Original Research Article

INVESTIGATING THE EFFECT OF TEACHER QUALIFICATION ON STUDENTS' PERFORMANCE IN MATHEMATICS INSTRUCTION IN ASUNAFO NORTH MUNICIPALITY

ABSTRACT

Mathematics has a positive impact on the world, but students' performance in the subject is declining. Many researchers believe that one of the causes of this decline is the lack of qualified teachers. To investigate this further, a study was conducted in the Asunafo North Municipality to examine the effect of teacher qualifications on students' performance in mathematics classrooms. The study used a descriptive survey design and included 76 participants, consisting of 60 students (WASSCE candidates) and 16 final year mathematics teachers. Data was collected through questionnaires and interviews, and analyzed using IBM SPSS version 23. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used, as well as paired samples T-test to answer the hypothesis testing. The results of the study showed that students taught by highly qualified teachers performed better than those taught by less qualified teachers. This indicates that teacher qualification has a significant impact on students' performance in mathematics. The study concludes that teacher qualification is a major factor affecting students' academic performance in mathematics. Based on the findings, it is recommended that education stakeholders in Ghana, including the Ministry of Education, should employ only qualified teachers who are graduates or masters' holders with teaching qualifications to teach mathematics at the SHS level.

Keyword: **mathematics, teachers' qualification, performance, mathematics classroom**

INTRODUCTION

Igberadja (2016) stated that education is crucial for all human activities, and it plays a significant role in the development of human capital, individual well-being, and better living opportunities. The quality of education in any country depends on the quality of its teachers. To improve students' performance in mathematics, employing qualified teachers in all schools is vital (Abe &Adu, 2013). Okuruwa (2011) found that investing in the quality of teachers' policies is closely

related to a boost in students' performance. The credentials and proficiency of teachers, such as their certification status and degree in their area of expertise, are highly relevant and positively correlated with students' learning outcomes in mathematics(Salman, 2009).

According to Abe and Adu (2013) and Ayomola (2013), teacher qualification is one of the requirements for one to become a registered teacher. Educationally qualified teachers are those who have received academic training from educational institutions and have obtained qualifications such as Bachelor of Science (B. Sc), Bachelor of Arts (B.A), Master of Arts (M.A), Higher National Diploma (HND), among others. Meanwhile, professionally qualified teachers are those who have received professional training that provided them with knowledge, skills, techniques, and aptitudes that are different from general education. They possess degrees such as Bachelor of Education (B. Ed), Bachelor of Science Education (B.Sc. Ed), Bachelor of Arts Education (B.A. Ed), Master of Education (M. Ed), and so on.

On the contrary, some researches have revealed that the educational qualification of teachers does not have a significant impact on the academic performance of their students. For example, Igwe (2015) conducted a study to assess the impact of teachers' qualifications on the academic performance of students in Mathematics subjects in Kano State. The study found no significant relationship between the qualifications of teachers and the performance of their students. Similarly, Adeniji (2018), Osokoya (2018), and Oladele (2018) observed that teachers' qualifications have only a minimal contribution to the variance in students' cognitive achievement. However, Bilesanmi (2016) and Okonwa (2012) discovered that the qualifications and experience of teachers had a highly significant impact on the academic achievement of their students in mathematics. Coonery (2015) suggested that students fail to understand mathematics when taught by ineffective teachers. Izumi and Evess (2012) supported this view by stating that

teacher quality is the most important factor among other critical factors such as quality curricula, funding, small class size, and learning situations. George (2014) attributed the poor performance of students in mathematics to teacher qualification, inadequacy of materials, as well as administrative factors.

Adesina (2016) and Fafunwa (2015) have suggested that only those with at least a Bachelor of Science (B.Sc) degree in mathematics can effectively teach secondary school mathematics syllabus, as other teachers may struggle with it. Lussa (1985) has pointed out that people cannot give what they do not possess, and that a good curriculum alone cannot achieve the desired goals without well-trained, qualified, and motivated teachers. The Ministry of Education (2004) identifies professionally qualified teachers as those who have undergone formal training in a teaching subject area and professional education, falling into various academic categories. Mkpa (2013) defines trained teachers as those who have completed their education in a formal teacher training institution or a planned training program, including principles and practice of education and internship. Such teachers should be able to perform their functions in and out of the classroom. Furrugia (2017) describes professional teachers as possessing knowledge in education theory and practice, and finding job satisfaction in contributing to their country's social, cultural, and economic development. They should also be able to understand students' abilities to benefit from the social context in which they live, and help them achieve their intellectual and social potential.

Adieze (2015) argues that the presence of untrained and unqualified teachers in the teaching profession is detrimental to the profession. He refers to them as temporary workers who cause gaps in the system whenever they find better opportunities in their original profession. Abe

(2014) suggests that it is important to compare the scores of students in mathematics achievement tests based on the qualifications of their teachers to determine the impact of formal teaching methods on the students' performance.

Problem statement

The performance of students in mathematics is greatly affected by the teaching and learning methods employed in the classroom. Unfortunately, over the years, the performance of students in this subject has been poor, which can be attributed to factors such as inadequate teaching styles, lack of qualified teachers, and insufficient use of instructional materials. These factors often result in teachers being unable to effectively impart knowledge to students. In addition, students often feel unmotivated in mathematics classrooms due to factors such as the repetitive nature of the subject and teacher-centered instructional style. Active experience and teacher qualification have been identified as crucial in the learning process. Despite efforts by the government and other stakeholders to improve student performance in mathematics, the outcome has not been satisfactory. The study aims to explore the impact of teachers' qualifications on the performance of students in mathematics in selected Senior High Schools in Asunafo North Municipality, given that poor performance in this subject has been reported by the West African Examination Council.

Objectives of the study

Specifically, the study focused on the following objectives.

1. To find out the performance of students in mathematics by teachers' qualification in Asunafo North Municipality.
2. To find out the difference in student performance in mathematics by teachers' qualification in Asunafo North Municipality.

Research questions

The research work was based on the following research questions;

1. What influence has teacher qualification have on students' performance in mathematics?
2. Is there any difference between students' performance in mathematics and teachers' qualification?

Research Hypotheses

Based on the above research question in 2, the below hypothesis was formulated. The hypotheses were denoted by null hypotheses (**H0i**) and alternative hypotheses (**HAi**) where, i =1, 2

H01: Null hypothesis:

There is a significant difference in performance of students taught with different qualification

versus

HA1: Alternative hypothesis:

There is no significant difference in performance of students taught with different qualification.

LITERATURE REVIEW

This chapter presents what other researchers and learners have documented about the impact of teachers' qualification on the performance of students. Specifically, the review covers the conceptual frame work of the research topic, the relationship between; teachers' qualification and students' academic performance and on teachers' qualification and classroom delivery. Furthermore, the review covered reasons why students mostly fail mathematics and the possible solution to the problem, and finally on other indicators of academic performance (i.e., age and academic performance, gender and academic performance, and school environment and

academic performance. This was done to deepen the researcher understanding of their field of study and as well help the researcher in shaping the objectives of the study.

Conceptual frame work

There is growing interest among educators, policymakers, and researchers in comprehending the factors that may make certain teachers more effective than others(Guarino, Hamilton, Lockwood, & Rathbun, 2006). The current emphasis on educational accountability at various levels highlights the importance of understanding these factors. However, there is limited research that links specific teacher qualifications to student achievement. A qualified teacher is defined as someone who holds a teaching certificate, possesses at least a bachelor's degree from a four-year institution, and is well-versed in their area of specialization (Usman, 2012). It is important to note that the evidence that teachers with credentials promote student achievement more effectively than those without credentials is somewhat inconclusive (Adeyemi, 2010). While some studies find small relationships between teachers' subject-matter expertise and the achievement of their students, other research finds a significant impact of teachers' qualifications on the performance of students, particularly in mathematics (Rivkin, Hamshek and Kain, 2006). Researchers have not reached a consensus on the specific teacher factors that influence students' academic achievement, which is why this research aims to shed light on the topic and assist educational policymakers in making decisions concerning the contribution of teacher qualifications to the success or failure of students in mathematics.

Teachers' qualification and students' academic performance

The researcher's perspective on the qualification of mathematics teachers is that their professional knowledge, skills, and attitudes should be based on what their students will need to know and be able to do in order to make meaningful contributions to a democratic society. While

this qualification could have a positive, negative, or no effect on students' math performance, studies show that teacher qualifications have a considerable impact on students' academic achievement. Several studies have found that teachers' experience and education significantly influence academic performance, particularly in mathematics (Olaleye, 2011). For example, fully certified mathematics teachers have a positive impact on the mathematics achievement of secondary school students. Studies done by Adeyemi (2014) shows that there is a positive relationship between teacher qualifications and academic achievement in chemistry and English languageUnanma et al. (2013). Richardson (2008) found a significant relationship between teacher qualifications and student achievement in mathematics, with a higher performance by students of mathematics teachers with 5 or more years of experience. In general, students learn more mathematics when their teachers have additional subject-specific degrees or coursework in mathematics and standard mathematics certification. However, some studies have found little to no significant correlation between teacher experience and student achievement.

Teachers' qualification and classroom delivery

The NCLB Act of 2001 mandated that teachers in schools should be "highly qualified" starting from 2005. This federal legislation defines highly qualified teachers based on their background characteristics, such as state certification, a bachelor's degree, and demonstrated subject area competence for secondary teachers. The purpose of this provision is to increase the likelihood of having effective teachers in classrooms who can promote student learning. Numerous studies have shown that the amount of learning that takes place in a classroom can be attributed to teachers' qualifications and teaching practices (Gregory & Russell, 2008). However, some scholars believe that teaching practices are more important than teachers' education, credentials,

or experience. Teaching efficacy and practices have received less attention in research literature, primarily because they are more challenging to measure(Shacter & Thum, 2004). Studies that have examined the direct measures of teaching practices of highly qualified teachers have shown significant effects on student learning. Therefore, academically and professionally qualified teachers are employed in Ekiti State to carry out instructional processes(Ahiazu& Prince, 2011). In conclusion, more research is needed to compare teachers' qualifications and their instructional practices to add to the literature on this topic.

Why students fail mathematics and the possible solution

According to Sa'ad and Usman's report in 2014, an alarming 75% of students who took the May/June 2010 WAEC exams failed to meet the minimum entry requirements for tertiary institutions. Similarly, Sa'ad and Rabiu's findings revealed that over 70% of students who took the November/December WAEC exams in the same year failed mathematics. In the same vein, only 29.17% of candidates obtained credits in five subjects, including Mathematics and English language in the November/December exams. The WAEC May/June 2014 WASSCE results also showed a massive failure in Mathematics and English language. It is crucial to note that Mathematics is a fundamental requirement for admission into prestigious courses such as medicine, engineering, and architecture, among others. However, despite its significance, poor performance in Mathematics has been a recurring issue in national examinations (Aduda, 2003). In this discussion, we will delve into the various reasons or factors that often lead to students failing Mathematics.

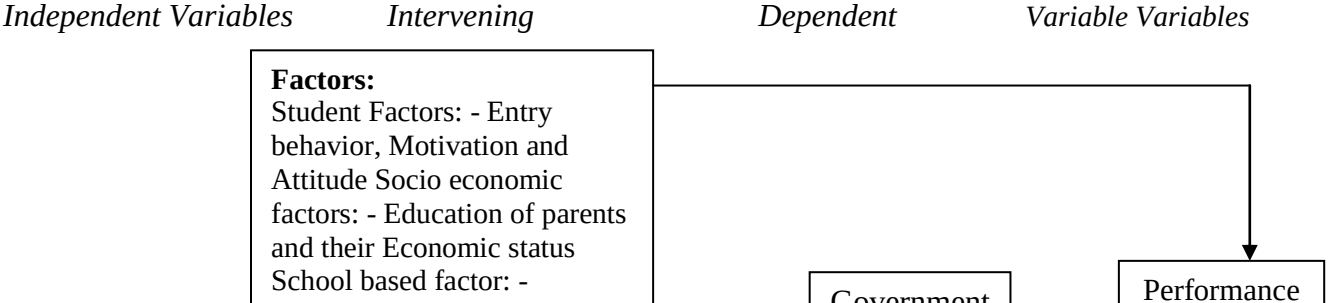

Chart 1 :Factors Contributing to Poor Performance in Mathematics (*Source: Mbugua, Kibet, Muthaa and Nkonke, 2012)*

Mbugua et al (2012) identified various factors that determine the behavior of performance in mathematics among students. These factors include student entry behavior, motivation and attitude, economic status of parents, availability and usage of teaching/learning facilities, school type, and teacher characteristics. However, they also acknowledged that government policy can affect the behavior of the dependent variable unexpectedly or can prevent the impact of the independent variables on the dependent variable. Bakare (1994) categorized factors that contribute to poor academic performance into four principal areas, such as child cognition skills, physical and health factors, psycho-emotional factors, lack of interest in the school program, family cognition stimulation/basic intuition, home discipline, lack of role model, and finance, school location and physical buildings, interpersonal relationship among school personnel, instability of educational policy, under-funding of educational sector, leadership, and job losses. Moreover, various studies have identified many causes of poor performance in mathematics among students, such as a shortage of well-trained teachers, inadequate teaching facilities, lack of funds to purchase necessary equipment, poor quality of textbooks, large classes, poorly motivated teachers, lack of laboratories and libraries, poorly coordinated supervisory activities, interference of the civil service, incessant transfers of teachers and principals, automatic promotions of pupils, the negative role of public examinations on the teaching-learning process,

and inequality in education opportunities. In addition, Stan (2002) identified various causes of poor performance in mathematics, such as acute shortage of qualified professional mathematics teachers, poor knowledge of mathematics content by many mathematics teachers, overcrowded mathematics classrooms, students' negative attitude towards mathematics, undue emphasis on the coverage of mathematics syllabus at the expense of meaningful learning of mathematics concepts, and inadequate facilities and mathematics laboratories. Furthermore, Shield and Kelly (1999) found out that the reasons for poor performance in mathematics from the point of views of principals are lack of learning support, principal teachers' dissatisfaction with the in-career training of teachers in mathematics, perceived shortage of instructional resources for teaching mathematics, learners taught by teachers who have not participated in career professional development, and mathematics contents not fully covered. Karue and Amukowa (2013) pointed out that lack of meaningful library and laboratory, qualified teachers, home environmental factors, family backgrounds, and little participation of parents in the education of their children are the main causes of poor performance in mathematics. Therefore, the causes of poor performance in mathematics among students are many and varied but they fall under school-based causes, teacher and students' personal causes. To resolve problems of massive failure of students in mathematics, Mbugua, Kibet, Muthaa, and Nkonke (2012) recommended the government to enhance the provision of teaching/learning materials and equipment to schools and extend loan facilities and bursaries to secondary school students from poor families.

Age and Academic Performance

It is evident that there is a large body of literature on the relationship between age and academic performance. The purpose of this review is to provide an overview of some of these studies in order to help guide researchers in this area. La Paro and Pianta (2000) found that older students

tend to perform better academically than their younger peers. This suggests that as people age, their brains develop, enabling them to do things that younger individuals cannot. This is especially significant when it comes to performance in subjects such as mathematics. Uphoff and Gilmore (1985) cited in Jabor et al (2011) used research evidence to argue that older and more mature students tend to fare better than their younger classmates. Tenzin (2002) reported that while younger students outperformed their peers in some subjects, older students tended to achieve at a higher level overall. However, Demies and Stearns (1992) cited in Jabor et al (2011) found no significant relationship between age and academic achievement. This suggests that age may not be a determining factor in academic performance, particularly when students receive proper teaching and are provided with an environment that promotes academic excellence. Jabor (2011) found that the oldest students achieved significantly higher scores than the youngest students at age nine, but this difference disappeared by age seventeen. This indicates that the development of the human mind occurs at an early age and is ready to handle a variety of situations thereafter. Agwagah and Harbor-Peter (1994) found in their study cited in Jabor (2011) that there were little differences between male and female students in mathematics achievement at ages nine through thirteen, but at age seventeen, females performed worse than males. Despite the numerous studies conducted on the relationship between age and academic performance, further research is needed in this area to clarify any remaining doubts.

Gender and academic performance

According to Abubakar and Uboh (2010), gender is a biological characteristic that distinguishes organisms based on their reproductive roles as male or female. In education, there has been a perception that men are better suited for difficult subjects such as mathematics, while women are better suited for other subjects(Abubakar, 2010; Eniayeju, 2010). However, recent research

suggests that this is not always true, as many studies have shown that girls perform better in school than boys in all major subjects, and they graduate from high school with higher grade point averages than their male peers(Perkins, Kleiner, Roey, &Brown, 2004). Although some studies have reported gender-related differences in academic achievement, other studies have found no significant differences between males and females in mathematics performance. Overall, more research on age and gender differences in academic achievement is needed to understand the impact that age and gender may have on students' academic performance.

School environment and academic performance

It has been observed that school buildings and classroom designs differ across countries, reflecting varying educational philosophies and available resources(Alexander, 2000). While these differences are expected, the impact of the school environment on academic performance should be a concern. The school environment encompasses a range of factors, such as safety, health, disciplinary procedures, and support services, that influence students' academic success(Oworye, 2011). A supportive school environment fosters students' learning, emotional and social development, and ethical growth, while reducing the likelihood of negative behaviors like substance abuse and violence(Mick Zais, 2011). Research has shown that the location of schools, including the geographical and noise-related factors, can impact academic achievement, with rural schools often facing resource and teacher shortages. According to Denial and Felix (2014), the school environment and peer influence are also significant factors affecting academic performance. Therefore, school authorities must focus on creating an environment that supports students' academic success and promotes their growth and development.

METHODOLOGY

A descriptive survey research design was utilized to conduct this study. Survey research involves asking participants to respond to a set of questions. A representative sample is selected from the population and studied to make inferences about the entire population. A survey was chosen as the research method because the study population, which comprised all the teachers and students, was too large to handle practically. Therefore, a sample had to be selected, and inferences were drawn from it to represent the whole population. The total population of the two schools' WASSCE candidates was 240, of which 176 were from Mim Senior High School, and the remaining 64 were from Wiredu Brempong SHS Technical. The researchers used a purposive sampling technique to select the mathematics teachers and simple random sampling to choose 60 students from the 2020 WASSCE candidates. Out of the selected students, 38 were from Mim Senior High School, and 22 were from Wiredu Brempong SHS. In total, 16 mathematics teachers participated in the study, 10 from Mim SHS and 6 from Wiredu Brempong SHS Technical. The researchers chose this technique because it was easier to obtain a representative sample.The study employed the use of a number of research instruments in order to gather needed information for the study. The instruments used were questionnaires and interview guides in answering the following research questions;What influence has teacher qualification have on students' performance in mathematics?Is there any difference between students' performance in mathematics and teachers' qualification? Both descriptive and inferential statistics were used in the process of analyzing the data obtained. The IBM SPSS version 23 was used in obtaining the percentages, frequencies, mean, standard deviation, and the standard error mean for the descriptive part. On the part of the inferential, the correlation, paired sample t-test, and t-test were used in analyzing and answering the teachers' qualification on the students' performance, the mean score of the teacher qualifications on students' performance and the hypothesis.

RESULTS AND DISCUSSION

This chapter concentrates on the discussion of data collected from the teachers of Mim SHS and WireduBrempong SHS on the effects of the qualification of teachers on the performance of students in mathematics within the Asunafo North district.

Demographic characteristics of the respondents

Respondents Work Place

This section talks about the outcome from the two selected school for the study. It gives the demographic representations of the students and the teachers under study.

Table 1: Distribution of Students by Schools

Schools	Frequency	Percent (%)
Mim SHS	38	63.3
WireduBrempong SHS	22	36.7
Total	**60**	**100.0**

Source; Field survey, 2024

Table 1 shows that the total number of students used for the study from Mim Senior High School was 38 representing 63.3%. 22 total number of students representing 36.7% were from Wiredu Brempong Senior High School.

Table 2: Gender of Students According to Schools

Sex	Frequency	Percent (%)
Male (Mim SHS)	20	33.3
Female (Mim SHS)	18	30.0
Male (Wiredu Brempong SHS)	15	25.0
Female (Wiredu Brempong SHS)	7	11.7
Total	**60**	**100.0**

Source; Field survey, 2024

From Table 2, 20 students from Mim SHS representing 33.3% of 60 respondents were male, whiles their female counterpart were 18 representing 30.0%. again, out of the 60 respondents 15 of the student from Wiredu Brempong SHS were male representing 25.0% whereas 7, representing 11.7% were female.

Table 3: Gender of Students

Schools	Frequency	Percent (%)
Male	35	58.3
Female	25	41.7
Total	**60**	**100.0**

Source; Field survey, 2024

Table 3 shows the combined gender for both schools of which 35 of the students representing 58.3% of respondents were male whereas 25, representing 41.7% were female. In all the above information indicates that the male respondents were the majority.

Table 4:Distribution of Teachers by Schools

Schools	Frequency	Percent (%)
Mim SHS	10	62.5
WireduBrempong SHS	6	37.5
Total	**16**	**100.0**

Source; Field survey, 2024

From the survey as illustrated in Table 4, the work places of the respondents shows that 10 of the teachers representing 64.3% of them were teachers of Mim Senior High School. The remaining 6of the teachers representing 35.7% of the respondents were also teaching at the WireduBrempong Senior High School. In effects majority of the respondents were staff of the Mim Senior High School.

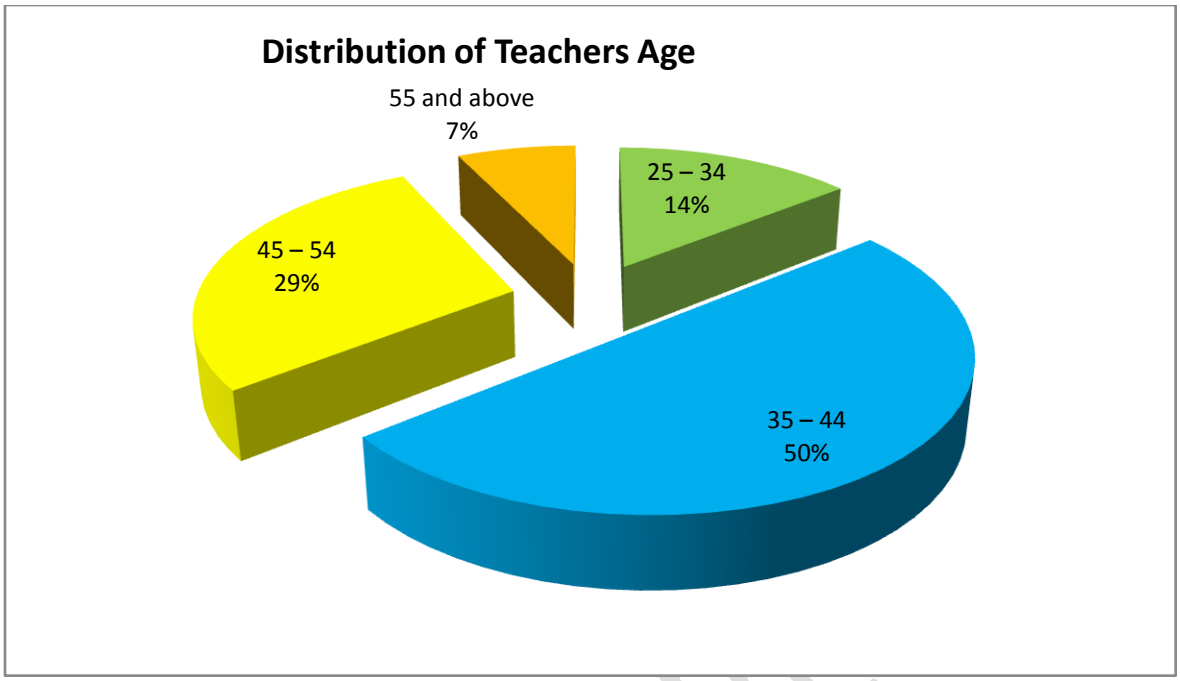

Figure 1:Pie Chart of AgeCategory of Teachers(Source; Field survey, 2023)

From the chart(Figure 1) it was realized that 50% of the respondents have their age within 35 – 44 years, followed by those who age was between 45 – 54 years (28.6%). The next age with the next higher number of the respondents was age category 25 – 34 (14.3%) and eventual 55 and above (7.1%) was the age category with the least staffs. It is clear that the respondents were made of people from all level of age.

Sex of Teachers

Table 5: Sex Distribution of Teachers

Sex	Frequency	Percent (%)
Male	14	87.5
Female	2	12.5
Total	**16**	**100.0**

Source; Field survey, 2024

In Table 5, out of 16 respondents 14 (87.5%) of them were males and the rest 2 representing 12.5% were female. This simply is the case because female mathematics teachers are not common. The researcher was made to know that mathematics is regarded as a difficult subject and that reason many females fear to venture into the field hence creating a big gap in that regard.

Teachers' Qualification

Table 6: Distribution of Teachers' Qualification

Qualification	Frequency	Percent (%)
Diploma/HND	2	12.4
M.Ed./M.A.Ed. /M.sc Ed	2	12.4
M.A / M.sc	1	6.1
B. Ed/B.A. Ed/B. Sc Ed	8	50.00
B.A / B.Sc.	3	20.1
Total	**16**	**100.0**

Source; Field survey, 2024

Results from Table 6 depicts that 8 of the respondents by qualification had their degree in education (B. Ed/B. A Ed/B.sc Ed) representing 50.0%. This was followed by 3 (20.1%) of teachers with degree without education background (B.A / B.Sc.). Lastly 2 (12.4%) the respondents by qualification hadMasters in Education and those with Diploma qualification were 2 (12.4%). Respondents by qualification with M. A /M.SC were the least with 1 (6.1%).

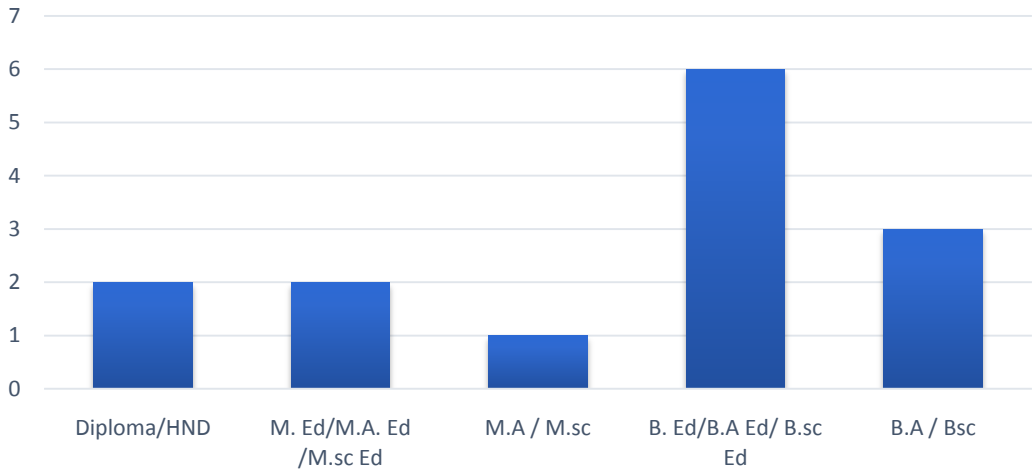

Figure 2:Bar Graph of Teacher' qualifications

Research Question 1: Does teacher qualification has influence on students' performance in mathematics?

Under this question, the researcher sought to find out the effect of teachers' qualification on the performance of students in the mathematics classroom. Again, at what level of the mathematics teacher in terms of qualification has influence on the student in the mathematics classroom. Hence, we look at the mean score on the teachers' qualification and the impact on the students' performance. A 4 – point Likert scale of 0 to 3 was use on the questionnaire instrument. The 8 items in the instrument was the unit of measurement for the means score.

Table 7: Mean Score of Teacher Qualification on Students' Performance

Parameters	Mean	N	Std. Deviation	Std. Error Mean
Students 'performance by Teachers with Diploma/ HND	1.71	57	0.47	0.13
Students' performance by Teachers with M.Ed.	3.14	60	0.54	0.14

/M.A.Ed. /M.sc Ed				
Students' performance by Teachers with M. A/M. Sc	1.86	59	0.54	0.14
Students' performance by Teachers with B. Ed/ B.A. Ed/B.Sc. Ed	3.00	58	0.56	0.15
Students' performance by Teachers with B.A/B. Sc	1.71	59	0.47	0.13

Source; Field survey, 2024

From Table 7, the findings depict that the mean performance of students by Teachers with Diploma/HND is 1.71 with a standard deviation of 0.47, and a standard error of mean to be 0.13. Students' performance by Teachers with M.Ed. /M.A.Ed. /M.sc Ed had the mean of 3.14, at a standard deviation of 0.54, and a standard error of mean 0.14. The mean of students' performance by teachers with MA/M. Sc is 1.86, with a standard deviation of 0.56 and the standard error of mean 0.15.

However, Students' performance by Teachers with B. Ed/B.A. Ed/B.Sc. Ed had the mean of 3.00 with a standard deviation of 0.56 and a standard error of mean of 0.15. Whiles Students' performance by Teachers with B. A/B. Sc had the mean 0f 1.71 with a standard deviation of 0.47 and a standard error of mean 0.13

Table 8: Correlation of Teacher Qualification on Students' Performance

Variable correlated	N	Correlation	Sig.

Classroom performance of students by teachers with higher qualification	60	0.59	0.03
Classroom performance of students by teachers with lower qualification	59	1	

Source; Field survey, 2024

Table 8 shows that there is significantly ($p = 0.03 < 0.05$) positive correlation ($r = 0.59$) in performance of students in the mathematics classroom by teachers with higher qualification to that of students by teachers with lower qualification. This implies that as the qualification of the teaches increases so their performance in the classroom also increases. Hence, teacher qualification has influence on students' performance in mathematics.

Table 9: Paired Samples T – test of the Mean Score of Teacher Qualification on Students' Performance

Variables paired	**Paired Differences**					**T**	**Df**	**Sig. (2-tailed)**
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Classroom performance of students by teachers with higher qualification & with lower qualification.	1.71	0.47	0.13	1.56	1.02	10.3	13	0.000

Source; Field survey, 2024

Table 9 shows the paired – sample T-test indicating a test statistic of 13 and p – value of 0.000 with a 13 degree of freedom. The two – tailed p – value of 0.000 is much or far less than the conventional 0.05 level of significance (0.000 <0.05). this clearly indicate that teacher qualification has influence on students' performance in mathematics and that there is difference

in students' performance in mathematics by teachers' level of qualification. It can therefore be certified that classroom students' performance in mathematics can be improve upon whenever teachers attain a higher qualification in the subject.

Research Question 2: Is there any difference between students' performance in mathematics and teachers' qualification?

Under this section, the study looks into the difference in performance of students taught by teacher with different qualifications namely, Diploma/HND versus Degree holders, Degree holders versus Masters holders, Diploma/HND versus Masters Holders and Professional teachers versus Non – professional teachers.

Table 10: T - Test on students' results with teacher's qualification

Variable	Paired Differences					T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Professional & Non-Professional teachers' students' performance	26.34	19.41	1.77	29.85	22.83	14.8	119	0.000
Diploma/HND & Degree teachers students' performance	13.42	18.19	1.66	16.70	10.13	8.08	119	0.000
Degree & Masters holders' students' performance	15.32	70.76	6.46	28.11	2.53	2.37	119	0.019
Master's & Diploma/HND teachers students' performance	28.73	70.00	6.39	41.39	16.10	4.50	119	0.000

Source; Field survey, 2024

Table 10 seeks to explain significant mean difference if any among the performance of students taught by teachers of different qualification. The T-test recorded a significant mean difference of 26.34 indicating an appreciable difference. This statistically shows that there is difference in performance of students taught by professional teachers and that of the performance of students been taught by non – professional teachers. Again, the test statistic of 14.87 and p – value of 0.000 with a 119 degree of freedom as the paired sample T – test. The two – tailed p – value of 0.000 is far lesser than the conventional 0.05 level of significance. This therefore shows that there is difference in students' performance in mathematics when taught by professional teachers or non – professional teachers. It could therefore be inferred that professional teacher have better teaching skill which enable them to teach well, hence the possible reason why their wards perform better than their counterparts.

On the performance of students taught by Diploma/HND and Degree teachers, the mean difference between the two was 13.42 which indicate a significant difference. This demonstrate that students of degree holder teachers outperformed the students of Diploma/HND holders. Again, Table 10 shows the test statistic of 8.08 and p – value of 0.000 with a 119 degree of freedom as the paired sample T – test. The two – tailed p – value of 0.000 is far less than the conventional 0.05 level of significance ($0.000 < 0.05$). This therefore shows that there is difference in students' performance in mathematics when taught by Diploma/HND holders versus Degree holders.

Furthermore, it was notices that students being taught by master's holders have performance which were not different from the performance of students being taught by degree teachers with a mean difference of 15.32, at a standard deviation of 70.00 with a standard error of the mean 6.39. Moreover, as shown in Table 11 the test statistic of 2.37 and p – value of 0.019 with a 119

degree of freedom as the paired sample T – test. The two – tailed p – value of 0.09 is greater than the conventional 0.05 level of significance (0.019 < 0.05). This therefore shows that there is difference in students' performance in mathematics when taught by degree teachers or Master's holders.

Similarly, performance of students taught by Masters' teachers and Diploma/HND had a mean difference of 28.73. This indicated that students' performance by Master's students were better as compared to student taught by Diploma/HND teachers. Their paired – sample T – test indicates that the test statistic is 4.50, p – value of 0.000 and a 119 degree of freedom. Since the two – tailed p – value of 0.000 is less than the conventional 0.05, it is therefore obvious to say that there is difference in performance of student taught by Masters' holders and Diploma/HND.

Confidently, there is a difference in students' performance in mathematics and teachers' qualification. It could conclusively be inferred that the higher the qualification of a teacher the higher his competent level and hence the higher the performance of his students in his subject.

4.5 Hypothesis testing

H01: Null hypothesis:There is a significant difference in performance of students in mathematics taught with different qualification versus

HA1: Alternative hypothesis:There is no significant difference in performance of students in mathematics taught with different qualification

Table 11: T - Test on students' results with teacher's qualification

Variable	Paired Differences					T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Professional & Non-Professional teachers' students' performance	26.34	19.41	1.77	29.85	22.83	14.87	119	0.000

Diploma/HND & Degree teachers students' performance	13.42	18.19	1.66	16.70	10.13	8.08	119	0.000
Degree & Masters holders' students' performance	15.32	70.76	6.46	28.11	2.53	2.37	119	0.019
Master's & Diploma/HND teachers students' performance	28.73	70.00	6.39	41.39	16.10	4.50	119	0.000

Source; Field survey, 2024

Table 11 shows, the test statistic of 14.87, p – value of 0.000 and a 119 degree of freedom of professional teachers' students and non – professional teachers' students' performance as the paired sample T – test. The two – tailed p – value of 0.000 is far less than the conventional 0.05 level of significance. This therefore shows that there is a significant difference in students' performance in mathematics when taught by professional teachers and non – professional teachers.

On the performance of students taught by Diploma/HND and Degree teachers, Table 11 shows the test statistic of 8.08 and p – value of 0.000 with a 119 degree of freedom as the paired sample T – test. The two – tailed p – value of 0.000 is far less than the conventional 0.05 level of significance ($0.000 < 0.05$). This therefore shows that there is significant difference in students' performance in mathematics when taught by Diploma/HND holders versus Degree holders.

However, the paired – sample T – test on Masters and Degree teachers' students' performance as shows a test statistic of 2.37, p – value of 0.019 and a 119 degree of freedom. The two – tailed p – value of 0.09 is greater than the conventional 0.05 level of significance ($0.019 < 0.05$). This

therefore shows that there is significant difference in students' performance in mathematics when taught by degree teachers or Master's holders.

Similarly, performance of students taught by Masters' teachers and Diploma/HND had a test statistic of 4.50, p – value of 0.000 and a 119 degree of freedom. Since the two – tailed p – value of 0.000 is less than the conventional 0.05, it is therefore obvious to say that there is a significant difference in performance of student taught by Masters' holders and Diploma/HND.

Finally, from the above discussions there is enough evidence to show that there is a significant difference in performance of students in mathematics taught with different qualification.

CONCLUSION AND RECOMMENDATIONS

The conclusion emanates from the findings of the study from which conclusions are derived. The recommendations are proposed base on the conclusions drawn.

Conclusion

The study has empirically revealed that teachers' qualification is a major factor that can affect students' academic performance in Mathematics. It has also shown that teacher quality is a panacea for attainment of educational goals and objectives. It is therefore not out of place for the National Policy on Education (2009) to have equivocally stated that no educational system can rise above the quality of its teachers. Teachers, therefore, need to constantly seek for ways of improving their knowledge, techniques, and pedagogical skills by always taking on part time course to move them into a qualification higher than what they hold at any point in time.

Recommendation

Following the study, the below recommendations were deemed important to be taken notice of and if possible be observed critically.

i. The stakeholders of education in Ghana including the ministry of education should ensure that only qualified teachers that are graduates or masters' holders with teaching qualification should be employed to teach mathematics at the SHS.

ii. All non-professional and unqualified teachers should be encouraged to pursue their post graduate studies such as Post Graduate Diploma in Education, Master's and Doctoral degrees in Mathematics / Education. This will help improve teachers' quality of teaching and consequently improve the academic performance of students in mathematics.

iii. The performance of students and holistically, the quality of teacher education in Ghanaians teachers should be encouraged to participate in pedagogically-oriented and content-oriented professional development activities to improve the quality of their teaching and consequently the performance of their students in tests and examinations.

iv. Teachers should be encouraged to constantly seek to update their knowledge and skills through workshops, seminars and conferences. This will keep them conceptualized the current trends in Mathematics teaching.

Declarations

Data Availability

Upon genuine request all data for the study can be made available.

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