

A STUDY OF TYPES OF SCHOOL BUS ROUTES IN OKLAHOMA

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By

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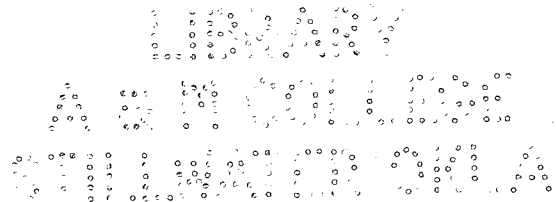
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PREFACE

The writer is fully aware of the many variables concerning the physical part of the school transportation problem, as well as the variation caused by the differences of opinions of the transportation administrators. It is his ardent hope that these efforts may some day be referred to as one of the many steps that were taken to overcome absurdities that existed in administration of the transportation of school children.

Arthur D. Kerr

APPRECIATION

The writer is deeply grateful for the inspiring guidance received throughout the preparation of this volume from Dr. Haskell Pruett.

A. D. K.

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INTRODUCTION

Since the Massachusetts Legislature passed the first law authorizing consolidation of school districts back in 1867 there has been a gradual increase in the growth and importance of the problem of pupil transportation.¹

The urban schools were the first to adopt the centralized plan of organization.

The idea first spread to the rural communities about 1880. For forty years centralization in urban and rural districts has grown at a steady rate.²

Naturally this progress has not been achieved without encountering many difficulties. In R. H. Wilson's report in 1918, he wrote,

There are of course, certain difficulties to be overcome in providing transportation for the pupils, but these are more imaginary than real. The people of 86 consolidated districts in Oklahoma and in thousands of consolidated districts in other states and Canada have overcome these difficulties. The better schools far more than compensate for the added inconvenience and expense.

He states further that,

In the 56 districts reporting 198 wagons, 12 trucks, 50 private conveyances, 12 trucks and several automobiles were used to provide transportation for pupils during the past school year.³

1 J. F. Abel, Consolidation of Schools and Transportation of Pupils, Bulletin No.41, 1923, U. S. Bureau of Education, pp. 5-11.

2 J. F. Abel, Recent Data on Consolidation of Schools and Transportation of Pupils, U. S. Bureau of Education, p. 33.

3 R. H. Wilson, Seventh Biennial Report of State Superintendent of Public Instruction, Oklahoma, 1918, pp. 26-27.

When these figures are compared with those of the "Seventeenth Biennial Report" stating that,

There were 688 transporting districts with 2,489 motor buses, 25 panel buses, and 10 horsedrawn wagons, furnishing transportation to 102,138 white and 4,188 negro children daily, at an annual expense of \$2,136,369.84,⁴

one may be assured that consolidation and transportation of children has grown to be one of the major problems in the administration of schools that furnish transportation. Yet the fact that there are 2,799 one-teacher schools and 1,215 two-teacher schools in the state, indicates that there is still an urgent need for some consolidation in Oklahoma.

Perhaps the lack of adequate supervision in the dependent schools of the state can be partially overcome by consolidation, which may be encouraged by larger state subsidies in building programs, by legislation to redistrict, or by administering schools already consolidated so efficiently that communities that now have one-room schools will want consolidation. Surely, studies such as are found on the following pages will bring to light new truths, and that those truths may be used in administering transportation more efficiently in the present as well as the future transporting districts.

⁴ Seventeenth Biennial Report of the Superintendent of Public Instruction of the State of Oklahoma, 1938, p. 123.

CHAPTER I
STATEMENT OF PROBLEM

In this study an attempt will be made to compare the cost of pupil transportation on the different types of school bus routes in the state of Oklahoma from a study of the maintenance costs as stated in the reports certified to the State Superintendent of Public Instruction from the districts furnishing transportation. Special effort will be made to compare the pupil-miles of transportation actually needed, with the pupil-miles of transportation now being furnished by the districts on each type of route studied.

When one recalls the numerous variables such as; density of pupil population, kind of road, moving of tenants, size of buses, length of route, condition of buses, topography of community, multiple route, types of routes, etc., one is inclined to agree with J. C. Jenson, Superintendent of Public Instruction of Utah who states,

One is almost overwhelmed with the multiplicity of ways of estimating cost of transportation.¹

John S. Vaughn in the Twelfth Biennial Report of State Superintendent of Public Instruction of Oklahoma says,

The problems of transportation are very complex because of the varying conditions that prevail. The geographic distribution of the pupils, the density or sparsity of pupil population, the road condition on each route and other factors that influence the cost

1 J. C. Jenson, A Study of Transportation in the Schools of Utah, p. 32.

of transportation..... The transportation problem is growing each year in the number of districts and pupils involved, and in the cost of equipment and operation. Some attention must be devoted to the economical management of a public service that is rapidly approaching a million dollar outlay.²

Roy Lyell Johns³ estimates that the unit cost most desired by which comparisons are to be made, perhaps most fairly, is the cost of transporting one pupil one mile per day.

F. O. Evans⁴ of California further complicates the possibility of finding a satisfactory unit cost for comparing the costs of transporting districts by showing that one pupil and one mile prove to be quite variable when used in the measurement of unit costs of transportation.

Almack and Bursch say,

Some schools are reporting costs in terms of cost per mile; others cost per day; and still others cost per day per pupil. None of these are entirely satisfactory, either from the standpoint of accurately representing the facts or as a basis for comparing cost in one school with another.

It is obvious that cost per day per pupil is not a just basis for comparing the efficiency of transportation in two schools, if the average distance that pupils are hauled is greater in one than in the other, or if conditions of roads vary.

Cost per day, per mile, or per pupil, ignores too many variable factors to need further comment. Cost per pupil-mile based upon the number of miles each child is actually carried in the bus, gives the truest picture of the facts. Cost per pupil-mile, figured on this basis, will mean the same in any system as it includes the two variable factors

² John S. Vaughn, Twelfth Biennial Report of State Superintendent of Public Instruction, Oklahoma, 1928, pp. 44-45.

³ Roy Lyell Johns, State and Local Administration of School Transportation, Teachers College, Columbia University, N. Y., 1928, p. 50.

⁴ F. O. Evans, Tax Digest, July, 1929, p. 12.

upon which costs are largely dependent--pupil and distance.⁵

It is little less than absurd to use as a unit cost for comparison, the procedure used by James Oscar Payne where he states,

Therefore the unit of cost by which comparisons will be made in this study is the cost of transporting one child, one mile, per day: presuming that he rides the entire distance of the route if he desires, without any calculable additional expense.

He explains further that,

This unit is to be arrived at by dividing the annual cost of transportation by the number of pupils, times the length of term in days, times twice the length of the route.⁶

A pupil three miles out on a 23 mile one-way route would have his per mile cost figured on the assumption that he rides twice the length of the route when the bus actually travels the route only once per day, i.e., it is driven to school in the morning and out to the end of the route in the evening.

It seems that one may as well assume that the students were picked up from the beginning of the route, as they actually are, and that they were distributed equally along the route making the entire load ride approximately one-half the length of the route rather than twice the length of the route. Perhaps this study will shed more light on problems of this nature.

⁵ Almack and Bursch, the Administration of Consolidated and Village Schools, 1925, pp. 143-144.

⁶ James Oscar Payne, A Study of the Administration of Pupil Transportation in Centralized Schools of Oklahoma 1928-29, p. 29.

The following items are contained in the 1938-39 transportation reports to the State Superintendent of Public Instruction.

1. Average number of pupils legally transported daily each month.
 - a. Grades 1-8 in the district
 - b. Grades 9-12 in the district
 - c. Grades 1-8 legal transfer
 - d. Grades 9-12 legal transfer
2. Make of body
3. Year body was built
4. Ownership
5. Kind (All steel, wood or composite)
6. Length of body
7. Make of chassis
8. Ownership of chassis
9. Model of chassis
10. Wheel base in inches
11. Capacity of chassis in tons
12. The number of the bus
13. Number of routes each bus runs
14. The kind of driver (Pupil, teacher, or other adult)
15. Name of driver
16. Aggregate number of pupils hauled during the year
17. Number of days bus ran
18. Average number of pupils transported
19. Number of children living along route in the district in grades 1-8
20. Number of children living along route in the district in grades 9-12
21. Out of the district--grades 1-8
22. Out of the district--grades 9-12
23. Number of families living along route in the district
24. Number of bus stops within districts
25. Number of bus stops outside districts
26. Number of miles driven daily
27. Length of each route
28. Average number of non-resident non-transferred pupils transported
29. Number of miles of hard surface roads
30. Number of miles of improved roads
31. Number of miles of unimproved roads
32. Date on new equipment--body
 - a. Number of routes used on
 - b. Make
 - c. Engine number of chassis on which body is used
 - d. Total purchase price
 - e. Allowance for old body
 - f. Warrants issued

- g. Balance due
- 33. New chassis purchased between June 30, 1938 and July 1, 1939
 - a. Used on route number
 - b. Engine number
 - c. Make
 - d. Total purchase price
 - e. Allowance for old chassis
 - f. Warrants issued in payment
 - g. Balance due for chassis
- 34. Contractor's annual salary
- 35. Driver's salary
- 36. Total cost of gasoline
- 37. Total cost of oil
- 38. Tires and tubes
- 39. Repair and rebuilding bodies
- 40. Repair and overhaul of chassis
- 41. Payment on chassis
- 42. Payment on bodies
- 43. Insurance, license, chains, etc.
- 44. Total expenditure for maintenance and equipment of each route
- 45. Gallons of gasoline used
- 46. Quarts of oil used

Many of these items agree identically with J. C. Jensen's⁷ study wherein he recommends that the following factors concerning the cost of transportation be made uniform throughout the state.

1. That elementary pupils be studied in separate groups from high school students in computing the costs of transportation.
2. Get good drivers even at greater cost than for poor drivers.
3. Provide only comfortable and safe conveyance.
4. Recognize three types of roads.
5. The length of the route must be considered.
6. The type of conveyance determined by the number of pupils hauled.
7. The number of pupil-miles.
8. The cost per pupil-mile. This was found by dividing the total daily cost of said group by the number of pupil-miles of said group.

⁷ J. C. Jensen, op. cit., p. 32.

9. The cost per pupil per year.
10. For district owned buses.
 - a. Cost of conveyance
 - b. Repair, oil, and gas
 - c. Cost of garage or sheds
 - d. Depreciation of vehicles, garages and sheds
 - e. Interest on investments
 - f. Insurance, sundries, etc.

Your attention is called to the fact that in the items quoted above no mention was made concerning the type of route to be used in transporting school children; although a careful study of the transportation maps of the schools of Oklahoma recorded recently, reveal that nearly half of the routes are of the one-way type.

Julian E. Butterworth⁸ in his article on "Cutting Transportation" mentions nothing of the type of route.

Dr. R. M. Fisinger⁹ in a recently completed plan for classifying these costs, sets up categories of administration, operation of vehicles, operation of garage, maintenance of building equipment and tools, fixed charges, debt service, and capital outlay.

Routing, then, may be one of the most important phases of administration.

Since in this study special attention is going to be given to the different types of routes, it is necessary to

⁸ Julian E. Butterworth, Cutting Transportation Costs, The Nations Schools, January 1940, Vol. 25, pp. 55-56.

⁹ R. M. Fisinger, A Uniform System of Cost Accounting of School Transportation, Ph.D. Dissertation, Cornell University, 1939, p. 8.

give a brief explanation of these types. The only mention I have been able to find about types of routes is used by Almack in a topic on planning transportation. He states,

Routes are classified into two types. The "Circular" type is laid out from the school or other central point on a road, and after making a loop or circuit, returns to the school on another road. The "Shoestring" route is the second type. It is laid out in one general direction from the school, usually along a main road.¹⁰

In this study routes will be grouped under four headings, namely: One-way, Retracing One-way, Loop, and Retracing Loop.

The One-way type of route will be a route that terminates in our district usually at points farthest out from school. An ideal situation would be for the driver to live at that point. In the morning the bus starts from this outermost point and proceeds in the general direction of school without making any retracing drives. The bus is left at school--usually in a school garage--where it may be repaired if it need be. In the evening it is driven back over the same route in the reverse order.*

Type number two, the Retracing One-way route, will have all the characteristics found in the One-way route except it will have one or more areas along the route served by retracing the same road--on the trip to school and on the trip from school. A retracing route will use the same road on one or more sections of the route four times during the

¹⁰ Almack and Bursch, op. cit., 1925, p. 143.

* See page 11 showing typical routes.

day.*

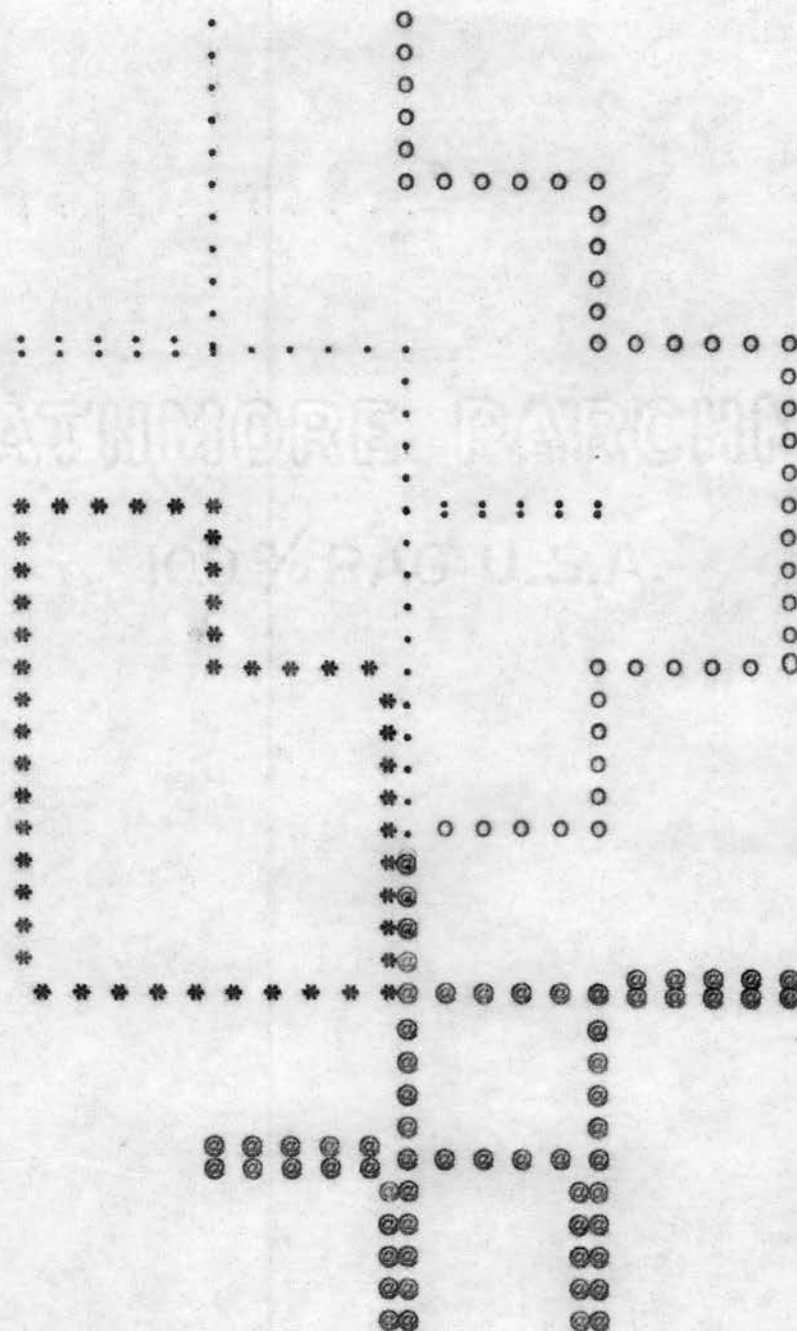
Type number three, the Loop route, will be those routes that have their origin at or near the school, and proceeding into the near-by area and back to school again, picking up passengers all along the route, but making no retraces with the exception of a short distance near the school which may be necessary to retrace. In the evening the truck makes the same route again in the same order to deliver each child to the point where he entered the bus in the morning.*

Type number four, the Retracing Loop, will be those routes that have their origin at school or near-by and proceeds into the country and back again making whatever retraces necessary to provide the type of transportation desired by the board of education. Many districts drive down each mile line, if necessary, in order that the student may not have to walk.*

It is very difficult to provide the kind of transportation demanded in most communities without making retraces along the route; so it is to be expected that there will be far more retracing routes than those without retraces.

* See page 11 showing typical routes.

MAP SHOWING TYPES OF ROUTES



- One-way routes
- Retracing one-way routes
- * Loop routes
- ⊙ Retracing loop routes

CHAPTER II

CHOICE OF ROUTES AND MATERIAL FOR STUDY

The major portion of data for this study was found in the transportation offices of the state department of education. The 1938-39 records were used since they were the most recent and most nearly complete. These records consist of the Annual Transportation Reports for the fiscal year ending June 30, 1939, Part I--Statistical, Part II, Financial and the transportation maps of each of the transporting districts. Each of these reports was certified as being accurate by either the clerk of the board of education, the superintendent of schools or by both, making their authenticity worthy of scientific research.

Since in the state reports, no attempt was made to classify the routes as to the types, it was necessary to study the maps and make that classification before material for this study could be collected. (See Appendix A)

As many variables as possible were eliminated in the choice of material. First, all contract vehicles were discarded since only operating expenses were to be studied and in contract buses the contract salary must take care of the depreciation in the owner's truck.

Next, all buses that made two routes were eliminated from this study since there was no way telling what part of the actual expense of the two routes should be charged to either route.

And last, the thing that eliminated more routes from this study than any other was the poorly drawn maps on file in the state department. Many were neat in appearance but were incomplete making them useless for this study. On some the stops were not marked and it was impossible to tell which bus actually transported the children when more than one bus used the same road near school.

After days of tiresome work, 197 routes were classified as to type, and on 97 of the same routes the distance each child lived from school was found as well as how many children were picked up on each one-fourth of the routes.

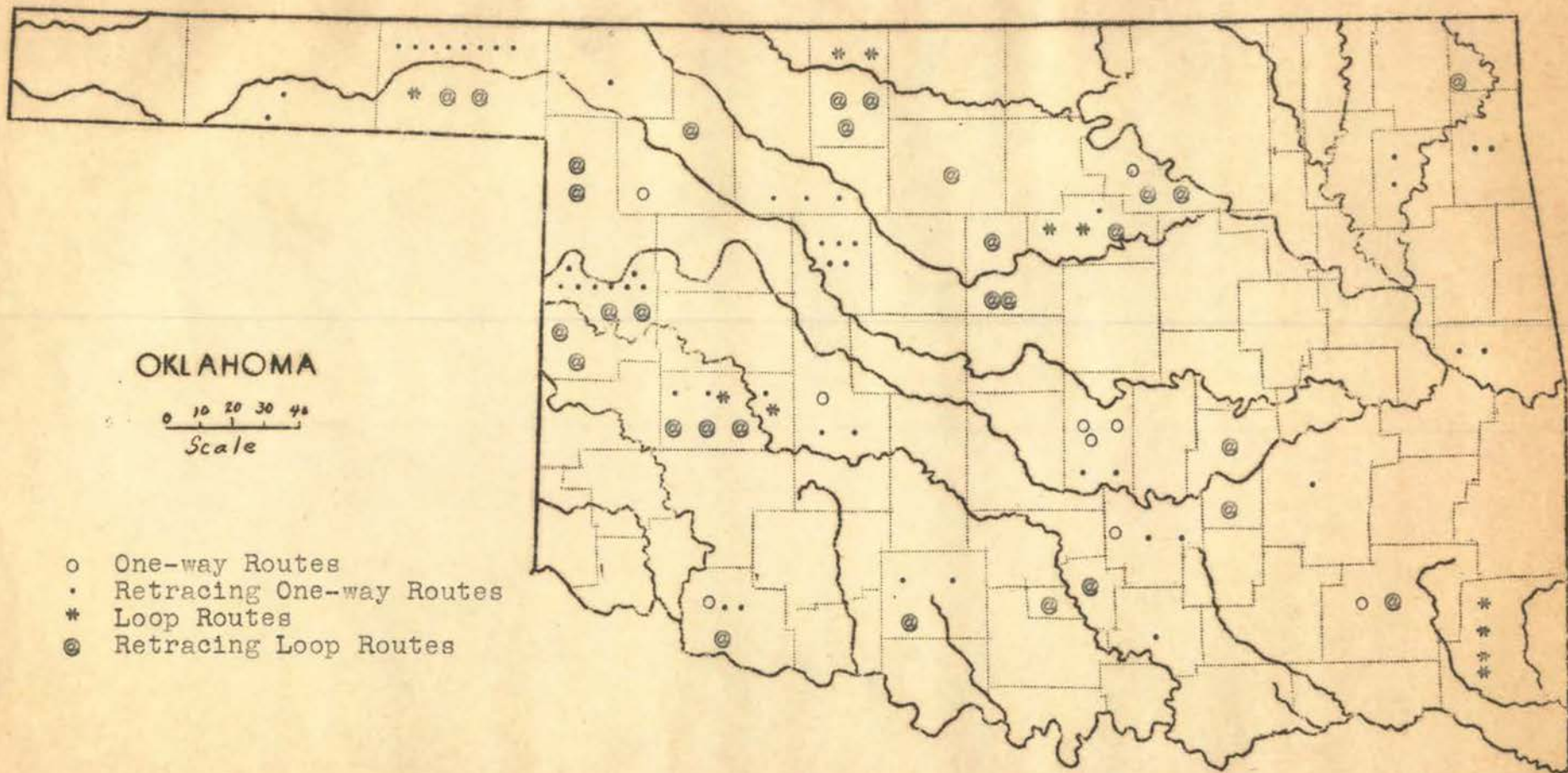
The study of schools of the counties was made in alphabetical order; so variation in the writer's ability to read maps as he became more familiar with them did not affect one area only. Map on page 15 shows distribution of routes over the state.

The following is a key to the counties of Oklahoma as referred to in this study.

COUNTIES	08 Caddo	16 Comanche
01 Adair	09 Canadian	17 Cotton
02 Alfalfa	10 Carter	18 Craig
03 Atoka	11 Cherokee	19 Creek
04 Beaver	12 Choctaw	20 Custer
05 Beckham	13 Cimarron	21 Delaware
06 Blaine	14 Cleveland	22 Dewey
07 Bryan	15 Coal	23 Ellis

24 Garfield	42 Logan	60 Payne
25 Garvin	43 Love	61 Pittsburg
26 Grady	44 Major	62 Pontotoc
27 Grant	45 Marshall	63 Pottawatomie
28 Greer	46 Mayes	64 Pushmataha
29 Harmon	47 Murray	65 Roger Mills
30 Harper	48 Muskogee	66 Rogers
31 Haskell	49 McClain	67 Seminole
32 Hughes	50 McCurtain	68 Sequoyah
33 Jackson	51 McIntosh	69 Stephens
34 Jefferson	52 Noble	70 Texas
35 Johnson	53 Nowata	71 Tillman
36 Kay	54 Okfuskee	72 Tulsa
37 Kingfisher	55 Oklahoma	73 Wagoner
38 Kiowa	56 Okmulgee	74 Washington
39 Latimer	57 Osage	75 Washita
40 LeFlore	58 Ottawa	76 Woods
41 Lincoln	59 Pawnee	77 Woodward

DISTRIBUTION OF ROUTES STUDIED



OKLAHOMA

0 10 20 30 40
Scale

- One-way Routes
- Retracing One-way Routes
- * Loop Routes
- ⊙ Retracing Loop Routes

CHAPTER III
COMPARATIVE STUDY

INTRODUCTION

By choosing for this study only those routes on which district owned equipment is used, by eliminating all buses that are driven on two routes daily, and by considering only the sole cost of operation, a large number of variables have been eliminated, that have entered into other comparative studies. Perhaps all those who have studied the problem of school transportation would agree that the primary purpose can be defined as that of transporting children to and from the training centers, but so far practically no agreement has been reached concerning an equitable standard to be used as a basis for comparison. F. O. Evans¹ of California doubts very seriously if a satisfactory standardized unit of transportation can be determined due to the following inherent causes.

1. The difficulty of evaluating certain variable factors, due to a great variation in service required.
2. The difference in the density of population, size of district, the topography of the district and the type and condition of roads, cost of living, etc.
3. The difficulty of finding a proper basis for comparing school transportation owing to the lack of satisfactory units.

He found that more than one-half of the total cost of transportation is independent of mileage.

Since the district must provide transportation for

1 F. O. Evans, Tax Digest, July 1929, p. 9.

all the school children on the route, it would seem that the "bus seat mile" would be a more equitable basis for comparison. The routes must be planned for a maximum attendance and that amount of transportation is usually furnished by the district the entire year whether the children use it or not.

Other comparisons have been made on cost per pupil per year, cost per pupil per day, and cost per pupil per mile, but none of these have given any consideration to the amount of transportation furnished as compared with the amount actually necessary to transport the students to and from school.

A. SPECIAL STUDY

A special study of the distance from school and the distribution of the load along the route was made on 97 routes in 70 different school districts in the state.

The first part of this chapter will deal primarily with a study of those 97 routes. Data in tables 9 to 17 inclusive used in this first study are marked *.

Tables 1 to 4 inclusive show the number of pupils on each route and the distance they live from school by main traveled road. These tables were made by compiling data found in a careful study of each route as shown on the transportation maps on file in the office of the Transportation Division of the State Department of Education of Oklahoma.

TABLE I

DISTANCE CHILDREN LIVE FROM SCHOOL BY MAIN TRAVELED ROAD
TYPE I--ONE-WAY ROUTE

County	District	Route	Total Number On Route	Miles From School																
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
8	7007	1	22	0	0	6	1	0	6	0	2	1	1	1	1	3				
59	17069	1	36	1	7	3	1	0	3	5	3	7	6							
60	8056	1	33	3	3	2	8	5	3	4	5									
62	7003	1	55	0	4	7	4	0	4	5	5	5	9	5	2	2	2	2	1	
63	8004	1	39	0	10	10	6	0	3	7	0	3								
63	8004	2	35	0	2	4	0	0	8	5	1	8	2	5						
63	8004	3	25	0	0	8	1	0	4	3	2	0	2	0	5					
64	6001	4	63	0	1	3	9	8	5	7	1	1	4	4	6	2	8	8	4	
71	8010	1	35	0	2	5	9	4	13	2										
77	8004	2	26	0	15	0	0	1	0	0	7	3								
367				4	44	48	39	18	49	38	24	28	24	15	14	7	10	5		

TABLE II
 DISTANCE CHILDREN LIVE FROM SCHOOL BY MAIN TRAVELED ROAD
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Total Number On Route	Miles From School																	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4	5009	2	30	5	0	1	6	10	8												
4	5009	3	14	0	1	3	2	2	1	1	3	1									
4	5009	4	14	1	1	2	0	3	1	2	3	1									
4	5128	1	21	0	4	2	1	2	1	1	3	2	2	2	1						
4	5128	2	25	0	0	1	12	1	4	1	2	4									
4	5128	3	29	0	0	0	6	6	0	3	0	4	9	1							
4	5128	4	35	0	2	0	8	2	5	4	6	1	7								
4	5075	3	38	0	1	1	10	5	6	8	3	3	1								
6	8029	1	35	0	2	3	3	3	3	2	5	6	8								
6	8029	2	38	0	7	6	7	8	3	0	4	3									
6	8029	3	45	0	1	1	0	2	11	16	10	4									
6	8029	4	33	2	0	0	3	5	5	3	0	0	5	2	4	4					
6	8029	5	30	0	0	5	8	5	10	0	2										
8	7015	4	60	5	18	7	11	0	2	3	1	3	2	3	0	3	2				
8	7007	3	48	0	11	6	3	7	3	6	6	6									
21	5006	1	39	0	8	4	0	2	2	3	7	3	4	6							
21	5006	2	37	2	6	1	5	6	3	9	1	4									
30	18003	1	36	0	0	0	12	5	6	2	6	2	4								
35	7010	3	88	0	15	5	25	16	10	0	0	7	10								
44	5002	4	44	0	6	4	8	7	1	0	0	3	12	1	1	1					
44	5002	2	13	0	1	0	1	3	0	0	0	0	1	1	0	6					
44	5002	5	16	0	0	0	3	0	6	4	3										
46	7018	2	27	0	2	9	7	7	2												
46	7018	1	58	0	2	15	4	26	8	3											
60	7101	3	25	1	1	1	1	2	3	3	1	2	5	0	5						
61	7017	1	57	0	0	0	2	2	1	2	12	4	9	2	8	8	2	2	3		

TABLE II (Continued)
 DISTANCE CHILDREN LIVE FROM SCHOOL BY MAIN TRAVELED ROAD
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Total Number On Route	Miles From School																		
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
62	5001	4	44	0	9	3	4	3	4	12	9											
62	5001	3	49	0	11	3	0	9	5	7	8	3	0	3								
63	17117	2	23	0	0	8	5	7	0	1	1	0	0	1								
63	17117	3	57	0	0	3	4	0	0	7	7	18	18									
65	8007	3	36	0	0	9	14	7	3	3												
65	5001	2	28	0	2	5	8	8	5													
65	5001	3	45	0	3	7	0	11	8	14	2											
65	5001	4	25	0	6	0	4	0	2	2	0	1	1	0	0	4	1	1	1	2		
65	5005	1	43	0	20	17	6															
65	5012	1	19	5	3	2	4															
65	17066	2	15	0	0	0	0	0	2	4	6	3										
65	17066	3	35	0	0	2	0	2	0	2	7	0	6	10	6							
68	7045	2	41	0	2	2	0	3	2	2	5	2	0	3	2	3	3	3	4	2	3	
68	6004	4	41	4	2	3	11	11	1	1	0	0	0	1	0	7						
69	7027	2	43	0	2	10	0	1	23	2	5											
69	7002	2	31	0	1	0	4	5	3	3	1	4	0	0	4	2	4					
70	5088	3	18	0	0	5	2	2	0	4	3	0	0	0	2							
70	5012	2	32	0	0	2	2	4	7	3	4	7	3									
71	8010	3	29	0	2	6	3	11	7													
71	8008	2	32	0	0	5	2	4	16	3	2											
75	18006	1	27	3	0	0	4	10	4	6												
75	6007	6	45	0	0	2	0	5	3	3	1	6	1	2	12	4	3	0	0	2	1	
75	18001	2	25	0	1	1	5	4	0	8	1	5										
				1716	28	153	175	227	249	199	163	138	112	108	38	45	42	15	6	8	6	4

TABLE III

DISTANCE CHILDREN LIVE FROM SCHOOL BY MAIN TRAVELED ROAD
TYPE III--LOOP ROUTE

County	District	Route	Total Number On Route	Miles From School													
				1	2	3	4	5	6	7	8	9	10	11			
2	7097	1	31	0	8	12	10	1									
2	7097	2	26	1	5	4	4	7	2	3							
4	5009	1	27	0	0	3	5	6	6	2	5						
50	18011	3	78	0	9	28	21	13	0	7							
50	18011	4	120	0	29	35	38	18									
50	18011	5	43	0	16	10	15	2									
50	18011	6	54	0	3	27	16	8									
60	8056	4	48	0	0	6	17	5	6	1	10	0	3				
60	7101	2	19	0	0	0	1	3	1	2	2	3	4	3			
75	8003	3	25	0	5	6	11	3									
75	6001	3	26	1	0	5	3	0	2	2	5	0	3	5			
			497	2	75	136	141	66	17	17	22	3	10	8			

TABLE IV
 DISTANCE CHILDREN LIVE FROM SCHOOL BY MAIN TRAVELED ROAD
 TYPE IV--RETRACING LOOP ROUTE

County	District	Route	Total Number												
			On Route	1	2	3	4	5	6	7	8	9	10	11	12
2	7077	1	48	1	17	5	5	3	4	8	4	1			
2	7086	1	36	7	1	0	16	4	8						
2	7086	2	26	0	0	1	8	4	8	5					
4	5075	1	40	0	12	6	3	1	7	11					
4	5075	2	26	1	5	6	1	2	3	2	3	3			
23	5002	1	33	0	0	0	0	5	8	11	4	3	2		
24	4018	1	31	0	3	4	9	6	3	6					
23	4018	2	29	0	3	4	1	2	1	5	5	1	7		
32	17009	2	63	0	15	18	7	2	2	13	3	2	1		
32	17009	1	55	0	17	16	11	11							
42	18004	1	33	3	0	0	1	14	15						
42	18004	2	24	0	0	5	8	10	1						
42	9001	1	50	0	0	3	12	6	11	8	10				
47	5001	2	76	2	10	31	5	13	15						
47	5001	3	81	0	14	24	22	11	5	5					
58	7026	2	80	4	16	10	3	8	13	7	8	3	8		
59	8005	1	38	0	6	15	17								
59	8005	2	36	0	0	6	4	14	3	9					
60	8005	6	24	0	3	3	7	3	3	2	3				
64	6001	1	75	0	0	40	30	5							
65	8006	4	34	3	5	2	11	13							
65	8006	2	26	0	2	1	3	0	2	7	1	5	5		
65	15009	2	47	1	15	7	20	4							
65	15009	3	59	0	7	16	7	6	7	16					
69	5036	2	35	0	0	5	10	20							
71	8008	4	36	0	0	0	1	23	6	5	1				
75	4107	1	18	0	0	0	1	1	3	3	0	2	6	1	1
75	4107	2	23	0	0	4	0	8	1	6	4				
75	18006	3	47	1	13	6	16	9	2						
77	8004	4	50	0	4	7	9	14	8	7	1				
			1279	23	168	245	248	222	139	136	47	20	29	1	1

By use of these tables the amount of transportation necessary to bring the children from their homes to school has been calculated.

Tables 5 to 8 inclusive show the distribution of the pupils along the route, i.e., those who get on the bus the first one-fourth, second one-fourth, third one-fourth, and fourth one-fourth of the route. This enables one to calculate very closely to the exact pupil-miles of transportation furnished by the district to transport the pupils to and from school on each route. If students are distributed along the routes as shown in table 5, it would be an equitable assumption to assume that the students in any fourth of the route were distributed approximately in the same proportion. The average length of the type-one route is 16 miles; so the first 83 pupils (See Table 5) must live an average of 14 miles, or the mean distance between 16 and 12 miles, from school. The 80 students that live on the next one-fourth of the route must live an average distance of 10 miles, or the average of 12 and 8. Again, we are assuming that as many live in the first part of the one-fourth of the route as in the second part of the same one-fourth, which fact seems to be borne out by the distribution found by each of the four distribution tables.

This line of thinking was used on types one and two and the number of pupil-miles required to transport the children to school was multiplied by two, to find the

TABLE V
DISTRIBUTION OF CHILDREN ALONG THE SCHOOL BUS ROUTE
TYPE I--ONE-WAY ROUTE

County	District	Route	Number of Children Loaded on School Bus According to Quarter of Route				Total
			First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
8	7007	1	7	7	3	5	22
59	17069	1	9	8	10	9	36
60	8056	1	7	5	14	7	33
62	7003	1	11	13	17	12	53
63	8004	1	10	3	11	15	39
63	8004	2	6	8	14	7	35
63	8004	3	6	8	5	6	25
64	6001	4	13	21	16	13	63
71	8010	1	4	7	9	15	35
77	8004	2	10	0	0	16	26
			83	80	99	105	367

TABLE VI
 DISTRIBUTION OF CHILDREN ALONG THE SCHOOL BUS ROUTE
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Number of Children Loaded on School Bus According to Quarter of Route				Total
			First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
4	5009	2	9	9	7	5	30
4	5009	3	2	6	4	2	14
4	5009	4	4	4	4	2	14
4	5128	1	10	5	3	3	21
4	5128	2	9	6	10	0	25
4	5128	3	2	13	8	6	29
4	5128	4	16	13	6	0	35
4	5075	3	8	3	9	18	38
6	8029	1	8	4	10	13	35
6	8029	2	7	7	8	16	38
6	8029	3	8	18	18	1	45
6	8029	3	8	7	9	9	32
6	8026	5	6	9	8	7	30
21	5006	1	13	8	6	12	39
21	5006	2	7	9	9	12	37
30	18003	1	7	11	2	16	36
35	7010	3	21	42	11	14	88
44	5002	4	15	2	17	10	44
44	5002	2	6	2	1	4	13
44	5002	5	14	1	1	0	16
46	7018	2	10	9	2	6	27
46	7018	1	8	3	26	21	58
60	7101	3	10	5	8	2	25
61	7010	1	24	23	0	10	57
62	5001	4	8	10	9	17	44
62	5001	3	9	10	9	21	49
63	17117	2	3	5	10	5	23
63	17117	3	14	26	10	7	57
65	8007	3	6	7	21	2	36
65	5001	2	7	8	5	8	28

TABLE VI (Continued)
 DISTRIBUTION OF CHILDREN ALONG THE SCHOOL BUS ROUTE
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Number of Children Loaded on School Bus According to Quarter of Route				Total
			First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
8	7015	4	5	4	6	45	60
8	7007	3	5	9	12	22	48
65	5001	3	11	11	13	8	43
65	5001	4	10	4	11	0	25
65	5005	1	7	15	7	14	43
65	5012	1	1	4	2	12	19
65	17066	2	9	4	2	0	15
65	17066	3	14	6	7	8	35
68	7045	2	8	11	15	7	41
69	7027	2	4	5	21	13	43
69	7002	2	4	6	4	17	31
70	5088	3	2	6	3	7	18
70	5012	2	13	5	9	5	32
71	8010	3	6	7	7	8	27
71	8008	2	7	10	6	9	32
75	18006	1	11	5	7	4	27
75	5007	6	12	2	18	13	45
75	18001	2	8	3	5	9	25
			425	403	421	467	1716

TABLE VII
DISTRIBUTION OF CHILDREN ALONG THE SCHOOL BUS ROUTE
TYPE III--LOOP ROUTE

County	District	Route	Number of Children Loaded on School Bus According to Quarter of Route				Total
			First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
2	7097	1	7	12	11	1	31
2	7097	2	3	7	10	6	26
4	5009	1	3	10	7	7	27
50	18011	6	0	0	27	27	54
50	18011	5	0	0	22	21	43
50	18011	3	8	7	10	53	78
50	18011	4	0	0	58	62	120
60	8056	4	6	6	11	25	48
60	7101	2	3	3	13	0	19
75	8003	3	0	10	10	5	25
75	6001	3	0	8	8	10	26
			30	63	187	217	497

TABLE VIII
 DISTRIBUTION OF CHILDREN ALONG THE SCHOOL BUS ROUTE
 TYPE IV--RETRACING LOOP ROUTE

County	District	Route	Number of Children Loaded on School Bus According to Quarter of Route				Total
			First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
2	7077	1	6	16	10	16	48
2	7086	1	2	10	10	14	36
2	7086	2	3	7	7	9	26
4	5075	1	4	9	11	16	40
4	5075	2	5	4	7	10	26
23	5002	1	13	6	6	8	33
24	4018	1	7	8	6	10	31
24	4018	2	7	6	8	8	29
32	17009	2	19	7	19	18	63
32	17009	1	16	11	17	12	55
42	18004	1	1	20	8	4	33
42	18004	2	6	9	9	0	24
42	9001	1	4	18	22	6	50
47	5001	2	21	24	9	21	76
47	5001	3	4	5	7	65	81
58	7026	2	20	12	11	37	80
59	8005	1	1	12	7	18	38
59	8005	2	6	8	5	17	36
60	8056	6	0	5	7	12	24
64	6001	1	10	13	32	20	75
65	8006	2	10	9	5	2	26
65	8006	4	7	10	6	11	34
65	15009	2	11	10	13	13	47
65	15009	3	8	11	15	25	59
69	5036	2	4	12	16	3	35
71	8008	4	0	13	17	6	36
75	4107	1	2	5	7	4	18
75	4107	2	7	6	10	0	23
75	18006	3	16	16	11	4	47
77	8004	4	7	5	21	17	50
			227	307	339	407	1279

daily requirement, because the buses were driven back over the same road on the evening trip. Exactly the same process can be used on types three and four routes, but since a state ruling requires the buses on loop routes to make the route in the same order in the evening as it does in the morning, one needs only to multiply the total number of children times the average length of the route since they are transported the entire length of the route daily. The writer wishes to acknowledge here that this procedure is not strictly scientific, since a large load may have been hauled a short distance and small load may have been transported a long distance, making an untrue average. A glance at the tables 9 to 12, however, will show that the largest bus loads are, in a majority of cases, found on the longest routes; so that any variation toward a more accurate figure would lend to raise the estimate of pupil-miles of transportation furnished by the district on types three and four routes, thereby making the comparison more contrasting than the figures now reveal.

Table 13 has the most interesting discoveries made in this study. Perhaps the fact which would cause the greatest concern among taxpayers is that it cost 77¢ per pupil per mile for one group of children four and one-half miles from town on one type of route and 67¢ for another group of children who live an average of six miles from town on another type of route.

TABLE IX
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE I--ONE-WAY ROUTE

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days bus Ran	Average Load	Length of Route	Total Operating Cost
8	7007	1	2	4793	178	27	12	\$484.75 *
60	8056	1	2	6966	178	20	10	672.38 *
59	17069	1	1	8923	175	61	20	835.18 *
62	7003	1	1	6668	172	39	21	826.47 *
63	8004	2	1	6760	176	38	11	441.84 *
63	8004	1	1	7474	176	42	13	721.69 *
63	8004	3	1	4461	176	25	12	455.26 *
64	6001	4	2	8653	180	48	36	505.87 *
71	8010	1	1	6423	178	36	11	339.52 *
77	8004	2	1	4588	175	26	14	503.50 *
				65709	1764	352	160	\$5786.46

TABLE X
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days Bus Ran	Average Load	Length of Route	Total Operating Cost
4	5009	2	3	5429	175	31	10	\$279.22 *
4	5009	3	3	2488	175	14	16	316.14 *
4	5009	4	2	3184	175	18	19	325.14 *
4	5128	1	2	3656	175	21	25	540.43 *
4	5128	2	2	4412	175	26	18	372.80 *
4	5128	3	2	5533	175	32	19	317.13 *
4	5128	4	2	5286	175	30	25	335.44 *
4	5075	3	1	5572	173	32	25	412.03 *
6	8029	1	1	6342	176	36	16	661.34 *
6	8029	2	1	5468	176	31	16	663.79 *
6	8029	3	1	2175	176	12	13	685.18 *
6	8029	4	1	4588	176	26	15	828.45 *
6	8029	5	1	3034	176	17	14	708.20 *
8	7015	4	2	8301	178	52	28	1158.89 *
8	7007	3	2	7036	178	41	25	498.31 *
21	5006	1	1	6844	176	38	24	511.35 *
21	5006	2	1	7647	176	43	25	739.00 *
30	18003	1	1	6416	176	36	26	494.70 *
35	6010	3	1	11510	175	66	16	638.60 *
44	5002	4	2	3223	178	18	16	312.57 *
44	5002	2	2	1990	178	11	22	232.70 *
44	5002	5	1	2779	178	15	25	359.18 *
46	7018	1	2	5764	175	33	15	571.94 *
46	7018	2	1	7016	175	40	33	824.84 *
60	8056	5	2	5860	176	25	13	566.43 *
60	7101	3	1	3799	177	21	27	591.35 *
60	7101	4	1	2954	177	17	16	485.15 *
61	7007	1	1	8567	175	49	22	501.47 *
61	5115	2	1	3124	178	50	15	498.29 *
61	7028	2	1	4146	172	24	22	544.52 *
62	5001	2	1	8372	175	48	11	517.73 *
62	6001	3	1	6160	175	35	17	644.67 *
62	5002	4	1	6810	176	39	24	515.67 *
62	5002	9	1	6689	176	38	14	622.30 *
62	5002	6	1	7109	176	40	24	550.60 *
63	17117	1	1	5183	176	30	16	1048.07 *

TABLE X (Continued)
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days Bus Ran	Average Load	Length of Route	Total Operating Cost	
63	17117	2	1	4281	176	25	15	834.72	*
63	17117	3	1	6871	176	50	16	613.44	
64	6001	5	2	8364	180	46	44	795.99	
64	6001	2	2	9167	180	50	40	478.22	
65	8007	2	1	5959	178	33	27	542.53	*
65	8007	3	2	6218	178	35	19	539.22	
65	5001	2	1	6076	180	34	21	617.94	*
65	5001	3	2	7430	180	41	19	411.27	*
65	5001	4	1	4692	180	26	22	483.08	*
65	5004	1	2	8506	179	47	23	466.13	
65	5005	1	1	5401	180	30	23	540.00	*
65	8006	3	2	6290	177	35	18	379.16	
65	8006	5	2	4940	177	28	15	575.97	
65	5012	3	2	7058	177	40	18	444.72	
65	5012	1	1	4154	177	23	13	382.56	*
65	17066	2	2	2301	177	13	14	490.44	*
65	17066	3	1	4779	177	27	18	499.00	*
68	7045	2	1	5559	175	32	25	566.27	*
68	6004	3	1	8985	176	51	32	914.52	*
69	16016	2	1	9771	176	56	17	524.81	
69	16016	4	1	5899	176	34	13	393.83	
69	7027	2	1	3033	178	17	19	458.35	*
69	5042	2	1	8222	177	46	19	484.15	
69	5042	6	1	7606	177	43	28	537.42	
69	7002	2	1	5801	173	33	24	675.73	*
69	7002	3	1	8617	176	49	30	751.00	
69	7002	4	1	7612	175	43	25	720.62	
69	7002	6	1	10061	176	57	31	688.63	
69	4014	1	1	4592	180	26	17	541.23	
69	16016	3	2	5881	176	33	13	342.55	
70	5015	1	1	6300	175	35	25	404.48	
70	5015	3	1	6840	175	39	23	472.29	
70	5088	1	1	2418	175	14	15	323.34	
70	5088	3	1	2213	175	13	25	291.22	*
70	5012	1	2	4417	175	25	17	313.40	

TABLE X (Continued)
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days Bus Ran	Average Load	Length of Route	Total Operating Cost
70	5012	2	1	4905	175	28	22	584.22 *
70	5012	3	2	3598	175	20	16	251.24
70	5012	4	2	4926	175	28	19	320.00
71	8010	2	1	4407	178	25	14	339.58
71	8010	3	1	4600	178	26	14	415.25 *
71	8010	4	1	7170	178	40	15	364.80
71	8008	2	2	4154	176	24	14	273.11 *
71	8008	5	2	4159	176	24	15	273.05
75	5007	5	2	8676	180	48	15	324.00
75	18006	1	2	4798	175	27	10	260.16 *
75	18006	2	1	5804	175	33	11	365.11
75	18006	3	2	8100	180	45	12	572.31
75	5007	6	2	9000	180	50	15	260.40 *
75	5002	3	2	9463	179	54	11	338.66
75	8003	5	1	6786	175	39	11	299.83
75	8003	5	2	7123	175	41	12	270.61
75	18001	1	1	4926	175	28	18	540.29
75	18001	2	2	4968	175	29	17	516.01 *
75	18001	6	1	7426	175	41	22	674.36
75	5002	2	2	8015	179	43	13	328.77
76	5002	2	1	6907	175	39	34	440.36
76	5002	3	1	5187	175	30	31	440.36
77	8006	1	1	8282	175	42	19	527.26
77	8006	2	1	5697	175	32	31	542.09
77	8006	3	2	5180	172	30	29	649.18
Entire Total				566026	16931	3229	1910	48524.16
Starred Total				233650	8465	1484	968	25625.07 *

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TABLE XI
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE III--LOOP ROUTE

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days Bus Ran	Average Load	Length of Route	Total Operating Cost
2	7097	1	1	5733	177	31	18	\$354.38 *
2	7097	2	1	4208	177	23	15	529.66 *
4	5009	1	1	3975	175	22	20	314.77 *
50	18011	3	2	11338	180	63	14	476.93 *
50	18011	4	2	15499	180	86	14	475.70 *
50	18011	5	2	5609	180	31	10	537.90 *
50	18011	6	1	6349	180	37	11	502.14 *
60	7101	2	1	3603	177	20	17	898.37 *
60	8056	4	2	2554	176	49	16	493.74 *
72	5002	2	1	14514	177	82	40	459.31
72	5002	3	1	13806	177	78	53	496.71
72	18007	1	1	9754	175	56	29	788.49
72	5002	4	1	14514	177	82	42	507.90
75	8003	3	2	7946	175	45	9	271.70 *
75	6001	3	1	7228	178	41	22	446.45 *
Entire Total				132930	2661	746	330	7554.15
Starred Total				80342	1956	448	166	5301.74 *

TABLE XII
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE IV--RETRACING LOOP

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days Bus Ran	Average Load	Length of Route	Total Operating Cost
2	7077	1	1	8184	175	47	24	\$574.38 *
2	7086	1	1	3926	176	22	24	442.41 *
2	7086	2	1	5477	176	31	22	443.68 *
4	5075	1	1	6545	173	33	26	474.99 *
4	5075	2	1	4570	173	27	32	474.99 *
23	5002	1	1	8188	178	46	34	461.90 *
24	4018	1	1	4772	176	27	34	697.96 *
24	4018	2	1	4072	176	28	33	665.31 *
32	17009	1	1	9823	178	55	14	636.81 *
32	17009	2	1	7841	178	44	32	755.50 *
42	18004	1	1	5301	175	31	19	620.59 *
42	18004	2	1	4636	174	27	14	666.06 *
42	9001	1	1	8130	175	47	16	566.72 *
47	5001	2	2	8996	175	51	13	356.05 *
47	5001	3	2	5370	175	31	17	366.05 *
50	18001	2	2	17117	180	95	20	866.26
50	18011	3	2	11338	180	63	14	356.56
58	7026	2	1	11964	175	68	40	937.99 *
59	8005	1	1	5467	175	31	12	528.19 *
59	8005	2	1	5761	175	32	14	665.31 *
60	15004	1	1	6297	173	36	11	530.80
60	15004	2	1	5207	173	30	10	543.66
60	15004	3	1	3373	175	19	17	564.55
60	8056	6	1	4426	176	25	13	699.46 *
62	5004	1	1	6994	178	39	19	424.14
63	8004	1	1	7474	176	42	13	721.69
63	8004	4	1	7415	171	43	10	418.23
64	6001	1	2	12477	180	69	32	478.22 *

TABLE XII (Continued)
 STATISTICAL DATA CONCERNING SCHOOL BUSES
 TYPE IV--RETRACING LOOP

County	District	Route	Kind of Driver	Aggregate Pupils Hauled	Days Bus Ran	Average Load	Length of Route	Total Operating Cost
66	5001	1	1	6864	190	38	16	\$484.26
66	5004	3	2	5113	179	29	15	514.50
66	8006	4	2	6119	177	35	14	568.36 *
66	8006	2	1	7088	177	40	16	780.61 *
66	15009	1	1	6891	175	39	16	436.98
66	15009	2	1	7873	175	45	16	429.14 *
66	15009	3	1	9732	175	56	16	418.70 *
66	5019	1	1	7819	176	44	16	602.09
66	5019	2	1	8758	176	50	15	311.68
66	7033	1	1	9588	180	53	26	835.35
69	5036	2	1	6196	174	36	14	417.64 *
71	7158	1	1	6335	178	35	15	591.87
71	7158	2	1	5700	178	32	22	651.29
71	7158	3	1	8016	178	45	23	589.96
71	7187	1	1	3948	179	22	21	521.61
71	8008	4	2	5109	176	29	12	259.98 *
71	8008	6	2	4895	176	28	12	414.32
72	4033	1	1	4134	176	24	32	770.57
72	18001	3	1	8356	175	47	13	342.58
72	18001	5	1	8606	175	49	15	520.53
75	4107	1	1	3453	176	20	22	556.27 *
75	4107	2	1	5308	176	30	24	447.78 *
75	18006	3	1	6792	175	39	19	572.31 *
75	5002	1	2	8876	179	49	19	453.47
75	8003	2	1	6199	175	36	8	326.82
77	8004	4	2	6919	175	39	21	537.84 *
Entire Total				376528	9511	2133	1027	29284.77
Starred Total				201315	5270	1146	639	15935.72 *

It shows that the cost per year per student for those who live out on a One-way route was only \$2.54 per year more than those on the Retracing Loop route; although the load, which if larger decreases cost up to the maximum capacity of the bus, was larger on the Retracing Loop route. The average load for the Retracing One-way routes was 35 compared with 45 on the Retracing Loop routes. It shows that the wasted time by useless riding is only 66.2% on the Retracing One-way routes as compared with 133.2% on the Retracing Loop routes. In other words, if the 1279 pupils on the Retracing Loop routes were transported with the same efficiency as the 1716 pupils on the Retracing One-way routes, enough pupil-miles of transportation would be saved to transport one pupil around the world at this latitude every two days of school.

Most of the children have certain chores to do around home so the loss of time in making the 15,585 pupil-miles of extra hauling every two days amounts to an overwhelming lot in a year's time. On the 30 Retracing Loop routes in this study there would be 56,160 more pupil-hours of time lost in one school year than if type two routes had been established. This would make a loss of 44 hours for each student per year.

Table 13 states further that the annual operating cost of buses on the Retracing One-way routes was \$523.16 as compared with \$531.19 on the Retracing Loop. The Retracing

Loop route cost only about 2% more. Nearly 28% larger load was hauled on the bus used on the Retracing Loop route. This more or less substantiated the assumption of the Taxpayer League of California² that the cost per mile for a bus was a constant factor whether the bus was loaded or not.

Another interesting citation found in table 13 in regard to average distance and annual cost is that for students who live four miles out it costs \$10.66, four and one-half miles \$12.46, six miles \$14.99, and six and one-half miles \$15.52.

All writers have agreed that distance is a potent variable in determining the cost, but when districts are reorganized and One-way routes established in densely populated areas the cost per child will be lowered considerably on the One-way Retracing routes.

² Tax Digest, p. 7.

TABLE XIII
NUMBER OF PUPIL-MILES OF TRANSPORTATION NEEDED AS COMPARED WITH THE AMOUNT
ACTUALLY GIVEN TO TRANSPORT THE CHILDREN TO AND FROM SCHOOL ON EACH TYPE OF ROUTE

Type of Route	Pupils	Average Distance From Town	Pupil Miles Needed Per Day on All Routes Studied	Pupil-Miles Given Per Day	Waste in Pupil-Miles	Waste in Percent	Average Annual Bus Cost	Average Annual Pupil Cost	Cost Per Pupil Per Mile for Needed Transportation
I	367	6 $\frac{1}{2}$	4680	5742	1062	22.6	569.68	15.52	.68
II	1716	6	21380	35598	14218	66.2	523.16	14.99	.68
III	497	4	4132	7455	3323	80.4	481.98	10.66	.72
IV	1279	4 $\frac{1}{2}$	11702	27285	15583	133.2	531.19	12.46	.77

B. A STUDY OF 174 SCHOOL BUS ROUTES

When an attempt is made to compare the operating cost of transporting vehicles, some of the first things to be considered are model of truck, size of body, average load, kind of driver, and perhaps the make of truck as well as the length of the route. Table 20 gives us a picture of how these items varied in the 174 routes studied. In the two types under which most of the routes are classified there is a striking similarity shown in the model and make of trucks. There are 97 type one, and 52 type two routes. This ratio is approximately 2 to 1 and by a glance at the table, one can see that this ratio holds true throughout the table with the exception of the two makes of trucks--G.M.C. and Dodge.

About the same percent of drivers are adults on each type of route. The student drivers are used by a little greater percent of the type two route. This is to be expected since the trucks are to be left at the outer end of the route over night and at the school garage in the day time, thereby making it inconvenient for an adult who wishes to do farm work to drive. It also requires the driver to furnish himself transportation back to the farm if he wishes to do work there during the school day. Many adult drivers over the state find work to do in town during the school day which gives them a little extra salary, thus making it possible for them to earn a living wage.

TABLE XIV
ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
TYPE I--ONE-WAY ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
8	7007	1	180.00	133.24	14.15	94.46	27.07	24.18	11.65	484.75 *
59	17069	1	315.00	198.90	22.15	176.80	64.37	24.65	33.31	835.18 *
60	8056	1	135.00	119.76	5.20	49.69	189.20	146.68	26.85	672.38 *
62	7003	1	450.00	269.18	16.13	84.86			6.30	826.47 *
63	8004	1	270.00	144.99	19.01	46.50	89.30	90.90	60.90	721.69 *
63	8004	2	270.00	112.46	12.65		7.30	1.00	38.43	441.84 *
63	8004	3	270.00	95.39	13.35	6.60	36.80	15.97	17.15	455.26 *
64	6001	4	290.85	114.53	12.90	28.75	40.84		18.00	505.87 *
71	8010	1	180.00	101.90	9.25		24.35	14.00	10.02	339.52 *
77	8004	2	450.00					53.50		503.50 *
Totals			2650.35	1244.85	118.23	410.86	664.86	361.23	224.30	5694.68 *
Average			265.04	124.49	11.82	41.09	66.49	36.12	22.43	569.47

TABLE XV
ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
4	5009	2	90.00	101.50	7.36	2.06	55.00	21.80	1.50	279.22 *
4	5009	3	90.00	96.04	7.00	45.10	55.70	21.80	1.50	317.14 *
4	5009	4	90.00	102.62	6.43	45.10	55.69	21.80	1.50	325.14 *
4	5128	1	108.00	139.75	6.72	60.00	195.00	14.00	16.96	540.43 *
4	5128	2	108.00	111.93	3.36	60.00	58.55	14.00	16.96	372.80 *
4	5128	3	108.00	127.27	3.36	48.00	15.00	14.00	1.50	317.13 *
4	5128	4	108.00	138.58	3.36	48.00	12.00	14.00	1.50	325.44 *
4	5075	3	225.00	103.05	12.01	38.77	12.35		15.85	412.03 *
6	8029	1	475.20	87.44	5.45		81.25		12.00	661.34 *
6	8029	2	475.00	92.14	6.65		75.00		12.80	663.79 *
6	8029	3	356.40	54.18	6.20		256.00		12.40	685.18 *
6	8029	4	445.50	103.00	4.80		262.75		12.40	828.45 *
6	8029	5	406.00	100.75	7.25		181.00		12.40	708.20 *
8	7015	4	180.00	299.77	95.10	123.80	321.78	73.12	65.12	1158.69 *
8	7007	3	180.00	180.64	14.95	45.16	58.77	6.39	12.40	498.31 *
21	5006	1	270.00	184.85	20.50			36.50		511.65 *
21	5006	2	270.00	195.80	24.25	55.80	99.95	93.20		739.00 *
30	18003	1	225.00	132.73	10.40	72.40	38.50		15.67	494.70 *
35	7010	3	225.00	190.66	32.00	87.45	75.00		28.49	638.60 *
44	5002	2	157.50	125.60	12.10		17.37			312.57 *
44	5002	4	112.50	102.20	18.00					232.70 *
44	5002	5	210.00	51.63	15.20	41.85	40.50			358.18 *
46	7018	1	157.50	127.15	14.35	138.57	134.37			571.94 *
46	7018	2	312.00	170.31	36.06	200.00	103.47			824.84 *
60	8066	5	135.00	91.32	5.20	64.28	114.48	134.65	21.50	566.43 *

TABLE XV (Continued)
 ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
 TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
60	7101	3	50.00	176.45	12.50	100.00	200.00	12.50	40.00	591.45 *
60	7101	4	235.00	105.78	6.87		100.00	12.50	25.00	486.15
61	7017	1	270.00	142.06	14.56	7.90	26.25	21.95	18.75	601.47 *
61	5115	2	310.00	139.58	11.22	1.40	29.44		6.65	498.29
61	7028	2	225.00	219.32	18.90	4.75	73.85	1.70	1.00	544.52
62	5001	2	306.25	115.40	9.80	36.20	23.21	26.67		517.73 *
62	5001	3	306.25	109.36	8.40	38.45	132.73	49.48		644.67 *
62	5002	9	272.00	119.34	9.60		92.93	9.56	12.24	515.67
62	5002	4	272.00	181.22	11.25		133.00	10.83	14.00	622.30
62	5002	6	272.00	191.75	10.36		50.00		26.50	550.60
63	17117	1	495.00	169.90	8.64	58.53	289.73	9.52	6.75	1038.07
63	17117	2	270.00	168.47	7.60	3.75	309.71	29.55	25.44	834.72 *
63	17117	3	315.00	209.42	12.80	11.45	37.37		27.40	613.44 *
64	6001	3	258.08	156.13	34.80	83.70	31.57	213.71	12.00	795.99
64	6001	2	290.00	128.57	16.70		24.10		18.00	478.22
65	8007	2	180.00	164.36	17.50		124.42	35.00	21.25	542.53
65	8007	3	180.00	136.78	21.90		153.04	27.50	20.00	539.22 *
65	5001	2	268.80	138.64	20.00	2.00	80.00	75.00	33.50	617.94 *
65	5001	3	144.40	187.07	20.25	2.00	32.50	5.50	35.85	427.57 *
65	5001	4	224.00	175.92	19.00	5.00	10.81	12.50	35.85	483.08 *
65	5004	1	180.00	193.87	10.95		44.33	18.98	18.00	466.13
65	5005	1	198.00	156.65	30.40	12.25	86.00	20.70	36.00	540.00 *
65	8006	3	135.00	152.57	7.40	26.51	28.75	2.80	26.13	379.16
65	8006	5	135.00	111.20	13.11	48.00	142.06	92.35	34.25	575.97
65	5012	1	135.00	100.94	8.40	.75	174.13	13.00	12.50	444.72 *

TABLE XV (Continued)
ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
65	5012	3	135.00	146.47	22.20	12.50	51.89	13.00	1.50	382.56
65	17066	2	90.00	200.44	20.00		55.00	100.00	25.00	490.44 *
65	17066	3	90.00	204.00	15.00		45.00	100.00	45.00	499.00 *
68	7045	2	270.00	213.03	23.64	5.00	27.65		26.95	566.27 *
68	6004	3	315.00	292.02	36.25	4.75	265.00		1.50	914.52 *
69	16016	2	225.00	129.30	10.50	24.80	135.21			524.81
69	16016	4	225.00	134.70	8.13		26.00			393.83
69	7027	2	225.00	138.15	15.35	3.40	45.15	15.00	6.30	448.35 *
69	5042	2	225.00	163.41	23.01	2.46	59.98		9.29	483.15
69	5042	6	250.00	152.45	28.08	25.00	68.78	3.33	9.28	536.92
69	7002	2	270.00	133.42	13.95	84.06	100.02	27.78	46.50	675.73 *
69	7002	3	270.00	205.90	19.95	116.16	83.74	15.40	39.85	751.00
69	7002	4	270.00	168.88	12.00	107.00	65.78	47.84	51.05	722.55
69	7002	5	273.75	178.38	16.82	113.21	46.25	2.00	37.42	667.83
69	4014	1	225.00	106.49	15.30		187.78	3.00	3.75	541.23
69	16016	3	162.00	137.55	8.00		35.16			342.71
70	5015	1	180.00	110.96	24.00		88.02		1.50	404.48
70	5015	3	180.00	140.34	44.10		106.35		1.50	472.39
70	5088	1	135.00	67.90	2.94	27.54	76.78	5.05	8.13	323.34
70	5088	3	135.00	68.32	3.36	3.15	40.14	54.65	6.60	311.22 *
70	5012	1	112.50	121.08	3.00		23.38	12.44	41.00	313.40
70	5012	2	405.00	118.68	5.25	1.25	30.51	10.53	13.00	584.22 *
70	5012	3	112.50	77.04	3.15	2.25	39.38	3.24	13.68	251.24
70	5012	4	112.50	128.64	4.05		65.88	.35	8.58	320.00
71	8010	2	180.00	102.73	7.50		26.40	13.00	9.95	339.58
71	8010	3	180.00	124.60	12.50	66.00	21.50	4.00	6.65	415.25 *

TABLE XV (Continued)
ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
TYPE II--RETRACING ONE-WAY ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
71	8010	4	180.00	111.59	6.25		35.99	19.00	11.97	364.80 *
71	8008	2	90.00	128.31	8.40	5.00	26.42	5.26	9.72	273.11 *
71	8008	5	90.00	129.22	8.60	1.50	28.34	4.20	11.19	273.05
75	5007	5	112.50	125.00	7.00	3.00	60.00	15.00	1.50	324.00
75	18006	1	135.00	61.49	6.38		18.25	12.16	26.88	260.16 *
75	18006	2	225.00	62.22	5.61		28.43	14.35	29.50	365.11
75	18006	3	405.00	108.82	5.72		14.36	11.56	26.85	572.31
75	5007	6	112.50	75.00	7.00	12.50	39.90	10.50	3.00	260.40 *
75	5002	3	97.50	80.64	6.30		76.47	76.25	1.50	338.66
75	8003	4	180.00	74.26	12.36		16.43	.35	16.43	299.83
75	8003	5	112.50	79.37	24.50	4.50	33.89	11.41	4.89	271.06
75	18001	1	226.25	146.69	11.59	12.00	30.88	18.93	93.95	540.29
75	18001	2	226.25	131.45	8.95	12.00	17.50	23.25	96.61	516.01 *
75	18001	6	226.25	158.21	11.11	67.42	44.50	70.26	96.61	672.36
75	5002	2	90.00	77.70	5.85		75.80	77.80	77.92	328.77
76	5002	2	270.00	187.78	9.10	3.95	75.65		16.17	562.65
76	5002	3	270.00	142.76	4.55	11.88	60.34		14.73	504.26
77	8006	1	225.00	133.30	10.62	38.57	85.04	9.55	26.18	528.26
77	8006	2	225.00	235.00	9.36	29.90	112.86		36.97	649.09
77	8006	3	225.00	134.63	13.32	47.45	190.31	2.65	35.82	649.18
Total			20428.23	13234.89	1240.17	2467.18	7637.50	1979.77	1751.46	48824.79
Average			212.79	137.89	12.92	25.69	79.56	20.62	18.24	508.59
* Total			10598.80	6831.43	649.77	1507.42	4233.82	983.69	771.34	25635.16
* Average			216.80	139.42	13.22	30.76	86.40	20.07	15.74	523.16

TABLE XVI
ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
TYPE III--LOOP ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
2	7097	1	180.00	132.56	17.40		2.15	.49	21.78	354.38 *
2	7097	2	180.00	85.43	12.00	47.00	132.62	70.81	1.80	529.66 *
4	5009	1	90.00	134.12	10.96		56.39	21.80	1.50	314.77 *
50	18011	3	112.50	178.28	21.34	91.60	49.50		23.71	476.93 *
50	18011	4	112.50	162.20	14.75	91.60	78.65	14.50	1.50	475.70 *
50	18011	5	112.50	138.84	20.16	121.20	39.40	87.30	18.50	537.90 *
50	18011	6	226.00	149.70	14.44	43.00	21.00	29.50	20.50	502.14 *
60	7101	2	421.50	122.98	12.63	50.00	246.26	15.00	30.00	898.37 *
60	8056	4	135.00	100.64	6.50	79.59	115.80	33.46	22.75	493.74 *
72	5002	2	315.00	121.56	11.75		11.00			459.31
72	5002	3	315.00	153.40	17.75		10.56			496.71
72	18007	1	405.00	209.22	17.76	23.82	54.31	27.63	50.75	788.49
72	5002	4	315.00	160.20	18.25		14.45			507.90
75	8003	3	112.50	61.76	14.62	5.75	69.73	2.45	4.89	271.70 *
75	6001	3	180.00	187.00	27.00		7.45	44.00	1.00	446.45 *
Total			3211.50	2097.89	237.31	552.56	909.27	346.94	198.68	7554.15
Average			214.10	139.86	15.82	36.84	60.62	23.13	13.24	503.61
* Total			1861.50	1453.51	171.80	528.74	818.95	319.31	147.93	5301.74
* Average			169.23	132.14	15.62	48.07	74.45	29.03	13.45	481.98

TABLE XVII
ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
TYPE IV--RETRACING LOOP ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total	
2	7077	1	270.00	136.33	13.77	45.54	14.00	55.25	39.49	574.38	*
2	7086	1	270.00	132.64	10.97	27.30			1.50	442.41	*
2	7086	2	270.00	141.63	12.27		9.28		1.50	434.68	*
4	5075	1	225.00	139.29	13.27	32.00	63.60		4.83	477.99	*
4	5075	2	225.00	170.09	12.64		54.91		12.35	474.99	*
23	5002	1	135.00	180.00	12.50	12.75	20.00	60.50	41.15	461.90	*
24	4018	1	270.00	183.74	12.00	117.02	102.80	2.50	9.90	697.96	*
24	4018	2	270.00	208.76	12.00	120.62	35.65	8.48	9.90	665.31	*
32	17009	1	315.00	142.38	24.30		146.43		8.70	636.81	*
32	17009	2	315.00	187.02	32.70	98.00	114.28		8.50	755.50	*
42	18004	1	270.00	90.66	10.94	89.46	127.90	18.52	13.11	620.59	*
42	18004	2	270.00	87.92	11.25	43.20	226.34	6.23	21.01	665.95	*
42	9001	1	225.00	151.50	14.10	35.17	102.40	30.00	8.50	566.67	*
47	5001	2	225.00	97.97	8.00		29.20	25.60	1.50	387.27	*
47	5001	3	225.00	101.00	7.00		21.15	.40	1.50	356.05	*
50	18011	2	112.50	289.40	43.56	174.50	198.80	39.50	8.00	866.26	
50	18011	3	112.50	178.28	21.34	91.60	49.50		23.71	476.93	
58	7026	2	270.00	370.79	28.29	46.71	64.55		157.65	937.99	*
59	8005	2	270.00	138.34	9.15	50.00	15.03	.43	45.24	528.19	*
59	8005	1	270.00	107.90	12.18	120.52	35.63	8.48	9.90	564.63	*
60	15004	1	360.00	100.80	7.50				62.50	530.80	

TABLE XVII (Continued)
 ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
 TYPE IV--RETRACING LOOP ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
60	15004	2	360.00	112.86	6.30		2.00		62.50	543.66
60	15004	3	360.00	127.80	14.25	4.30	26.83	245.60	23.40	602.46
60	8056	6	180.00	117.13	5.20				62.50	564.53
62	5004	1	240.00	126.00	12.50		30.00	15.64		424.14
63	8004	1	270.00	144.99	19.10	46.50	89.30	90.90	60.90	721.69
63	8004	4	262.50	85.03	8.00		.80	.25	61.65	418.23
64	6001	1	290.85	128.57	16.70		24.10		18.00	478.22 *
65	5001	1	262.80	139.21	20.75	1.40	18.00	10.50	25.60	484.26
65	5004	3	135.00	147.08	11.94	38.00	86.39	65.62	28.27	514.30
65	8006	4	135.00	121.66	9.90	82.26	132.85	53.60	33.09	568.38 *
65	8006	2	475.00	138.55	9.36	59.50	55.10	7.23	35.87	780.61 *
65	15009	1	180.00	93.60	4.98		81.25	75.65	1.50	436.98
65	15009	2	180.00	88.79	6.66	1.95	83.26	66.98	1.50	429.14
65	15009	3	180.00	97.96	6.74		67.91	64.59	1.50	418.70 *
66	5019	1	360.00	116.05	12.00	99.74		3.00	11.30	602.09
66	5019	2	360.00	112.91	13.25		4.82	5.90	14.80	511.68
66	7033	1	315.00	157.20	33.30	151.00	110.35	5.00	63.50	835.35
69	5036	2	245.00	96.89	7.68	3.37	55.20	2.05	6.75	417.64 *
71	7153	1	495.00	66.91	10.70	4.97			14.29	591.87
71	7153	2	450.00	108.71	10.19	56.39	9.00		17.00	651.29

TABLE XVII (Continued)
 ITEMIZED OPERATING AND MAINTENANCE COSTS CONCERNING SCHOOL BUSES STUDIED
 TYPE IV--RETRACING LOOP ROUTE

County	District	Route	Salary of Drivers	Gasoline Cost	Oil Cost	Tires & Tubes	Chassis & Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
71	7158	3	450.00	102.12	11.41		6.80		18.00	588.33
71	7187	1	180.00	119.29	14.49	92.66	113.67		1.50	521.61
71	8008	4	90.00	113.68	9.20	2.50	18.32	3.40	22.68	259.98 *
71	8008	6	90.00	109.59	14.40	42.00	94.99	46.20	17.14	414.32
72	4003	1	370.00	143.93	50.61	53.64	114.13	36.73	1.50	770.57
72	18001	3	270.00	79.67	2.10		61.19	28.12	1.50	442.58
72	18001	5	270.00	94.15	5.00		124.62	25.26	1.50	520.53
75	4107	1	180.00	144.06	8.30	.35	5.15	25.00	8.16	381.02 *
75	4107	2	130.00	132.93	10.10	89.30	20.23	4.75	10.32	447.68 *
75	18006	3	225.00	62.22	5.61		28.43	14.35	29.50	365.11 *
75	5002	1	112.50	78.96	4.95	102.85	79.41	74.30	1.50	454.47
75	8003	2	112.50	65.40	11.78	4.75	121.80	5.70	4.89	326.82
77	8004	4	180.00	233.29	15.00	4.98	54.17			537.44
Total			13627.15	7203.86	732.18	2046.70	3153.39	1232.91	1152.55	29275.27
Average			252.36	133.41	13.56	37.90	58.40	22.83	21.34	542.13
* Total			7130.65	4305.89	367.78	1086.70	1754.77	704.64	587.00	15935.72
* Average			297.67	143.43	12.26	36.22	58.49	23.47	19.57	531.19

Since the average daily haul for type four route is a larger number, one would expect a larger percent of adults to be employed for drivers on that type of route. The fact that drivers on this type route may live in town, hold some other part-time job and drive a truck too, no doubt accounts for the few percent larger proportion of adult drivers on the retracing loop route.

Such proportions as 5 to 2, 47 to 25, and 7 to 3, found in the comparison of the length of body in the two most common types of routes, leads one to believe the type of equipment is practically the same on both types of routes.

The average lengths of bodies used on the different types of routes are: Type I, 16.3 ft., Type II, 15.4 ft., Type III, 16.3 ft., and Type IV, 15.88 ft. This makes the average for all nearly 16 ft. exactly. Larger buses will surely be used when the road conditions are improved.

There is a wider range in length of bodies on the type two route. The 8 one-ton trucks in this study are found to be used on type two routes. This accounts for variation in the length of bodies since smaller trucks would necessitate smaller bodies. The 16 ft. body and three-ton trucks are by far the most common on all type routes. The few large bodies found on type two routes are used in more densely settled regions, while the small "pick up" trucks are used in the sparsely populated region in the western part of the state. It has been shown that the trucks used

TABLE XVIII
SERVICES RENDERED AND UNIT COSTS

Type of Route	Aggregate Annual Haul	Bus Load	Length of Route	Cost Per Pupil Per Year	Cost Per Bus Per Year Per Mile of Route
I					
Highest	8923	51	36	33.62	67.24
Lowest	4461	20	10	9.43	14.05
Average	6571	35	16	15.52	36.16
II					
Highest	11510	66	33	34.97	50.57
Lowest	1990	11	10	5.21	11.95
Average	5896	34	20	14.94	25.66
III					
Highest	15499	86	53	44.91	53.79
Lowest	3975	20	9	5.60	9.93
Average	8862	49	22	10.67	22.89
IV					
Highest	17117	95	34	29.71	54.37
Lowest	3373	19	8	5.66	13.58
Average	7898	40	19	12.45	28.51

TABLE XIX
HIGHEST, LOWEST, AND AVERAGE
EXPENSE ITEMS ON EACH TYPE OF ROUTE STUDIED

Type of Route	Salary of Drivers	Cost of Gasoline	Cost of Oil	Tires & Tubes	Chassis Repair & Overhaul	Body Repair & Overhaul	Chains Insurance Etc.	Total
I								
Highest	450.00	262.18	22.15	176.80	189.20	146.68	60.90	835.18
Lowest	135.00	95.39	5.20					339.52
Average	265.04	124.49	11.82	41.09	66.49	36.49	22.43	569.47
II								
Highest	495.00	299.77	95.10	200.00	321.00	213.71	96.61	1158.69
Lowest	50.00	51.63	2.94					232.70
Average	212.79	137.89	12.92	25.69	79.56	20.62	18.24	508.59
III								
Highest	421.50	209.22	27.00	121.20	246.26	87.30	50.75	898.37
Lowest	90.00	61.76	6.50		2.15			271.70
Average	214.10	139.86	15.82	36.84	60.62	23.14	13.24	503.61
IV								
Highest	495.00	289.40	43.56	174.50	226.34	245.60	157.65	770.57
Lowest	90.00	62.22	2.10					311.68
Average	252.36	133.41	13.56	37.90	58.40	22.83	21.34	542.13

on each type of route are practically the same size, use about the same proportion of each make of trucks, their ages are usually near the same and that they carry about the same size bodies. It will be interesting to note the average and range of service rendered in table 18.

In the aggregate haul both extremes are found on type four routes. Type two, which has the widest varieties and shortest average length of bus bodies, has the smallest average load. Type four has the shortest average length of bodies and has next to the highest average load. This fact indicates that type four buses are in general much more crowded than the buses on type one and two.

In the bus load column there is a variation of from 11 to 85 in the average haul of the 174 school buses varying in length from 11 to 20 feet. District officials who allow such extremes to occur, especially on the low haul side, are inviting further state control.

The average length of the loop route is about $2\frac{1}{2}$ miles longer than the average length of the one-way route. This means that every child on the loop route rides $20\frac{1}{2}$ miles a day as compared to an average ride of 9 miles on the one-way route.

In the last column is perhaps a new basis for comparing expenses--that of the cost annually per bus for a mile of route. These figures could be used as an aid in figuring the cost of the establishing of new worked routes

TABLE XX
SHOWING MODEL OF TRUCKS, MAKE OF CHASSIS,
KIND OF DRIVERS, AND LENGTH OF BODIES

Model of Truck or Year in Use						Make of Chassis						
Route Type	1st	2nd	3rd	4th	5th	Ford	Chev.	Inter.	Diam.	T. G.M.C.	Dodge	Total
I	0	1	3	3	3	8	1	0	0	0	1	10
II	2	18	22	32	23	18	33	42	0	1	1	97
III	0	8	2	2	3	4	2	5	0	1	3	15
IV	1	10	15	13	12	13	16	16	0	1	6	52

Route Type	Kind of Driver			Length of Body in Feet											Average
	Adult	Student	Teacher	10	11	12	13	14	15	16	17	18	19	20	
I	7	3	0	0	0	0	0	0	1	7	1	0	1	0	16.3
II	59	35	2	3	2	2	3	15	5	47	7	4	4	1	15.4
III	10	5	0	0	0	1	1	0	1	7	4	0	0	0	16.3
IV	42	11	0	0	0	0	4	2	25	3	0	1	0	15.88	

TABLE XXI
CAPACITY OF TRUCK IN TONS

Route Type	1-Ton	2-Ton	3-Ton	4-Ton	Total
I	0	0	9	1	10
II	8	0	81	8	97
III	0	0	11	4	15
IV	8	0	49	5	54
Totals	8	0	150	18	176

to pick up transfer students. When comparing the two most common types, it will be noticed that the one-way loop route is \$2.85 cheaper per mile than the retracing loop route.

Table 19 is self-explanatory. One glance at it will surely suggest the lack of efficient administration. In the cost of oil column there is a variation from a high of \$95.10 to a low of \$2.10 for the year's oil bill. Further investigation was made and it was found that the trucks were the same size, same make, hauled the same size bodies, and the expensive one was only one year older. The above mentioned trucks were 1936 and 1937 model Chevrolets. The writer doubts if those in charge could justify an oil bill of \$95.10 when the average for all trucks in this study is

a little more than \$12.00.

An expense of \$321.00 on a chassis that used 317 quarts of oil and \$299.77 in gasoline on a route 8 miles longer than the average is the kind of evidence that supports a need for more conscientious administration.

CONCLUSIONS

After selecting 174 school bus routes, making a careful study of how far from school each child lived and the number picked up on each one-fourth of the route, and reviewing the items in the certified reports on file in the offices of the State Department of Education, it seems that the following conclusions and recommendations are justified. If from these efforts, school administrators are caused to think more seriously about the important task of more economical routing of school buses or it arouses ambitions in other students of school administration to do more of the much needed research in the field of transportation, the writer will feel that his work has not been in vain.

1. That from the plurality of numbers the one-way retracing route is the most common in the state.

2. That the most efficient routes from the standpoint of wasted pupil miles of transportation, are the fewest in number in the state. (Table XIII)

3. That the retracing loop route is the most extravagant with the student's time--causing them to ride 133% farther than they need to get to school and wasting twice as much pupil time as does the retracing one-way route.

4. That students on the two types of loop routes live on an average of 4 to $4\frac{1}{2}$ miles from school while those on the one-way routes live on an average of 6 to $6\frac{1}{2}$ miles from school.

5. That a majority of the one-way routes cost an average of \$523.16 while the majority of the loop routes cost \$531.19. (Table XIII)

6. That the cost for the actual amount of transportation needed for children from their homes to school was 68¢ per pupil per mile on one-way routes as compared with 72¢ and 77¢ per pupil per mile on the loop routes. (Table XIII)

7. That by far the most common size school bus is the 3-ton size. (Table XXI)

8. That there is about the same percent of new buses on each type of route. (Table XX)

9. That the International, Chevrolet, and Ford trucks are the most popular in order mentioned. (Table XX)

10. That about one-third of the school buses are driven by students. (Table XX)

11. That the most popular length of school bus bodied is sixteen feet. (Table XX)

12. That buses on the loop routes and retracing loop routes are the most crowded. (Table XVIII)

13. That the cheapest average annual haul per pupil was on the type of routes with the most crowded condition in the bus. (Table XVIII)

14. That the average annual cost per mile of bus routes is \$25.66 on the retracing one-way route as compared with \$28.51 on the retracing loop type of route. (Table XVIII)

15. That many of the extremes in the detailed expense

account is most difficult to explain.

16. That, from the reports from the many school districts, many school administrators have failed to keep record on their machines; so when reporting time came expenses were divided by guess work or averaged among a number of trucks thereby destroying all the purpose of keeping records.

In the light of the foregoing studies and the statements made above, the writer wishes to sum up this entire study with one broad statement which, if clearly understood by the citizenry of the state as well as school administrators, would have more to do with further enlargement of consolidated schools and consolidation than any statement in the past decade. Any district in which retracing routes are now established could, by changing the type of routes and adding buses, make its district as much as four times as large as it is now, and no child would have to ride as long and the children in the present district would spend less than one-half the time on the school bus going to and from school that they do at the present time.

RECOMMENDATIONS

1. The type of route should be added to the many items on the school bus reports to the State Department of Education.
2. A set of daily reports from each truck to correspond with state reports should be required as a part of the school records, so officials could "weed out" the causes of extreme expenditure.
3. Each superintendent should make or delegate someone to make a report every six weeks to the board of education similar to one found in the appendix B in order that negligence in oiling, greasing, etc., can be overcome.
4. Truck drivers should be required to drive on schedule when roads are good.
5. A study to determine the maintenance cost of different aged district owned school trucks should be made.
6. A study should be made to determine the habits, attitude, etc., of the drivers of trucks with high operating expenses and low operating expenses.
7. It would be interesting to know how much school gasoline, oil, and expense goes into extra curricular events such as band trips, athletic trips, scout trips, paying superintendent's traveling expenses, etc.
8. The state should take whatever steps necessary to eliminate the irregularity of districts in order that schools might be more erectly efficient and the tax burden

more equitable.

9. A study should be made to determine if conclusions made in this study will hold true for contract bus routes.

10. A study should be made of all district owned school buses to determine the relation of the increase in operating expenses with the increase age of the truck chassis.

11. A study of the estimated cost of operating certain counties or districts under a reorganized plan should be made.

12. A study should be made of the variation in the price paid by different school districts over the state for truck chassis, bus bodies, gasoline, oil, etc.

APPENDIX A

In making the selection of routes for this study, the first problem was to select those routes that were eligible for study, i.e., on which district owned equipment was used. This required the study of the Part II Transportation Reports of the many districts on file in the transportation department of the State Department of Education. A careful study of the maps of the districts that contained these routes was then made by the writer and two assistants. If a route on a map was legible enough to show clearly the stops, the distance children lived from stops, the direction of route and number of stops and also showed what bus picked up the children when two buses used the same road near the school; then the route was chosen for study and a record of the route was kept on mimeographed blanks such as shown on page 64. A record of its identity and type of route, and the number of children that lived each mile from school by main traveled road was recorded in the prepared spaces on the form, and the number that entered the bus each one-fourth of the route was recorded in aggregate form along the margin as 10, 19, 24, and 36. These three items, along with the many items on the certified reports, form the basis of this study.

The most difficult part of gathering information was determining the pupil miles of needed transportation. This item required careful study of the road and distance from school to each home. After a laborious day in which little was accomplished, the writer decided to mark a sheet of

cellophane off in squares the size of the sections on the maps of the schools, and put distances in miles from a fixed point on the cellophane, i.e., 1, 2, 3, 4, etc. Then by placing the 0 distance at the location of the school house, this cellophane guide simplified much the task of calculating needed transportation. A sample of this auxiliary is found on page 64.

Marshall Gregory, Director of Research, in the State Department of Education furnished the writer with composite form of all the information received by the state for each vehicle used in transporting school children. Figures for many of the tables found in this thesis were taken from those forms.

APPENDIX B

The transportation system of a school is one of the first things to reflect poor administration. Since the patrons of any school district see more of the transportation, and have, more or less, daily contact with it, it is more important than ever, from the standpoint of the school administrator that the whole transportation system be run in a business-like manner.

One of the most important things to do in promoting an efficient system is to cultivate pride among the drivers and students which will cause them to respect a systematic procedure. This may be achieved in a number of direct and indirect ways. Perhaps the one thing in which the driver and student must take a joint responsibility and which does tend to promote promptness etc., is a well planned bus schedule for each route.

Each bus should run its route on scheduled time. The schedule should be made before school starts by the superintendent and driver actually running the route and making all stops. The driver then should have a copy of that schedule fixed in the front of the bus and one should be posted in the superintendent's office. A form as on page 66 has proved to be quite satisfactory. No bus should be allowed to run ahead of time. Yet the driver should have it made clear, that barring trouble, he is expected to be at school on scheduled time. It should not be unusual

to see five out of six buses unloading students at the same time in the morning. Soon the students will be as eager to arrive exactly on schedule as anyone, and will joyously announce that, "All the buses were here at the same time this morning". Upon arriving the drivers should be required to fill in a very brief daily report such as the one on page 68, sign it, and send it to the office by a student. These daily reports should be modeled after the state reports so that the annual report would merely be a composite of the daily reports.

Then in order to detect absurdities in expenses etc., the superintendent should make a six weeks report to the board of education such as the one shown on page 69. This form was made for a small school but the idea, with variations on needed information, can be used for any number of buses. The same form can be used for an annual or semester report. Reports like these kept for a period of a few years would clearly show a number of things about transportation such as expensive drivers, excess consumption of oil, or gasoline, etc. Not only are these reports useful in the capacity mentioned above but the psychological effect on drivers knowing they are being closely checked is wholesome. Each driver is anxious to see if his name comes out in the paper as the driver of the most efficient truck for the past six weeks. Daily reports to the office makes each driver a little more conscious of his all-important job.

DAILY TRUCK REPORT

ROUTE NO. _____ DATE _____ TRUCK NO. _____

-
-
1. Time left garage _____ Time arrived at school _____
 2. Was your bus swept today? _____
 3. Does your bus need washing? _____
 4. Please report in person any misconduct _____
 5. Grade pupils in district transported _____
 6. Grade pupils out of district transported _____
 7. High school pupils in district transported _____
 8. High school pupils out of district transported _____
 9. Speedometer reading now _____ Actual miles on route _____
 10. Purpose of any extra driving _____
 11. Speedometer reading at start _____ . At finish _____
 12. Expense of extra driving _____
 13. Number of gallons of gas used _____
 - 14.. Number of gallons added _____

OPERATING EXPENSES

15. Gasoline added _____ gals. Cost _____ Gauge Now _____
16. Oil added _____ qts. Cost _____ Oil changed at _____
(reading)
17. Anti-Freeze added _____ qts. Cost _____ Kind used _____
18. Chassis expense:
 1. _____ Cost _____
 2. _____ Cost _____
 3. _____ Cost _____
19. Body expense:
 1. _____ Cost _____
 2. _____ Cost _____
 3. _____ Cost _____
20. Miscellaneous:
 1. _____ Cost _____
 2. _____ Cost _____
 3. _____ Cost _____
21. Have you reported your needs to the mechanic? _____

 Signed

TRANSPORTATION SUMMARY

Period Beginning _____ Ending _____

Truck Number							
Total Number Transported							
Transfers Transported							
Miles Driven							
Gasoline Used							
Gasoline Cost							
Qts. Oil Used							
Cost of Oil							
Tires & Tubes							
Chassis							
Chains, Grease							
Service Charge							
Labor Hours							
Cost of Labor							
Driver's Salary							
Body							
TOTAL EXPENSE							
Miles/Fuel Gal.							
Cost Per Day							
Cost/Student/Day							
Cost/Student/Mile							
Weight							
Cost/Ton/Mile							

Signed _____

In addition to the six weeks reports mention before, it is equally necessary to keep a close check on the stock in the district owned school garages. Only a few minutes are required to make an inventory of gasoline, oil, and parts each six weeks. The school mechanic or head driver will be anxious to know how he is checking up, whether long or short. A form such as the one on page 71 will serve quite well to make a periodic stock inventory. All forms mentioned above can be printed with the school mimeograph at a very nominal cost.

SCHOOL GARAGE STOCK REPORT

NUMBER _____

DATE _____

GASOLINEOILGallons in Pump _____
(date) _____Quarts on Hand _____
(date) _____

Gallons in Trucks _____

Quarts Bought
This Period _____Gallons Bought
This Period _____

Total _____

Total _____

Quarts in Garage _____

Gallons in Pump _____

Quarts Used _____

Gallons Used _____

Total _____

Gallons in Trucks _____

Oil (short or long) _____
Qts.

Total _____

Gasoline (short or long) _____
Gals.GREASEPARTS ON HAND NOT CHARGED
TO ANY TRUCKNo. Lbs. on Hand _____
(date) _____

Hoses _____

No. Lbs. Bought
This Period _____

Springs _____

Total _____

Battery Cables _____

No. Lbs. Used _____

Tires _____

No. Lbs. On Hand _____

Tubes _____

Total _____

Anti-Freeze _____

Chains _____

Grease (short or long) _____
Lbs.

REMARKS:

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