



TEACHERS' PROFESSIONAL COMPETENCIES AS DETERMINANTS OF STUDENTS' ACADEMIC ACHIEVEMENT IN MATHEMATICS IN UYO EDUCATION ZONE OF AKWA IBOM STATE, NIGERIA.

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ABSTRACT

This study examined teachers' professional competencies as determinants of students' academic achievement in Mathematics in Uyo Education Zone of Akwa Ibom State, Nigeria. Two hypotheses were formulated to guide the study. Literature relating to the variables under study was reviewed. Ex-post facto research design was adopted. A sample of 800 out of 7479 students was selected using stratified and simple random sampling procedure. The instruments titled Teachers' Professional Competencies (TPC) and Mathematics Academic Achievement Test (MAAT) Items were used for data collection. The reliability estimate of the TPC was established using Cronbach Alpha giving a reliability estimate of .78 for teachers' lesson presentation and .79 for teachers' knowledge of the subject mastery while MAAT was established using Kuder Richardson formula K-R20 at .80. These estimates having met the criterion for stability, warranted in use for data collection. Linear Regression was adopted to test the two hypotheses at .05 level of significance. The result of the analysis revealed that teachers' lesson presentation and teachers' knowledge of subject mastery significantly predicts students' academic achievement in Mathematics. Based on this finding, it was recommended among others that teachers should regularly attend conferences, seminars and workshops of stakeholders in education in order to improve their competence in lesson presentation, subject mastery and enhance students' academic achievement in Mathematics.

KEYWORDS: Teacher knowledge of subject mastery, Teacher lesson presentation, Teachers' professional competencies, Mathematics achievement.

INTRODUCTION

The contribution of mathematics knowledge to global development and its importance to individual functioning are reasons for giving mathematics high priority at all levels of education programmes.

Despite importance of Mathematics as a subject; a requirement for daily business transaction, and skills for self accountability, a veritable tool for future career and a fundamental machinery for national progress, it remains a subject which students' achievement over the years has been

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dwindling (Ibok, Meremikwu, & Umoh, 2020). This ugly trend of high failure rate in Mathematics is a national challenge. The dwindling performance in mathematics has often been attributed to teachers' professional competences. The poor performance of students in senior secondary certificate examination (SSCE) and West Africa Senior School Certificate Examination (WASSCE) is an indication of the decline in performance, which seemed to be accounted for by poor classroom teaching, knowledge of the subject matter and teachers' lesson presentation. Studies (Abreh, Owusu & Amadahe, 2018; Kalhotra, 2013 and Sa'ad, Adamu, & Sadiq, 2014) into the causes of these abysmal performances of students in mathematics especially their performances in WASSCE in the sub-region, have identified factors such as students' attitude, inappropriate or poor teaching strategies, teacher competencies and lack of motivation as some of the causes. Research reports from Olunloye (2010) revealed that many reasons accounted for students' poor achievement in Mathematics. Among these are teacher competencies poor teaching approaches, lack of confidence in the subject, poor attitude towards the subject and learning environment.

. Teachers' competencies which consists of teachers' lesson presentation, knowledge of subject matter) determined the achievement of the objectives of the lesson delivered, this invariably may affect students' performance in schools. Well qualified and competent teachers are better placed to manage their classrooms effectively than others (Masor, Ibok, & Etura, 2023). These actions may not be instructional in nature but they facilitate instruction and enhance students' academic performance. Teacher professional competencies is the combination of knowledge, skills, behavior used to improve performance, or as the state or quality of being adequately qualified and capable of performing a given role. Olunloye (2010) see teachers' professional competencies as combination of knowledge, skills, attitudes, values, and personal characteristics, that enabling the teacher to act professionally and appropriately in a situation. Professional competencies are both academic and pedagogical. Academic competencies are the teachers' knowledge of his

subject while Pedagogical competency is the art of teaching the subject, observing such principles as teaching from known to unknown, concrete to abstract and from simple to complex (Ibok & Unoh, 2019). A teacher who doesn't have both the academic and pedagogical competencies would undoubtedly have a negative influence on the teaching and learning of his/her subject.

Teacher professional competencies are the skills and knowledge that help a teacher be successful in teaching. To enhance student learning, teachers must have expertise in a wide range of teaching competencies so that they are able to deal with every student having different learning styles. Teachers seem to have an important influence on students' academic achievement and also play a crucial role in mathematical attainment. Teachers are ultimately responsible for translating policy into action and principles based on practice during their interaction with the students. No matter how well-developed and comprehensive a curriculum is, if it is not properly interpreted to a useable form it may not be seen as good. Its success is dependent on the quality of the teacher implementing it (Ibok & Unoh, 2019). Lesson presentation is refers to as effective use of selected resources, effective use of voices, hand, parts of the body, ability to demonstrate as the need arises, and effectiveness of class control and management (Masor, Ibok, & Etura, 2023). It is often seen as that act of imparting knowledge or transmitting information to the learner. According to Pantziara, and Philippou (2013), lesson presentation is important because they help keep a presentation interesting, help the presenter communicate with confidence, and motivate the audience to listen.

A good lesson presentation of teachers provide significant improvements to students' academic achievement in Mathematics (Masor, Ibok, & Etura (2023). Popoola and Oluwanife (2016) in their study on effects of teachers' lesson study on Ekiti State secondary school students' academic achievement in Mathematics found a significant influence of teacher lesson presentation on students' academic achievement in mathematics. Study conducted by Azuka, Jekayinfa, Durojaiye and Okwuoza (2013) on difficulty topics in the new senior secondary school mathematics curriculum found lesson presentation as one of the factors that influence effective teaching and learning Mathematics in schools. Akanni (2015) also found that teachers'

impact on students' achievement are hang on teachers' ability present the lesson to students' understand. Mensah and Nabie (2021) in their study found that approach to teaching and learning and lesson presenting mathematics concepts could promote students' motivation and increased achievement in mathematics. The deficiencies in Mathematics teaching according to Popoola (2013) ranges from failure to; cover contents in schemes of work, give and mark assignments, supervise instruction, properly handle instructional materials to be used during lessons, assess learning outcomes regularly and lesson presentation. Several research studies conducted such as (Eyyam & Yaratana, 2014; Tay & Mensah-Wonkyi, 2018 and Zengin, Furkan & Kutluca, 2012) found lesson presentation positive impact on students' academic achievements. Good lesson presentation facilitate the delivery of mathematics concepts and make learning easy for students. According to Baffoe and Mereku (2010), good lesson presentation leads to the achievement of set objectives and also sustains the learners' attention in the learning of the subject matter. A teacher may have good mastery of the subject matter but the choice of method of presentation may reduce or enhance his effectiveness in imparting such knowledge to the learner. The communication which takes place between students and teacher determines the degree of achievements of the students. Teaching of mathematics requires continuous reflection, lesson presentation and decision making before, during, and after classroom instruction (Buabeng-Andoh, 2012; Mensah-Wonkyi, & Adu, 2016 and Sparrow, Kissane & Hurst, 2010).

Mastery of subject matter refers to the level at which the teachers posses a good grasp of knowledge of the subject he teaches and skills necessary for teaching the subject. Adunola, (2011) saw teachers' mastery of the subject matter as necessary characteristics which enables the teachers to communicate concepts, ideas, and principles in a way that would facilitate effective learning. A teacher that masters his subject matter teaches very well. He is able to perform his duty efficiently and effectively. Students understand lesson more and with keen interest when lesson was taught by a teacher who master his subject matter very well.. He is capable of developing and implementing curriculum. Teacher subject mastery is an important aspect of the teaching

profession. Subject mastery enables the teacher to simplify topics in the language that can easily be understood by the learners (Ibok, Undie. Masor, Unoh & Etura, 2023).

The mastery of subject matter empowers the teacher with knowledge for critical thinking and the capacity to help their learners to grasp the appropriate knowledge, skills, attitudes and values.. According to Lydiah, Ngugi, and Thinguri (2014), it is of necessity that teachers master the subject matter before imparting it to learners since it enables the teacher to adequately prepare for content delivery. Awofala and Lawani (2020) examine the effect of increasing mathematics achievement of senior secondary school students through differentiated instruction and found teacher master of subject area significantly influence students' academic achievement in schools. Studies conducted by Awofala. (2017), on assessing senior secondary school students' mathematical proficiency as related to gender and performance in mathematics in Nigeria have found a consistent relationship between teacher subject matter knowledge and students' academic achievement in schools. Also, Yu and Singh (2016) in their studies on teacher support, instructional practices, student motivation and mathematics found that teacher's knowledge of subject matter significantly influence students' performance in schools. This is in line with the findings of Olowoyeye and Sunday (2014) whose studies revealed that teachers' subject mastery is significant and necessary to students' performance.

Buabeng-Andoh (2012) identified teacher knowledge of the subject matter as a factor that affected effective teaching and learning in schools. Duru, Dominic, Zugwai, Udoha, and Ochuba (2020) examine the effects of teacher subject mastery on the academic performance of secondary school students in Jalingo Local Government Area of Taraba State and found teacher subject mastery significantly predict students' academic performance. Subject mastery improves the quality of teaching, inspires the students and improves their academic performance. Subject mastery extends to understanding the content of a subject as well as knowing how to teach the subject. Adequate knowledge of the subject matter helps the teacher to teach the learners correctly.

Purpose of the study

The main of this study is to examine teachers' professional competencies as determinants of students' academic achievement in Mathematics in Uyo Education Zone of Akwa Ibom State, Nigeria. Specifically, the study seeks to determine;

i) the extent to which teacher lesson presentation predicts academic achievement of students' in Mathematics

ii). the extent to which teacher knowledge of subject mastery predicts academic achievement of students' in Mathematics

Research questions

The following research questions were posed

i) How does teacher lesson presentation predicts academic achievement of students' in Mathematics?

ii). How does teacher knowledge of subject mastery predicts academic achievement of students' in Mathematics?

Hypotheses

The following null hypotheses were formulated to guide the study.

i). Teacher lesson presentation do not significantly predicts academic achievement of students' in Mathematics

ii). Teacher knowledge of subject mastery do not significantly predicts academic achievement of students' in Mathematics

METHODOLOGY

The study area was Uyo Education Zone of Akwa Ibom State. The research designed adopted is Ex-post facto design. Ex-post facto research is a method of testing possible antecedents of events that have happened and cannot, therefore, be manipulated. The information collected from the sample through the questionnaire was quantified, analysed and interpreted using appropriate statistical techniques, which allowed for valid generalizations.

The population for the study consisted of all SS 11 students in public mixed secondary schools in Uyo, Education Zone of Akwa Ibom State Nigeria. There are seven thousand four hundred and seventy-nine (7479) SS II students including males and females. A multi-stage sampling technique involving stratified, proportionate and simple random techniques were adopted in selecting students for the study. The schools were stratified based on gender and local government area. From a total of 78 public secondary schools, 25 (32%) schools were randomly selected for the study, from the selected schools in each local government area, 11% of the total number of students were selected using proportional random sampling technique, giving a total sample of 800 students for the study.

Two instruments were used, a structured four point Likert scale questionnaires titled "teachers' professional competencies" and Mathematics achievement test were constructed by the researchers. The questionnaire consisted of two sections (A&B). Section A described the bio-data of the respondents while section B dwelt on the main variables which include teachers' lesson presentation and teachers' knowledge of subject mastery. The questionnaire was based on four-point Likert scale used in measuring respondent's level of agreement or disagreement, namely; Strongly agreed, Agreed, Disagreed and Strongly disagreed. The instrument was face validated by two experts in measurement and evaluation from the University of Calabar. The reliability estimate of the questionnaire was established through Cronbach Alpha reliability which give .78 for teachers' lesson presentation and .79 for teachers' knowledge of the subject mastery while students' achievement test in Mathematics was established through Kuder Richardson formula K-R20 which give .80.

The statistics package for social sciences (SPSS) computer programme was used to analyze the data collected. The hypotheses were tested using Simple Linear Regression Analysis for the two hypotheses of the study.

RESULTS

The result of the analysis is presented in the table 1 & 2. The hypotheses were tested at .05 significance level.

Hypothesis one: Teacher's lesson presentation do not significantly predicts academic

achievement of students' in Mathematics. The independent variable in this hypothesis is Teacher's lesson presentation while the dependent variable is students' academic achievement in Mathematics. To test this hypothesis, Simple Linear regression was used. The F-ratio test was used to test for the significance of the overall prediction model, while t-test was used to test for the significance of the contribution of the regression constant and coefficient (which represents the predictive power of the independent variable) in the prediction model. The mean and standard deviation of the variables were also computed. The results are presented in Table 1.

TABLE 1: Regression analysis of teacher's lesson presentation as predictors of academic achievement of students' in Mathematics.

Variables	X	SD			
Teacher's lesson presentation	15.89	3.88			
Mathematics achievement	25.65	5.89			
R-value = .344		Adjusted R-squared = .115			
R-squared = .118		Standard error = 3.78656			
Source of variation	Sum of squares	Df	Mean square	F-value	R-value
Regression	4181.342	1	4181.342	106.328*	.000
Residual	31381.370	798	39.325		
Total	35562.712	799			
Predictor variable	Unstandardized coefficient B	coefficient Std.error	Std.coeff	t-value	p-value
Constant	54.342	1.453		37.399*	.000
Teacher's lesson presentation	1.546	.065	.076	23.785*	.000

- Significant at .05 level. $P < .05$

The results in Table 1 show that the R-value of .344 was obtained, resulting in an R-squared value of .118. This means that the variation of teacher's lesson presentation accounted for about 11.8 % of the total variation in academic achievement of students in Mathematics. The p-value (.000) associated with the computed F-value (106.328) was less than .05. As a result, the null hypothesis was rejected. This means that teacher's lesson presentation significantly influence academic achievement of students in Mathematics, with both the regression constant (54.342) and coefficient (1.546) contributing significantly in the prediction model ($t = 37.399$ & 23.785 respectively, $p = .000$ & $.000 < .05$).

Hypothesis two: Teacher's mastery of subject matter do not significantly predicts academic achievement of students' in Mathematics. The independent variable in this hypothesis is Teacher's mastery of subject matter while the dependent variable is students' academic achievement in Mathematics. To test this hypothesis, Simple Linear regression was used. The F-ratio test was used to test for the significance of the overall prediction model, while t-test was used to test for the significance of the contribution of the regression constant and coefficient (which represents the predictive power of the independent variable) in the prediction model. The mean and standard deviation of the variables were also computed, The results are presented in Table 2.

TABLE 2: Regression analysis of teacher's mastery of subject matter as predictors of academic achievement of students' in Mathematics.

Variables	X	SD
Teacher's mastery of subject matter	14.68	3.45
Mathematics achievement	25.65	5.88
R-value = .321 R-squared = .103		Adjusted R-squared = .101 Standard error = 3.43212

Source of variation	Sum of squares	Df	Mean square	F-value	R-value
Regression	3662.654	1	3662.654	91.624*	.000
Residual	31900.058	798	39.975		
Total	35562.712	799			

Predictor variable	Unstandardized coefficient B	Std.error	Std.coeff	t-value	p-value
Constant	48.432	2.082		23.262*	.000
Teacher's mastery of subject matter	1.654	.077	.099	21.481*	.000

- Significant at .05 level. $P < .05$

The results in Table 2 show that the R-value of .321 was obtained, resulting in an R-squared value of .103. This means that the variation of teacher's mastery of the subject matter accounted for about 10.3 % of the total variation in academic achievement of students in Mathematics. The p-value (.000) associated with the computed F-value (91.624) was less than .05. As a result, the null hypothesis was rejected. This means that teacher's mastery of subject matter significantly influences academic achievement of students in Mathematics, with both the regression constant (48.432) and coefficient (1.654) contributing significantly in the prediction model ($t = 23.262$ & 21.481 respectively, $p = .000$ & $.000 < .05$).

DISCUSSION

The result of the first hypothesis revealed that teacher's lesson presentation do significantly predicts academic achievement of students' in Mathematics. The finding is in agreement with Ibok and Unoh (2019) who stated that well qualified and competent teachers are better placed to manage their classrooms effectively than others. A good lesson presentation of teachers provides significant improvements to students' academic achievement in Mathematics. According to Pantziara, and Philippou (2013), lesson presentation is important because they help keep a presentation interesting, help the presenter communicate with confidence, and motivate the audience to listen. The finding is in support of Popoola and Oluwanife (2016) who in their studies on effects of teachers' lesson study on Ekiti State secondary school students' academic achievement in Mathematics also found a significant influence of teacher lesson presentation on students' academic achievement in mathematics. Study conducted by Azuka, Jekayinfa, Durojaiye and Okwuoza (2013) on difficulty levels of topics in the new senior secondary school mathematics curriculum found lesson presentation as one of the factors that influence effective teaching and learning Mathematics in schools.

The finding also agreed with Mensah and Nabie (2021) who found teachers' lesson presentation of mathematics concepts to promote students' motivation and increased achievement in mathematics. The finding agreed with the studies conducted by (Eyyam & Yaratana, 2014; Tay & Mensah-Wonkyi, 2018 and Zengin, Furkan & Kutluca, 2012) who found lesson presentation significantly influence students' academic achievements. According to Baffoe and Mereku (2010), good lesson presentation leads to the achievement of set objectives and also sustains the learners' attention in the learning of the subject matter.

The result of the second hypothesis revealed that teacher's mastery of the subject matter do significantly predicts academic achievement of students' in Mathematics. The finding is in agreement with Adunola (2011) who saw teachers' mastery of the subject matter as necessary characteristics which enables the teachers to communicate concepts, ideas, and principles in a way that would facilitate effective learning. The finding is in consonance with Lydiah, Ngugi, and Thinguri (2014) who stated that teachers should possess mastery the subject matter before imparting it to learners since it enables the teacher to adequately prepare for content delivery. The finding is in line with Awofala and Lawani (2020) who found master of subject area significantly influence students' performance in schools. The finding agreed with studies by (Buabeng-Andoh, 2012; Mensah-Wonkyi & Adu, 2016 and Sparrow, Kissane, & Hurst, 2010) who found teacher master of subject matter to determines the degree of achievements of the students. The finding also agreed with Awofala (2017) who found a consistent relationship between teacher subject matter knowledge and students' academic achievement in Mathematics in schools. Yu and Singh (2016) in their finding on teacher support, instructional practices, student motivation, and mathematics found that teacher's knowledge of subject matter significantly influence students' performance in schools.

This is in line with the findings of Duru, Dominic, Zugwai, Udoha and Ochuba (2020) examine the effects of teacher subject mastery on the academic performance of secondary school students in Jalingo Local Government Area of Taraba State and found subject mastery significantly predict students' academic achievement.

CONCLUSION

Teacher professional competencies is the combination of knowledge, skills, behavior used to improve performance, or as the state or quality of being adequately qualified and capable of performing a given role. Adequate knowledge of the subject matter and lesson presentation helps the teacher to teach the learners Mathematics to understanding. Based on the finding of this study, it could be concluded that teacher lesson presentation and knowledge of subject matter become very necessary and essential because it enhances academic performance in Mathematics. Therefore, teacher lesson presentation and knowledge of subject matter are very important factors and should be considered to enhance students' academic performance in Mathematics.

RECOMMENDATIONS

Based on the finding of the study, the following were recommended

- i. Teachers should be given opportunity for professional development programme in order to improve their competence in lesson presentation, subject mastery through by regularly attending conferences, seminars and workshops of stakeholders in education to enhance students' academic achievement.
- ii. Knowledge of subject mastery should be a criterion for recruitment of teachers in secondary schools to improve students' academic performance and reduce the rate of examination malpractice
- iii. School administrators should devise means to identify and tackle weaknesses in teachers' subject knowledge, such as linking with partner schools, inviting advanced skilled teachers or other experts and periodic organising of professional development programmes for teachers

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