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ABSTRACT
        Twenty-four expenditure variables were correlated
with achievement scores on the Iowa Test of Educational Development
to find out how various types of expenditures were related to
educational quality. The expenditure variables (instructional cost,
operating cost less transportation, and total costs) were used as
numerators in a fraction. The denominators were: (1) the number of
students enrolled in the district, (2) revised number of students
enrolled, obtained by giving more weight to high school students due
to higher cost of educating, (3) number of teachers, and (4) revised
number of teachers, weighting high school teachers. The statistical
analysis of the variables showed that a correlation existed between
per-teacher expenditures and composite pupil achievement test scores,
and that the three most important measures were instructional cost,
operating cost less transportation, and total costs less
transportation. No relationship was found between per-pupil spending
and achievement test scores. The results suggested that an
educational program designed to provide a minimum level teacher
expenditure with a satisfactory pupil teacher ratio was a more
efficient method of allocating resources than concentrating on a
minimum level of per-pupil expenditure. (BC)

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UNITED STATES DEPARTMENT OF AGRICULTURE
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LOCAL SCHOOL EXPENDITURES AND EDUCATIONAL QUALITY: A CORRELATION ANALYSIS*

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A major factor contributing to the viability of any community is the quality of its educational system. This factor takes on an added dimension in rural areas because many of today's national social problems are thought to be due to the inadequate elementary and secondary education provided to residents of rural areas. Urban problems have been compounded by the migration of poorly educated workers from rural America. And, at the same time, efforts to develop rural economies and reverse the population flow are often hindered by low quality schools. To compound the problems, as rural communities have declined, the resources necessary for providing adequate education to the remaining residents have diminished and the quality of the school system has continued to deteriorate.

Because of its importance there has been considerable research done on ways to measure and improve education. Many have focused on the field of educational finance, assuming that the amount a school district spends has a strong impact on the quality of the local school system. Benchmark surveys have been made showing national or regional differences in spending for education. Attempts have also been made to determine which social and economic characteristics are associated with increased levels of spending for education, such as those of Miner (2) and Shapiro (4). Finally there have been attempts to determine whether economies of scale exist for education, and if they do, to determine the optimum sized school. Both Hansen (1) and Riew (3) have completed this type of study.

A major problem facing all research in this field has been obtaining an adequate measure of the quality of the local educational system. Usually, researchers have been forced to assume that per capita or per pupil expenditures bear some direct relationship to education quality, and continue their research on that assumption. There has, however, been almost no testing of the hypothesis that expenditure per pupil, or expenditure per capita is a useful and accurate measure of the quality of education.

This paper reports the results of a test of the assumption that per pupil expenditure bears a significant relationship to educational quality. In addition, the relationships between several alternative measures of expenditure and educational quality were examined.

PROCEDURE

The Iowa Test of Educational Development, a standardized educational achievement test, was given in more than 80 percent of North Dakota's school districts during 1965 as part of a State-wide survey of education. At the same time, extensive educational finance data was collected from each school district. The availability of this data made a test of the correlation between expenditures and achievement test scores possible.

Twenty-four separate expenditure variables were correlated with composite achievement scores for 9th graders, 11th graders, and for the combined 9th and 11th grades to determine which measures of expenditure were related to educational quality. The expenditure variables used were in the form of a fraction, with six possible numerators and 4 different denominators. The numerators were: (1) Instructional Cost. This included only expenditures for salary of the teaching and custodial personnel, textbooks, aud: visual aids, teaching supplies and other expenditure relating directly to instruction. (2) Operating Cost Less Transportation, which includes (1) and school health expenditure, as well as other operating expenditure not directly connected with instruction. (3) Operating Cost. This included transportation costs with (2). (4) Total Operating Cost, which included outgoing transfer payments with (3). At present this is the best figure which can be obtained from the Census of Governments, the only consistent set of national figures. (5) Total Operating Cost Less Transportation Cost. (6) Total Cost. This included all costs both current and capital for the school district.

The denominators used were: (1) The number of students enrolled in the district. (2) A revised number of students obtained by weighting high school students by 1.25. This was done to adjust for the greater cost of educating high school students. (3) The number of teachers. (4) A revised number of teachers, obtained by weighting the number of high school teachers by 1.25.

The last two denominators were used to test the hypothesis that the relevant variable is the amount of resources brought to bear on a classroom unit rather than on an individual student. These denominators reduce distortions caused by small differences in student-teacher ratios which do not provide increases in quality. This is especially important in rural areas where small class sizes may force per pupil costs above the national average without providing anywhere near an average quality education.

The per teacher measure also fits well with current educational theories about what factors contribute to the quality of the educational system. The largest portion of per teacher expenditure goes for the teacher's salary, an item which reflects both the experience and the education of the teacher. The rest reflects the books, audio visual materials, and other teaching aids which each teacher has to work with.

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Product moment correlations were computed for each of four size groups of high schools, those with enrollments less than 100, between 100 and 200, between 200 and 400, and those between 100 and 400. Although no significant results were obtained for districts with high school enrollments of less than 100 students, statistically significant correlations were obtained for both 9th and 11th graders for districts with high schools from 100-200, 200-400, and 100-400 pupils.

FINDINGS

Detailed results of the study are shown in Table 1. The most important findings appear to be these: (1) A statistically significant correlation exists between some measures of per teacher expenditure and composite pupil achievement test scores. In order of their apparent significance the three most useful measures are instructional cost, operating cost less transportation, and total cost less transportation. This correlation appears consistent among grades and among different sizes of high schools. (2) No statistically significant relationships exist between any measure of per pupil, or revised pupil spending and achievement test scores. (3) If transportation costs are not separated from operating costs, no significant correlation exist between expenditures and achievement test scores.

CONCLUSION

This study does not provide the answer to the question of how to improve rural schools. Much study and research remains before any such answer can be obtained. Its findings do suggest, however, a new approach for both research and operating programs concerned with small rural school districts. It appears that the total funds available for use in a classroom unit, rather than the funds used per pupil, is the significant variable for studies of educational finance.

These results, if applicable on a national basis, suggest changes in the orientation of operating programs and future research. Those State aid programs designed to bring poorer school districts up to a minimum level of per pupil expenditure appear to be open to criticism. It appears that a program designed to provide a minimum level of per teacher expenditure, while keeping the pupil teacher ratio within acceptable limits, might be more successful in improving the quality of education in those districts.

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Table 1.—Correlation Between Various Measures of Expenditure and Composite Score on the Iowa Test of Educational Development by Size of High School, Rural High Schools in North Dakota, 1966

Measure of Expenditure 1/	Size of High School								
	100-199 Pupils 2/			200-400 Pupils 3/			100-400 Pupils 4/		
	9th	11th	Combined: 9 & 11	9th	11th	Combined: 9 & 11	9th	11th	Combined: 9 & 11
PER PUPIL:									
Instructional Cost	.143	.068	.087	.098	.163	.184	.108	.063	.070
Operating Cost Less Transportation	.113	.058	.058	.097	.020	.168	.091	.055	.052
Operating Cost	-.102	-.210	-.213	-.024	.010	-.021	-.106	-.195	-.192
Total Operating Cost	-.106	-.215	-.219	-.017	.154	-.055	-.100	-.184	-.181
Total Operating Cost Less Transportation	.106	.051	.050	.094	.137	.158	.090	.060	.054
Total Cost	.070	-.177	-.200	.013	.035	.033	.077	.156	.016
PER PUPIL (REVISED):									
Instructional Cost	.169	.104	.090	.128	.225	.185	.130	.088	.031
Operating Cost Less Transportation	.138	.093	.059	.125	.195	.169	.111	.079	.045
Operating Cost	-.080	-.180	-.200	.004	.011	-.021	.086	-.173	-.199
Total Operating Cost	-.085	-.186	-.210	.009	.015	.009	-.081	-.163	-.188
Total Operating Cost Less Transportation	.131	.086	-.050	.120	.183	.158	-.111	.083	-.044
Total Cost	.055	-.149	-.020	.038	.064	.043	-.058	-.136	-.176
PER TEACHER:									
Instructional Cost	.325**	.259*	.304**	.207	.389**	.357*	.297**	.293*	.337**
Operating Cost Less Transportation	.306**	.261*	.326**	.204	.352*	.339*	.286**	.292**	.310**
Operating Cost	.071	-.038	.021	.043	.108	.096	.055	.007	.035
Total Operating Cost	.065	.044	.014	.045	.106	.094	.056	.001	.019
Total Operating Cost Less Transportation	.302	.256*	.283	.197	.333*	.394*	.284**	.294**	.343**
Total Cost	.097	.007	.105	.084	.165	.184	.082	.023	.051
PER TEACHER:									
Instructional Cost	.335**	.287*	.306**	.236	.406**	.357*	.309**	.315**	.310**
Operating Cost Less Transportation	.316**	.289*	.309**	.234	.374*	.340*	.298**	.314**	.284**
Operating Cost	.078	-.016	.021	.078	.140	.096	.069	.016	.036
Total Operating Cost	.072	-.022	.015	.077	.136	.095	.070	.022	.029
Total Operating Cost Less Transportation	.312**	.285*	.283*	.223	.352*	.394*	.295**	.314**	.354**
Total Cost	.103	.014	.103	.114	.192	.184	.094	.044	.093

* Significant at .10 level.
** Significant at .05 level.
1/ For definitions see text.
2/ N = 41
3/ N = 25
4/ N = 66

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