

PRELIMINARY ANALYSIS OF FACTORS EXPLAINING ACHIEVEMENT IN OKLAHOMA ELEMENTARY AND SECONDARY EDUCATION¹

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Results of the study indicate that teacher performance is particularly important in student achievement and that peak performance is attained between 3 and 10 years of experience. Other significant teacher-related factors include pupil-teacher ratio, workload, salary, and graduate (M.S.) education. Student achievement is also influenced by the instructional (*e.g.*, audiovisual) materials, books, periodicals, and nonvocational units offered by the school. Use of ability groups, accelerated classes, and special education classes are directly related to elementary student achievement.

The main objective of this study was to quantify the effect which various factors, including those of students, schools, and environment, have on the quality of elementary and secondary education in Oklahoma.

METHODS

The data used in this study were obtained from the Oklahoma State Department of Education, which assessed Oklahoma school programs, pupil backgrounds, and resultant achievement. In a stratified random sample, the population of school districts in Oklahoma was divided into subpopulations according to geographic location and size of school district. After the schools were drawn randomly, students in the fourth, eighth, and eleventh grades of these schools completed standardized achievement and IQ tests and filled out a questionnaire. The survey, which was conducted in March, 1970, included 2,019 fourth grade students, 1,854 eighth grade students, and 1,776 eleventh grade students. Data were also obtained from the students' parents and from their school administrators.

In the regression analysis, the achievement score, a measure of the quality of edu-

cational output, was used as the dependent variable. Independent or explanatory variables consisted of three general types of inputs into the educational system. The schooling input or education process variables included program offerings, teaching innovations, instructional materials, and teacher qualifications and workloads. Student input variables included race, IQ, time spent studying, residence patterns, activities, and post-high school plans. Environmental variables examined in the study were parents' education, occupation, income, and interest in their children's education.

Equations explaining modern mathematics and composite achievement scores were estimated for the fourth, eighth, and eleventh grades. (The statistical procedure and equations used to estimate student achievement are presented in a paper, AGEC 7031, available from the Department of Agricultural Economics, Oklahoma State University.) The achievement scores are district averages on standardized tests prepared by Science Research Associates, Inc.

RESULTS AND DISCUSSION

Fourth grade

All three types of inputs into the educational system affected fourth grade achievement. The percentage of students is

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special education and in accelerated classes were both positively related to achievement. Smaller pupil-teacher ratios and pupil-professional personnel ratios were associated with greater achievement. However, achievement scores declined at a decreasing rate with an increase in the pupil-teacher ratio. Average modern mathematics scores varied directly with value of audiovisual material and the number of available periodicals per pupil.

Teacher influence was particularly strong in determining fourth grade scores. The percentage of teachers with a planning period was positively related to these scores. A large percentage of teachers who have less than 3 years experience or more than 10 years experience can be detrimental to fourth grade achievement. Those school districts offering higher standard teacher salaries (standardized as to level of experience and academic degree) attain higher achievement levels, apparently by attracting better teachers.

As expected, student characteristics and environmental variables are important in explaining achievement levels. The average number of books read by students during the past summer positively affected the composite scores. Changing schools repeatedly retarded student achievement. The percentage of mothers whose occupation is professional or executive and parents' net income directly affected achievement.

Eighth grade

Major educational process variables affecting eighth grade achievement scores included ability groupings, special education classes, and factors associated with teachers. In this study, those districts with special education classes and ability groupings had higher eighth grade achievement scores. Giving teachers a planning period improved their performance and, consequently, raised both modern mathematics and composite scores. Increasing the percentage of teachers with the master's degree increased modern mathematics scores, but at a decreasing rate. Evidently, a larger standard teacher salary produces higher student achievement by attracting better qualified teachers.

Student characteristics are particularly important in explaining the composite score. IQ and time spent studying were

positively related to the composite score. Changing schools many times was detrimental to eighth grade achievement.

Environmental variables, including the percentage of fathers who attended college and the parents' net income, were positively related to student achievement. A higher percentage of parents who talked with their children about school work at least once a week was associated with a higher average modern mathematics score. Also, a greater percentage of parents who plan for their children to go to college was associated with a higher average composite score.

Eleventh grade

In regard to the eleventh grade achievement scores, those factors associated with teacher performance were again the most important educational process variables. Modern mathematics scores increased at a decreasing rate with increases in the percentage of teachers with a master's degree. Increases in the percentage of teachers with 10 or more years experience caused achievement scores in the eleventh grade to decline. A higher percentage of teachers with a planning period was associated with higher eleventh grade achievement scores. Larger standard district salaries, apparently, improved achievement by attracting better qualified teachers.

Other educational process variables which affected achievement were the number of books per pupil and nonvocational units. The number of books per pupil was positively related to both modern mathematics and composite scores. Those districts offering more nonvocational units had higher composite scores, but the composite score increased at a decreasing rate with increases in the number of nonvocational units offered.

Student characteristics are also important in explaining eleventh grade achievement. The percentage of students in subject-related clubs or honor societies positively affected composite scores. Higher percentages of students who had spent most of their lives in a city of 10,000 or more population were associated with lower eleventh grade achievement scores. Increases in the average number of times that students changed schools were associated with declines in the modern mathematics score.

The average district eighth grade composite score had a significant and positive effect on eleventh-grade composite scores; *i.e.*, school districts with higher eighth grade composite scores had higher eleventh grade composite scores. The average number of books read during the last summer directly affected the modern mathematics score.

Environmental variables again proved to be important factors in determining student achievement. The percentage of fathers who attended college or whose occupation is professional or executive was positively related to eleventh grade achievement. As the percentage of parents who talk to their children about their school work

at least once a week increased, eleventh grade achievement scores increased.

Examination of those variables which do not significantly affect achievement can also be an important part of the evaluation. Facilities and equipment have no statistically detectable effect on achievement. After correcting for parents' education, occupation, and income, race appeared to have no significant effect on achievement in any grade. Some of these omitted variables may, in fact, be important, but do not show significance because of limited data on them in the sample or because they are closely correlated with other variables which were included in the equation.