



Riding time and school size as factors in the achievement of bus transported pupils
by Alan George Zetler

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
DOCTOR OF EDUCATION
Montana State University
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Abstract:

The purpose of this study was to define possible limits to high school consolidation and bus transportation in sparsely populated rural areas—limits determined by maximum bus riding time and optimum school size. Nine separate G.P.A. components and four standardized tests were used as criterion variables.

A sample of 812 bus pupils from 40 Montana high schools were classified into a 4 by 3 factorial post hoc experiment. Four levels of bus riding time were used: 0-30 minutes, 31-45 minutes, 46-60 minutes, and 60 or more minutes. School size levels were: small (0-99 pupils), medium (100-499), and large (500 or more).

No conclusive evidence of interaction between bus riding time and school size was found. Conclusion: Specific combinations of school size and bus riding time do not exist that could account for any given level of G.P.A. or standardized test achievement within the transported Montana high school rural population.

Bus riding time alone had no significant effects on transported pupils. Conclusion: Within any one of the three levels of Montana high schools, transported pupils riding the bus up to 90 minutes one-way will not experience differences in G.P.A. or standardized test achievement that can be attributed to the bus ride itself.

Significant difference among school size means were found for some components of G.P.A. Conclusion: G.P.A.'s earned by Montana bus pupils during the first three years of high school, or earned in required high, school courses, cannot be attributed to the size of school attended; senior and elective courses G.P.A. can be attributed to the size of school and favors the medium sized school.

Raw or standard scores of the ACT, ITED, NMSQT, and PSAT were recorded and normed on the bus population. Conclusion: Under the conditions of increasing discrimination of testees as schools become larger, PSAT verbal and NMSQT achievement significantly favors those bus pupils attending large high schools. Bus pupils from large high schools are more apt to possess those attributes required on standardized tests than are bus pupils from medium or small high schools.

RIDING TIME AND SCHOOL SIZE AS FACTORS IN THE
ACHIEVEMENT OF BUS TRANSPORTED PUPILS

by


ALAN GEORGE ZETLER

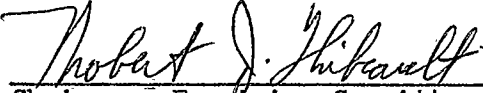
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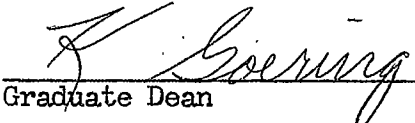
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VITA

Alan George Zetler

Alan George Zetler was born February 8, 1930 at Duke Center, Pennsylvania, the youngest son of George I. Zetler and Hazel Hutton Zetler. He married Dorothea Inez Perkins on August 18, 1956 at Denver, Colorado. They have four children: Tracie Lynn, Peggy Jo, Mark Alan, and Kimberly Dawn.

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A.G.Z.

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ABSTRACT

The purpose of this study was to define possible limits to high school consolidation and bus transportation in sparsely populated rural areas--limits determined by maximum bus riding time and optimum school size. Nine separate G.P.A. components and four standardized tests were used as criterion variables.

A sample of 812 bus pupils from 40 Montana high schools were classified into a 4 by 3 factorial post hoc experiment. Four levels of bus riding time were used: 0-30 minutes, 31-45 minutes, 46-60 minutes, and 60 or more minutes. School size levels were: small (0-99 pupils), medium (100-499), and large (500 or more).

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CHAPTER I

INTRODUCTION

Many children can no longer secure an elementary and secondary education within walking distance of their homes. Advances in technology and attitudes toward travel have been incorporated into educational thinking to the extent that transporting pupils to school at public expense is no longer a question of acceptance but one of degree.

Evaluation of any educational practice must echo the premise on which it was based. Pupil transportation is no exception. Students board the bus for one purpose--to take advantage of an educational opportunity that does not exist in the immediate neighborhood. Busing pupils is an educational means and never an end in itself. The National Education Association's Department of Rural Education states: (51:33)

It is also evident that the only justification of the pupil transportation effort, what it is and what it may become and in spite of its tremendous outlay for tangibles, will be in terms of an intangible--the educational opportunity it contributes.

This study is addressed to the question of whether or not that opportunity is being fulfilled.

Consideration of the pupil transportation movement must be accompanied by equal consideration of the school consolidation movement. These two elements are similar to the "chicken or the egg" argument and attempts to determine cause and effect are moot, for it is the parallel use of the two concepts that is important.

The philosophy behind school consolidation has aims allied with those of pupil transportation. Bringing together students from two or more previously separate schools will make available educational opportunities that heretofore were denied, at least for some of the students. If this were not so, what justification could be offered for the process? The increased opportunity may be academic, economic, or social, each with various degrees of overtness or subtlety. The school patrons and professional educators must arrive at some balance point where the advantages of consolidation can be realized within the limits of feasible transportation. Conversely, the transportation system must be designed or altered to realize the potential of the consolidation.

Roe (57:253) categorizes busing systems into two classes, one involved with populated urban and suburban centers while the other involves sparsely populated rural areas. The latter type was investigated in this study. Urban and suburban school transportation presents a different set of problems than does busing in the sparse rural regions. Sociological factors, such as racial integration, are becoming dominant in creating pressures for expanded city busing. The area from which students are drawn for a certain school building may depend on the capacity of the structure or the willingness of the local district to finance transportation. Distances traveled by the pupils are small and large numbers will board the bus at each pickup stop.

In contrast, sparsely populated regions, such as found in the high plains and mountain states, very often have open-ended maximum

school enrollments. Upper limits are determined by how far the bus routes can reasonably extend into the surrounding countryside. Secondary education per pupil costs are generally higher than elementary per pupil expenditures. Coupled with a lack of students, this concentrates many rural educational problems at the high school level. Equipment, staff, and activities necessary for a comprehensive secondary school program demand an enrollment not easily satisfied in areas of low population density.

In the words of Aubertine: (4:592)

The consolidation movement continues to reduce the number of small, rural schools, but in the plain and mountain regions of our nation, the combining of school districts is not always feasible.

. . . Moreover, if schools were consolidated the more remotely located students would spend unduly long hours traveling.

A declining rural farm population within a predominantly urban society makes pupil transportation a necessity. With many small schools losing their clients, consolidation together with longer bus routes are inevitable to insure a competitive education for the remaining rural pupils.

But the problem of consolidation advantages weighed against transportation limitations must be met. The urban centers are growing larger and the small rural community is shrinking. Rural school patrons usually have a choice of accepting either limited consolidation

with shorter bus routes and a smaller high school, or more extensive consolidation with longer bus routes and a larger school.

Questions may be raised. Should we consolidate and let the transportation vary accordingly? Should we consider the actual advantages possible from busing students and then consolidate accordingly? Is it possible the advantages and/or disadvantages of the resulting school size and those attributable to busing may not be independent? The results of this study provide partial empirical evidence to assist in solving this problem.

Statement of the Problem

In the state of Montana, pupils from the rural countryside are bused into various sized high schools operating in small rural communities or in larger towns and urban centers. Some bus pupils experience a considerably longer school day than other bus pupils, measured from morning loading time to evening unloading. The total length of school day as determined by bus riding time may have an effect on transported high school pupils as evidenced by realized achievement in school.

Montana high schools range along a size continuum from very small rural enrollments to large urban institutions. The degree to which the transported rural pupil is able to perform academically may be a singular function of the size of school attended. The social atmosphere and curricular offerings could be in agreement or conflict

with what the bus pupil regards as important.

A blending of transportation effects with school size effects may create conditions under which academic performance can not be explained by the singular influence of transportation or size alone, but only by the unique outgrowth of the two forces acting in concert.

Statement of null hypotheses. Three statistical hypotheses of "no difference" will be tested by this study:

1. Bus riding time and school size are non-interacting variables as determined by the earned marks and standardized test scores achieved by transported high school rural students.
2. Bus riding time has no singular effect on the achievement of transported high school rural students as determined by earned marks and standardized test scores.
3. School size has no singular effect on the achievement of transported high school rural students as determined by earned marks and standardized test scores.

Three research or alternate hypotheses follow from the null statements. Each research hypothesis is measured by the same criteria of earned marks and standardized test scores:

1. Bus riding time and school size are interacting variables affecting the achievement of transported high school rural students.
2. In the absence of interaction, bus riding time affects the achievement of transported high school rural students.
3. In the absence of interaction, school size affects the achievement of transported high school rural pupils.

Significance and Need for the Study

Getting a child to school was originally an individual family responsibility, but the pattern by which formal education grew made public support for pupil transportation necessary. Featherston and Culp (28:2) credited three factors as primarily responsible for school transportation growth: (a) the passage of compulsory attendance laws, (b) the consolidation of rural attendance centers, and (c) the increased holding power of secondary schools, which is a recent development. State legislatures have stimulated the growth of transportation systems by providing financial support. Laws were passed that require a bus for those students living beyond certain specified distance limits. Recent trends in school statutes generally point toward more accessible transportation at public expense.

An assessment of pupil transportation and school consolidation was made at midcentury by Culp, who was quoted by the N.E.A. as saying: (51:31)

School transportation was not designed merely as a convenience to children who live beyond a reasonable walking distance from school. In its basic philosophy and practical existence, school transportation is an indispensable and integral part of our system of consolidated schools, which were developed to serve the educational needs of our time.

Authors in the field of pupil transportation place the cost of school busing between 3.6 percent and 5.0 percent of current public

education expenditures. (28:9; 34:10; 49:59) Over one third of the nation's elementary and secondary school students now ride buses to school. (34:9) With such an investment in money, time, and talent, it is not surprising that school transportation has been the subject of considerable research and evaluation.

But investigation has proceeded on an uneven front, covering only three of the four objectives, which Isenberg (51:169) claims are desired in any transportation program. The first objective is safety, or the elimination of avoidable hazards. Second is efficiency, the combining of all effort effectively to insure a competent busing operation. Third is economy which implies that the lowest possible cost is realized within desirable standards. The final objective is adequacy, or the degree to which the potentials of transportation contribute to the educational program. Defined in another way by Isenberg, adequacy asks "to what degree is the potential of the program achieved within justifiable practices?"

The adequacy objective has received much speculation but little concrete research effort. In the absence of systematic study, assumptions have been advanced around which transportation practices have been built. Repeated application of the practices has resulted in a generally accepted set of operating standards. However, continued use does not attest to the soundness of the underlying assumptions. The problem of transportation adequacy should therefore be explored, particularly

with relationship to school consolidation because the two concepts are mutually supporting.

One of the assumptions in question is bus riding time; more specifically, the length of time students of high school age can be expected to ride the bus one way without adverse effects. Writers have loosely concurred for some time that one hour should be the maximum. (19:1197; 28:94; 48:473) Recommended riding times for elementary pupils are somewhat less, usually a fifteen minute reduction. Montana is one state that has enacted a law regulating bus riding time, but it is applicable only to elementary children. The statute reads: (47:243)

No child attending public elementary school shall be required by any school board to ride a school bus, under average road conditions, more than one (1) hour per trip of said children in said school bus, without the consent of the child's parents or guardian.

Consolidation-transportation relationship. In the sparsely settled regions, the size of school often depends on how large a geographical area can be encompassed. In terms of the bus ride, the school size is dependent on how many minutes or hours the students are willing or allowed to ride the bus. One basis for consolidation decisions should be the effect of bus riding time as weighed against the educational benefits students may expect from increased school size. Consolidation success must be measured by the achievement of those pupils whom the movement intended to serve.

The enrollments of Montana high schools, given in Table 1, page 10, illustrates a sparsely settled state having a predominance of small high schools.

The model size of Montana high schools falls in the 50 to 99 enrollment range. Over half of the state's high schools enroll 149 students or less. The situation would appear to be ripe for extensive consolidation, except for the fact that Montana's large land area and sparse rural population exert a tempering influence to the movement.

Three alternatives are open to a district that decides to abandon its high school: (a) two or more small enrollment districts can form a centralized high school, (b) the abandoning district may send all its high school students intact to an adjacent district's larger high school, or (c) the abandoning district may be broken up, the pupils within each segment attending high school in the neighboring districts that annex each part. The choice of alternatives can result in various lengths of bus rides and different sizes of high school enrollment.

If it were known that long bus rides did or did not affect the academic performance of the transported pupils, the decision would be simplified. On the other hand, research has substantiated the wisdom of practicing attendance consolidation and district reorganization. According to Isenberg, (35:68) "the conclusions of dozens of studies point out that reorganized districts and consolidated schools have advantages over unreorganized and nonconsolidated schools . . ." Since transportation and school consolidation are complementary concepts, the

TABLE 1. ENROLLMENTS OF MONTANA PUBLIC HIGH
SCHOOLS IN 1969-1970 BY INTERVALS OF FIFTY

Enrollment of School	Number of Schools
0 - 49	19
50 - 99	48
100 - 149	32
150 - 199	16
200 - 249	16
250 - 299	4
300 - 349	4
350 - 399	2
400 - 449	4
450 - 499	4
500 - 549	3
550 - 599	1
600 - 649	1
650 - 699	3
700 - 749	1
750 - 799	0
800 - 849	0
850 - 899	1
900 - 949	2
950 - 999	0
1,000 - up	10
Total	171

Source: Montana Educational Directory (46:11,117)

question of transportation adequacy should be investigated in relation to its effect on consolidation. Research does exist on busing systems, but it has been aimed at securing safe, efficient and smoothly operating programs, with adequacy being only a secondary consideration. (20:1544)

Transportation is classified as an auxiliary service and does not directly add to the educational offering. (18:1167) Nevertheless, the costs consume district and state funds. The price tag for pupil transportation rose from 93 million to over seven times that amount during the period from 1944 to 1964. (23:11) Montana daily expenditures for school busing amounted to \$18,658 during the 1968-1969 school year. (45:3) Mounting financial outlay and millions of involved children make it critical that the system be evaluated to determine the optimum educational benefit possible per transportation dollar.

To the writer's knowledge, no investigation has used bus riding time as a systematic variable with school size in considering the achievement of transported high school rural students. A statement by Moehlman (44:408) supported the effort:

The problem of public school transportation needs careful research and study before it gets out of hand and determines the school program instead of depending on it.

Procedures

Investigation of the problem and testing of the null hypotheses required the following procedures:

1. Literature was reviewed on pupil transportation, school size, and achievement to lend direction and guidance to the subsequent analysis.

2. Bus riding time was divided into four levels of one-way time and high schools were divided into three size levels. Any member of the eventual sample was able to be classified into any one of twelve time-size combinations. Those students riding the bus for 30 or less minutes were subdivided according to whether they attended small (99 or less), medium (100 to 499), or large (500 and over) enrollment high schools. The same three school size subdivisions were made for bus pupils whose one-way riding times were 31-45 minutes, 46-60 minutes, and 61 or more minutes.

3. All bus routes in Montana were ranked from longest to shortest on the basis of the maximum mileage experienced by any high school pupil riding the route. Routes covering 40 or more one-way miles, plus selected shorter routes, became the basis for selecting transportees and schools used in the sample. Selection continued until a minimum of 50 students were placed in each of the twelve time-size combinations.

4. Dependent variable data consisting of earned school marks and standardized test scores were gathered in the field by the investigator.

5. The data was statistically interpreted using factorial experiment techniques. This process permits an analysis of two or more

independent variables acting simultaneously, as well as permitting an examination of the singular effects for each variable alone.

6. The results of the study were reviewed in relation to the increased educational opportunity potential that both pupil transportation and school consolidation claim as benefits.

Limitations of the Study

The study was confined to public high school pupils in the state of Montana. Only students from high school districts having at least one long bus route, as determined by Montana State Department of Public Instruction records, were subjected to investigation. Bus routes were those satisfying both of the following criteria: (a) The route was eligible for state financial reimbursement as determined by the State of Montana T-1 Form entitled, School District Application for Registration of School Bus and State Reimbursement. The form had to be on file in the State Department for the 1967-1968 school year. (b) At least one of the high school pupils riding the route lived near the end of the bus run so that his total miles traveled per day was near maximum for the route. At least one of the high school students riding the route had to live at less than maximum distance, the purpose being to guard against bias within any one riding time category for any one bus route.

Students on whom data was gathered were listed as eligible transportees (living three or more miles from the school) on the T-1 Form applicable to the selected bus route(s). The student members of the sample were riders on vehicles that actually delivered the students to the high school building. Feeder bus minutes were part of the total one-way riding time only if the investigator was able to interview the feeder bus operator to secure the correct number of additional minutes.

Riding time minutes were those figures reported by the bus driver or manager, minutes actually timed by the investigator, or totals obtained from school office personnel. Travel time was confined to the number of minutes spent on the vehicle from loading to unloading. Time spent en route from home to bus pick-up point or minutes spent waiting for bus arrival were not included in riding time.

Students investigated were members of: (a) the 1969-1970 junior high school class, (b) the 1969-1970 senior high school class, or (c) alumni of the school with either the 1968 or 1969 graduating classes.

Criterion variable data was confined to earned marks and standardized test scores that appeared on the pupil's permanent high school record or personal guidance file. Scores on all standardized tests were recorded but only those which satisfied the following three requisites were analyzed: (a) the test was administered in an arbitrarily selected minimum of 11 or more sampled high schools, (b) the number of schools administering the test were stratified proportionally to the

total numbers of schools occurring in the size categories, and (c) the test was administered to individual bus students with frequencies proportional to the total number of pupils found in the four riding time categories.

Definition of Terms

Certain concepts referred to in the study are subject to different meanings and interpretations. The following terms are therefore defined along with comments about common usage:

Consolidation. . . . a process whereby students who previously attended separate schools are brought together in a single building. (35:67)

"Attendance consolidation" or "attendance center consolidation" are terms having the same meaning. It is not necessary that the original legal school districts be joined--only the students.

Reorganization . . . the formal combination of previously separate and legally constituted school districts into one school district. (35:67)

Reorganizing districts does not imply a necessary combining of attendance centers, although this is often the case. One board of school trustees now functions where before there had been two or more boards carrying out duplicate duties.

Riding time. . . . the number of minutes a student spends in transit one way on a school bus, measured between loading and unloading.

Rural population . . those persons living in towns of under 2,500 inhabitants or living in open country where the density of population is sparse enough so that the area cannot be classed as urban fringe.

Most of the townsfolk living in small communities are rural even though they have no connection with farming. Consequently, they are called "rural non-farm people" as opposed to the rancher or farmer who lives on 10 acres or more or who receives a cash crop income of \$250 or more. (7:4)

High school rural student. . . any high school child whose parents or guardian are part of the rural population.

Rural high school. . a high school building located in a town of less than 2,500 inhabitants.

The enrollment or curriculum offered by the school has nothing to do with the classification.

School size. the total number of students registered in a high school building.

High school size refers to the total enrollment in grades 9-12 or grades 10-12, inclusive, depending on the adopted organization pattern.

Urban. incorporated and unincorporated places having 2,500 or more inhabitants. (65:xv)

A town may be closely tied with agriculture but still be urban by definition.

Urban high school. . a high school building located in a town of 2,500 or more inhabitants.

CHAPTER II
REVIEW OF LITERATURE

A literature search concentrated on three topics relevant to the stated problem. The points reviewed were: (a) development, conceptual design, and scope of pupil transportation; (b) consolidation-transportation relationships; and (c) achievement as it relates to the rural student, school size, and bus riding time.

Development, Conceptual Design, and Scope of Transportation

Parents used to accept the responsibility of getting their children to school as long as there was a school building within reasonable reach of each settlement. By foot, horseback, or drawn wagon, a pupil could get to school if he was willing, even though the journey may have worked a hardship.

But a growing nation dictated that the common good depended on compulsory education. Demands entailed responsibilities, so in 1869 the state of Massachusetts passed the first law authorizing public funds for transportation. Other states were slow to follow. By 1900, only one-third of them had enacted similar legislation. The remaining states gradually established public support for school transportation during the next 19 years.

School buses were originally an adaptation of the farm wagon, and the name "transportation wagon" was therefore applied. Distance

by horse-drawn vehicle was of course limited. Brown's assessment of transportation in his Tennessee district during 1917 illustrates the mileage boundaries then existing. He wrote, "Twenty-two transportation wagons are in use, hauling from twenty to thirty children, each a distance of from two to six miles." (8:2)

To supplement his arguments directed to those who were against hauling children to school, Calhoun (12:7) in 1917 quoted a colleague writing in the North Dakota Bulletin:

Let him who has a lively imagination tell us what mothers would say whose children had always been transported warm and dry, when it should be seriously proposed that hereafter the little ones should wade while horses spoiling for exercise stand in barns and kick the boards off for sheer amusement or lack of exercise.

The wise use of horse energy may have had popular appeal in those days; but, of course, the basic thesis was the welfare of the child.

The rapid expansion of school busing could not have been possible without the breakthrough caused by the invention and acceptance of motorized vehicles. With them came demands for better roadways. The rapid growth of publicly supported transportation together with the increase in paved rural roadways is summarized in Table 2, page 19.

TABLE 2. SURFACED RURAL ROADS AND PUPILS TRANSPORTED
FOR SELECTED YEARS

Years	Miles of surfaced rural roads	Transportees at public expense
1921-1922	387,000	594,000
1929-1930	662,000	1,902,826
1939-1940	1,318,000	4,144,161
1949-1950	1,865,000	6,980,689
1959-1960	2,557,000	12,700,989

Source: Featherston and Culp (28:4)

The 40 year span preceding 1960 saw transportation increase 21 times, while paved rural roads grew by seven times. Only seven states still grant compensation to school districts for adverse road conditions but the practice is generally thought unnecessary. (30:400)

The expansion of paved roads and school busing was not parallel and therefore suggests other factors may have contributed to the growth of pupil transportation. Crenson (23:10), the N.E.A. Department of Rural Education (51:116), Featherston and Culp (28:2), and Wilson (68:675) each list a variety of reasons for the spread of pupil transportation. The one factor on which all agree is school consolidation

and district reorganization. Even though school busing was an auxiliary service, Crenson said that consolidation "raised the status of the bus to an absolute essential." (23:10)

A second factor isolated by authorities was the twentieth century pattern of population growth found in the United States. Partial evacuation of rural areas was accompanied by the concomitant rise in suburban and inner-city school problems. Sheer numbers of people, many of them migrants from rural regions, created a sociological phenomena peculiar to our time. Disclosures such as those of the Coleman Report (16:295) have turned much thought toward the possibility of solving urban educational inequities by means of busing. In addition, the distance created by suburban sprawl has accounted for bus services unknown prior to World War II.

Among other factors responsible for the expansion of pupil transportation were the better holding power of secondary schools, leadership of state departments in inspection and standards, the availability of administrative talent, and an increase in the application of the child benefit theory. This last reason has been the stimulation for greater parochial school busing and racial integration attempts.

Legal responsibility for transportation. States are responsible for education. The equalization of opportunity within political boundaries can partially be accomplished by passage of transportation statutes. State government legislative action reflects the school trans-

portation needs and, conversely, the development of the busing system can be regarded as a response to legislative stimulus.

The fifty states have generated fifty unique transportation systems. Uniformity exists, particularly in traffic laws and school bus standards. (28:7) School bus standards refers to mechanical equipment. Safety features on buses have gained general acceptance and much research has been directed toward this end. Other aspects of bus programs usually covered by state regulations are the training of bus drivers, fleet inspection of vehicles, and a host of detailed activities subsumed under the heading of operational regulations. With each function, record keeping and accounting are inherent.

But the visible operations are manifestations of a deeper ideal. It is the conceptual design of a state's transportation system that is responsible for determining who shall be bused and for what purpose. Since the population under investigation in this study are Montana students, reference to Montana law illustrates the legal design on which a state supported program is based.

Section 75-4301 of the Revised Codes of Montana establishes the legal authority for operating a school busing system at the local level. It states: (47:238)

Boards of trustees to furnish transportation. The board of trustees of any school district or county high school within the state of Montana may furnish transportation to and from school for all pupils residing within their district, who are enrolled in the public schools of their district, or who have been granted permis-

