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A STUDY OF TEACHERS' AND STUDENTS' VARIABLES IN MATHEMATICS CLASSROOMS AND IMPLICATIONS ON STUDENTS' PERFORMANCE

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Abstract

This study assessed the relationship between selected teachers and students variables and academic performance of students in mathematics classrooms in Kwara State, Nigeria. Variables of interest were teachers' qualification, teachers' experience and students' attitude. A sample of twelve teachers and two hundred and fifty students responded to 15 items questionnaires for each category of the respondents and data obtained, being a descriptive study was analyzed using Chi-square. The study found that the influence of teachers' qualification on students' academic performance is statistically significant compared to students' attitude and teachers' experience. Recommendations were made based on the findings, which include the need for teaching of mathematics in secondary school to be handled by qualified teachers and regular re-orientation of mathematics teachers through seminars and workshops.

Key words: Qualification, Attitude, Experience, Performance, Mathematics

Introduction

Mathematics as a school subject is recognized as the foundation of science and technology without which no nation can be economically independent. It is defined as the science of counting and measuring with language of precision. Thus, Mathematics is seen as core to different fields of study serving as basic entry requirement into various disciplines such as medicine, architecture, commerce and engineering which today, have direct impact on human existence.

Mathematics is used throughout the world as an essential tool in many fields, including natural science, engineering, medicine, finance and the social sciences. The importance of mathematics in most fields of human endeavor cannot therefore be underestimated. Its usefulness in science and technological activities as well as commerce, economics, education and even humanities is almost at par with the importance of education as a whole. Fajemidagba (1990) opined that, the teaching of Mathematics, being one of the key subjects in the secondary school education system in Nigeria is very important to all human existence because the compulsory nature of

mathematics and the required competence in the subject as determinant of post-secondary education carries with it an assumption that all members of our society should have the knowledge of the subject. Hence, the consistent efforts and interest of stakeholders on the need to revamp the effective teaching and learning of mathematics considering the general impression that mathematics is difficult by its very nature and abstract in context.

In their study on search for the causations of poor academic achievement in Mathematics, Aremu and Soka (2003) submitted that, though the search is unending but that poor academic performance of students in mathematics in spite of different efforts by stakeholders is largely blamed on the teachers who are regarded as the custodian of knowledge, skills and values. The authors observed that some of the failures on the part of the teachers were non-use of verbal reinforcement strategy and poor interpersonal relationships which might be occasioned by qualification and experience of such teachers. In the same vein, Goldhaber and Brewer (2000) whose study was on teacher certification status and high school student achievement mathematics found that teacher certification and, by extension, experience were strongly associated with upward students' achievement in mathematics. The researchers also found out there exist a significant association between higher degrees of education or teaching experience with desired learning outcome among students in mathematics.

Related research evidences from the studies of researchers like Tella (1998); Amazigbo (2000) and Akanmu and Fajemidagba (2013) however indicated that students, on the other side, may be responsible for their poor academic performance. Factors identified aside teachers' related variables includes students' cognitive style and students' lack of interest in mathematics leading to phobia for the subject and negative attitude in mathematics classrooms.

Purpose of the Study

The purpose of this study was to investigate the relationship between identified teachers variables and students variables on the academic performance of students in mathematics. Specifically, the objectives of the study were to:

- (i) Determine the extent of the relationship between teachers qualification and experience on students' academic performance in mathematics; and
- (ii) Ascertain if there exist any relationship between students academic performance and their attitude.

Research Hypotheses

1. There is no significant relationship between teachers' qualification and students' academic performance in mathematics.
2. There is no significant relationship between students' attitude and students' academic performance in mathematics.
3. There is no significant relationship between teachers' experience and performance of students in mathematics.

Methodology

The study, being descriptive, was a survey research as the researcher was only interested in determining the influence of the selected variables - independent (Teachers' qualification, teachers' experience and students' attitude) on students performance (dependent variables) in Mathematics. The instruments used for this study are researcher-designed teachers and students questionnaires. Each of the questionnaire consisted of 15-item statements aside the section A which delves on respondent' personal bio-data. The retrieved questionnaire were counted first and sorted into distributions. Also chi-square (X^2) statistical technique was employed to test hypotheses 1-3.

Results

HO₁: There is no significant relationship between teachers' qualification and students' academic performance in mathematics.

Table 1

Chi-square analysis of teachers' qualification and students' academic performance in mathematics

Item		Statement				Total
		A	SA	D	SD	
1	Count	7	5	0	0	12
	Expected	5.0	5.2	1.4	0.4	12.0
2	Count	5	7	0	0	12
	Expected	5.0	5.2	1.4	0.4	12.0
3	Count	4	8	0	0	12
	Expected	5.0	5.2	1.4	0.4	12.0
4	Count	4	2	4	2	12

	Expected Count	5.0	5.2	1.4	0.4	12.0
5	Count	5	4	3	0	12
	Expected Count	5.0	5.2	1.4	0.4	12.0
Total	Count	25	26	7	2	60
	Expected Count	25.0	26.0	7.0	2.0	60.0

Chi-square is denoted by; $\chi^2 = \frac{\sum(c-e)^2}{e}$

Where c is counted frequency while e is the expected frequency

$$\chi^2 = \frac{\sum(c-e)^2}{e} = 24.442 ; \chi^2_{12, 0.05} = 21.026$$

From Table 1, χ^2 -calculated is greater than χ^2 -tabulated, thus, the null hypothesis is not upheld and it implies that there is relationship between teachers' qualification and students' academic performance in mathematics

HO₂: There is no significant relationship between students' attitude and students' academic performance in mathematics

Table 2

Chi-square computation of students' attitude and students' academic performance in mathematics

Item		Statement				Total
		A	SA	D	SD	
1	Count	71	101	36	29	237
	Expected Count	85.5	93.1	27.2	31.2	237.0
2	Count	95	115	11	12	233
	Expected Count	84.1	91.5	26.7	30.7	233.0
3	Count	121	118	11	4	254
	Expected Count	91.7	99.8	29.1	33.5	254.0
4	Count	103	106	28	12	249
	Expected Count	89.9	97.8	28.5	32.8	249.0
5	Count	150	115	19	25	309

	Expected	111.5	121.4	35.4	40.7	309.0
	Count					
6	Count	72	111	30	36	249
	Expected	89.9	97.8	28.5	32.8	249.0
	Count					
7	Count	67	61	60	61	249
	Expected	89.9	97.8	28.5	32.8	249.0
	Count					
8	Count	36	51	32	82	201
	Expected	72.5	78.9	23.0	26.5	201.0
	Count					
Total	Count	715	778	227	261	1981
	Expected	715.0	778.0	227.0	261.0	1981.0
	Count					

$$\chi^2 = \frac{\sum (c-e)^2}{e} = 3.598; \chi^2_{21, 0.05} = 32.671$$

From Table 2, χ^2 -calculated is less than χ^2 -tabulated. Hence, the null hypothesis is upheld and it could be inferred that there is no statistically significant difference between students' attitude and their academic performance in mathematics.

HO₃: There is no significant relationship between teachers' experience and performance of students in mathematics

Table 3

Chi-square computation of teachers' experience and students' academic performance in mathematics

Item		Statement			Total
		A	SA	D	
1	Count	6	4	2	12
	Expected	4.3	6.0	1.7	12.0
	Count				
2	Count	5	5	2	12
	Expected	4.3	6.0	1.7	12.0
	Count				
3	Count	2	9	1	12
	Expected	4.3	6.0	1.7	12.0
	Count				
Total	Count	13	18	5	36
	Expected	13.0	18.0	5.0	36.0
	Count				

$$\chi^2 = \frac{\sum(c-e)^2}{e} = 4.733; \chi^2_{4, 0.05} = 9.488$$

Analysis on Table 3 shows that, χ^2 -calculated is less than χ^2 -tabulated; thus, hypothesis three is upheld and it implies that there is no significant relationship between teachers' experience and performance of students in mathematics

Discussion

The overall result of this study showed that out of the three hypotheses generated and tested, hypotheses 2 and 3 were upheld while hypothesis 1 was not retained. These results indicate that, teachers qualification plays an important role on students achievement in mathematics and is in line with Goldhaber and Brewer (2000) who noted in their research that students perform better in mathematics if taught by qualified teachers. This outcome, like that of Darling-Hammond, Berry and Thorenson (2001) study, affirms that teachers qualification has considerable influence on effective teaching and learning outcome. This study indicate that students achievement in mathematics is not statistically significant in relation to learners' attitude. Also, findings of this study is in the same direction with that of Harris and Sass (2006). According to the researchers, the relationship between teacher experience and student achievement is difficult to interpret since this variable is highly affected by market conditions or motivation to work. Harris and Sass (2006) point to a selection bias that can affect the validity of drawing conclusions about the effect of teacher's years of experience. If less effective teachers are more likely to leave the professions, this may give the mistaken appearance that experience raises teacher effectiveness. Selection bias could, however, also work in the opposite way as more able teachers with better opportunities to earn may be more likely to leave the profession. On the part of the students, this could be due to variations in human cognitive ability in processing information because a student who is field-independent (FDI) may be wrongly assumed to have bad attitude when absent from classroom repeatedly whereas a student with slow cognitive load memory, that is, field-dependent (FD) who attends classroom regularly as means to catch up with the intellectual demands of the task ahead may be wrongly placed as having good attitude (Akanmu & Fajemidagba, 2013).

Conclusions and recommendations

In this study, one variable (teachers' qualification) was found to have statistically significant influence on the academic achievement of students in mathematics while the other variables (teachers' experience and students' attitude) were of non linear effects or no influence. This development should caution school administrators that majoring in the subject of teaching and or, certification plus teachers' formal education is predictor of quality. The revelations from students'

attitude and teacher years of experience is to first, understand the variations that are subject to manipulation in individual learning style and regard focusing on content and pedagogical skills as basic. Hence, the following recommendations are suggested:

Recruitment of a mathematics teacher should be based on formal education, certification and majoring in the subject area. This may provide teachers the more opportunities for content-focused professional development which in turn may help in quality delivery and better performance among mathematics learners. Another recommendation stemming from the findings of this study is that rather than drawing conclusion on students' attitude, there will be need to account for the variations across types of students with respect to cognitive load memory of individual learner.

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