (5) Normal curve equivalents of the mean score on sixth grade student mathematics achievement tests
- (6) Percentage of students eligible for free and/or reduced lunch
- (7) Identification of school district classification as stipulated in Section 20-6-201 of the *Montana Codes Annotated*

Each school district was asked to provide a copy of the 1986-87 teacher salary schedule showing beginning and maximum salaries. For those school districts that operated without a superintendent, the data were obtained from respective County Superintendents of Public Instruction and/or supervising teachers.

Normal curve equivalents (NCE) of mean scores of all third and sixth grade students in the districts were used rather than mean scores, as there was no uniform norm referenced test given by school districts in Montana for the measurement of student achievement (Olson, 1987). Normal curve equivalents were

used because percentile or standard scores have meaning in reference to one specific test and do not necessarily equate to percentiles or standard scores for another test (Glass & Stanley, 1970). Achievement tests were designed to determine the knowledge and skills acquired by students in specific content areas at a certain point in time. Norm referenced tests, based on a relative standard, showed student performance in relation to a norm group which had been predetermined with specified characteristics. These data were obtained from school districts and the Montana Office of Public Instruction.

Beginning (base) teacher salaries and maximum teacher salaries for each district were obtained from the salary schedules provided by school districts, the Montana School Boards' Association, the Montana Education Association, and County Superintendents.

All budget data needed for this study were public information and were obtained from records on file with the Montana Office of Public Instruction. Budget data were taken from the Application for Tax Levies and State Equalization and the Trustees' Financial Summary that were filed by each school district with the respective County Superintendent of Public Instruction and the Montana Office of Public Instruction. The "Application" was a 16-page document that reflected general fund budgets of school districts. Applications for 1986-87, 1987-88, and 1988-89 and the Trustees' Financial Summaries for 1986-87 were the sources for ANB, number of teachers, taxable valuation, and instruction-related costs.

Listed below are the codes used for the variables in the study of both the major and secondary problems:

- (1) TVANB -- taxable valuation per student
- (2) TEXANB -- total instruction-related expenditures per student
- (3) TCHANB -- teacher-student ratio
- (4) ANB -- district student enrollment (average number belonging)
- (5) LUNCH -- percentage of students eligible for free and/or reduced lunch
- (6) BSALARY -- minimum (base) salary paid to teachers
- (7) MSALARY -- maximum salary paid to teachers
- (8) 3RNCE -- normal curve equivalents of mean scores on third grade reading achievement tests
- (9) 3MNCE -- normal curve equivalents of mean scores on third grade mathematics achievement tests
- (10) 6RNCE -- normal curve equivalents of mean scores on sixth grade reading achievement tests
- (11) 6MNCE -- normal curve equivalents of mean scores on sixth grade mathematics achievement tests

For study of the major problem, 100 percent of the data for the independent variables was obtained, as reported in Table 2. Table 3 reports the data obtained for the independent variables used in the secondary problem.

Table 2. Data collection of independent variables for the major problem by stratum.

Variable	Class 1	Class 2	Class 3	Total
TVANB				
Total Districts:	17	100	102	219
Districts with Data:	17	100	102	219
Percentage:	100%	100%	100%	100%
TEXANB				
Total Districts:	17	100	102	219
Districts with Data:	17	100	102	219
Percentage:	100%	100%	100%	100%

Table 3. Data collection of independent variables for the secondary problem by stratum.

Variable	Class 1	Class 2	Class 3	Total
TCHANB				
Total Districts:	17	100	102	219
Districts with Data:	17	100	102	219
Percentage:	100.0%	100.0%	100.0%	100.0%
ANB				
Total Districts:	17	100	102	219
Districts with Data:	17	100	102	219
Percentage:	100.0%	100.0%	100.0%	100.0%
LUNCH				
Total Districts:	17	79*	86*	182*
Districts with Data:	17	79	86	182
Percentage:	100.0%	100.0%	100.0%	100.0%
BSALARY				
Total Districts:	17	100	102	219
Districts with Data:	17	97	71	185
Percentage:	100.0%	97.0%	69.6%	83.1%
MSALARY				
Total Districts:	17	100	102	219
Districts with Data:	17	97	71	185
Percentage:	100.0%	97.0%	69.6%	84.5%

*Not all school districts provide a school lunch program for students.

Data obtained for the dependent variables used in both the major and secondary problems are reported in Table 4. Not all school districts tested students in each grade every year, and not all districts tested students for both reading and mathematics achievement every year.

Table 4. Data collection for dependent variables used for the major and secondary problems by stratum.

Variable	Class 1	Class 2	Class 3	Total
3RNCE				
Total Districts:	17	100	102	219
Districts with Data:	17	81	57	155
Percentage:	100.0%	81.0%	55.9%	70.8%
3MNCE				
Total Districts:	17	100	102	219
Districts with Data:	16	74	60	150
Percentage:	94.1%	74.0%	58.8%	68.5%
6RNCE				
Total Districts:	17	100	102	319
Districts with Data:	17	79	59	155
Percentage:	100.0%	79.0%	55.9%	70.8%
6MNCE				
Total Districts:	17	100	102	219
Districts with Data:	16	78	62	156
Percentage:	94.1%	78.0%	60.8%	71.2%

Hypotheses and Question

Four hypotheses were used to test the major problem, and four hypotheses were used to test the secondary problem. All hypotheses were expressed in alternate forms. Independent variables and dependent variables cited in the

following hypotheses for the major and secondary problems were referenced as follows:

Independent Variables

- (1) x_1 -- taxable valuation per student
- (2) x_2 -- total instruction-related expenditures per student
- (3) x_3 -- beginning teacher salaries
- (4) x_4 -- maximum teacher salaries
- (5) x_5 -- percentage of students eligible for free and/or reduced lunch
- (6) x_6 -- school district enrollment size
- (7) x_7 -- teacher-student ratio

Dependent Variables

- (1) y_1 -- NCEs of mean scores of third grade student reading achievement tests
- (2) y_2 -- NCEs of mean scores of third grade student mathematics achievement tests
- (3) y_3 -- NCEs of mean scores of sixth grade student reading achievement tests
- (4) y_4 -- NCEs of mean scores of sixth grade student mathematics achievement tests

Hypotheses for Major Problem

- (1) The independent variables of school district taxable valuation per student and school district instruction-related expenditures per student contribute

significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on third grade student reading achievement tests.

$$\circ H_1: R^2_{y_1, x_1, x_2} > 0.$$

- (2) The independent variables of school district taxable valuation per student and school district instruction-related expenditures per student contribute significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on third grade student mathematics achievement tests.

$$\circ H_1: R^2_{y_2, x_1, x_2} > 0.$$

- (3) The independent variables of school district taxable valuation per student and school district instruction-related expenditures per student contribute significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on sixth grade student reading achievement tests.

$$\circ H_1: R^2_{y_3, x_1, x_2} > 0.$$

- (4) The independent variables of school district taxable valuation per student and school district instruction-related expenditures per student contribute significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on sixth grade student mathematics achievement tests.

$$\circ H_1: R^2_{y_4, x_1, x_2} > 0.$$

Hypotheses for Secondary Problem

- (5) The independent variables of beginning teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district ANB, and teacher-student ratio contribute significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on third grade student reading achievement tests.

$$\circ H_1: R^2_{y_1, x_3, x_4, x_5, x_6, x_7} > 0.$$

- (6) The independent variables of beginning teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district ANB, and teacher-student ratio contribute significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on third grade student mathematics achievement tests.

$$\circ H_1: R^2_{y_2, x_3, x_4, x_5, x_6, x_7} > 0.$$

- (7) The independent variables of beginning teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district ANB, and teacher-student ratio contribute significantly to the amount of variability in the dependent variable of normal curve equivalents of mean scores on sixth grade student reading achievement tests.

$$\circ H_1: R^2_{y_3, x_3, x_4, x_5, x_6, x_7} > 0.$$

- (8) The independent variables of beginning teacher salaries, maximum teacher salaries, percentage of students eligible for free and/or reduced lunch, district ANB, and teacher-student ratio contribute significantly to the amount of

variability in the dependent variable of normal curve equivalents of mean scores on sixth grade student mathematics achievement tests.

$$\circ H_1: R^2_{y_4, x_3, x_4, x_5, x_6, x_7} > 0.$$

Question

- (1) What is the ranked order of each independent variable in terms of its unique statistical contribution to the variability of the normal curve equivalents of the mean scores on third and sixth grade student reading and mathematics achievement tests after the other independent variables have been taken into account?

Statistical Procedures for Analyses of Data

For this study, all hypotheses were tested for statistical significance with an alpha (α) level of .05. The probability of committing a Type I error (rejection of a true null hypothesis) occurs in only five percent of actual cases. For most practical purposes, the probability of .05 can be determined to be significant (Ferguson, 1981). All statistical procedures applied in both the major and secondary studies utilized the SPSS^x statistical package.

One-way analysis of variance tests (ANOVA) were used to determine if Class 2 and Class 3 school districts with achievement test data were representative of all districts in their respective class stratum. One-way analysis of variance was the appropriate statistical procedure to determine if there was a significant variation between the means of two groups (Williams, 1979). In this case, those

