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RESEARCH ARTICLE

RELATIONSHIP BETWEEN SCHOOL TYPE AND PUPIL'S MATHEMATICS ACHIEVEMENT ON THE PRIMARY LEAVING EXAMINATIONS IN UGANDA

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ABSTRACT

The purpose of the study was to examine relationship between school type and a pupil's achievement on the Mathematics Primary Leaving Examinations (PLE) (i.e., 7th grade) in Uganda**).** The study employed a cross- sectional survey design. Data were from the Uganda National Examinations Board (UNEB) Primary Leaving Examinations results for the year 2018 (*N = 903*). Date analysis was done using a One-Factor Analysis of Covariance (ANCOVA). This was conducted to determine the relationship between a pupil's school type (i.e., urban or rural, essentially school Social Economic Status [SES]) on the PLEs in Uganda, while controlling for pupils' prior mathematics achievement/knowledge. The results indicate that there are significant differences between urban and rural schools on student Mathematics achievement controlling for prior mathematics ability. Specifically, the adjusted means indicate that urban schools have higher mathematics achievement on average (*M* = 4.68, *SE* = 1.9) compared to rural schools (*M* = 4.76, *SE* = .2.5). Note that the lower mean indicates better performance, and a higher mean indicates poorer performance on the PLE exams. (i.e., 1 is the highest score and 9 is the lowest score).

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INTRODUCTION

For quite some time, a general perception of the comparative inferiority of rural schools has prevailed. This view implies the existence of rural-urban disparities in students' academic performance. The results of the SACMEQ II study confirm what Kulpoo (1998) found that in many less developed countries, education in rural areas is often synonymous with a poor context for learning. In the latter half of the 1990s, primary school students in rural areas of Sub-Saharan Africa consistently underperformed their urban counterparts by substantial margins. Foster (1977), as cited in Zhang (2006), refer to these disparities related to school location as one of the factors that contribute towards weak student achievement. The study indicated that more achievement inequality arises more from regional disparity of the school than it does from individuals' characteristics, such as social class and social ethnicity. According to Heyneman and Loxley (1983), schools tend to play greater roles in determining pupils' learning achievement in poor countries than in wealthy countries. The explanation given is that schools in poor countries vary more widely than those in wealthier countries in terms of their quality, in their use of trained teachers, and in materials. In poor countries, the study adds, the school makes a greater difference in how much content pupils learn than it would in a wealthier country. Zhang (2006) examines regional disparities in that pupils living in isolated or rural areas usually have a lower Social Economic Status (SES). That is, pupils from rural areas of less developed countries often suffer a socio-economic disadvantage. Zhang (2006) noted that, on average, students attending rural schools came from families with lower levels of SES in every system. For instance, the author contends that families of 6th-graders in Mauritius and Seychelles were, on average, much better off than those in other countries, especially Malawi, Mozambique, Uganda, and both the Tanzanian mainland and Zanzibar. However, while pupils' families in Mauritius and Seychelles were better off, the same author found that the gaps between the well-off and not so well-off were much smaller in these countries than the case in Botswana, Namibia, and South Africa. The same author stresses the relations in the SACMEQ study between rural students and SES. That is, rural students not only lagged behind their counterparts in reading ability but also compared unfavorably in the school conditions that are important to academic success in general. The SES levels of the families of rural students were lower, and the rural students tended to have less home support for their academic work. In addition, rural students tended to be older than their urban counterparts, as a result of late entry into the school system. Consequently, this results into a higher incidence of grade repetition. Numerous studies have shown that school SES has a link with

academic achievement. Some U.S. studies found that mean school SES and individual student SES are predictors of various student academic outcomes (Caldas & Bankston, 1997; Rumberger & Palardy, 2005). Conversely, Sirin's (2005) meta-analysis of 74 studies conducted between 1990 and 2000, found that school SES is more strongly correlated with academic performance than individual student SES. Moreover, the results from all three cycles of the Program for International Student Assessment (PISA) show that, in most countries, academic outcomes tend to be more strongly associated with school SES than with individual students' socio-economic background (Organization for Economic Co-operation and Development [OECD], 2004; 2005; 2007). While the research literature clearly shows that school SES is a determinant of student outcomes, no findings show whether the association is consistently strong for all students. McGaw (2007) suggested that the association between school SES and academic achievement is stronger for lower SES students than for their more privileged peers. Others, such as Opdenakker and Van Damme (2001), found similar results in that SES is a critical determinant of student achievement. This is evident in the results of the study that compared ability level of students from high SES to those from low SES in Belgium. McConney and Perry (2010) found that the association between mathematics achievement and mean school SES was particularly strong for low SES students who had high levels of mathematics self-efficacy. On the other hand, Rumberger and Palardy (2005) found that the association between school SES and student achievement was equally strong for both low and high SES students in the U.S. McConney and Perry's (2010) secondary analysis of PISA in 2003 also found that the association in Australia is similar for all students regardless of their social background. There are other studies showing that the achievement of all students is greater in high SES schools (Lauder & Hughes, 1999; OECD, 2004; 2007), but the link does exclude other factors that may account for variances in student achievement.

Overall, the pretest mean was higher (M = 7.05, SD = 2.09) than the posttest mean (M = 4.88, SD = 2.31). For the pretest, the urban schools had higher mathematics scores (M = 6.77, SD = 2.10) compared to the rural schools (M = 7.91, SD = 1.79). Additionally, for the posttest, rural schools' scores were lower (M = 4.93, SD = 2.45) than the urban schools (M = 4.72, SD = 1.84).

ANCOVA Assumptions: Independence was tested via an examination of residuals. A random display of points of the residuals against values of independent variable (i.e., urban and rural) provided evidence of independence. Normality was tested on the covariate (i.e., pretest mock examinations), the dependent variable (i.e., posttest PLE examinations), and separately in each group (urban and rural). Again, the assumption was tested via examinations of S-W, skewness and kurtosis, histograms, and Q-Q plots. Calculated z scores for skewness and kurtosis indicated that there was some significant skewness and kurtosis, but not for all (i.e., pretest (S = -7.83, K = -6.25), posttest (S = 1.93, K = -6.54), urban pretest (S = -4.40, K = -6.66), rural pretest (S = -9.79, K = -4.29), urban post (S = .90. K = -6.88), and rural posttest (S = -.74, K = .86). The S-W test was also significant ($p < .05$). Histograms and Q-Q plots suggested relatively normal distributional shapes across all the variables and in the groups. Overall, there is evidence that normality has been met. Linearity of the dependent variable with the covariate was examined with scatterplots, both overall and by group. Overall, the scatterplots suggested positive linear relationships. Homogeneity of Regression Slopes was suggested by similar regression lines evidenced in the scatterplots of the dependent variable and covariate by the independent variable (reported earlier as evidence for linearity). There was a significant interaction between the main effect and the pretest (F (1, 850) = 12.85, p = .001). The Homogeneity of Variance assumption was not satisfied ($p < .05$). A One-Factor ANCOVA was conducted to assess the effect of School Type (i.e., urban or rural) on student PLE mathematics achievement controlling for pretest mathematics. The IV was School Type. The DV was scores on the PLE mathematics exam (i.e., the posttest) that is administered following completion of the 7th grade. Scores on a mock examinations administered half way of the 7th grade were used as the covariate (i.e., the pretest). The results of the ANCOVA suggest a statistically significant main effect of the covariate on the DV (F = 544.643, df = 1, 949, $p < .001$). There were also statistically significant main effects of School Type (F = 39.317, df = 1, 949, $p < .001$) on the posttest adjusting for the pretest. The effect size for School Type was small (partial η^2 = .040) and large (partial η^2 = .365) for the covariate. Observed power was strong for both. The results indicate that there are significant differences between urban and rural schools achievement controlling for prior ability. Specifically, the adjusted means indicate that urban schools have higher achievement on average (M = 4.68, SE = 1.9) compared to rural schools (M = 4.76, SE = 2.5). Note that the lower mean indicates better performance, and a higher mean

Table 1. Analysis of Covariance Summary

Source	Sum of Squares	*df*	Mean Square	*F*	Sig.	Partial Eta Squared
Intercept	7.653	1	7.653	2.181	140	.002
PretestM	1911.964	1	1911.143	544.963	.001	.365
Sch. Type	137.505	1	137.964	39.317	.001	.040
Error	3330.026	949	3.509			

**p < 0.01

METHODS AND MATERIALS

The study employed a cross- sectional survey design. The primary data source for the study was the Primary Leaving Examinations Mathematics results for students in public primary schools in Wakiso district, Uganda (N = *903*). The sample design included a two stage stratified random sample. First stage involved selecting schools and in the second stage students were selected from schools. The procedure of estimation involved computing the average of each group's achievement scores and attached standard errors, the gap of standard errors and statistical significance of standard errors at 0.01 level.

RESULTS

Descriptive Statistics: Before conducting the analysis, outliers were removed (n = 49). That is, all pretest and posttest scores with z scores >$\pm$ 1.96 for were removed. Thus, the final analysis sample contained 678 urban and 225 rural (N =903).

indicates poorer performance on the PLE exams. (i.e., 1 is the highest score and 9 is the lowest score).

DISCUSSION

The findings showed that there is a statistically significant difference between school types (i.e., urban versus rural) on pupil mathematics achievement. That is, the rural school (low SES) had lower mathematics scores compared to the urban (high SES) schools. This result is not surprising as numerous studies have shown that school SES has a link with academic achievement, with higher SES schools having higher achievement in general (Caldas & Bankston,1997; Rumberger & Palardy, 2005; Zhang, 2006)). Additionally, the only study done in Africa, SACMEQ II, found that in many less developed countries, education in rural areas is often synonymous with a poor context for learning. That is, primary schools in urban areas of Sub-Saharan Africa consistently outperform perform their rural counterparts by substantial margins. In Uganda, a lot of previous studies compare with the findings in this study (Kasirye, 2009; UBOS, 2017; Ochwo, 2013 & Vermeulen, 2013).

Conversely, examining the research literature in the United States, urban schools are at a disadvantage when viewing results for students. It is not a surprise as the urban schools are the ones with the lower SES. Results show that a large percentage of U.S. students attending urban middle schools achieve low levels of mathematics proficiency (Ruby, 2006). Ruby notes several issues which apply to Uganda as well. Lack of learning material coupled with insufficient funding is among the critical problems. In Uganda, it can be seen that, since the introduction of the Universal Primary Education (UPE), rural schools no longer get funding from the parents as they used to do. The meager UPE resources cannot sufficiently cover their needs. Moreover, considering higher standard of living today, these rural schools tend to be at a greater disadvantage compared to the urban schools. Since lack of materials is a determinant of student achievement (Nanyonjo, 2007), the significant results found in this study, may be partly explained by insufficient resources in the Ugandan rural schools.

Conclusion and Recommendation

Evidence from the study has led the researcher to conclude that Primary school students from rural environment do not perform as well as students from urban environment. All not else equal, rural students suffer disadvantage simply as the result of their residence in rural areas or their attendance at rural schools. It could be argued that these students are therefore, in terms of their overall progress, achieving less. There is a big worry that Rural pupils may not make it academically in their rural environment. Therefore, the feeling that one must attend a metropolitan school in order to achieve success has merit. The government could consider allocating more funds to rural schools for the purchase of basic learning materials and textbooks, especially those schools serving poor communities, as well urban schools in slum areas. Alternatively, the government may wish to consider introducing or encouraging charity or donor programs for providing pupils from poor backgrounds with basic learning materials and textbooks, irrespective of whether these pupils are in rural or urban schools.

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