THE EFFECT OF SECONDARY CONSOLIDATION UPON ACHIEVEMENT IN FUNDAMENTALS AND UNIT COST

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"THE EFFECT OF SECONDARY CONSOLIDATION UPON ACHIEVEMENT IN FUNDAMENTALS AND UNIT COST."

Since large administrative districts were established in British Columbia in 1945, the "revolution of consolidation" has been virtually completed. The present study analyzes the effects of this movement of consolidation upon pupil achievement in the fundamental subjects and per pupil cost in the secondary schools of School District No. 20.

The study begins with a survey of pertinent literature. Studies relating the two factors "size of school" and "general quality of education" are reported to favour the large school overwhelmingly. When "size of school" and actual "achievement" are related, however, the result is found to be varied with approximately half the studies favouring the large school and the other half finding no significant difference. It is noted that most of the latter studies are more closely controlled than the former.

Studies relating the factors "size of school" and "cost per pupil" are also shown to be conflicting. Slightly more than half of these find the large school to be the more economical. The others find the reverse, but many of the latter point out that where such is the case the large school is offering a higher quality of education.

The achievement aspect of the present study proceeded by measuring the achievement of 308 transported students of the consolidated secondary school and 94 students of small rural secondary schools. A

group of 117 non-transported students of the consolidated school served as a control. The measuring device used was the Progressive Achievement Battery. The numbers shown are those remaining after the groups were matched on the basis of intelligence, socio-economic status, and percentage grade composition. The principal statistical technique employed in the analysis of data was the standard error of the difference for matched groups and the t-test for significance.

The financial study proceeded by a determination of the cost per pupil figures for current, capital, and total expenditures representing the transported students of the consolidated school and the secondary students of the small rural schools. All transportation expenditures of the consolidated school were charged to the transported students.

The study found that there was no significant difference in achievement on fundamentals between the transported students of the consolidated school and those of the small rural schools. Individual grade comparisons showed, however, a tendency toward superior achievement of the transported consolidated over the rural pupils in the senior grades. The total rural school cost per pupil was found to be approximately two-thirds that of the consolidated school when transportation costs were included in the latter.

It was concluded that although the study did not show a marked superiority of the consolidated school in achievement, it did indicate at least its equality with the small rural schools. Since achievement in fundamentals is more nearly the main emphasis of the rural school than it is of the consolidated comprehensive school even equality in this area was held to be a notable accomplishment of the consolidated school.

It was further concluded that two-thirds of the expenditure of the consolidated school was justified on the basis of equality in achievement with the rural school. Whether or not the remaining third was justified as paying for the other emphases of the comprehensive programme was left for further research in that area.

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C O N T E N T S

TABLES

CHAPTER I

INTRODUCTORY STATEMENT

A. General Statement of the Problem

The problem of this study is the determination of the effects of the consolidation of schools upon pupil achievement and per pupil cost in the secondary schools of British Columbia School District Number 20 (Salmon Arm).

B. Background

In his Report of the Commission of Enquiry into Educational Finance[1] in British Columbia, Cameron strongly recommended the formation of larger school administrative districts. The British Columbia Department of Education promptly accepted the recommendation and obtained the legislation necessary to implement it. School districts were summarily enlarged and their administration was completely reorganized to meet the new demands.

As has been the case elsewhere, the reorganization of administrative districts was followed in British Columbia by a reorganization of attendance areas. Within a few years of district reorganization, the consolidated school dominated the field of secondary education in rural and semi-rural areas.

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1 Cameron, Maxwell A., Report of the Commission of Enquiry into Educational Finance, Province of British Columbia, 1945.

One of the major deterrents to a consolidation programme is the necessity of abandoning existing small school buildings and constructing others adequate for the needs of central schools. This deterrent was minimized, however, in British Columbia because at this time many existing buildings were in need of replacement following the war years and because the population increase was creating a heavy demand for new construction. The trend to consolidation was, therefore, given added impetus by its coinciding with the post-war boom in school construction.

Rapid though the movement was, it did not present the appearance of being a headlong dash toward an educational fad made possible at last by the larger districts. Experience in other parts of Canada and in the United States indicated that consolidation of schools presented at least part of the answer to British Columbia's problem of sparse population. Nevertheless, the speed of the movement made it impossible to study its growth as this growth occurred. It was necessary to assume that the advantages of consolidation would be evidenced in the peculiar circumstances of British Columbia as had been evidenced elsewhere.

Now that the movement has abated and consolidation is an accomplished fact, the question naturally arises, "Has this movement fulfilled our expectations of improved educational quality and reduced educational cost?" The results of research carried on in other parts of North America offers an invaluable

frame of reference within which to work. Nothing, however, can answer this question completely for British Columbia - indeed for individual school districts in British Columbia - other than local or regional research carried on under the many special local and regional conditions which defy generalizations.

CHAPTER II

RELATED STUDIES

A. Classification

Studies interrelating the three factors of size of school, quality of education, and cost of education can be classified for convenience into four categories. The first three categories are obtained by combining, two at a time, the three factors. The fourth is obtained from considering the three factors simultaneously. The four groups, then, are considerations of the relationship of size of school and quality of education (including academic achievement); of size of school and cost of education; of cost and quality of education; and finally, of size of school, quality of education and cost of education considered together.

Since the three factors are at least suspected of being related, it could be said that their consideration, two at a time, without controlling the third, would be dangerous. In spite of this obvious danger, the practice may be justified in studies of broad scope where the uncontrolled factor is judged to be relatively constant and where the relationship found between the two factors being considered is sufficiently one-sided. The weight assigned to the relationship, nevertheless, must vary with the degree to which measured or judged control has been established.

For purposes of analysis, then, the review of the literature has been divided according to the categories mentioned.

B. Size of School and Quality of Education

1. Size of school and general quality of education

The relation between size of school and general quality and efficiency of work has been the subject of considerable investigation. One volume of the National Survey of Secondary Education[2] was devoted to a comparison of a total of 614 selected and unselected rural high schools of enrollment up to 300. Consideration was also given to the differences noted between the smaller and larger schools that were studied. Some pertinent conclusions were:

(a) The selected schools were manifestly superior to the unselected schools.

(b) The selected schools were found to be in larger districts than the unselected.

(c) They more often provided transportation than did the unselected schools.

(d) The size of the school is a more important factor in quality of education than is selection among small schools.

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2 Ferris, E. N., Gaumnitz, W. H., Brammell, P. R., The Smaller Secondary Schools, U. S. Office of Education, Bulletin No. 17, 1932, 236 pp.

Wiggans and Spaulding[3] investigated 495 four-year high schools in Texas in which enrollments ranged between ten and one hundred fifty. When the results of this study are presented as a whole, it appears (1) that schools able to employ eight or more teachers are not seriously handicapped with respect to administrative control over their staffs, (2) that the size of the teaching staff rather than the pupil enrollment tends to determine the number of different subjects assigned to each teacher, and (3) that schools employing eight or more teachers exhibit no special handicaps with respect to the assignment of specific subjects to teachers who are qualified to teach those subjects. In summary, the study states that four-year high schools employing eight or more teachers are large enough to afford reasonably satisfactory conditions. Conversely, schools of fewer than eight teachers would seem to be too small.

Similar to this study is that of Breternitz[4] where eighty-seven high schools in Nebraska were classified as to type and size, ranging in enrollment from seventy-six to one thousand. The only real difference found to exist was between schools grouped as to size, in which case the large schools were uniformly superior in quality of education.

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3 Wiggans, D. M. and Spaulding, F. T., When are High Schools Too Small?, School Review No. 41, 1933, pp. 585-594.

4 Breternitz, Louis A., High School Organization in Nebraska, Nebraska Educational Journal No. 20, January, 1940, pp. 10-25.

Two comparable counties in New York State were studied by Yaple[5] to determine, "by acceptable research procedures", whether consolidated school services were superior to non-consolidated school services. Eleven centralized school areas were compared with seven non-centralized areas on the following aspects of the programmes: (1) staff, (2) plant, (3) curricular and extracurricular offering, (4) transport, (5) guidance service, (6) library service, (7) lunch programme, (8) health education, and (9) pupils. The consolidated school areas were found to provide better facilities and better programmes. Superiority was pronounced in plant, transport, guidance service, and lunch programme. Definite superiority was found to exist in curricular and extracurricular offerings, library service, and health education. Staff of centralized schools was somewhat, but not markedly, superior. Non-centralized schools were superior in some aspects of pupils, notably, holding power. Academic achievement was, unfortunately, not among the aspects of pupils compared.

2. Size of school and academic achievement

Although studies relating general quality of education to size of school are of interest in this review of the literature, the more particular interest centres on the relation of that special aspect of quality, namely, academic achievement, to the size of school. Some attempts to establish such a relationship are described below.

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5 Yaple, G. W., Centralized Schools and Better Schools, American School Board Journal No. 117, December, 1948, pp. 39-41.

Alves, Anderson, and Fowlkes[6] reported on Ohio, where the state department of education annually conducts a state scholarship contest in which tests are given to pupils of all types of schools. For four years, 1930 to 1934, the composite scores showed direct correlation between pupil achievement scores and size of schools. For example, in 1933, the composite average score of pupils in small rural high schools was 186, in somewhat larger village schools was 201, and in the still larger city high schools was 210.

A large scale study by Covert[7] compares the achievement in a number of subjects of elementary school pupils trained in one-teacher schools and those trained in large rural schools. In Figure 1 and in Table I, a summary is given of the results of the testing programmes in eight states. The sizes of rural schools and number of pupils included in each of the surveys are indicated in Table II.

An explanation of Table I is given by the author as follows:

> In the Indiana survey report, three comparisons between the median reading abilities of pupils in large rural schools and those of the corresponding grades in one-teacher schools are shown. In each of these higher scores were made by pupils of the large schools. In a similar manner read across the page for results in each state on each subject and for the total results in each subject.

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6 Alves, H. F., Anderson, A. W., Fowlkes, J. G., A Study of Local School Unit Organization in Ten States, U. S. Office of Education, Bulletin No. 10, 1938.

7 Covert, Timon, Educational Achievement of One-teacher and Large Rural Schools, U. S. Bureau of Education, Bulletin No. 15, 1928.

TABLE I

COMPARISON OF MEDIAN SCORES OF PUPILS IN LARGE AND IN SMALL RURAL SCHOOLS IN EIGHT STATES

Subjects	Number of comparisons	Number of instances in which higher median scores were earned		Percent of instances in which higher median scores were earned	
		Large Rural	Small Rural	Large Rural	Small Rural
1	2	3	4	5	6
Reading:					
Indiana	3	3	-	100	-
Kansas	6	6	-	100	-
Kentucky	3	3	-	100	-
New York	8	8	-	100	-
Oklahoma	8	4	4	50	50
Texas	7	7	-	100	-
Virginia	4	4	-	100	-
West Virg.	12	4	8	33.3	66.6
Total	51	39	12	76.5	23.5
Arithmetic:					
Indiana	6	6	-	100	-
Kansas	22	21*	-	95.4	-
Kentucky	6	6	-	100	-
New York	8	8	-	100	-
Oklahoma	11	6	5	54.5	45.4
Texas	4	4	-	100	-
Virginia	20	20	-	100	-
W. Virginia	6	2	4	33.3	66.6
Total	83	73	9	87.9	10.9
Spelling:					
Indiana	3	3	-	100	-
Kansas	3	3	-	100	-
Kentucky	3	3	-	100	--
New York	3	3	-	100	-
Oklahoma	6	4	2	66.6	33.3
Texas	2	2	-	100	-
Virginia	5	5	-	100	-
W. Virginia	6	2	4	33.3	66.6
Total	31	25	6	80.6	19.4

*Of 22 comparisons between pupils' scores in the two types of schools in Kansas in arithmetic, the median scores in one case were equal.

TABLE II

SIZE OF RURAL SCHOOLS AND NUMBER OF PUPILS IN COVERT SURVEY

State	No. of pupils in 1-teacher schools	Size of school	No. of pupils
Indiana	2,852	6 or more teachers	714
Kansas	1,232	city schools	1,008
Kentucky	2,947	6 or more teachers	261
New York	2,050	4 or more teachers	2,835
Oklahoma	3,169	consolidated	2,527
Texas	643	5 or more teachers	2,430
Virginia	186	4 or more teachers	2,259
West Virginia	9 1-teacher;	6 3-teacher schools	

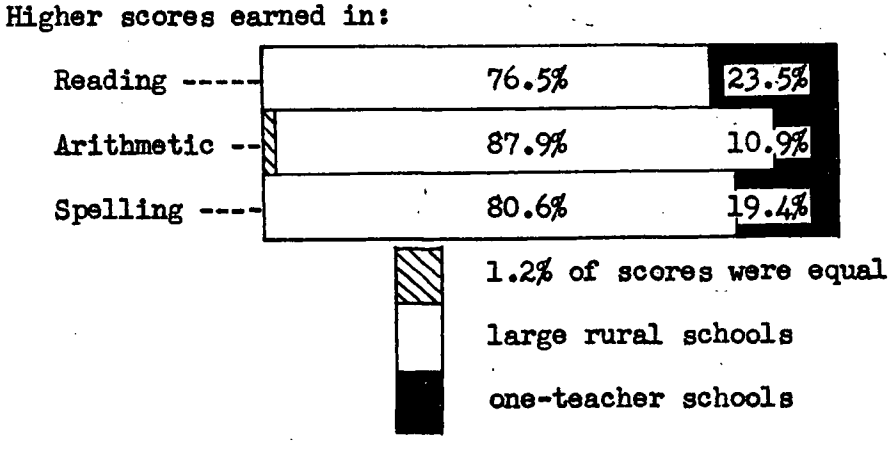

Figure 1. - Comparison of Median Scores of Pupils in Large and in Small Rural Schools in Eight States.

Data presented in Table 12 (Table I) show that pupils in large rural schools made higher median reading scores in thirty-nine of the fifty-one comparisons and lower in twelve than those of the corresponding grades in one-teacher schools. In terms of percentage the median scores were higher in large schools in 76.5 percent of the total number of comparisons made.

In arithmetic and spelling, as in reading, pupils in large rural schools made a much larger percent of the higher median scores than those of corresponding grades in one-teacher schools. In a total of eighty-three comparisons between arithmetic ability of pupils in the two types of rural schools included in the sight surveys, seventy-three, or 87.9 percent, show higher, and nine or 10.9 percent, lower median scores (in one comparison they were equal) for pupils in large rural schools, grade for grade, than for those in the one-teacher schools. In a total of thirty-one comparisons of writing ability twenty-five, or 80.6 percent show higher, and six, or 19.4 percent, lower median scores for pupils in the large schools, grade for grade, than for those in the one-teacher schools.

Of the eight state survey reports, six show that all comparable median reading, arithmetic, and writing scores were uniformly higher in large than in one-teacher rural schools. In two, the Oklahoma and West Virginia studies, some scores were higher in one-teacher schools. In Oklahoma, the median scores were higher in four of a total of eight comparisons in reading, in five of a total of eleven comparisons in arithmetic, and in two of a total of six comparisons in writing for pupils in one-teacher schools than for those of the corresponding grades of large rural schools. In West Virginia, the median scores were higher in eight of a total of twelve comparisons in reading, in four of a total of six comparisons in arithmetic, and in four of a total of six comparisons in writing, for pupils in one-teacher schools than for those of the corresponding grades of large rural schools.

Since the tests in each survey were given to large numbers of pupils, they should be representative. Assuming that pupils tested in both types of rural schools were equally well classified, summaries shown in Table 12 (Table I) indicate that pupils attending large rural schools in various sections of

> the U. S. learn to read, spell and solve arithmetical problems decidedly better than those who attend one-teacher schools. Summaries of similar results on other subjects confirm the statement that pupils trained in large rural schools make higher comparable scores on educational tests than those trained in one-teacher schools.
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> To show the facts in Table 12 (Table I) graphically, Figure 5 (Figure 1) is presented. The percentage distribution of higher median reading, arithmetic, and spelling scores shown in the table are represented in the respective bars of the graph.
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> The upper bar of Figure 5 (Figure 1) represents all one hundred percent of the comparisons made between reading abilities of pupils in the two types of schools in the eight states; the light portion represents the percent of higher median scores earned in the large type rural schools; the shaded portion, that earned in the small type. Similarly, the middle bar represents comparisons in arithmetic abilities; the hatched portion of this bar shows the percent of scores which were equal, grade for grade, in the two types of schools.[8]

A study in New York State by Clem and Hovey[9] compares high school students of 193 village schools and 196 rural schools on the Regents' Examination. Subjects covered were arithmetic, English, geography, reading, spelling, and United States history. This comparison showed that the mean marks of the village school pupils excelled those of the rural school group in every subject. The difference between the two groups was found to be statistically significant.

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8 Covert, op. cit., p. 11.

9 Clem, O. M. and Hovey, C. W., "Comparative Achievement of Village School Pupils and Rural School Pupils", Elementary School Journal, vol. 34, December, 1933, pp. 269-272.

Similar in many respects to the study just mentioned is that of McIntosh and Schrammel[10] who analysed the results of 3,532 eighth grade entrants in a state-wide contest. Pupils from graded schools in villages and cities were classified as Division A whereas those from rural schools were classified as Division B. Subjects tested in the contest were arithmetic, civics, history, English, reading and spelling. In such a comparison the median scores were Division A, 198.7 and Division B, 186.7, leading the authors to the conclusion that the "distribution of the scores of the 1,921 pupils in graded schools and of the 1,611 pupils in rural schools are somewhat the same except that the former are higher in median."[11]

A study by Fulmer[12] shows, in its sociological setting, some results which are pertinent here. A survey of a ten-district area in South Carolina was conducted to determine conditions affecting the development of children and young people. Particular attention was given to the effect of tenancy on their status. The data also show, however, that the efficiency of the schools is related closely to the environment of the homes, rural or non-rural, and the taxable

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10 McIntosh, H. W. and Schrammel, H. E., "Comparison of the Achievement of Eighth Grade Pupils in Rural Schools and in Graded Schools", Elementary School Journal vol. 31, December, 1930, pp. 301-6.

11 McIntosh and Schrammel, op. cit., p. 305.

12 Fulmer, Henry L., An Analytical Study of a Rural School Area, Charleston: South Carolina Agricultural Experimental Station, Bulletin No. 320, 1939, pp. 70-71.

resources. Specifically, it was found that the reading ability of rural grade seven pupils is three to four years lower than in non-rural schools. Test scores of the grade eleven pupils in rural schools were lower than in grade eight in non-rural schools.

An interesting feature of this study is that the difference between rural and non-rural schools is remarked upon not so much as a result of size of school but as a result of differing socio-economic status. Whereas many studies have found such a difference and have attributed it to size of school without controlling socio-economic status, this study does the reverse.

Another study by the same author[13] was conducted by means of personal interview and standardized testing of the pupils of fifteen rural school districts in central South Carolina. Children in the smaller schools were found to be lower in achievement than those in the nearest village schools, and lower still than those in the nearest city schools. This difference is attributed to both size of school and socio-economic status as borne out by a conclusion of Fulmer that "to raise the economic, social, and educational levels of the area, consolidated schools ... are recommended."

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13 Fulmer, Henry L., A Rural School Area in Central South Carolina, Charleston: South Carolina Agricultural Experimental Station, Bulletin No. 325, 1940.

In contrast to many of the studies mentioned in this review is that of Nelson[14] who, in a closely controlled study in California, found few sizeable differences in achievement between pupils in large and small secondary schools in the subjects measured by the Stanford Achievement Test.

Similar to the above study in findings is that conducted by Dreier[15] in Minnesota. The purpose of the study was to determine how well the rural child who attends an ungraded school achieves when compared with the rural child who attends a graded school. The criterion of achievement was skill in language, reading, arithmetic and spelling as determined by standardized achievement tests at the sixth, ninth, and twelfth grade levels.

The study proceeded by the selection of forty-one rural counties in Minnesota out of the eighty-five which agreed to participate. A random sample of twenty-two percent was taken of the schools in each of the categories. The following standardized tests were then administered:

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14 Nelson, T. L., Comparison of the Achievement of Pupils in Schools of One or Two Teachers with Pupils of Those of Eight or More Teachers, Doctor's thesis, Berkeley: University of California, 1932.

15 Dreier, William H., "The Differential Achievement of Rural Graded and Ungraded School Pupils", Journal of Educational Research, September, 1949, vol. 43, pp. 175-189.

(a) Achievement

Grade Six: Stanford Achievement Test, Intermediate Partial Battery.

Grades Nine and Twelve: Progressive Achievement Tests, Advanced Battery.

(b) Intelligence

Otis Quick Scoring Mental Ability Tests, Beta and Gamma.

(c) Socio-economic Status

Sewell Farm Family Socio-economic Status Scale (Short Form)

A careful analysis of the data shows that:

(a) Rural grade six pupils from graded and ungraded schools do not differ significantly at the one percent level on the achievement measured.

(b) Rural grade nine pupils with graded and ungraded elementary school backgrounds do not differ significantly in arithmetic and spelling. Differences in mean language and reading favour graded backgrounds.

(c) Rural grade twelve students with graded elementary school backgrounds made higher means than those with ungraded backgrounds.

Rural elementary schools in Virginia were studied by Ingle[16] for the purpose of answering the following questions:

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16 Ingle, John Preston, "Subject Matter Achievement in Rural Elementary Schools in Virginia", Education Abstracts, vol. 5, July 1940, pp. 239-240.

(1) Is the small rural school of one to three teachers producing learning results commensurate with larger schools? (2) How does the typical rural pupil compare with the typical urban pupil in subject matter achievement scores and mental ability scores? (3) How do certain factors in the rural school compare with those in the urban school in their effect on pupil achievement?

The primary data used in this study were the results of a three-year state-wide testing programme carried on from 1931 to 1934 inclusive. A total of 131,741 pupils were tested, only grades four to seven being represented.

Point scores on subject matter were averaged according to school, type of school, and school division in the state, and these average scores converted into equivalent educational ages. The same procedure was used with point scores on mental ability tests. Mean educational age was the principal technique used in the study. The advantage of one type of school over another type of school was represented by the difference between the mean educational ages representing the schools. A difference, large or small, between mean educational ages that persisted in successive comparisons of the same groups was judged to be significant. Mean educational age and mean mental age of certain groups of pupils were compared with mean chronological age and mean mental age respectively on successive tests and the progress of the pupils was observed.

Test scores for white pupils were tabulated and interpreted separately from test scores for Negro pupils. The results of the study include the following points: (1) When chronological age was held constant and mean educational ages of pupils were compared, the larger school had a distinct advantage over the smaller school. (2) When grade was held constant, there was a significant difference between the educational ages in favour of the larger school. (3) When grade and chronological age were held constant and mean educational ages of pupils were compared, there was a distinct and significant difference in favour of the urban children over the rural school of one to nine or more teachers. (4) When mean mental age was held constant and mean educational ages of pupils were compared, no significant differences between the different types of schools were observed. (5) Mean educational age and mean mental age for the same group of pupils in successive tests over a period of three years fluctuated together. (6) Among the contributing factors to the differences between the rural and urban pupils, between the small rural school and the graded rural school, and between the small rural school and the urban school were shorter term of school in the small rural school; young, inexperienced, and inefficient teachers in the small school; low salaries paid

to the teachers in the small school; poor housing and inadequate equipment and supplies in the small school; and the effects upon both teacher and pupil of poor living conditions and a static environment in rural communities.

It will be noted that most of these factors mentioned as contributing to the difference between rural and urban pupils are not inherent in the size of the schools but rather are products of a different level of educational expenditure and of a difference in socio-economic status.

A study, similar in type to that of Dreier, was conducted by Thornberg[18] to determine the efficiency of college students as conditioned by the size of the high school from which they come. Achievement and size of school were therefore being related, with the criterion of achievement being future success at college.

Grades were tabulated by size of high school for those students who entered the State College of Washington as freshmen in September of two consecutive years. The grades A, B, C, and K were assigned point value of 3, 2, 1, and 0, respectively.

It will be noticed from Table III that students from the smallest high schools have an average of only 4.92 hours of A grade, while the students from the largest

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18 Thornberg, Lester H., "College Scholarship and Size of High School", School and Society, vol. 20, August, 1924, pp. 189-92.

high schools have an average of 9.95 hours of A grade. A comparison of the points made by each group shows a difference of 24.17 points between the largest and smallest high schools.

According to this investigation, students from large high schools are superior in college work to those from small high schools. In general, the study shows that scholarship increases with the size of the high school, although the increments are not regular. The most marked difference in the quality of college work is found between students coming from high schools of fewer than one hundred students. Thornberg adds that this does not seem to be due so much to difference in native capacity as to difference in preparatory training.

C. Size of School and Cost of Education

Figures comparing the cost per pupil in urban and rural schools covering all of the United States were presented for the year 1933-34 by Herlihy.[19] These figures, summarized in Table IV, show that on every item except coordinate activities the urban schools spent more than twice as much per pupil as did the rural.

Although such material is pertinent in such a discussion it is not directly to the point in that it compares urban and rural schools rather than large and small schools. The question arises whether it is the size of the urban school or its

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19 Herlihy, L. B., "Urban and Rural School Expenditures", School Life, vol. 21, June, 1926, pp. 272-4.

TABLE III

AVERAGE GRADES AND AVERAGE POINTS MADE BY STUDENTS ACCORDING TO SIZE OF HIGH SCHOOL

Size of school	No. of cases	A	B	C	Points average
1-50	20	4.92	19.6	13.67	67.65
51-100	54	5.86	18.32	19.19	73.22
101-200	79	9.24	20.93	13.36	82.94
201-300	60	6.91	20.49	18.60	80.34
301-500	19	9.71	25.44	12.94	92.97
501-1,000	40	9.93	22.07	18.76	92.72
1,000 up	153	9.95	23.23	16.16	92.46

TABLE IV

COMPARISON OF URBAN AND RURAL COST PER PUPIL, UNITED STATES, 1933-34

	Rural	Urban
Number of school systems	440	145
General Control	1.43	3.02
Instruction	30.76	66.98
Operation	3.46	8.77
Maintenance	1.21	2.82
Coordinate activities & auxiliary agencies including transportation	5.52	2.91
Fixed charges	.72	1.92
Total current expense	43.10	86.42
Per diem expenditure	.28	.48
Expenditure on basis of 100-day school session	27.59	47.56

more generous instructional programme which causes its per pupil cost to be higher. In addition a rural-urban price differential is shown to exist in most areas.

Bradshaw[20] in an analysis of the consolidation of schools in Eugene, Oregon in 1946, points out that when the Eugene tax levy was 43.9 mills, the tax levies in five other non-consolidated districts were 37.4, 36.8, 32.6, 52.5 and 42.5 mills. This comparison leads Bradshaw to conclude, "No matter how it is figured, better education was bound to cost more money....But these figures also indicate that in the consolidated district the tax dollar is buying more education than the tax dollar in the independent districts."[21]

In the face of extravagant claims for the financial advantages of consolidated schools, Gaumnitz[22] concludes that consolidation does not always cost less money because consolidation is usually accompanied by an improvement in the level of the school programme. He adds, as did Bradshaw, "but it should not be lost sight of that in these consolidated schools society buys a great deal more for the money spent than before consolidation."[23]

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20 Bradshaw, R. W., "Effective Consolidation of Schools", American School Board Journal, vol. 115, August, 1947, pp. 29-31.

21 Bradshaw, op. cit., p. 31.

22 Gaumnitz, W. H., "Small Schools-Large Costs", School Life, vol. 20, June, 1935, pp. 232-3.

23 Ibid., p. 232.

On the subject of unit costs of maintenance and operation of consolidated schools, however, Pace[24] finds an inverse relationship between these factors and the size of the school. This inverse relationship holds good, he finds, despite the fact that the small schools were not as well kept as the larger units.

Another factor is introduced by the Rural School Survey Committee of Indiana.[25] Its findings show that the cost of transportation is important in determining the most economical size for the rural consolidated unit. In particular, it shows that increasing consolidation tends to increase the cost.

Enlow[26] conducts a study in the Atlanta Public School System which "attempts to get beneath the superficial treatment which so readily yields large 'savings' by a mere transition to bigness."[27] In answer to the statement that the per pupil cost of certain small elementary schools was large because of the size of the schools as measured by average daily attendance, Enlow shows that the school with the lowest cost per pupil is next to the smallest in size, and the largest school in terms of average daily attendance is by no means the smallest in cost. About forty percent of

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24 Pace, Henry A., "School Building Costs in Utah", Review of Educational Research, vol. 2, 1932, p. 145.

25 The Rural School Committee of Indiana Report, Indianapolis: State Department of Public Instruction, 1926, cited in Review of Educational Research, vol. 2, 1932.

26 Enlow, E. R., "Do Small Schools Mean Large Costs?", Peabody Journal of Education, vol. 16, pp. 1-11, July, 1938.

27 Ibid., p. 1.

the schools were operated at less than the cost of the largest school. The correlation, however, between size, as measured by average daily attendance, and per pupil cost was found to be -.431, indicating a tendency for larger schools to be operated at less cost. He concludes that in per-pupil cost studies, other factors besides average daily attendance must be considered.

Illustrating the lack of a demonstrated superiority for all aspects of either the large or the small school in the matter of cost is the group of three analyses of the Pennsylvania schools performed in the same year. Ballen[28] found that the per-pupil cost for general control increased gradually as the school units decreased in population. Davidheister[29] concluded that larger schools were more economical in maintenance. The third study, by Helveston and Fetter,[30] found, however, a gradual decline in the per-pupil cost of operation as the average daily attendance decreased.

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28 Ballen, L. R., A survey of costs of public education in the commonwealth of Pennsylvania for the fiscal year 1933-34, Master's thesis, Temple University, cited in Monroe, W. S., Encyclopedia of Educational Research, 1950, p. 1050.

29 Davidheister, J. W., The cost of repairs and maintenance of fourth-class school districts in the state of Pennsylvania for the fiscal year 1933-34, Master's thesis, Temple University, cited in Monroe, W. S., Encyclopedia of Educational Research, 1950, p. 1050.

30 Helveston, H. W. and Fetter, J. M., The cost of operation in districts of the first, second, third, and fourth class districts in the state of Pennsylvania for the fiscal year 1933-34, Master's thesis, Temple University, cited in Monroe, W. S., Encyclopedia of Educational Research, 1950, p. 1050.

D. Cost and Quality of Education

Data were gathered from the 1943 Army-Navy Qualifying Test for Civilians by Davenport and Remmers[31] which enabled conclusions to be drawn as to the effect educational expenditures have upon educational achievement. The 316,000 subjects who wrote the test were at least high school graduates with ages from seventeen to twenty-one years. The test used contained sections on reading, verbal understanding, basic mathematics, and science. Mean scores were calculated for each state, other pertinent information was determined for each state, and correlation coefficients were derived, presumably to show a cause-and-effect relationship. State means were found to correlate .63±.06 with state average teachers' salaries, .77±.04 with state average total per-pupil cost, and .80±.03 with state average current per-pupil cost. The conclusion arrived at is, "In general, the more money the state spends on education, the more the pupils achieve on such a test of basic subjects."[32]

This conclusion is reinforced by Little[33] who states, "This study reveals quite definitely that any increased cost that may have resulted from consolidated schools over the country

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31 Davenport, K. S. and Remmers, H. H., "Educational Achievement as Compared with Money Spent on Schools", School and Society, vol. 61, May 19, 1945, pp. 333-5.

32 Ibid., p. 335.

33 Little, H. A., "Do Consolidated Schools Cost More?", Nation's Schools, vol. 14, December, 1934, p. 24.

is largely due to a better school program rather than to the consolidation of schools."[34]

Many studies such as those of Powell,[35] Grimm,[36] and Mort and Cornell[37] show increased quality of education as expenditure level increases. Such studies generally proceed by classifying schools by expenditure into groups such as below average, average, and above average. The existence had been speculated, however, of a critical point beyond which further expenditure would yield no increase in quality. It was in search of such a critical point that Woollatt[38] investigated the effect on quality as the expenditure level goes from high to higher.

"The Growing Edge" refers to an instrument, developed by the Metropolitan School Study Council, used to differentiate the quality of high expenditure systems. Scores for thirty-three school systems of the Metropolitan School Study Council were compared statistically with costs per pupil of the systems.

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34 Loc. cit.

35 Powell, Orrin E., Education Returns at Varying Expenditure Levels, New York, Bureau of Publications, Teachers' College, Columbia University, 1933.

36 Grimm, Lester R., Our Children's Opportunity in Relation to School Costs, Springfield, Ill.: Department of Research, Illinois Educational Association, 1938.

37 Mort, Paul R., and Cornell, Francis G., American Schools in Transition, New York, Bureau of Publications, Teachers' College, Columbia University, 1941, pp. 167-95.

38 Woollatt, Lorne Hedley, Cost-quality Relationships on the Growing Edge; Study of Returns for Money Spent in High Expenditure School Systems, Metropolitan School Study Council, Research Studies, No. 4, 1949.

The instrument measures in four areas: (1) teaching the basic skills, (2) teaching the areas of knowledge, (3) the discovery and development of special aptitudes of individuals through test and tryout, and (4) the development of gross behaviour patterns like citizenship, character, and thinking.

Dealing with each of the four areas in turn, Woollatt concludes that there is an improvement in the teaching of basic skills from the high expenditure to the very high expenditure levels. He notes also an improvement in the use of lifelike situations and of variety in teaching these skills. The same conclusion is found for teaching the areas of knowledge. He does find, however, a critical point at $150 per pupil where he found no improvement to take place in this area. The plateau comes to an end at $170 per pupil and then continues to rise to the maximum expenditure of $220 per pupil.

In the lower ranges of high expenditure, it is found that increasing returns in special aptitude discovery are secured even under average staffing characteristics; but that, in the upper regions of expenditure, increasing returns are accompanied by very favourable staffing characteristics. It is found that schools spending from $155 to $170 appear to be losing ground in the discovery of special aptitudes because of reliance on classroom teachers without assistance from school specialists.

The trend for behaviour patterns is similar to that described for special aptitudes. There is less variation about the mean than in the latter but the comment regarding staffing applies equally well.

In general, Woollatt concludes, "Just as we have seen that there is a general increase in the quality of schools as cost increases, so it is evident that there is a general increase in skills, knowledge fields, special aptitudes, and behavior patterns....In these specific phases there are variations between intermediate critical points of expenditure, but the general picture is one of increasing expenditure accompanied by increasing quality."[39]

E. Cost of Education, Quality of Education, and Size of School

When the three variables, quality of education, cost of education, and size of school are all considered in the same study any relationships found would seem to carry the additional weight of being free from spurious effects which may be present when only two of the three are considered.

Such a study is that carried out in the four-year high schools of California by Nanninga.[40] The criteria for quality of education were number of conventional courses offered, number of non-conventional courses offered, and number of extra-curricular activities offered. Some conclusions that are derived from the statistical analysis are as follows:

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40 Nanninga, S. P., "Costs and Offerings of California High Schools in Relation to Size", Journal of Educational Research, vol. 24, December, 1931, pp. 356-64.

1. The relationship between cost per pupil for teachers' salaries and size of high school is curvilinear, revealing an eta of -.458±.032.
2. The relationship between cost per pupil for current expenditures and size of school shows an eta of -.588±.027.
3. The curves for these two relationships show a steady decrease in cost up to a school of approximately 500 in enrollment.
4. The cost per pupil remains approximately the same for schools of enrollment 500 to 1,400.
5. Some schools larger than 500 enrollment have a low per capita cost indicating that, in the larger schools, other factors besides size influence the cost of education.
6. The offering of conventional courses increases with size until a school of from five hundred to six hundred enrollment is reached. The relationship between the number of conventional courses offered and the size of school is eta equals .820±.013.
7. Schools of five hundred enrollment or more offer more non-conventional courses than the smaller schools offer.
8. The total number of extra-curricular activities offered increases from a mean of twelve, for schools having an enrollment under fifty, to twenty-five, for schools having approximately five hundred enrolled.

9. When the curves obtained from the "best fit lines" representing the cost and offerings of California high schools are presented on a single chart, it is evident that a school of from five hundred to six hundred in enrollment offers more courses and provides more curricular and extra-curricular activities and costs less than the smaller schools, and moreover, offers and costs approximately the same as the largest schools of the state.

This study is corroborated by that conducted in the same state, three years later, by Dawson.[41] The latter study found that "the size of the student body is a determining factor in the efficiency of a school."[42] His study also considered the relationship between cost and size, showing that per pupil cost in average daily attendance in schools having ten pupils or fewer was $205; in schools having eleven to twenty pupils, $117; in schools having 191 to 210 pupils, $74. Considering both educational efficiency and cost per pupil the study reports sharp losses when the school enrollment falls below 210.

Somewhat similar findings, with some qualifications in achievement are presented by Riddle,[43] whose data were obtained

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41 Dawson, H. A., Satisfactory Local School Units, Field Study No. 7, George Peabody College for Teachers, 1934.

42 Ibid., p. 18.

43 Riddle, John I., The Six-year Rural High School, Contributions to Education, No. 737, New York: Teachers' College, Columbia University, 1937.

from small and large rural high schools in Alabama. Ten schools in each group were selected to obtain schools representative of communities similar as to type of population, industry and social background. The mean enrollment of the small schools was seventy pupils and of the large schools two hundred seventy pupils. The major items considered in the comparison were the staff, the buildings and equipment, the curricula, the characteristics of the pupils, and the cost. The data for pupil characteristics and their achievement and advancement were based upon detailed study of Junior III and Senior III pupils of all the schools.

The findings of the study led to the following conclusions in substance: The average large school is superior in that it has a superior staff, a superior building and superior equipment, a superior curriculum in respect to wider range of electives for Senior III pupils and superior achievement of these same pupils in English. No significant differences were found in the pupil personnels at the junior-high level in achievement in English, algebra, and Latin. Achievement of Senior III pupils in American history and physics was practically the same for the two groups of schools. The progress of pupils through school was similar in both groups. The per pupil cost, based on average daily attendance, was $45.49 less in large schools, $34.19 of this differential being due to higher per pupil cost of instruction in the small schools.

F. Summary

If an interrelation is sought between the three factors, size of school, quality of education, and cost of education, evidence may be obtained from studies which deal with any two of these factors separately or which consider all three simultaneously.

Studies investigating the relationship between size of school and quality of education produce results which seem to depend somewhat upon the criterion of quality used. The two rather distinct criteria commonly used are (1) ratings on aspects of the total school programme which are judged to be significant of quality and (2) scores on achievement tests. Use of the former criterion almost invariably shows differences in favour of the larger schools. It is interesting, however, that one study finds smaller schools superior in holding power. When achievement scores of pupils are used as the basis of comparison, superiority of the larger schools is found in about half the studies but no significant difference is found in the other half. It may be significant that, in general, those studies of achievement indicating the superiority of the larger schools do not control intelligence while those finding no difference do.

When the relationship between size of school and cost is investigated, considerable disagreement develops. The principal technique used is to compare schools by correlation or other statistical means on the basis of average daily attendance and cost per

pupil. Some studies compare only certain aspects of cost, such as maintenance, with size of school. Although small schools are shown to be financially superior to large schools in about half the studies summarized, it is often pointed out in such studies that the larger schools are probably offering a better programme. This lack of control of quality of education seems to lead to much of the disagreement in results.

Particularly when transportation is a factor, as in consolidated schools, there is some evidence that an optimum size exists above and below which costs per pupil are higher.

Quality of education compared to cost of education is most often studied by the technique of classifying schools in groups according to expenditure levels. These groups are then examined statistically for the quality they represent. Quality is measured by achievement test scores in some studies and by devices for rating the school programme in others. In general the studies show a positive relationship over a wide range of expenditure levels. Evidence exists that some aspects of school programmes show decreasing returns as cost per pupil increases, but that this is not the general situation.

When quality and cost of education are both related to size of school in the same study the pattern appears to corroborate the results of some of the previous studies. There is a direct relationship found between quality and size and an inverse relationship between cost and size. Both of these results are

heavily qualified, however. One study shows little favourable change when the enrollment rises above five to six hundred. Another, in a closely controlled setting, shows very little difference in the actual achievement aspect of quality between the large and small schools.

In general, the evidence indicates a slight tendancy for larger schools to cost less and to be superior in achievement to small schools. This tendancy is far from invariable and the limits of size are not defined within which it operates.

CHAPTER III

DEFINITION OF THE PROBLEM

A. Specific Statement of the Problem

The small rural secondary schools in this study typify unconsolidated schools. The consolidated school is made up of two groups of students, those who are not transported to school, i.e., those who live in the city, and those who are transported to school. The latter group is particularly important in this study because it consists of pupils who, had it not been for consolidation of attendance areas, would probably be attending small rural secondary schools.

Answers are sought in this study to the following questions concerning these three groups:

1. Is the achievement of the secondary school pupils who are transported to the consolidated school superior to, inferior to, or the same as that of equivalent pupils who attend small rural high schools?
2. Does the achievement of either or both of these groups differ from that of town pupils who attended a sizeable secondary school even before consolidation took place?
3. Is the per pupil cost for current and capital expenditures for the pupils who are transported to the consolidated school more or less than that for the pupils attending small rural high schools?

B. Delimitation of the Problem

1. Scope of comparison

A complete consideration of the effect of consolidation would involve a very large number of factors, many of which are difficult, if not impossible to assess adequately. Some of these factors are:

(a) achievement of pupils in fundamental subjects.

(b) cost per pupil in average daily attendance.

(c) provision for individual differences, both curricular and co-curricular.

(d) quality and experience of teachers.

(e) practical availability of schooling.

(f) holding power of the schools.

(g) student body esprit de corps.

(h) sociological effect on small communities.

(i) personalization of instruction.

(j) convenience to pupils and their families.

(k) social adjustment of pupils.

(l) pupil study habits, attitudes, and appreciations.

(m) extent of cooperation between the home and school.

(n) provision of extra services to pupils, such as medical, nutritional, and counselling services.

Of these aspects only the first two will be considered in this study, namely, achievement of pupils in fundamental subjects and cost per pupil in average daily attendance.

2. Geographical scope

The study includes all secondary school pupils in School District Number 20 (Salmon Arm). Four schools are represented, three of them being small rural high schools and the fourth being a consolidated school.

C. Educational Hypotheses

1. That the transported students in the consolidated high school are superior in achievement to the students of the small rural high schools.
2. That the non-transported students in the consolidated secondary school are superior in achievement to the students of the small rural high schools.
3. That the non-transported and transported students of the consolidated secondary school do not differ in achievement.
4. That the cost per pupil in average daily attendance in the consolidated high school is less than the cost per pupil in average daily attendance in the small rural high schools.

D. Statistical Hypotheses

The statistical hypotheses given below are numbered to correspond to the educational hypotheses above.

1. (a) Hypothesis

$M_T > M_R$, where $M_T \equiv$ the mean achievement of the transported students of the consolidated school.

$M_R \equiv$ the mean achievement of the students of the small rural schools.

(b) Null hypothesis to be tested

$M_T - M_R = 0$

2. (a) Hypothesis

$M_N > M_R$, where $M_N \equiv$ the mean achievement of the non-transported students of the consolidated school.

(b) Null hypothesis to be tested

$M_N - M_R = 0$

3. Hypothesis to be tested

$M_T - M_N = 0$

4. Hypothesis to be tested

$C_T < C_R$, where $C_T \equiv$ cost per pupil for the transported students of the consolidated school.

$C_R \equiv$ cost per pupil for the students of the small rural high schools.

CHAPTER IV

THE EXPERIMENTAL METHOD

A. Experimental Materials

1. Measurement of intelligence

(a) Otis Self-Administering Tests of Mental Ability, Intermediate Examination: Form C

- administered to grades seven, eight, and nine.

(b) Otis Self-Administering Tests of Mental Ability, Higher Examination: Form C

- administered to grades ten, eleven, and twelve.

2. Measurement of socio-economic status

Wrightstone Social Background Data Sheet[44] was used. This sheet eliminates much of the subjectivity and labouriousness of scoring the Sims Score Card for Socio-economic Status; yet it measures essentially the same thing. The two instruments correlate $r = .90$.

3. Measurement of achievement

(a) Progressive Achievement Tests, Intermediate Battery, Form B.

- administered to grades seven, eight, and nine.

(b) Progressive Achievement Tests, Advanced Battery, Form B.

- administered to grades ten, eleven, and twelve.

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44 Wrightstone, Wayne J., "A Social Background Data Sheet", Journal of Educational Sociology, vol. 7, 1934, p. 525.

B. Experimental Groups

Although this study is mainly characteristic of the survey type, it involves in a real sense an experimental variable. This variable is the effect of consolidation upon students, who, had consolidation not been put into effect, would probably be attending small rural high schools. The experimental group consists of the transported students of the consolidated secondary school, grades seven to twelve, numbering 308. One control group consists of the students of the three small rural high schools, grades seven to twelve, numbering 94. A comparison of these two groups will test the effect of consolidation from the point of view of improvement, if any, caused by consolidation. The second control group is comprised of the non-transported students of the consolidated school, grades seven to twelve, numbering 117. A comparison of the experimental group with this group will test the effect of consolidation from the point of view of the similarity of the experimental group to semi-urban students.

C. Achievement Study Design

1. Controls

(a) Intelligence

Little need be said here in justification of the procedure of controlling intelligence when groups are being comparedin achievement. Some researchers have found the community of function between standardized

achievement tests and general intelligence tests to be as high as ninety percent.[45]

(b) Socio-economic status

Although it is not general practice to control socio-economic status even in closely controlled achievement comparisons, the consideration of such a control was unavoidable here. The three experimental groups represent three points on a scale of rurality-urbanity. It was felt quite possible that the three groups might show three different levels of socio-economic status. That such a difference in socio-economic status would influence an achievement comparison is indicated by research results. Chauncey,[46] for example, tested a group of 113 eighth and 130 ninth grade pupils with the Sims Score Card for Socio-economic Status, the Stanford Achievement Tests, and the Otis Self-Administering Tests of Mental Ability. He found correlations of r = .23 (Grade 8) and r = .30 (Grade 9) between socio-economic status and achievement with intelligence partialled out.

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45 Kelley, Truman Lee, Interpretation of Educational Measurements, Yonkers, World Book Company, 1927, p. 208.

46 Chauncey, M. R., "The relation of the home factor to achievment and intelligence test scores", Journal of Educational Research, vol. 20, 1929, pp. 88-90.

A similar study using the same tests was carried out by Shaw[47] using pupils of grades four to eight. The correlation between socio-economic status and achievement with intelligence partialled out was found to be r = .27.

For the reasons outlined above socio-economic status is controlled in the achievement comparisons of this study.

(c) Grade Percentages

The percentage composition by grade of each experimental group has been controlled by equating the groups on this basis. For example, if grade seven pupils make up twenty percent of one group, grade seven pupils must make up twenty percent of the other two groups as well. This technique must be employed because the achievement test scores for the grades ranging from seven to twelve can be lumped together in a group only if they are expressed as grade percentiles. Further, there is no guarantee of equivalence of percentiles from one grade to the next.

2. Procedure

(a) Intelligence test scores were obtained for all members of the experimental and control groups. In about half of the cases, recent Otis I.Q. scores were available

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47 Shaw, D. C., "The relation of socio-economic status to educational achievement in grades four to eight", Journal of Educational Research, vol. 37, 1943, pp. 197-201.

from school records. Otherwise the tests were administered.

(b) Socio-economic status data sheets were administered to all pupils in the four schools.

(c) Achievement tests were administered to all pupils in the four schools.

(d) A short general questionnaire was completed by all pupils to provide general information which would lead to the elimination of newcomers to the district.

(e) All tests, data sheets, and questionnaires were marked and compiled.

D. Financial Study Design

1. Current Expenditure Items

(a) General

All current expenditure items were obtained for the fiscal year 1952, that is, from January 1 to December 31 of that year. All data in this financial study were obtained from the Board Offices of School District Number 20.

Four schools are represented in the comparison. Three of these are small rural schools and will be referred to as Falkland, Eagle River, and North Shuswap. The fourth is the consolidated school and will be referred to as Salmon Arm.

(b) Item Classification Used

Current expenditure figures were obtained for each of the four schools separately for the item classification as used by the School Board Offices. The seven main divisions of this classification are as follows:

i. Administration
ii. Instruction
iii. Operation
iv. Repairs and Maintenance
v. Transportation
vi. Non-operating Expenses
vii. Debt Services

The item "Repairs and Maintenance" is considered to be a current expenditure since it includes no major repairs or alterations. The item "Debt Services" includes interest but not repayment of capital.

(c) Reducing Items to School Level

Unfortunately for the purposes of this study, the records from which financial data were obtained did not separate the expenses of the individual schools within the school district. In most cases, however, the expenses could be reduced to school level by compilation from more fundamental records such as bills and receipts. In a few minor cases, the total expense for the school district was distributed pro rata among the schools of the district

and is shown as such for the particular schools under consideration. This technique effectively eliminates that item from a comparison of the schools but it provides a realistic cost per pupil figure for the schools.

(d) Splitting costs within a school

The three small rural schools, Falkland, Eagle River, and North Shuswap, actually contain pupils of the elementary grades in addition to their secondary-grade pupils. Since this study deals only with the secondary pupils, the problem arises of dividing expenses attributed to the whole school between the elementary and secondary parts of the school. An answer to this problem was sought by recourse to research on the subject.

The most suitable basis obtainable for distributing school costs between the elementary and secondary sections of the schools was that supplied by the Vancouver School Board. In 1953 the ratio of secondary cost per pupil to elementary cost per pupil was 1.538. Figures for the year 1953 were chosen as they were the most free from the spurious influences of the post-war period.

(e) Assigning transportation costs

Where pupils other than those of the consolidated school in Salmon Arm are transported in the same buses the expense attributed to the consolidated school is determined on the basis of the number of pupil miles per day.

2. Capital Expenditure Items

(a) General

Educational cost analyses seldom include capital expenditures in cost per pupil figures. The reason for this omission is not that it should not be included but that, in most cases, it cannot be computed. In order to depreciate capital expenditures for use in calculating cost per pupil there must, first, be an adequate method of determining value and secondly, be an adequate method of determining the life of the object of expenditure. In most cases these two conditions cannot be met. The conditions are felt to be met in this study, however, to a sufficiently high degree to justify the use of capital expenditures.

(b) Basis of property valuation

School property valuation may be placed on one of three bases,[48] original cost, replacement value, or present value. In actual practice the latter two bases can seldom be ascertained with even loose standards of accuracy. The former basis, original value, may be used in a comparative study with accuracy only when the objects being compared originated at the same time. This, however,

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48 Daly, R. L. "Fundamentals of pupil cost accounting", American School Board Journal, vol. 81, July, 1930, pp. 55-6.

is the case with all the school buildings considered in this study. Since they were built in the same building programme their original costs are directly comparable.

Valuation will be placed upon buses also at original cost since eight out of nine of them were purchased at the same time.

Property within the schools, such as furniture and equipment, will be valuated on the basis of appraised value. Fortunately all such property in the school district was appraised at the same time in 1951. Although the appraised values may coincide with neither replacement values nor present values, they will be valid for purposes of comparison.

(c) Basis for determining property life

The basis for establishing life expectancy of school buildings, furniture, and equipment is appraisal. The basis used for buses is appraisal on grounds of actual experience in the school district.

3. Procedure

(a) Current expenditures for each of the four participating schools were obtained. Totals for the three small rural schools were added together and the secondary pupils share was separated from the elementary pupils share by the procedure outlined in section 1. (d). The costs per pupil in average daily attendance for current expenditures

were then obtained for the transported pupils of the consolidated school and for the secondary pupils of the small rural schools.

In this comparison all current transportation expenditures of the consolidated school were attributed to the transported pupils of that school and not to the school population as a whole.

(b) Capital expenditures for buildings, furniture and equipment, and buses, were obtained. Valuations and estimates of life expectancy were placed upon them. The costs per pupil in average daily attendance for capital expenditures were then obtained for the transported pupils of the consolidated school and for the secondary pupils of the small rural schools.

All capital transportation expenditures of the consolidated school were also attributed to the transported pupils only of that school.

(c) Current and capital cost per pupil figures were added to obtain total cost per pupil figures for the transported pupils of the consolidated school and for the secondary pupils of the small rural schools.

CHAPTER V

ANALYSIS OF ACHIEVEMENT STUDY DATA

A. Matching of Groups

1. Technique employed

The principal technique employed in the statistical analysis of the achievement study is that of matched groups.[49] In this technique groups are matched when they are made alike as regards mean and standard deviation in some measure.

The matching measure in this study is mean and standard deviation of intelligence. The three groups are, in addition, matched in grade percentage composition, and mean socio-economic status.

In the matched groups method, the standard error of the difference between the two means being tested is given by the following formula:[50]

$$SE_{D_{M_1-M_2}} = \sigma_D = \sqrt{(\sigma_{M_{x_1}}^2 + \sigma_{M_{x_2}}^2)(1 - r_{xy}^2)}$$

where $x \equiv$ the function under study

$y \equiv$ the matching variable

$r_{xy} \equiv$ the correlation between x and y in the population from which the sample is drawn

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49 Garrett, Henry E., Statistics in Psychology and Education, Longmans, Green, and Co., Toronto, p. 213.

50 Loc. cit.

2. Original Data

Data were gathered covering a total of 534 pupils. Of this number, 109 were pupils of small rural secondary schools, 308 were transported pupils of the consolidated school, and 117 were non-transported pupils of the consolidated school. Where all the data was not present - a result of school absence during the administration of one or more tests - the pupil was eliminated. If a pupil had moved to the school district during that school year he was also eliminated. Before matching began, then, the original 109 small rural school pupils were reduced to 94.

3. Grade percentages

Since matching was to proceed by eliminating cases, the group which contained the smallest number was selected as the model and the other two groups were matched to it. This model group was the small rural school group.

Table V shows in column 1 the number of pupils occurring in each grade in the model group, whereas column 2 shows these numbers converted to percentages. For the three groups to be matched with respect to grade percentage composition, the transported and non-transported groups had also to conform to the percentages of column 2. The number in each grade required to meet this condition appear in columns 3 and 4.

TABLE V

GRADE PERCENTAGE COMPOSITION MATCHING DATA

Grade	1. Rural (Model) Group Number Present	2. Percentage present in 1. and desired in 3. and 4.	3. Transported Group Number Desired	4. Non-transported Group Number Desired
12	3	3%	5	2
11	8	8%	13	6
10	16	17%	27	13
9	19	20%	31	15
8	21	23%	36	17
7	27	29%	46	22
Total	94	100%	158	75

4. Intelligence and socio-economic status

The intelligence of the model group was calculated to be as shown in Table VI. By trial and error, pupils were eliminated from the other two groups so that the remaining group in each case had the correct number of pupils in each grade, had a mean I. Q. of 102.00, had a standard deviation I. Q. of 12.40, and had a mean socio-economic status of 39.60.

As may be seen in Table VI it was possible to match the groups in mean and standard deviation I. Q. exactly. It was also possible to obtain for the rural and transported groups

TABLE VI

INTELLIGENCE - SOCIO-ECONOMIC STATUS MATCHING DATA

Matching Item	Rural (Model)	Transported (Matched)	Non-transported (Matched)
Mean I. Q.	102.00	102.00	102.00
S.D. I. Q.	12.40	12.40	12.40
Mean S. E. S.*	39.60	39.41	47.05

*Socio-economic status.

socio-economic status means which could be considered equivalent. The latter mean for the non-transported group, however, was so much higher than the means for the other two groups that it was accepted as necessary to leave this group unmatched in this respect. If a match were forced for this non-transported group, the numbers of the group would be reduced to the point of insignificance.

The effect of leaving mean socio-economic status of the non-transported group unmatched with the other two groups is not considered serious. Such a result is to be expected since the pupils comprising this group are semi-urban in character whereas those in the other two groups are rural. Differences inherent in the nature of the circumstances should be measured and recognized but perhaps it would be meaningless to eradicate such differences by matching when they are as large as they are.

B. Achievement Comparisons

1. Achievement Data

Mean and standard deviation of achievement grade percentiles of small rural secondary school group:

$M_R = 47.75$

$\sigma_R = 23.35$

Mean and standard deviation of achievement of transported students of the consolidated secondary school:

$M_T = 51.10$

$\sigma_T = 22.45$

Mean and standard deviation of achievement of non-transported students of the consolidated secondary school:

$M_N = 50.95$

$\sigma_N = 23.95$

Difference in mean achievement between the transported group and the rural group:

$M_T - M_R = 51.10 - 47.75 = 3.35$

Difference in mean achievement between the non-transported group and the rural group:

$M_N - M_R = 3.20$

Difference in mean achievement between the transported group and the non-transported group:

$M_T - M_N = 0.15$

2. Testing Statistical Hypotheses

(a) Transported group versus rural group

The hypothesis as stated was:

$$M_T > M_R$$

The null hypothesis to be tested was:

$$M_T - M_R = 0$$

Standard error of the rural achievement mean:

$$\sigma_{M_R} = \frac{\sigma_R}{\sqrt{N_R}} = \frac{23.35}{\sqrt{94}} = 2.41$$

Standard error of the transported achievement mean:

$$\sigma_{M_T} = \frac{\sigma_T}{\sqrt{N_T}} = \frac{22.45}{\sqrt{158}} = 1.79$$

Correlation coefficient between the function under study (achievement) and the matching measure (intelligence):

$$r_{xy} = .73 \quad \text{(see Table VII)}$$

Therefore, standard error of the difference between the transported mean and the rural mean:

$$SE_{D_{M_T - M_R}} = \sigma_D = \sqrt{(\sigma_{M_T}^2 + \sigma_{M_R}^2)(1 - r_{xy}^2)}$$

$$= \sqrt{\left[(1.79)^2 - (2.41)^2\right]\left[1 - (.73)^2\right]}$$

$$= 2.05$$

$$\text{Critical ratio, C.R.} = \frac{D}{\sigma_D} = \frac{3.35}{2.05} = 1.63$$

The null hypothesis must therefore be accepted, i.e.,

$$M_T - M_R = 0$$

(b) Non-transported group versus rural group

The hypothesis as stated was:

$$M_N > M_R$$

The null hypothesis to be tested was:

$$M_N - M_R = 0$$

The calculation is similar to that above.

$$M_R = 2.41 \qquad M_N = 2.77 \qquad r_{xy} = .73$$

$$\sigma_D = \sqrt{\left[(2.41)^2 + (2.77)^2\right]\left[1 - (.73)^2\right]} = 2.51$$

$$C.R. = \frac{3.20}{2.51} = 1.23$$

The null hypothesis must therefore be accepted, i.e.,

$$M_N - M_R = 0$$

(c) Transported group versus non-transported group

Hypothesis to be tested:

$$M_T - M_N = 0$$

The calculation is again similar to that above:

$$M_T = 1.79 \qquad M_N = 2.77 \qquad r_{xy} = .73$$

$$D = \sqrt{\left[(1.79)^2 + (2.77)^2\right]\left[1 - (.73)^2\right]} = 2.25$$

$$C.R. = \frac{0.15}{2.25} = 0.07$$

The hypothesis must therefore be accepted, i.e.,

$$M_T - M_N = 0$$

Because of the lack of significance of the difference in achievement between the transported consolidated group and the rural group it

was felt necessary to make comparisons between the two groups at the various grade levels. Table VIII shows the results of these comparisons. The grades being compared were not necessarily equivalent in intelligence so the mean intelligence for each grade is shown. It is noted that the differences in achievement for Grades 7, 10, 11, and 12 are not significant at the .01 or .05 levels. In Grades 10, 11, and 12 the differences in achievement are consistently in favour of the transported consolidated group, even although the means of intelligence for this group are consistently below those of the rural group. The importance of this trend is seen in Grade 9 where a difference in favour of the consolidated group is significant at the .05 level despite the slightly unfavourable mean intelligence. Although a significant difference is found at the Grade 8 level in favour of the transported consolidated group it must be interpreted as meaningless since at that level the group had an advantage of 5.167 in mean intelligence.

C. Summary of Statistical Results

When the three groups of pupils, those from small rural high schools, those transported to the consolidated school, and those of the consolidated school who are not transported, are compared two at a time on the basis of achievement scores no differences, significant at the .01 or the .05 level, are detected.

When the transported consolidated pupils are compared at the various grade levels with the rural pupils there is a definite pattern formed, in Grades 9 to 12, of differences in favour of the

consolidated pupils. The pattern holds in spite of lower intelligence means for the consolidated group. In Grade 9, where the consolidated group is at only a slight disadvantage in intelligence, the achievement difference in its favour rises to significance at the .05 level.

TABLE VIII

COMPARISON OF ACHIEVEMENT OF TRANSPORTED CONSOLIDATED AND RURAL SCHOOL PUPILS BY GRADES

Grade	Mean I. Q.		Mean Achievement		Critical Ratio	Significance of Differences in Achievement	
	Consolidated	Rural	Consolidated	Rural		at .05 Level	at .01 Level
12	112.400	117.667	79.200	73.667	2.298	no	no
11	104.538	105.000	71.923	65.000	1.363	no	no
10	103.148	105.750	67.444	63.938	1.024	no	no
9	99.423	99.625	46.195	38.055	2.053	yes	no
8	106.167	101.000	48.222	37.429	2.674	yes	yes
7	97.870	100.170	41.890	48.850	1.959	no	no

CHAPTER VI

ANALYSIS OF FINANCIAL STUDY DATA

A. Current Expenditures

1. Current expenditures excluding transportation

The analysis of current cost figures, excluding those for transportation, is shown in Table IX. As has been previously noted, it was impossible to break some items down to the individual schools. This was the case for the items "Administration" and "Janitor's Supplies". The former by its very nature could not be charged in specific amounts to individual schools since it represents the operating costs of the School Board offices. The latter could not be so charged because no records were kept of the actual distribution of supplies. In both cases the items were charged to the individual schools pro rata based upon average daily attendance. This practice effectively eliminates the items from comparison but maintains realistic cost per pupil figures.

It is to be noted that Table IX shows rural school costs which include the elementary sections of the schools. Subsequent calculations will provide the costs for the rural secondary sections.

TABLE IX

SCHOOL CURRENT EXPENDITURES, EXCLUDING TRANSPORTATION AND TEACHERS' SALARIES

FOR SCHOOL DISTRICT NO. 20, 1952

Item	Consolid'd School	Rural Schools (Elementary and Secondary)			
		Falkland	Eagle River	N. Shuswap	Total
Administration					
Salaries, Office Expenses and General	$ 2,725.97	$ 855.34	$ 844.32	$ 368.52	$ 2,068.18
Instruction					
School Clerical Salaries	420.24	-	-	-	-
Teaching Supplies	2,818.42	607.76	518.02	158.02	1,283.80
Operation					
Janitors' Salaries	5,459.43	1,344.00	1,200.00	720.00	3,264.00
Janitors' Supplies	602.25	189.01	186.64	79.63	455.28
Light, Heat, Water	2,633.71	827.13	541.75	411.16	1,780.04
Insurance	729.20	143.00	90.77	86.99	320.76
Repairs and Maintenance	1,010.56	232.21	1,353.36	309.89	1,895.46
Non-Operating Expenses	155.00	-	-	-	-
Debt Services	1,518.12	353,31	224.25	214.94	792.50
Total	$ 18,072.90	$ 4,551.76	$ 4,959.11	$ 2,349.15	$ 11,860.02

The following calculations lead to current expenditure, excluding transportation, cost per pupil figures being based on average daily attendance for the consolidated secondary school and for the small rural secondary schools. Weighted enrollments shown for the rural schools are necessitated by the previously established practice of considering secondary education to be more costly than elementary education by a factor of 1.538.

Consolidated Secondary School:

Expenditure for teachers' salaries = $59,743.60

Current expenditures excluding transportation but including teachers' salaries = $77,816.50

Enrollment in average daily attendance = 426.2

Cost per pupil for current expenditures, excluding transportation = $\frac{\text{current expenditures}}{\text{average daily attendance}}$

$= \frac{\$77,816.50}{426.2}$

= $182.58

Rural Secondary Schools:

Current expenditures excluding transportation and teachers' salaries = $11,860.02

Elementary enrollment in average daily attendance = 208.6

Secondary enrollment in average daily attendance = 112.6

Weighted secondary enrollment = 112.6 x 1.538

= 173.2

Total weighted enrollment = 208.6 + 173.2

= 381.8

Secondary share of current expenditures excluding teachers' salaries and transportation = \$11,860.02 x $\frac{173.2}{381.8}$

= \$5,380.18

Actual salaries of secondary teachers = \$13,213.50

Total secondary current expenditures excluding transportation = \$18,593.68

Cost per pupil for current expenditures excluding transportation = $\frac{\$18,593.68}{112.6}$

= \$165.12

2. Current expenditures for transportation

School buses transport 299 pupils to the consolidated secondary school. These buses also serve, however, 339 pupils of elementary schools located either in Salmon Arm or along the bus routes. If transportation expenditures were distributed on the basis of number of pupils carried the consolidated secondary school would be charged with 0.47 of the total.

Since secondary consolidation is more advanced than elementary consolidation, the pupil mile is seen to be a more exact basis for distribution of costs. The following calculation uses this basis to arrive at a cost per pupil figure for current transportation expenditures for the transported students of the consolidated school. (All transportation costs of the consolidated school are charged to the transported students only.)

Daily pupil miles of consolidated secondary students = 2238

Daily pupil miles of other students = 1401

Fraction of transportation expenditures to be charged to consolidated secondary students = $\frac{2238}{3639}$ = .61

Total current transportation expenditures = $20,564.05

Consolidated school's share = $12,544.07

Cost per pupil = $41.94

In actual fact the three rural secondary schools considered in this study, although typical of rural, unconsolidated schools in size and location, do transport pupils to school. Since the comparison of this study presumes to involve three typical unconsolidated schools, these rural transportation costs are included for the record only and are not used in the main comparison. The following calculation leads to a transportation cost per pupil figure for these rural schools:

Total current transportation expenditures for rural schools = $13,425.75

Rural secondary students' share = $6,087.60

Cost per pupil = $54.07

3. Total current expenditures

The total cost per pupil for current expenditures for the transported students of the consolidated secondary school is found to be $224.52. That for the small rural secondary students is found to be $165.12. Including actual transportation cost, which is not done for purposes of comparison in this study, the latter figure becomes $219.19.

B. Capital Expenditures

1. Consolidated school

The procedure used in calculating capital cost per pupil figures is to calculate the cost per pupil based upon the depreciation of capital assets for the following:

Building Expenditure:

Building constructed during 1950

Building cost = $363,035.10

Estimated life = 60 years

Number of pupils served = 426

Cost per pupil per year = $\frac{363,035.10}{60 \times 426}$ = $14.20

Furniture and Equipment:

Appraised value (October 4, 1951) = $26,706.14

Estimated average life = 10 years

Number of pupils served = 426

Cost per pupil per year = $\frac{26,706.14}{10 \times 426}$ = $6.27

Transportation:

Total original cost of seven buses = $54,227.16

Average life of bus body = 10 years

Average life of bus chassis = 5 years

Total cost of seven replacement chassis = $22,400

Total cost of buses and replacement chassis = $76,627.16

Number of transported pupils served = 299

Cost per pupil per year = $\frac{\$76,627.16}{10 \times 299}$ = $25.63

Total Capital Expenditure

Total capital expenditure per pupil = $46.10

2. Small Rural Schools

Building expenditure:

Buildings all constructed during 1950

Total building costs = $130,383.22

Estimated life = 45 years

No. of elementary pupils served = 208.6

No. of secondary pupils served = 112.6

Cost per secondary pupil per year = $\frac{130,383.22 \times 173.2}{45 \times 112.6 \times 381.8}$

= $11.65

Furniture and equipment:

Appraised value (October 4, 1951) = $6,588.54

Estimated average life = 10 years

No. of elementary pupils served = 208.6

No. of secondary pupils served = 112.6

Cost per secondary pupil per year = $\frac{6,588.54 \times 173.2}{10 \times 112.6 \times 381.8}$

= $2.65

Transportation:

Total original cost of two buses = $12,374.00

Total cost of two replacement chassis = $6,400.00

Total cost of buses and replacement chassis = $18,774.00

Number of pupils served = 321.2

Cost per pupil (pro rata distribution) = $\frac{18,774.00}{10 \times 321.2}$

= $5.84

Total capital expenditure

Total capital expenditure per pupil including transportation = $20.14

Total capital expenditure per pupil excluding transportation = $14.30

C. Summary of Results

Table IX shows a summary of the cost analysis results. It may seem incongruous that whereas the two groups are approximately the same in current transportation cost per pupil, they are considerably different in capital transportation. This situation is caused by the fact that one of the rural schools' bus routes is operated on a contract basis. This enlarges current and reduces capital expenditure.

TABLE X

COST PER PUPIL COMPARISON OF THE CONSOLIDATED AND THE SMALL RURAL SECONDARY SCHOOLS OF SCHOOL DISTRICT NO. 20, 1952

Expenditure	Consol. School Cost per Transported pupil	Rural School Cost per pupil
Current, excluding transportation	$182.58	$165.12
Current, transportation	41.94	54.07
Total current	224.52	219.19
Capital, buildings	14.20	11.65
Capital, furniture and equipment	6.27	2.65
Capital, transportation	25.63	5.84
Total capital	46.10	20.14
Total current and capital	270.62	239.33
Study comparison (total for consolidated school, total excluding transportation for rural schools	270.62	179.42

CHAPTER VII

CONCLUSION

A. Summary of Findings

This study has sought to determine the effect of the consolidation of secondary schools upon achievement of the pupils and upon cost per pupil. The transported pupils of the consolidated school have been considered pupils who, but for consolidation, would be attending small rural schools. These pupils have been compared with pupils who are actually attending typical small rural schools. The non-transported pupils of the consolidated school have been used as a control for the achievement comparisons. The groups were matched with respect to mean and standard deviation intelligence and were controlled in mean socio-economic status and percentage grade composition. The main findings are as follows:

1. Although the mean achievement of the transported consolidated group was 51.10 compared to 47.75 for the rural group, there was no significant difference in achievement at the .01 or .05 level.
2. The mean achievement of the transported consolidated group and the non-transported consolidated group was practically the same, 51.10 and 50.95 respectively.

3. When the transported consolidated pupils are compared at the various grade levels with the rural pupils there is a definite pattern of differences formed in Grades 9 to 12 in favour of the consolidated pupils. This pattern holds despite the lower intelligence means of the consolidated group. In Grade 9, where the consolidated group is at only a slight disadvantage in intelligence, the achievement difference in its favour rises to significance at the .05 level.
4. When all transportation expenditures of the consolidated school are charged to the transported pupils of that school, the current cost per pupil is $224.52 compared to $165.12 per pupil for the small rural school (excluding transportation for the latter to increase the typicality).
5. The capital cost per pupil for the consolidated school is found to be $46.10 compared to $14.30 for the rural schools (excluding transportation for the latter).
6. The total cost per pupil considering transportation as above is $270.62 for the transported consolidated pupils and $179.42 for the rural school pupils.

B. Educational Implications of Findings

No attempt is made to generalize the findings of this study to the broad educational scene. Interpretive conclusions or educational implications will be drawn, however, applying to the educational system within which the study was performed; namely, School District Number 20. These implications are as follows:

1. It cannot be said that consolidation in this setting has increased academic achievement to any great extent as it can be measured by standardized achievement tests. This does not necessarily constitute a disparagement of consolidation, however. The effect of consolidation, in this setting as elsewhere, has been to produce the comprehensive school in which achievement in the fundamental academic subjects is but one of several important emphases. To a large extent the small rural school, unable to support a comprehensive programme, has retained such achievement as its single most important emphasis. To say that the consolidated school is equal or only slightly superior to the small rural school in achievement in fundamentals is to affirm at least equal strength in an aspect of its programme which would logically be considered most vulnerable.

3. It has been shown that the non-consolidated school costs a total of $91.20 per pupil less than the consolidated school. If the two types of school were producing the same total educational returns, consolidation would obviously be poor economy. The question of interpreting the meaning of the difference in cost per pupil depends, therefore, upon whether or not the consolidated school produces total educational returns superior to the non-consolidated school to the extent of $91.20 per pupil or approximately one-third of its total expenditure. At least two-thirds of the consolidated school expenditure is justified on the basis of its equivalence or slight superiority in achievement over the non-consolidated school. Assuming equal efficiency of operation,

the other third pays for the comprehensive programme that is offered. For example, some aspects of the consolidated school programme which are unavailable to pupils of the small rural secondary schools are:

(a) specialist counselling services

(b) extensive library services

(c) extensive extracurricular programme

(d) commerce courses

(e) agriculture courses

(f) specialist art and music courses

(g) Industrial Arts and Home Economic courses

(h) extensive science laboratory equipment.

C. Relation of the Study to Future Research

The demands of a section of the general public for an examination of the cost of consolidation and of the modern comprehensive school will make further research in this area highly desirable. More accurate and verified information must be available before these educational practices can be interpreted adequately to those who support them financially. Less demanding than this reason, but more fundamental, is the need for intelligent progress to be based upon a thorough knowledge of the strengths and weaknesses of the established system.

This study has dealt with only two aspects of consolidation and has done so in a restricted area in the province of British

Columbia. It has shown that the results of research carried on in other parts of North America may not necessarily be applied to this educational system where, among other things, consolidation is often obtained at a high price because of unfavourable geography. Future research directly suggested would be in the area of the effect of a larger number of aspects of consolidation carried on sufficiently extensively to be representative of British Columbia.

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