

## EDUCATION PRODUCTION FUNCTION AND QUALITY OF EDUCATION IN DAY SECONDARY SCHOOLS IN KENYA

**Nelson Jagero (PhD)**

*P.O Box 1320 Mutare Zimbabwe*

[jageronelson@yahoo.com](mailto:jageronelson@yahoo.com)

### ABSTRACT

*The purpose of this study was to establish the extent to which school inputs affect the quality of education in day secondary schools in Kisumu County Kenya. The study was conducted in 18 day secondary schools, 18 head teachers, 123 teachers and 600 students. Proportionate sampling was used to select the number of day secondary schools in various divisions within the County. Simple random sampling was used to select the teachers and students for the study. Data was analysed using Linear multiple correlation. The most important inputs that affected the performance of the day secondary schools included involvement of Parents Teachers Association (PTA) in running of the schools; amount of instructional materials supplied and expenditure in laboratory equipment. The study recommended that PTAs should be strengthened, so that they could contribute to the provision of physical facilities in order to improve quality of education in the day secondary schools.*

**Keywords:** *Day secondary schools, Education Production Function, School Inputs, Quality of Education.*

### INTRODUCTION

An input-output relationship which is sometimes called the Education Production Function (EPF) was used in this study. Much controversy surrounds the definition and measurement of inputs and outputs of education. The problem lies in the lack of agreed goals of education which can be translated to operational and measurable objectives. Thus, there can be no standardized units of outputs or inputs. Inputs are teachers' qualifications and experience, teacher pupil ratio, books and other learning materials, laboratory equipment, schools' physical plants, and output is the pupils' achievement.

The specific measures of output were the grades attained by each day school in the Kenya Certificate of Secondary Education national examination. The problem about the input measures is the qualitative dimensions of the inputs which is not only hard to define, but also, very difficult to measure. In this study quality measures such as teacher's experience and qualification, teacher pupil ratio, books and other learning materials, laboratory equipment were used as inputs.

#### **a. Production Theory:**

Education is a production process using scarce human, financial and physical resources in the production of educated persons. Since those resources have alternative uses, economic concepts of production theory can be applied to its operations and planning. Thus, in resource allocation at macro and micro levels efficiency should be deliberately pursued to enable the maximization of the consumption and the investment objectives of education.

#### **b. Cost-models or Input models**

In determining whether economies of scale exist in the educational sector, there is a need to determine the average cost curve over the long run. The production function framework is used in this estimation.

Suppose the total input in any school unit i.e the number of students in the school in a given year is given by

$$O1 = f(X1, X2).....(i)$$

Where O1 = total output

X1 =total number of students in school in a specific year,

X2 = the quality index, indicating the gains in knowledge, skill and civic responsibilities resulting from the educational process.

Suppose also

$$f(X_1, X_2) = f(X_3, X_4, \dots, X_n) \dots \dots \dots (ii)$$

Where  $X_3, X_4, \dots, X_n$  denote the unit measure of the inputs into the school system. If the price of each input is represented by  $P$  then the average cost can take the following form;

$$C = f(X_1, X_2; P_1, P_2, \dots, P_m; X_3, X_4, \dots, X_n) \dots \dots \dots (iii)$$

The major factor affecting per pupil cost are the prices of major goods and services which serve as inputs in education. The long run cost function can thus take the following forms:

$$C = f(a, b, c, d, e, f, g) \dots \dots \dots (iv)$$

Where

$C$  = per pupil recurrent expenditure

$a$  = teacher-pupil ratio

$b$  = teacher's qualification and experience

$c$  = head teacher's qualification and experience

$d$  = student average admission score

$e$  = instructional materials supplied

$f$  = laboratory equipment

$g$  = parent's teachers association

Substituting  $X_1$  for  $C$  and  $X_2, X_3, \dots, X_n$  for  $a, b, c, \dots, h$  for equation (iv), the equation is rewritten as a regression model as given below.

$$X_1 = a + bX_2 + cX_3 + dX_4 + eX_5 + fX_6 + gX_7 + hX_8 \dots \dots \dots (v)$$

Where  $X_1$  is per pupil recurrent expenditure

$X_2$  to  $X_8$  are as defined for  $a, b, c, d, e, f, g$  in equation (iv) and  $a, b, c, d, \dots, h$  in equation (v) are constants.

### c. Performance or Output Model

The quality of the output of educational system is measured by results of examinations of given standards. There are other school outputs such as discipline and good citizenry. Examination results are always used because it allows for easy comparison. Thus if a school has higher points or scores in such examinations, the school is judged to be of higher quality. It must however be emphasized that there is more to the educational process than competence in cognitive ability. Nevertheless, in this study, the researcher restricted himself to this measure alone since this is the best known and acceptable measure of output quality.

Both the environmental effects of socio-economic status or circumstances of the student and the school effects-financial, physical and human resources work separately but harmoniously through the process variables for the production of the output of the system. The quality and quantity of school input, status and process variables are the major determinants of the quality of output.

#### The purpose of this study was:

To establish the extent to which school inputs like teacher pupil ratio, student average admission score, head teachers qualification and experience, laboratory equipment supplied, instructional material supplied, teacher's qualification and experience and parent's teacher's association contributions affect the quality of education in day secondary schools as measured by examination performance.

### STUDY POPULATION

According to the Kisumu District Education Office, the District had a total of 112 secondary schools. Out of these, 70 (62.5%) were government maintained or assisted schools. The rest were either private or church-sponsored. This study focused on the government maintained or assisted schools, out of the 70 government schools, 56 (80%) were day secondary schools. The 56 day secondary schools were distributed as follows: Maseno Division - 17 schools i.e 31% of the total day school's population; Winam Division - 17 schools (31%); Nyakach Division 14 schools (25%); Muhoroni Division 8 schools (13%).

### **SAMPLING PROCEDURE**

The district was stratified according to the four divisions. Proportionate random sampling technique was used to select a sample of 18 schools which represented about 32% of the study population. Two of the 18 schools were used for a pilot study while the remaining 16 were used for the main study.

a) **Selection of Schools in the four Divisions:** The proportionate random sampling method ensured a fair representation of the study population. This was because a proportionate number of secondary schools were randomly selected from each division, depending on the number of schools it had.

Table 3.2 shows the number of schools selected for the study in each Division. Maseno and Winam have a total of 17 day secondary schools each, or 31% of the study population and according to proportionate sampling method, the two Divisions provided 31% of the schools selected for the study. The two Divisions each provided six schools. The six schools were selected by random sampling technique. Using the same method, the remaining two divisions of Nyakach and Muhoroni provided four and two schools, respectively in the study.

b) **Selection of Head teachers, Teachers and Students.** All the head teachers of the 18-day secondary schools participated in the study. Between five to seven teachers and between fifteen to forty-five students were selected from each school depending on school size using random sampling procedure. The study involved a total of 18 head teachers, 123 teachers and 600 students.

### **METHODS OF DATA ANALYSIS**

Data was analyzed using linear multiple correlation method. All the completed questionnaires were examined by the researcher, and the information contained therein was tabulated in frequency tables and percentage. The data which were used for computer inputs were converted into percentages, averages and ratios to allow the execution of computer programmes. Linear multiple correlation was used in order to establish the extent in which school inputs affect pupil performance. Using SPSS (Statistical Package for Social Sciences), the correlation coefficients between the independent variables (school inputs) and dependent variable (performance) were obtained. The magnitude of a correlation coefficient provides an index of practical significance of the observed relationship between two or more variables (Creswell, 2003).

### **FINDINGS**

#### **Linear multiple correlation on how school inputs affect quality of education**

Linear multiple correlation was used to analyze the data on school inputs. This was to establish the extent to which the independent variables (school inputs) affect the dependent variable (performance). The correlation coefficient ranges from -1.0 to + 1.0, that means a correlation can be positive or negative. A higher absolute value of correlation coefficient indicates a close relationship between the independent variable and dependent variable, while a small value indicates a less definite relationship.

The school inputs used in the study were teacher-pupil ratio (X1), student average admission score (X2), head teachers qualification and experience (X3), laboratory equipment expenditure(X4), Instructional Material supplied (X5), Parent's Teacher's, Association (PTA) and other school related bodies contributions (X6) and teacher's qualification and experience (X7). Those School inputs were used as independent variables, while performance (X) was used as a dependant variable.

Using SPSS - Statistical Analysis Package, the correlation coefficient between the independent variables and dependant variable were obtained as shown in Table 1.

From Table 1, it can be seen that Parent's Teacher's Association and other School related bodies (X6), and instructional material supplied (X5) had the highest correlation coefficient with performance (X). Their correlation coefficients were 0.764 and 0.732 respectively. Both the correlation was significant at 0.001 confidence level in a one tailed test.

What can deduced from Table 1 is that schools which had supplied more instructional materials, and whose Parent's Teachers Association and other school related bodies contributed to development of the various schools performed better in the national examinations.

The other school related bodies a part from Parent's Teacher's Association which contributed to the development of day secondary schools were Board of Governors, School sponsors and Old Students Association. Other bodies were District Development Committees (DDCS), Lions Club, Jomo Kenyatta Foundations, British Council and the Giant Groups

**Table 1: Linear multiple correlation for school inputs of day secondary schools**

	X1	X2	X3	X4	X5	X6	X7	X
X1	1							
X2	0.471	1						
X3	0.216	0.255	1					
X4	0.143	0.571*	0.460	1				
X5	0.138	0.542	0.410	0.654*	1			
X6	0.673	0.621*	0.371	0.861**	0.752*	1		
X7	0.082	0.464	0.375	0.657*	0.305	0.441	1	
X	-0.078	0.522	0.318	0.592*	0.732**	0.764**	0.259	1

\*\* Significant at 0.001 confidence level in a one tailed test.

\* Significant at 0.01 confidence level in a one tailed test.

Out of the 18 day secondary schools under the study, 17 had Parent`s Teacher`s Associations, 18 had Board Of Governors, while 17 schools had sponsors. Only one day school had Old Student Association which was established before 1963. Since the majority of day secondary schools in the district were established in the 1980's, they did not have Old Student Association. The main sponsors of most of day secondary schools were churches. Those churches were mainly Anglican Church of (ACK), Catholics and Pentecostal churches.

The high correlation between Parent`s Teacher`s Association and other school related bodies with performance could be explained by the fact that those bodies organised harambees ( fundraising) to put up and purchase more school facilities in day secondary school in the district. The majority of day secondary schools which performed well in the national examination had their Parent`s Teacher`s Association formed between 1980-1990.

The Parent`s Teacher`s Association and other organisations mentioned above had contributed immensely to the development of day secondary schools in the district. Their contributions included constructions of laboratories, classroom, teachers' houses and buying of laboratory equipment. Other contributions were buying of textbooks, school furniture and providing of bursary funds. School sponsors in addition to the above mentioned contributions, gave spiritual nourishment to the students.

Functions of the Parents Teachers Associations, Board of Governors and the school sponsors in day secondary schools in the district were; discussion of development projects, Kenya Certificate of Secondary Education results and students' discipline.

The other functions of the Parent`s Teacher`s Associations, Board Of Governors and the school sponsors were to organize harambees ( fundraising) for school development, to organize parents and prize giving days to discuss any strike or projects which need funds.

Since Parent`s Teacher`s Association and Board Of Governors and other School related bodies contributions had a great influence in the performance of day secondary schools in the district there is a need to strengthen those bodies. Head teachers and Board of Governors should start the Old Student`s Association, especially in day secondary schools started in 1970's or earlier. This would enable those day secondary schools to attract funds from their old students who may be in well placed positions in the country.

The higher correlation (0.732 significant at 0.001 confidence level in a one tailed test) between instructional materials supplied and performance meant that day secondary schools which supplied more instructional materials performed better in the national examinations. Since textbooks and other instructional materials like chalk, papers and exercise books are important as shown in the correlation analysis, schools should spend more money on instructional materials. At least day secondary schools should purchase necessary textbooks to be shared by at least three pupils per book in order to improve examination performance.

There was also a high correlation between laboratory expenditure supplied (X4) with performance. The correlation coefficient was 0.592 significant at 0.01 confidence level in a one tailed test. It can be concluded that day secondary schools which spent more money in purchasing laboratory equipment performed better than those schools which spent less money.

Laboratory equipment were lacking in most day secondary schools in the district. This meant that day secondary schools could not offer practical oriented subjects, in line with the objectives of 8-4-4 education system. Since there was a high correlation between day school's performance and laboratory equipment supplied, schools should strive to buy more laboratory equipment and chemicals to improve their performance especially in the sciences which are compulsory in the 8-4-4 education system. Purchasing of necessary equipment will mean that day schools will not borrow equipment as mentioned earlier.

As can be seen from Table 1, there was a correlation of 0.522 between average admission (X2) and performance. It can be deduced that schools which attracted students with high marks in Kenya Certificate of Primary Education tended to perform better in the national examinations. When interviewing head-teachers, the admission of weak students was due to the fact that day secondary schools, select the students after national, provincial and other district boarding secondary schools. Day secondary schools should be allowed to select the best students from nearby primary schools, since they have limited catchment areas, compared to boarding schools.

As can be seen from Table 1, there was a negative correlation between teacher-pupil ratio(X1) and performance. The correlation coefficient was - 0.078. It can be deduced that day secondary schools with low teacher-pupil ratio tended to perform better than those with a high teacher-pupil ratio. Though the district generally had a low teacher-pupil ratio, most the day secondary schools still lacked teachers in the sciences, languages and technical subjects as mentioned earlier. This low teacher-pupil ratio could be explained by the fact that there are many teachers teaching the liberal arts. May be those day secondary schools with high teacher-pupil ratio had a shortage of teachers in sciences and languages, thus affecting the performance of those schools in the subjects. In some day schools in the study, a science teacher was expected to teach up to 28 lessons a week instead of the required 24 lessons, making them ineffective.

Parent`s Teacher`s Association and other school related bodies (X6) had a high correlation with other school inputs. It had a correlation coefficient of 0.861 and 0.752 with laboratory equipment expenditure (X4) and instructional material supplied (X5) respectively. Both the correlations were significant at 0.001 confidence level in a one tailed test. It can be concluded that schools which had a lot of contributions from Parent`s Teacher`s Association and other schools related bodies, tended to spend more money buying laboratory equipment and instructional materials. In order to improve performance of day secondary schools, there is a need to strengthen the Parent`s Teacher`s Association and other related bodies, so that they could contribute to purchasing enough school facilities and equipment.

Schools with strong Parent`s Teacher`s Association and other school related bodies tended to attract students with high average admission score. The correlation coefficient between student average admission score(X2) and Parent`s Teacher`s Association and other school related bodies contributions(X6) was 0.621 significant at 0.01 confidence level in a one tailed test. The high correlation between average admission score and Parent`s Teacher`s Association and other school related bodies contributions could be explained by the fact that since those day secondary schools which had high contributions from Parent`s Teacher`s Association, tended to perform better in national examinations, those day schools also attracted students with high average admission scores.

It can also be concluded from Table 1 that those day secondary schools which spent more money on laboratory equipment tended also to spend more money purchasing instructional materials. There was a high correlation coefficient of 0.654 between laboratory equipment expenditure (X4) and instructional materials supplied (X5) and the correlation was significant at 0.01 confidence level in a one tailed test.

## RECOMMENDATIONS

Textbook funds should be levied from students, so that all day secondary schools should have necessary textbooks to be shared by at least two students per textbook to improve performance. Levying textbook funds from students will be cheaper than the requirement from the majority of day secondary schools that each student buys the necessary textbooks.

The government should change its policy, in order to provide equal opportunity for all types of schools to select their candidates to form one. Day schools should also be given a chance to compete with the boarding schools favourably when selecting students to form one.

Parent`s Teacher`s Association and other school related bodies, should be strengthened so that they could contribute to the provision of physical facilities in day secondary schools. The provision of more physical facilities in day secondary schools will make them attract students with higher average scores in Kenya Certificate of Primary Education.

Day secondary schools' head-teachers should strive to form Old Student Associations so as to get funds from the old students who would contribute generously to improvement of the schools.

#### REFERENCES

1. Borg, R (1983). *Educational Research, An Introduction*. New York: Longman.
2. Creswell, J. W. (2003). *Research Design: Quantitative, Qualitative and Mixed Method Approaches*. London: Sage Publications.
3. Hedderson J. (1991) *Statistical Package for Social Sciences (SPSS)*. California: Wadsworth Publishing Company.
4. Gall, M. & Borg, M. (1996). *Education Research: An Introduction*. New York: Longman.

#### **Nelson Jagero (PhD)**

*Area of specialization is Planning and Economics of Education, which are aspects of Education Management. I have taught research methods and Statistics in Research to both PhD and Masters Students for several years. I have supervised over 20 masters and PhD students. Currently I am Director of Open Distance and E Learning at Africa University Zimbabwe. I was also a senior lecturer in the School of Post Graduate Studies at Kampala International University, Dar es Salaam Constituent Collage Tanzania, and have been a lecturer at Maseno University in Kenya.*