

Effect of Gender and Location on Pupils' Academic performance in Katsina State

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Abstract

*This study was carried out to determine the effect of gender and location on academic performance in basic arithmetic operations among pupils from three LGEAs in Katsina state following the conduct of a teacher development programme. The study adopted sample cross sectional survey design. The initial sample for the study was 380 pupils comprising 196 and 184 male and female pupils as well as 206 and 174 pupils from urban and rural locations (with 361 pupils present at the time of data collection). The population of the study is made up of 24,482 primary five pupils from three Local Government Education Authorities (LGEAs) in Katsina Education Zone where in-service teacher development programme (ITDP) was conducted. From the population, an initial sample of 380 pupils comprising 196 and 184 male and female pupils as well as 206 and 174 pupils from urban and rural locations were selected through stratified random technique. At the time of data collection, 361 pupils made up of 186 & 175 male/females and 199 & 162 from urban/rural locations were respectively present. Data was collected using Basic Arithmetic Operations Academic Performance Test (BAOAPT) – a forty items tool selected from the standard test developed by National Examination Council (NECO) for National Common Entrance Examination (NCEE) between 2011 and 2018 with items within primary 5 curriculum content. A draft copy of BAOAPT was validated by three experts in mathematics education and their suggestions informed improvement of the tool. Reliability coefficient of BAOAPT was computed and found to be 0.722. Independent samples *t* test was used to analyse the data. Findings showed that male pupils outperformed their female counterparts from ITDP schools and pupils from schools in urban locations significantly differed in academic performance in mathematics relative to pupils from schools located in rural areas. However, performance of pupils across board was low. Based on the findings of the study, it was recommended that the state government and LGEAs sustain the programme in treatment schools and extend the scope of the intervention to LGEAs not involved ab. initio.*

Keywords: *in-service-teacher-development-programme (ITDP), gender, location*

Introduction

In most countries the world over, primary education is regarded as the most important as well as the most popular (Lawrence, 2018). As the foundation of the educational edifice that is expected to provide literacy and enlightenment to citizens, primary education is the key to the system's success or failure. A careful examination of primary education goals reveals that mathematics is required for the majority of them to be met. Sample cut-off marks for admission into Federal Unity Schools for male and female candidates from Nigeria's six geopolitical zones

in 2017 and 2018 revealed Katsina state as the least and consistently below the national merit cut-off marks. Similarly, the findings of a baseline line survey on Teacher Development Needs

Assessment (TDNA) of Teacher Development Programme (TDP) phase 1 states (including Katsina) revealed that the vast majority of students fell far short of curriculum expectations in numeracy De, Pettersson, Morris and Cameron (2016).

There is widespread dissatisfaction with teacher quality as evidenced by the sack of 22,000 primary school teachers in a former conjoined sister-state of Katsina – Kaduna. Justifying the sack, El-Rufa'i (2018) cited incompetence as the main reason as Education Sector Support Programme in Nigeria (ESSPIN) report showed that 83 per cent of the teachers in the state scored less than 25 per cent in mathematics and literacy exams developed for primary four pupils. Fortunately, Katsina state was included in the first phase of the UK Department for International Development's teacher development programme. The Programme was a six-year (2013–19) funded education program aimed at improving teaching quality in primary and junior secondary schools Oxford Policy Management (OPM, 2017). The programme was divided into two parts: pre-service and in-service. The goal of the in-service teacher development program (ITDP) component was to improve the ability of teachers who were already in service to provide quality learning to students in primary schools in target locations. The in-service teacher-development component of the program received approximately 80% of the program's budget. The intervention programme was envisaged to address gender and location differences in pupils' academic performances in mathematics.

Performance according to Mason (2017) is indicated by end of semester scores of a candidate while Williams (2018) sees it more as an aggregate of several factors that indicate a student's success. Pupils' performance in mathematics at the unity school exams for the years 2010-2016 has not been heart-warming as the percentage of pupils who scored between 51% and 100% in mathematics were respectively 23.67, 24.47, 24.39, 39.06, 34.15 and 49.14 (Ayinde & Folorunso, 2018). Regarding gender, Newman (2018) refers to it as the role of a male or female in society, or an individual's concept of themselves. Researchers such as Linn (2010) reported that the gender gaps in mathematics are insignificant while Lubienski (2011) reported that girls have slightly better grades in mathematics over the last four decades than boys. However, Samuelsson & Samuelsson (2016) in research highlighted a traditional gender gap in favour of boys. It is a rewarding experience to explore how the professional teacher development programme impacts on gender. Furthermore, location connotes the community in which a school is situated; such as city, town, or rural area. **There is** a dominant perception that rural schools are inferior to urban schools and as a consequence rural-urban differences in students' achievement levels. In a study John and Benjamin (2013) reported that rural students achieved significantly better in mean achievement than those in urban schools. This contradicts a similar study on 'Comparison of Rural Educational Disadvantage in Australia, Canada, and New Zealand' by Sullivan, McConney and Perry (2018) who reported that rural educational disadvantage does not exist in the three countries.

Statement of the Problem

Often times there are back and forth as well as conflicting research findings regarding learner outcomes with respect to the attribute variables of gender and location. Sequel to the implementation of a six-year (2013–19) United Kingdom's Department for International Development (DFID) funded in-service teacher development programme with a total budget of £34 million (approximately N 15.64 billion) that sought to improve the quality of teaching in primary and junior secondary schools (JSSs) and in Colleges of Education in six states in northern Nigeria that included Katsina, this research was carried out to establish whether the conduct of professional teacher development programme had moderating impact on pupils' academic performance with respect to the attribute variables of gender and location.

Objectives of the Study

The purpose of this study was to find the effect of gender and location on pupils' academic performance following the conduct of an in-service teacher development programme in Katsina State. The study was guided by the following objectives:

1. Find out the effect of gender on academic performance in mathematics among pupils from in-service teacher development schools in Katsina state.
2. Determine whether location (rural-urban) has effect on academic performance in mathematics among pupils from in-service teacher development schools in Katsina state.

Research Questions

The study posed the following questions for answers:

1. Are there any differences in academic performance in mathematics of male and female pupils from in-service teacher development schools in Katsina state?
2. Is there any difference in academic performance in mathematics of rural-urban pupils from in-service-teacher-development-programme schools in Katsina state?

Null Hypotheses

The following null hypotheses were formulated for testing at $p \leq 0.05$.

Ho₁: There is no significant difference between the academic performances in mathematics of male and female pupils from in-service teacher development schools in Katsina state.

Ho₂: There is no significant difference between the academic performances in mathematics of rural and urban pupils from in-service teacher development programme schools in Katsina state.

Methodology

This study adopted sample cross sectional survey as according to Ary, Jacobs, Sorensen and Razavieh (2010) surveys are classified on the basis of scope as census versus sample. Also, Price, Jhangiani and Chiang (2015) opined that survey research is non experimental that is used to describe single variable or assess statistical relationships between variables that can also be experimental. The choice of the design was informed by the motive of the researchers to describe the nature of the impact of attribute variables of gender and location on pupils' academic performance in the wake of the completion and institutionalization of in-service teacher development programme in intervention primary schools by DFID. The population of the study was made up of 24,482 primary five pupils from three Local Government Education Authorities (LGEAs) in Katsina Zone – namely; Katsina, Kaita and Rimi – where ITDP was conducted.

From the population, a sample of 380 pupils comprising 196 and 184 male and female pupils as well as 206 and 174 pupils from urban and rural locations was selected through stratified random sampling procedure. From Krejcie and Morgan (1973) table, sample size of 381 was recommended for a population of 50,000. For fair coverage of the 3 LGEAs with a population of 24,482, a sample 380 was selected as according to Dawson (2002) it is a general rule in quantitative research that the larger the sample the more accurate the results, though a researcher has to consider restriction of time and money. At the time of data collection (administration of BAOAPT) 361 (186 M, 175 F & 199 urban, 162 rural) pupils were present and data analysis was based on these numbers. Data was collected using Basic Arithmetic Operations Academic Performance Test (BAOAPT) that has 40 multiple choice objective items

on basic arithmetic operations selected from the standard test developed by National Examination Council (NECO) for National Common Entrance Examination (NCEE) that are within primary content. A draft copy of basic arithmetic operations academic performance test (BAOAPT) was validated by three experts. The reliability of BAOAPT was established through test-retest method with two weeks interval and by the use of Pearson Correlation Co-efficient Calculator, a correlation coefficient of $r = 0.722$ was obtained.

Treatment was administered in the implementation of in-service-teacher- development-programme (ITDP) by DFID where teachers in the three LGEAs were supported through workshops, follow-up support in schools, self-directed study, supply of lesson plans, audio-visual and other instructional materials. Data was collected when introduction letter was taken to the headquarters of Katsina State Universal Basic Education Board (SUBEB), Director; Planning, Research and Statistics (PRS) of the Board directed the three Education Secretaries of the study area to assist the researcher in the conduct of his research. At the LGEAs, Principal Personnel Officer (PPO) assisted in identifying schools suitable for the study and introducing the researcher to Head teachers and teacher research assistants in such schools. The BAOAPT took three days to administer in the study area, after which responses were marked and sorted for analysis. Data was analysed with the use of Statistical Package for Social Sciences (SPSS) version 20. Research questions were presented using descriptive statistics of mean and standard deviation while independent t-test was employed in the analysis of null hypotheses. Both hypotheses were tested at the fixed probability level of $P \leq 0.05$.

Results

The results of the study were obtained from research questions answered and hypotheses tested through analysis of scores of 361 pupils who attempted BAOAPT. Independent samples t test statistic was employed for the analysis.

Research Question 1: Are there any differences in academic performance in mathematics of male and female pupils from in-service teacher development schools in Katsina state?

Table 1: Basic Arithmetic Operations Academic Performance Test Scores Based on Gender in ITDP Group

Group	N	Mean	SD	Standard Error of the Mean	Mean Difference
Male	186	18.978	2.701	0.198	1.070
Female	175	17.91	2.655	0.200	
Total	361	36.888	5.356	0.398	

Table 1 shows the means and standard deviations of pupils' academic performance by gender in in-service teacher development schools. The result shows the males had a mean score of 18.98 and standard deviation of 2.701 while the females had a mean score of 17.91 and standard deviation of 2.655. The mean difference in basic arithmetic operations academic performance test with respect to gender was 1.070. It shows mean difference based on gender was slightly higher for male pupils. To ascertain the statistical significance of the difference, independent t-test statistical analysis was carried out.

Null Hypothesis One

There is no significant difference between the academic performances in mathematics of male and female pupils from in-service teacher development schools in Katsina state.

To test this hypothesis, independent t-test was used to establish the significance of the difference between mean academic performance in basic arithmetic operations academic performance test of male and female pupils. The summary of the computations is presented in Table 2

Table 2: Summary of Independent t-test on Academic Performance Scores Based on Gender in In-service Teacher Development Programme Schools

Group	N	Mean	SD	DF	T	P	Effect-Size (d)	Decision
Male	186	18.98	2.701	359	3.972	.000	0.399	Sig.
Female	175	17.91	2.655					
Total	361	36.888	5.356					

Table 2 shows that the t-value obtained is 3.972 and the p-value of 0.000 is observed at degree of freedom of 359. Since the set $p = 0.05$, this indicates that there is statistically significant difference in the academic performance of males and females in in-service teacher development schools in favour of male pupils. However, overall average performance is low in a test scored out of 40. Thus, the null hypothesis is rejected, and it is concluded that male pupils outperformed their female counterparts. Moreover, the effect size, d , of the difference between male and females pupils' performance was 0.399 which indicated small effect size by Cohen (1988) criteria.

Research Question 2: Is there any difference in academic performance in mathematics of rural-urban pupils from in-service-teacher-development-programme schools in Katsina state? Descriptive statistics on academic performance levels of urban and rural pupils taught by teachers in in-service teacher development programme schools, summary of the results is presented in Table 3.

Table 3: Basic Arithmetic Operations Academic Performance Test Scores Based on Location in In-service Teacher Development Programme Schools

Group	N	Mean	SD	Standard Error of the Mean	Mean Difference
Urban	199	17.91	3.362	0.238	1.31
Rural	162	16.60	4.407	0.346	
Total	361	34.51	7.769	0.584	

Table 3 shows the means and standard deviations of pupils' academic performance by location in in-service teacher development schools. The result shows pupils in urban schools had a mean score of 17.91 and standard deviation of 3.362 while those in rural locations had a mean score of 16.60 and standard deviation of 4.407. The mean difference in basic arithmetic operations academic performance test with respect to location is 1.31. It shows mean difference based on location is slightly higher for urban pupils. To ascertain the statistical significance of the difference, independent t-test statistical analysis was carried out.

Null Hypothesis Two

There is no significant difference between the academic performances in mathematics of rural and urban pupils from in-service teacher development programme schools in Katsina state.

To test this hypothesis, independent t-test was used to establish the significance of the difference between mean academic performance in basic arithmetic operations academic performance test of urban and rural pupils. The summary of the computations is presented in Table 4

Table 4: Summary of Independent t-test on Academic Performance Scores Based on Location in In-service Teacher Development Programme Schools

Group	N	Mean	SD	DF	T	P	Effect-Size (d)	Decision
Urban	199	17.91	3.362	359	3.189	.002	0.399	Sig.
Rural	162	16.60	4.407					
Total	361	34.51	7.769					

Table 4 shows the t-value obtained is 3.189 and the p-value of 0.002 is observed at degree of freedom of 359. Since the set $p = 0.05$, this indicates that there is statistically significant difference in the academic performance of urban and rural pupils in in-service teacher development schools in favour of urban pupils. Again, overall average performance is for the two groups is low in a test scored out of 40. Thus, the null hypothesis is rejected, and it is concluded that pupils in urban locations outperformed their counterparts from rural areas. In addition, the effect size, d , of the difference between pupils in urban and rural locations is 0.399 which indicated small effect size by Cohen (1988) criteria.

Discussions

The result of the analysis of data regarding null hypothesis one showed there was significant difference in the academic performance of males and females in in-service teacher development schools in favour of male pupils. This outcome concurs with Anjum (2015) who conducted a study on 'Gender Difference in Mathematics Achievement and its Relation with Reading Comprehension of Children at Upper Primary' and found that significant difference between mathematics achievement of girls and boys at upper primary school stage. Also, Oluyemo, Musbahu, Kukwil, Anikweze and Shaluko (2020) in a study on 'Gender Differences in Mathematics Interest and Achievement in Junior Secondary School Students, Niger State, Nigeria' revealed that male students excel in mathematics achievement more than their female counterparts. On the contrary, Obi, Agwagah, Newen and Nwoye (2017) in a study on 'Checkmating Gender Differentials in Pupils' Achievement and Retention in Mathematics Using Origami Teaching Aid in Nsuka Education Zone', involving 100 primary one pupils from two intact classes learning the concept of fraction, found that there was no significant difference in male and female achievement. Corroborating further, Ghasemi, Burley and Safadel (2019) who did a study titled, 'Gender Differences in General Achievement in Mathematics: An International Study' revealed no statistically significant differences were observed when comparing the achievement of girls and boys in mathematics.

The result of the analysis regarding null hypothesis two revealed statistically significant difference in the academic performance of urban and rural pupils in in-service teacher development schools in favour of urban pupils. This finding agrees with Mohd-Fauzi, Mohd-Yunus, Mahmud, Salim and Sulaiman (2017) in a study on differences in students' mathematics engagement between gender and between rural and urban schools in Pahang, Malaysia found students in urban schools better in overall engagement as compared to students in rural schools. Also, Da and Liu (2020) did a study on the different effects of teacher-student rapport on urban and rural students' math learning in China and reported urban students showed significantly higher mean scores for teacher-student rapport, mathematics self-efficacy, and mathematical academic outcome.

Reporting divergently, Ezeudu (2013) in a study on 'The Effect of Gender and Location on Students' Achievement in Chemistry in Nsukka Local Government Area Of Enugu State, Nigeria' and used a sample of 827 students comprising 473 males and 354 females from eight secondary schools using simple random sampling found that there was no significant difference in the academic achievement of student in urban and rural schools. Also, Illiyas (2017) in a study on 'Interest in Mathematics and Academic Achievement of High School Students in Chennai reported there was no significant difference between rural and urban area school students in respect of their achievement in mathematics. Similarly, Fernández-Cézar, Garrido and Solano-Pinto (2020) in a study on the effect of a STEM experimentation outreach programme on 5th and 6th graders reported that program effect was associated with neither sex nor with rural-urban schools.

Conclusion

The outcome of the study indicated that male pupils taught by teachers in ITDP schools outperformed their female counterparts in academic performance in mathematics. In addition, there was significant difference in the academic performance of urban and rural pupils in in-service teacher development schools in favour of urban pupils. Moreover, overall average performance with respect to gender and location for the two groups is low.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. The Katsina state government needs to institutionalise the programme in all treatment LGEAs and replicate same in control LGEAs.
2. The teaching of mathematics requires competent and experienced teachers, as such state government is required to employ, retain and incentivize competent teachers.
3. Professional bodies like Mathematical Association of Nigeria (MAN) and Mathematics Panel of Science Teachers Association of Nigeria (STAN) ought to promote approaches of ITDP in conferences, workshops and publication in their journals.

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