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A Comparative Analysis Of Student Achievement By School Type In Zimbabwe Secondary Schools*

Levi M Nyagura
Human Resources Research Centre
University of Zimbabwe

Abstract

The purpose of this study was to determine statistical differences in levels of student performance in ZJC English and Mathematics between six secondary schooltypes in Zimbabwe. 5293 Form 2 students who wrote ZJC examinations in 33 secondary schools in 1989 participated in the study. As predicted, students in high fee paying schools performed better in both English and Mathematics than students in former group A, former group B (urban and rural), mission and rural district council schools.

While students in former group A schools performed better in English than students in mission, former group B (urban and rural), and rural district council schools, the situation in Mathematics was different. Students in mission schools performed significantly better in Mathematics than their counterparts in former group A schools who performed significantly better than students in former group B (urban and rural) and rural district council schools.

Evidence from the study shows that students in former group B rural schools performed significantly better in English than students in former group B urban schools contrary to the postulated prediction. A startling finding was that rural district council schools performed in Mathematics as well as former group B urban schools despite the critical shortages in human, financial and instructional resources constraining them.

***Data used in this paper is from the Study funded by the World Bank between February and May, 1990.**

Students in mission schools significantly did better in both English and Mathematics than their counterparts in former group B (urban and rural) and rural district council schools.

The evidence from this study strongly indicates that there are significant variations in the quality of secondary education in Zimbabwe dependent on the type of secondary school. As is evident from the characteristics of the schooltypes, schools with sufficient provision of material and non-material inputs, and with high teacher stability tend to produce better student results even though the resources might not be efficiently utilized to produce optimal student performance.

Introduction

In his analysis of 72 empirical studies done in third world countries on elements of school quality which are significantly related to student achievement, Fuller (1986) distinguished two categories of school factors, namely, those which are not consistently related to student achievement and those which are consistently related to student achievement (Fuller, 1986, p.21).

Category 1: School quality elements not consistently related to student achievement:

- (i) Class size (no effect in 16 of 21 analyses);
- (ii) Laboratories (no effect in 7 of 11 analyses)
- (iii) Individual teacher salary levels (no effect in 9 of 13 analyses)

Category 2: School quality elements consistently related to student achievement:

- (i) Expenditures per pupil (effect in 6 of 11 analyses)
- (ii) Instructional materials (effect in 17 of 25 analyses)
- (iii) School library size and activity (effect in 15 of 18 analyses)

- (iv) Teacher training (tertiary level) (effect in 21 of 30 analyses)
- (v) Length of instructional program (effect in 11 of 13 analyses)
- (vi) Teacher's social class (effect in 7 of 10 analyses).

However, patterns of influence are mixed for several other elements of school quality. In particular, the teacher's total length of schooling influenced student achievement in 11 of 25 studies, inservice teacher training in 4 of 5 studies, teacher's length of experience in 10 of 23 studies, teacher's time spent on class preparation in 4 of 5 studies, teacher's expectations of pupil performance in 3 of 3 studies, quality of headmaster in 4 of 7 studies, student boarding in 3 of 4 studies, homework frequency in 5 of 7 studies, and school size in 4 of 9 studies. The lack of consistency in the pattern of influence of these variables is mainly due to the limited number of studies conducted.

Studies on secondary schools in Zimbabwe (Nyagura and Reece, 1989, 1990) revealed that major differences exist in the availability and quality of resources in the studied school types, namely, high fee-paying or trust schools; government group A (former all white) schools; government group B urban (former all black) schools; government group B rural schools (established after independence in rural district councils); mission (church run all black) schools, and rural district council schools (established after independence).

Nyagura and Reece (1989) found that rural district council schools were headed by young and inexperienced headmasters who held only minimal, and sometimes not even minimal, academic and professional qualifications. The situation in other types of schools was significantly different. They also found that teachers had limited opportunities to participate in inservice training, rural council schools had the least academically and professionally qualified teachers, group A and church run schools had better library facilities than did either group B or rural council schools, schools experienced shortages of textbooks and equipment with the shortages being more critical in rural district council schools which are run by the poorest communities in the nation.

In a study on curriculum implementation at the classroom level, Nyagura and Reece (1990) found that 62 percent of teachers in rural district council schools found it difficult to develop learning objectives from national syllabi while 53.8 percent of teachers in church run schools, 50 percent in group B schools and 33 percent in group A schools reported the same difficulty. Regarding their ability to specify and sequence content from national syllabi to meet the diverse needs of the learners, 64 percent of teachers in rural district council schools indicated that this activity was difficult while 42 percent in church run schools, 50 percent in group B schools and 33 percent in group A schools indicated the same difficulty.

Nyagura and Reece (1990) also found significant variations between schooltypes on the use of instructional approaches that promote greater participation by students in the learning activities. Contributing factors to these variations were significant differences between schools of teacher quality, inadequate professional support directed at improving teachers' classroom skills, inadequate instructional materials to allow students to work individually or in small groups, inadequate physical facilities in classrooms to allow use of learner-centred instructional strategies, and large classes under the control of poorly trained and inexperienced teachers (Nyagura and Reece, 1990).

In the same study, Nyagura and Reece (1990) found that the library activity was minimal in rural district council schools where only 39.6 percent of teachers indicated that the library was useful for their pupils. In contrast, about 83 percent of teachers in church run schools, 79 percent in group B schools, and 80 percent in group A schools indicated that the library was useful for their students.

The present study examined whether the highlighted differences in school quality elements between schooltypes in Zimbabwe secondary education result in significant differences in levels of student academic achievement in the Zimbabwe Junior Certificate (ZJC) national examinations in Mathematics and English.

The Study

The population for this study consisted of 1989 Zimbabwe Junior Certificate (ZJC) students. In particular, the 1989 ZJC results in English and Mathematics were the focus of the study. The goal in this study was to determine statistical differences in levels of performance between secondary schooltypes in Zimbabwe. More specifically the following hypotheses were formulated for investigation:

- (i) There are significant differences in academic achievement in ZJC Mathematics and English between schooltypes in Zimbabwe.
- (ii) High fee paying (trust) schools perform better than any other schooltype.
- (iii) Former group A schools perform better than former group B (urban), former group B (rural), mission, and rural district council schools.
- (iv) Mission secondary schools perform better than former group B (urban and rural), and rural district council schools.
- (v) Former group B (urban) schools perform better than former group B (rural) and rural district council schools.
- (vi) Former group B (rural) schools perform better than rural district council schools.

Method

Students who participated in the study were in 33 secondary schools sampled from four of the nine regions in Zimbabwe. The criteria for selecting the four regions (Harare, Mashonaland West, Midlands and Matabeleland North) were that the sample of schools chosen be representative of the national population of schools and that the students sampled in the different schooltypes be representative not only of the major ethnic groups in Zimbabwe but also of Ndebele and Shona students in both rural and urban schools. A stratified random sample of seven districts was made in the four regions as follows: Harare (the district is the same as the region), Mashonaland West (2 districts), Midlands (2 districts), Matabeleland North (2 districts). Further random sampling, proportional to the size of the secondary schools by the six schooltypes, was carried out in the sampled districts to give the following distribution of 48 schools: former group A

Questionnaires were mailed to 48 schools in February, 1990. Information requested from schools included Grade 7 Mathematics and English results of the 1989 ZJC students, textbook availability, ZJC classes and their Mathematics and English teachers. Data on ZJC Mathematics and English results, sex and age of students was obtained from the Ministry of Education and Culture examination records. More data about the 48 sampled schools was extracted from statistical returns to the Ministry of Education and Culture, the Ed.46 (Part II) forms.

Data Analysis

The postulated hypothesis were statistically tested using analysis of variance. In particular, hypothesis (ii) - (vi) were tested using Tukey's Honestly Significant Difference (HSD) procedure where the test statistic is the Studentized Range Statistic, q , given by $q = (2 F_{\text{comp}})^{1/2}$ where F_{comp} which represents the comparison or contrast between two means in the analysis of variance, is given by

$$F_{\text{comp}} = (m_i - m_j)^2 n_i n_j / (n_i + n_j) MS_{\text{within}}$$

in which m_i and m_j are two means, n_i and n_j are their respective sample sizes, and MS_{within} is the mean square within schooltypes from the analysis of variance.

Description of the Sample

Of the 48 schools originally sampled, 33 (68.8%) returned sufficient data by mid-April, 1990. A number of schools were unable to furnish the requested information because they were used as polling stations for the general election in March and some teachers and heads of schools were serving as polling officers. The final sample numbers and percentage breakdowns by schooltype and by pupils are presented in Table 1. The final sample consisted of 5 293 Form 2 students. However, if a student's score/grade in a subject was missing, s/he was not included in the analysis.

Table 1
Description of Final Sample by
Schooltype and by Pupils (%)

	#Schools Original Sample	#Schools Final Sample	#Students Final Sample
Former Gp A	4	3 (75)	735
Former Gp B (urban)	4	4 (100)	2008
Former Gp (rural)	6	3 (50)	537
High Fee-paying	4	2 (50)	155
Mission	6	6 (100)	801
District Council	24	15 (62.5)	1057
TOTAL	48	33 (68.8)	5293

Data presented in Table 2 summarizes a number of school characteristics under the following variables:

- GR7E - Grade 7 English grade/score
- GR7M - Grade 7 Mathematics grade/score
- AGE - Age of student
- EQUAL - Form 2 English teacher's qualification
- MQUAL - Form 2 Mathematics teacher's qualification
- EEXPER - Form 2 English teacher's years of experience
- MEXPER - Form 2 Mathematics teacher's years of experience
- CLSIZE - Class size
- TCHTHIS - Teachers' average years in the school
- ETEXT - Ratio of English books per pupil
- MTEXT - Ratio of Mathematics books per pupil
- SIZE - School size
- TPR - Teacher pupil ratio
- PERCTAF - Percentage total enrolment African

While the national assessment scheme for both ZJC and Grade 97 examinations awards 1 for the top grade and 9 for the lowest grade with 1-6 representing passing grades, the reported grades in this paper were transformed so that 9 represents the top grade and 1 the lowest grade ($T = 10 - x$, where x is the scored grade on the national scale of 1 to 9).

The variables EQUAL and MQUAL take the following values:

- 1 = Certificated graduate; uncertificated graduate; unrecognized degrees.
- 2 = O level plus 4 or 5 years teacher training; O level plus 2 or 3 years teacher training.
- 3 = Junior Certificate plus 2 or 3 years teacher training; Standard 6 plus 2 years teacher training.
- 4 = Teacher trainee; untrained teacher.

Table 2
Mean Characteristics of Schools in the
Sample by Schooltype (S.D.)

Variable	All Schools	Group A	Group B Urban	Group B Rural
GR7E	6.4 (1.7)	7.7 (1.2)	5.8 (1.4)	6.2 (1.4)
GR7M	7.0 (1.8)	7.5 (1.6)	6.6 (1.7)	7.1 (1.9)
AGE	16.1 (1.8)	15.2 (.9)	16.2 (1.3)	16.5 (1.9)
EQUAL	2.2 (1.4)	1.5 (.7)	1.9 (1.6)	2.5 (1.1)
MQUAL	2.6 (1.5)	1.1 (1.6)	2.6 (1.7)	1.0 (1.0)
EEXPER	6.9(19.5)	3.3 (8.7)	11.5 (30)	2.3 (2.0)
MEXPER	3.9(13.0)	1.7 (4.3)	5.1 (20)	1.9 (2.3)
CLSIZ	33.2(13.5)	34.6 (4.6)	29.4 (17)	35.8 (2.5)
TCHTHIS	2.6 (1.6)	3.7 (1.0)	1.7 (.4)	2.7 (.5)
ETEXT	.53 (.3)	.79(.2)	.38 (.2)	.42 (.1)
MTEXT	.53 (.3)	.79(.2)	.38 (.2)	.42 (.1)
SIZE	1029.0(558.0)	1296.0(407.0)	1503.0(319.0)	995.0(424.0)
TPR	26.4 (3.9)	26.6 (3.3)	28.5 (1.5)	21.4 (4.4)
PERCTAF	96.1 (12.9)	87.3 (4.0)	100.0 (.0)	100.0 (0.0)

Variable	High Fee Paying	Mission	District Council
GR7E	8.6 (.7)	7.6 (1.1)	5.3 (1.5)
GR7M	8.3 (.9)	8.2 (1.3)	6.2 (1.9)
AGE	14.6(.6)	15.8 (1.1)	16.9 (2.3)
EQUAL	1.0 (.0)	1.6 (.5)	3.6 (.8)
MQUAL	1.4 (.5)	2.8 (1.2)	3.3 (1.1)
EEXPER	2.2 (.8)	4.9 (3.2)	1.9 (1.0)
MEXPER	3.6 (2.2)	1.9 (1.3)	2.0 (1.3)
CLSIZE	27.0 (5.3)	42.9 (4.5)	39.3 (7.2)
TCHTHIS	5.2 (1.0)	4.4 (2.4)	1.7 (.7)
ETEXT	1.0 (.0)	.84 (.23)	.4 (.1)
MTEXT	1.0 (.0)	.84 (.23)	.4 (.1)
SIZE	600.0 (125)	644.0 (178)	314.0 (86)
TPR	14 (2.5)	26.6 (3.3)	26.3 (1.8)
PERCTAF	26.6 (4.4)	100 (0)	100 (0)

Data in Table 2 show that differences between the six types of schools are pronounced. In most respects, high fee paying, group A and Mission schools are more advantaged than group B (rural and urban) schools, which are more advantaged than district council schools. These differences are most pronounced with respect to material and non-material inputs. In particular, ZJC teachers of English and Mathematics in high fee paying and group A schools are fully qualified while the majority in rural district council schools are unqualified. High fee paying, mission and group A schools have a better provision of textbooks than group B (rural and urban) and district council schools. On the average, high fee paying, mission and group A schools have better teacher stability than group B (rural and urban) and district council schools.

With respect to student admission into secondary schools, high fee paying schools recruit pupils of average age 12.6, group A of 13.2, mission of 13.8, group B (rural and urban) of about 14.3, and district council schools of average age 14.9. In terms of academic performance in the national Grade 7 examinations in Mathematics and English, high fee paying schools admit the best qualified students with group A and mission schools admitting the second best qualified students and group B (rural and

urban) and district council schools the least qualified and older students. In terms of social composition, group B (rural and urban) and district council schools have 100 percent African enrolment while group A schools have an average of 87 percent and high fee paying an average of about 27 percent African. The small percentage of African (black) students in high fee paying schools is largely due to enormous school fees charged in these schools and partly due to employed selection procedures based mainly on performance in entrance examinations.

With respect to organizational complexity, high fee paying and mission schools are significantly smaller than group A and B schools but larger than district council schools. On average, teacher-pupil ratio (TPR) is smallest in high fee paying schools indicating that these schools have more teachers for the same number of students than other types of secondary schools. This situation is due to the ability of high fee paying schools to hire teachers paid for from school funds.

RESULTS

We present tests of hypothesis (i) - (vi) under ZJC English and ZJC Mathematics, respectively.

ZJC English

Table 3 presents descriptive statistics on ZJC English results by schooltype. The magnitude of the standard errors and the narrow ranges of the 95 percent confidence intervals for the mean strongly suggest that the schooltype means reported provide reliable average national levels of performance of the studied schooltypes in Zimbabwe.

Hypothesis 1

The results of the analysis of variance for ZJC English in Table 4 show that the schooltype means in Table 3 were highly significantly different ($F = 713.30$, $df = 5$; 4894, $p < 01$) indicating that students in different schooltypes in Zimbabwe have significantly different levels of achievement. We therefore accept hypothesis 1.

Table 3
Mean Performance in ZJC
English by Schooltype

Schooltype	N (Students)	Mean	Standard Deviation	Standard Error	95% Con- fidence Int. For Mean
Former GP A	661	5.88	2.12	.0825	5.72 - 6.04
Former Gp B (Urban)	1833	3.01	1.59	.0372	2.94 - 3.08
Former Gp B (Rural)	511	3.31	1.47	.0649	3.18 - 3.43
High Fee Paying (Trust)	153	7.10	2.07	.1672	6.77 - 7.44
Mission	765	5.57	1.89	.0683	5.44 - 5.71
Rural District Council	977	2.39	1.36	.0436	2.31 - 2.48
Total	4900	3.83	2.21	.0316	3.77 - 3.90

Table 4
Analysis of Variance For ZJC English
for the Six Schooltypes

Source	df	Mean Square	F-Ratio
Between Schooltypes	5	2025.76	713.30**
Within Schooltypes	4894	2.84	
Total	4899		

**p < .01.

Schooltype mean comparisons for English appear in Table 5.

Table 5
q Values for Schooltype Mean
Comparisons in ZJC English

	Former Gp A	Mission	Former Gp B (Urban)	Former Gp B (Rural)	Rural D.C.
High Fee Paying Former	11.41**	14.49**	40.79**	34.51**	45.46**
Gp A Mission	0	4.90*	53.08**	36.61**	58.15**
Former Gp B (Urban)		0	49.91**	33.20**	55.28**
Former Gp B (Rural)			0	5.03*	13.14**
				0	14.14**

*p < .05.

**p < .01.

Hypothesis 2

The results of studentized Range Statistic q show that students in high fee paying schools perform very significantly better than students in other schooltypes at $p < 01$ (see Table 5 row one for q -values). Hence hypothesis 2 is valid.

Hypothesis 3

q - values in row two of Table 5 confirm the validity of hypothesis 3, namely that former group A schools perform better than former group B urban schools ($q = 53.08$, $p < 01$), former group B rural ($q = 36.61$, $p < 01$), mission ($q = 4.90$, $p < 05$), and rural district council schools ($q = 58.15$, $p < 01$).

Hypothesis 4

From the q - values in row three of Table 5, it is evident that students in mission schools perform very significantly different from those in former group B urban ($q = 49.91$, $p < 01$), former group B rural ($q = 33.20$, $p < 01$) and rural district council schools ($q = 55.28$, $p < 01$). Hence hypothesis 4 is valid.

Hypothesis 5

The q - values reported in row four of Table 5 show that former group B urban students perform significantly different from those in former group B rural schools with the latter performing better than group B urban students ($q = 5.03$, $p < 05$). However, students in former group B urban schools performed very significantly better than students in rural district council schools ($q = 13.14$, $p < 01$). Hence hypothesis 5 is only partially valid.

Hypothesis 6

From data in row five in Table 5, it is evident that students in former group B rural schools perform very significantly better than students in rural district council schools ($q = 14.14$, $p < 01$). We thus accept hypothesis 6.

ZJC Mathematics

Descriptive data in Table 6 show that the computed schooltype means are satisfactory indicators of average national levels of performance by the six schooltypes in ZJC Mathematics. The results of the analysis of variance appear in Table 7 while the data on mean comparisons appear in Table 8.

Table 6
Mean Performance in ZJC
Mathematics by Schooltype

Schooltype	N (Students)	Mean	Standard Deviation	Standard Error	95% Confi dence Int. For Mean
Former GP A	682	2.71	1.91	.0732	2.56 - 2.85
Former Gp B (Urban)	1854	1.85	1.12	.0260	1.80 - 1.90
Former Gp B (Rural)	511	2.05	1.28	.0568	1.94 - 2.17
High Fee					
Paying (Trust)	151	5.02	2.44	.1986	4.63 - 5.41
Mission	763	4.52	2.52	.0911	4.3 - 4.70
Rural District Council	972	1.68	1.01	.0324	1.62 - 1.74
Total	4933	2.47	1.91	.0272	2.41 - 2.52

Table 7
Analysis of Variance For ZJC
Mathematics for the Six Schooltypes

Source	df	Mean Squares	F-Ratio
Between Schooltypes	5	1128.82	449.73**
Within Schooltypes	4927	2.51	
Total	4932		

**p < .01.

Hypothesis 1

From the analysis of variance results (Table 7), it can be seen that the schooltype means in Table 6 are highly significantly different ($F = 449.73$, $df = 5$; 4927 , $p < .01$) indicating that students in different schooltypes in Zimbabwe perform significantly differently in ZJC Mathematics. Hence we accept hypothesis 1.

Hypothesis 2

The mean comparison results in row one of Table 8 show that the performance of students in high fee paying schools is highly significantly different from that of students in former group A schools ($q = 22.93$, $p < .01$), former group B urban schools ($q = 33.44$, $p < .01$), former group B rural schools ($q = 28.62$, $p < .01$), rural district council schools ($q = 34.08$, $p < .01$), and significantly different from that of students in mission schools ($q = 5.01$, $p < .05$). Hence we accept hypothesis 2.

Table 8
q Values for SchooType Mean
Comparisons in ZJC Mathematics

	Former Gp A	Mission	Former Gp B (Urban)	Former Gp B (Rural)	Rural DC
High Fee Paying Former Gp A	22.93**	5.01*	33.44**	28.62**	34.08**
	0	30.66**	17.14**	10.07**	18.41**
Mission FormerGp B (Urban)		0	55.41**	38.57**	52.41**
Former Gp B (Rural)			0	3.57 ⁺	3.83 ⁺
				0	6.04**

*p < .05.

**p < .01.

+ Not significant at the .05 level of significance.

Hypothesis 3

The results of the q statistic in row two of Table 8 show that students in former group A schools perform highly significantly better than students in former group B urban schools ($q = 17.14$, $p < .01$), former group B rural schools ($q = 10.7$, $p < .01$), and rural district council schools ($q = 18.41$, $p < .01$). However, students in mission schools performed highly significantly better than students in former group A schools ($q = 30.66$, $p < .01$). In spite of this, the major portion of hypothesis 3 can be considered confirmed.

Hypothesis 4

Data in row three of Table 8 strongly confirm the validity of hypothesis 4, namely that students in mission schools perform better in Mathematics than former group B urban schools (q

= 49.91, $p < 0.01$), former group B rural schools ($q = 33.20$, $p < 0.01$), and rural district council schools ($q = 55.28$, $p < 0.01$). The hypothesis is accepted at this level of significance.

Hypothesis 5

The contrasts between schooltype means for former group B urban versus former group B rural, and former group B urban versus rural district council schools were not statistically significant. Hence there is no difference in performance in ZJC Mathematics between former group B urban students and those in former group B rural and rural district council schools at $p < 0.05$. Hypothesis 5 is thus rejected at the 5 percent significance level.

Hypothesis 6

The q - value in row five of Table 8 clearly confirms that students in former group B rural schools perform highly significantly better in Mathematics than those in rural district council schools ($q = 6.04$, $p < 0.01$).

DISCUSSION

This paper provides evidence regarding differences in student academic achievement levels in Zimbabwe secondary schools in ZJC English and Mathematics. Principal conclusions are that

- (a) Students in high fee paying schools perform significantly better in English and Mathematics than students in former group A schools, former group B (urban and rural) schools, mission schools, and rural district council schools.
- (b) Students in mission schools perform significantly better in Mathematics than students in former group A schools, former group B (urban and rural) schools, and rural district council schools. However, students in former group A schools perform significantly better in English than students in mission schools, former group B (rural and urban) schools, and rural district council schools.
- (c) Despite very low school quality elements in rural district council schools, students in these schools perform in Mathematics as well as students in the more advantaged former group B urban schools. It was also noted that

there were no significant differences in student achievement levels in Mathematics between former group B urban and former group B rural schools.

- (d) In both English and Mathematics, students in former group B schools perform significantly better than students in rural district council schools.

From the principal conclusions presented above together with data on school quality elements summarized in Table 2, it is evident that there are significant differences in the quality of secondary education in Zimbabwe largely dependent on schooltype. Generally, schools with better material and non-material provisions have better average student academic achievement levels. However, evidence from this study does not suggest that schools are efficiently utilizing the educational resources at their disposal to achieve optimal student performance. Nyagura and Riddell (1990) found that some rural district council schools are more effective than government, mission or high fee paying schools in raising the achievement of lower achieving students in English. Of particular importance was that after controlling for student intake achievement, some district council schools are equally as effective in boosting student achievement as government, mission or high fee paying schools.

A logical extension of this study would be an investigation into classroom practices such as lesson preparations and executions; amount and quality of homework; classroom organization, management and dynamics; instructional methods; teaching load; student evaluation; instructional materials and their availability, quality and relevance to the curriculum; public examinations; and students' attitudes, and into school practices such as headmaster's administrative styles; financial organization and spending priorities; school conditions and learning environment; parental/community involvement; headmaster's role in supervising, evaluating and monitoring instructional activities. Such information may have potential significance in identifying school and classroom practices that boost student academic achievement and that help to explain the differences in the quality of education between schooltypes.

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