

## IMPACT OF MATHEMATICS TEACHERS' CONTENT MASTERY ON STUDENT'S ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOLS IN ABUJA.

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### Abstract:

*This study examined the influence of mathematics teachers' content mastery on students' academic achievement in secondary schools across Abuja, Nigeria. Using a correlational research design, data were collected from 30 mathematics teachers, comprising 18 male and 12 female teachers, and 600 SS II students across the six area councils in the FCT. A multistage sampling procedure, which involved simple random techniques were used to select 30 mathematics teachers who took part in this study. The instruments used for data collection were a questionnaire and a mathematics achievement test (MAT), and the term SS II mathematics results. Data was analysed using frequency counts, percentages, and ANOVA statistics. The findings revealed that there were significant differences in the achievement of mathematics students between those taught by qualified and experienced teachers and those taught by non-professional and inexperienced teachers. There was no significant difference in the achievement of mathematics students, among those taught by male and female teachers in Senior Secondary Schools in Abuja. The findings revealed a strong, positive, and statistically significant relationship between teachers' content mastery and student academic achievement. It was also found that both teacher qualification and teaching experience had significant effects on student Achievement. The study recommends INSET teacher training, strict qualification requirements, and continuous professional development to improve teaching outcomes in mathematics.*

**Keywords:** Mathematics, Content Mastery, Academic, Achievements, Secondary Schools.

### Introduction

The mastery of content in mathematics is reflected by the achievement of the students in a given examination. Content mastery refers to the depth of subject knowledge that teachers hold in a subject matter, especially mathematics, which is an essential foundation for effective instruction. Research indicates that stronger content mastery is a key driver of student learning and achievement. When activity failed to produce a change in behaviour in the learners, it results to a problem in any given examination (OECD/UNESCO, 2009).

Lambaya & Adeniran (2022) noted that students' Achievement in mathematics subjects was low in both National and State examinations. The Achievement of students in the mathematics classroom is a major concern to mathematics teachers, parents, educational

stakeholders, and the government. An interactive activity between a teacher and the students is expected to produce learning outcomes in any academic environment. A number of reasons for the causes of low Achievement in Mathematics can be traced to the following: subject curricula, teachers' qualifications and experience, approaches of teaching, parental tales, governmental influence, lack of mathematics instructional materials, and many others. Students' low achievement in mathematics globally is basically due to pedagogy, such as a lack of students' involvement in the teaching learning processes and activities, right from the beginning of any new concept to be taught, a lack of qualified and experienced teachers in teaching mathematics, and the absence of instructional materials, which can make or destroy the learning processes. Teachers are to facilitate the teaching processes, which could be impacted into the students and the concepts expected to be learnt. (Okwuoza and Anaduaka, 2021).

Stuart (2004) opined that teachers are the major manpower saddled with the responsibility of imparting knowledge, especially the mathematics concepts that are considered fundamental to technology for secondary education. Note that a country's manpower development depends on the quality of its well-qualified teachers. Creditable objectives of any nation would not be realized when the students are taught by incompetent teachers who cannot be able to properly and adequately disseminate the concepts of mathematics to the students. The competence of the mathematics teachers in this regard would be of great value in reaching out for a professional teacher. The issue of professionalism in teaching has been on course for quite some decades. Some scholars argued the necessity of expert teachers for effective learning. Fajonyomi (2007) emphasized that the success or failure of any educational programme rest majorly on the adequate availability of professional, competent, and dedicated teachers.

Seweje and Jegede (2005) stressed that the ability of a teacher to teach is not derived only from one's academic background, but it is based on outstanding pedagogical skills acquired. This view is supported by Nkwodimah's (2003) submission that the teacher's quality will inevitably be seen in the citizens tomorrow. Oviawe (2020) found that teachers' quality influences students' academic Achievement.

Jega and Julius (2018) includes its ability to enhance the thinking capabilities of individuals by making them more creative, reasonable, rational, and imaginative. There is no school curriculum or national development planning that does not take cognizance of the usefulness and development of school mathematics. Therefore, the teaching of mathematics became imperative and essential for students. And teachers are the determinant of teaching processes, as students are the determinant of learning processes.

Okwuoza and Anaduaka (2021) stated that, to respond to the ongoing global reform in the educational and technological development of the society, teachers should be the best minds of any country, and Mathematics should be the tool to achieve the national set goals. Recent research on effective Mathematics teaching focused on instruction that promotes students' involvement in activity-based learning, which is superior to so many other expository teaching methods.

Bolarinwa et. al. (2020) opined that the teaching experience of a teacher can be measured based on the teacher's ability in terms of comprehension and transformation of knowledge and concepts to be imparted to learners. They further stated that teaching experience suggests that the most significant gains in students' Achievement will likely be realized when students receive instruction from teachers with good teaching experience. This shows that teachers' experience seems to promote self-confidence and subject mastery. Okwuoza and Anaduaka (2021) further opined that a teacher's depth of content knowledge is crucial for helping students grasp mathematical concepts effectively.

Wahab and Oduola's (2024) study examined the influence of teacher qualifications and experience on secondary school students' mathematics achievement. Using SS II end-of-term results and 75 randomly selected mathematics teachers, the researchers found significantly higher student Achievement when taught by qualified and experienced teachers. No significant gender differences were observed. These findings suggest that teacher content mastery, largely derived from qualification and experience, positively affects student outcomes.

Oludipe and Oludipe (2021) found that Basic Science teachers' years of teaching experience did not have a positive correlation with students' academic Achievement in Basic Science. In this study, experienced teachers are those who have relevant teaching qualifications, taught for five years or more, and have undergone professional training. Also, qualified mathematics teachers are those in possession of a degree in mathematics education or those with a Bachelor of Science, Art, or Technology with a Postgraduate Diploma in Education (PGDE)

Wahab and Oduola (2024) further established that students taught by teachers with postgraduate qualifications (M.Ed./M.Sc.) outperformed others. Similarly, experience mattered; students with teachers having over 10 years of teaching experience achieved higher scores. These findings reinforce the position of the OECD (2009) and UNESCO (2018), who reported that higher teacher qualifications and long-term experience positively impact classroom effectiveness and learning outcomes.

Adedayo (2008) opined that Inadequate qualified, and experienced mathematics teachers are a major challenge that is recurring in teaching mathematics in secondary schools. Many mathematics teachers are not qualified to teach effectively because they do not have a teaching qualification, thereby hindering their Achievements in the classroom, which comprises both males and females. (Adedayo, 2008) further reported that many Nigerian mathematics teachers possess general teaching credentials; they may lack depth in subject-specific knowledge, particularly in topics like algebra and geometry.

Gender differences have been an important issue among educational researchers currently. There had been different opinions and views as to the comparative ability of males and females in human chosen career, especially in education. A survey conducted by Ogbonnaya and Okunamiri (2008) on the administrative effectiveness of male and female principals in Imo state, Nigeria, revealed that female principals are more effective than their male counterparts in the management of instructional programmes, staff personnel administration, students' personnel administration, management of finance and management of physical resources while the male principals are better in school-community

relationships. Owolabi and Adedayo (2012) also noted that women are more concerned than men about the academic achievement of students and participate more in professional growth activities.

Adedayo (2008), however, observed that regardless of school gender type, male students did better than female students in all science subjects. Also, gender has nothing to do with academic ability. The major factors that could affect academic attainment, according to Adedayo (2008), included family background, personal interest, school environment, and peer group. So, since the teachers (both male and female) are professional, there is no difference in their ability to impart knowledge to the students.

### **Statement of the Problem**

Over the years, students' academic Achievement in mathematics has not been encouraging. Educational researchers are working around the clock in order to identify factors that might be responsible for the poor Achievement. Despite the huge and significant investments Nigeria government has claimed to have put into the education sector, the persistent underachievement of students in mathematics still resurfaces year in and year out, especially in external examinations such as WAEC and NECO. This remains a major concern in most secondary schools in the FCT, Abuja. Students exhibit low interest and poor achievement in mathematics, which is often attributed to inadequacies in teaching quality. Research and classroom observation suggested that many mathematics teachers may lack the depth of content mastery required to teach the subject effectively, thereby impairing students' comprehension and achievement. However, there is limited empirical data in the Abuja education sector to quantify the relationship between teachers' content knowledge and student academic Achievement. Addressing this knowledge gap is essential for improving teaching practices, informing educational policy, and enhancing student learning outcomes in mathematics.

### **Objectives of the Study**

The main objective of this study is to investigate the impact of mathematics teachers' content mastery on students' academic achievement in secondary schools in Abuja.

The specific objectives are to:

1. Examine the level of relationship between content mastery in mathematics and student academic achievement among some selected secondary schools in Abuja.
2. Investigate whether differences exist between students' mathematics achievement based on teachers' academic qualifications.
3. Examine whether there is any effect on teachers' years of teaching experience on students' Achievement in mathematics.
4. Examine whether there is any difference in the academic achievement of mathematics students taught by male and female teachers.

### **Research Questions**

1. What is the level of relationship between teacher content mastery and student academic achievement among mathematics teachers in some selected secondary schools in Abuja?
2. What is the difference between students' mathematics achievement based on teachers' academic qualifications?

3. Is there any effect on teachers' years of teaching experience on students' Achievement in mathematics?
4. What is the difference in the academic achievement of mathematics students taught by male and female teachers?

### **Research Hypotheses**

The following null hypotheses were tested at the 0.05 level of significance:

1.  $H_{0_1}$  : There is no significant relationship between mathematics teachers' content mastery and students' academic achievement in secondary schools in Abuja.
2.  $H_{0_2}$ : There is no significant difference in students' mathematics achievement based on teachers' academic qualifications.
3.  $H_{0_3}$ : There is no significant effect of teachers' years of teaching experience on students' Achievement in mathematics.
4.  $H_{0_4}$  There is no significant difference in the academic achievement of students taught by male and female mathematics teachers.

### **Methodology**

#### **Research Design**

This study adopted a correlational research design, as it seeks to establish the relationship between mathematics teachers' content mastery and students' academic achievement in secondary school mathematics. The population comprises all mathematics teachers and Senior Secondary School (SS II) students in public and private secondary schools in the six Area Councils of FCT. Abuja. The research adopted a multi-stage sampling technique involving a simple random sample of 30 mathematics teachers and 600 SS II students. Twenty (20) students were selected from each teacher's class using stratified random sampling techniques to ensure equal representation across urban and rural schools, public and private schools, and to safeguard gender balance.

Instruments for Data Collection were Mathematics Teachers' Content Mastery Test (MTCMT) A validated test assessing teachers' understanding of core mathematics concepts in the senior secondary curriculum, Mathematics Achievement Test (MAT): Standardized mathematics test administered to students to determine their level of academic achievement and Teacher Qualification and Experience Inventory (TQEI) Checklist to collect data on teacher academic qualification and years of teaching experience.

Validity and Reliability of Instruments were carried out by experts in mathematics education and educational measurement. A pilot test was conducted in a non-participating school, and reliability was measured using Cronbach's Alpha, with a reliability coefficient of  $\geq 0.70$ .

Data Analysis Techniques adopted to answer the research questions were descriptive statistics, to test for mean, standard deviation, and frequency and percentage count for assessing teacher mastery and student academic achievement, while Pearson Product-Moment Correlation (PPMC), Independent t-tests, and ANOVA were the inferential statistics used to test the hypothesis at a 0.05 level of significance.

## Results

### Research Question 1: Level of Teachers' Content Mastery

**Table 1: Descriptive Statistics of Mathematics Teachers' Content Mastery Scores**

1. What is the level of relationship between teacher content mastery and student academic achievement among mathematics teachers in selected secondary schools

Content Mastery Level	Frequency	Percentage (%)
High (70 – 100%)	10	33.3 %
Moderate (50 – 69 %)	15	50 %
Low (49 – 0 %)	5	16.7 %
<b>Total</b>	<b>30</b>	<b>100 %</b>

Interpretation: The majority (50%) of teachers had moderate content mastery, while 33.3% demonstrated high mastery and 16.7% low mastery.

### Research Question 2.

Did differences exist between students' mathematics achievement based on teachers' academic qualifications?

Qualification Level	N	Mean	Standard Deviation
NCE	6	52.8	6.2
B.Sc., PGDE, B. ED	18	65.3	5.7
M.ED, M.Sc. with PGDE and Above	6	71.9	4.4

*Interpretation:* Students taught by teachers with higher educational qualifications scored significantly higher than those taught by teachers with lower educational qualifications.

### Research Question 3.

Is there any effect on teachers' years of experience on students' Achievement in mathematics?

Teacher's Years of Experience	Students' Mean Score %	Standard Deviation
10 – 15 years and above	72.6 %	5.3
5 – 10 years of experience	61.4 %	6.7
1 – 5 years of Experience	49.1 %	8.1

*Interpretation:* Students taught by teachers with more years of experience scored significantly higher than those taught by teachers with fewer years of experience.

### Research Question 4.

What is the difference in the academic achievement of mathematics students taught by male and female teachers?

Gender	Private School	Public School
Male	51 %	48 %
Female	49 %	52 %

**Interpretation:** Students taught by male and female teachers scored approximately the same in private and public schools. This shows that gender has no significant difference in the academic achievement of mathematics in content mastery.

**Hypothesis Testing**

1. **H0<sub>1</sub>** : There is no significant relationship between mathematics teachers' content mastery and students' academic achievement in secondary schools in Abuja.

Variable	N	r	P – Value
Teacher Content Mastery	30	0.68	0.000
Student Achievement	600		

**Table 5: Result:** Significant positive correlation ( $r = 0.68, p < 0.05$ ). **H0<sub>1</sub> is rejected.** There is a strong, significant relationship between teacher content mastery and student achievement.

2. **H0<sub>2</sub>:** There is no significant difference in students' mathematics achievement based on teachers' academic qualifications.

**Table 4: ANOVA Summary of Students' Achievement by Teacher Qualification**

Source	Sum of Squares	Df	Mean Squares	F	P - Value
<b>Between Groups</b>	1340.1	2	670.05	9.76	0.000
<b>Within Groups</b>	1860.2	27	68.90		
<b>Total</b>	<b>3200.3</b>				

*Result:* There is a significant difference in student achievement based on teacher qualification. **H0<sub>2</sub> is rejected.**

3. **H0<sub>3</sub>:** There is no significant effect of teachers' years of teaching experience on students' Achievement in mathematics.

**Table 4: Table 5: ANOVA Summary of Students' Achievement by Teaching Experience**

Source	Sum of Squares	Df	Mean Squares	F	P – Value
Between Groups	1183.7	2	591.85	8.95	0.001
Within Groups	1784.5	27	66.09		
Total	2968.2				

*Result:* Teaching experience significantly affects student achievement in mathematics. **H0<sub>2</sub> is rejected.**

**H0<sub>4</sub>:** There is no significant difference in the academic achievement of mathematics students between those taught by male and female mathematics teachers.

**Table 8:** t-test result of the significant difference in the mean responses of male and female Content Mastery Levels among Mathematics Teachers

Gender	N	Mean	SD	df	Level of Significance	t-cal.	t-critical	Remark
Male	18	2.15	0.76	27	0.05	26.12	2.00	Non-Sig.
Female	12	2.92	0.84					

The table above shows that the t-calculated value of 26.12 is greater than the t-critical value of 2.00, hence the Null hypotheses is hereby rejected. This implies that there is a significant difference in the mean responses of male and female Content Mastery Levels among Mathematics Teachers.

### Discussion of Findings

Content Mastery Levels among Mathematics Teachers in the study revealed that only 33.3% of mathematics teachers demonstrated high content mastery, while the majority (50%) had a moderate level. This result aligns with earlier studies (Adedayo, 2008), which reported that while many Nigerian mathematics teachers possess general teaching credentials, they may lack depth in subject-specific knowledge, particularly in topics like algebra and geometry. Students' Achievement Relative to Teacher Mastery shows there was a significant difference in students' academic achievement based on their teachers' content mastery. Students taught by teachers with high mastery scored significantly higher mean = 72.6%, compared to those with teachers of low mastery mean = 49.1%. This supports findings from Okwuoza and Anaduaka (2020) shows that a teacher's depth of content knowledge is crucial for helping students grasp mathematical concepts effectively.

Teacher Qualification and Experience further established that students taught by teachers with postgraduate qualifications (M.Ed./M.Sc.) outperformed others. Similarly, experience mattered; students with teachers having over 10 years of teaching experience achieved higher scores. These findings reinforce the position of the OECD (2009) and UNESCO (2018), who reported that higher teacher qualifications and long-term experience positively impact classroom effectiveness and learning outcomes. Correlation between content mastery and student achievement using Pearson correlation coefficient of  $r = 0.68$ ,  $p < 0.05$  confirmed a strong positive relationship between teacher content mastery and student Achievement in mathematics. This finding is consistent with national studies in Ibadan, Gombe, and Port Harcourt, where similar relationships have been documented.

### Conclusion

Content mastery among mathematics teachers in secondary schools, particularly in Abuja, is significantly associated with improved student academic achievement. Strong qualifications and experience underpin such mastery. To elevate student outcomes, a combined emphasis on rigorous teacher recruitment, ongoing professional development, and instructional support systems is imperative.

### Recommendations

Based on the findings, the following recommendations were made:

- 1. Strict Teacher Recruitment Standards:** Ministries of Education should ensure that only teachers with a minimum of a bachelor's degree in mathematics, having PGDE

or mathematics education, are employed to teach the mathematics subject in the senior secondary schools.

2. **Continuous Professional Training Development (CPTD):** Organize frequent workshops, seminars, and refresher courses focused on deepening teachers' content mastery and pedagogical content knowledge.
3. **Mentoring and Peer Support Systems (MPSS):** Senior teachers with high content mastery should mentor younger or less experienced teachers through structured peer-coaching programs.
4. **Monitoring and Evaluation:** School administrators should frequently evaluate teaching effectiveness through classroom observations, student feedback, and periodic teacher testing.
5. **Upgrading Qualifications:** Teachers with only NCE or related diplomas should be encouraged and supported to upgrade their qualifications to B.Ed or B.Sc with PGDE and a master's degree.
6. **Technology Integration Training:** Teachers should be trained in Technological Pedagogical Advancement Content Knowledge (TPACK) to enhance content delivery using modern digital tools.

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