Teacher Instructional Behaviour as a Predictor of Students' Academic Performance in Mathematics in Calabar Education Zone of Cross River State, Nigeria

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Abstract
This study adopted Ex-post facto design to examine teacher instructional behaviours (lesson presentation, and classroom management skills) as predictors of students' academic performance in Mathematics. It was guided by two research questions and five null hypotheses. A sample of one thousand, two hundred and twenty five (1,225) Senior Secondary II students was selected from public schools using the stratified random sampling technique. Two instruments, Teachers' Instructional Behaviour Questionnaire (TIBQ) and Mathematics Performance Test (MPT), were used for data collection. The reliability of the questionnaire, established using Cronbach Alpha, was .84 for teacher lesson presentation and .82 for teacher classroom management while the reliability estimate of the Students' MPT was established through Kuder Richardson formula K-R20 which gave .81. The hypotheses were tested using Simple Linear Regression Analysis at .05 level of significance. The findings of the study revealed that teachers' lesson presentation significantly but negatively predicts students' academic achievement in Mathematics, teachers' classroom management does not significantly predict students' academic performance in Mathematics. Based on the findings of this study, it was recommended amongst others that teachers should improve their competence of lesson presentation through attending conferences, seminars and workshops in Mathematics education to enhance students' academic performance.
Keywords: teacher, instructional, behaviour, Mathematics, performance

Introduction

Mathematics is recognized worldwide as one of the most important subjects in most fields of human endeavours. Its usefulness in science, technological activities, commerce, economics, education and even humanities is almost at par with the importance of education as a whole. This implies that for one to function well in the society and in this era of technological advancement, one must possess relatively good knowledge of mathematics (Bosson-Amedenu, 2018). However, it is worthy to note that in spite of the great position that Mathematics occupies in one's life as well as its significant role in the scientific and technological advancement of any nation, it remains a subject for which students'

performance over the years, (especially between the eighties to present time) have been deplorable and miserable (Ibok et al., 2020).

The continued decline of students' academic performance in Mathematics examinations such as the Senior School Certificate Examination (SSCE) and University Tertiary Matriculation Examination (UTME) demands a critical study. In recent times, Nigeria has experienced a declining trend in Mathematics performance in public secondary schools (Ibok et al., 2020). The continued poor academic performance in Mathematics might be an indication that the outcome rate of learners in Mathematics has declined steadily through the years which is attributed to several factors including teachers' factors, students' factor, environmental factor, among others. Mathematics, like many other science subjects, requires many skills for effective and successful teaching. Unfortunately, many teachers at secondary schools may not have been properly equipped to teach Mathematics (Abreh et al., 2018). Consequently, such teachers teach Mathematics without reflecting on students' life experiences in their environment, and their lessons always remain at the abstract level of cognition. This inadequate background in Mathematics rather makes those teachers of mathematics in secondary schools impatient with their students which in turn generates fear and anxiety among the students as a result of classroom instructional behaviours (Ibok et al., 2023)

Classroom instructional behaviour is a description of observable actions exhibited by both teachers and students in the course of carrying out different activities during teaching and learning. Behaviour may be positive or negative, effective or ineffective. According to Ibok and Unoh (2019), effective instructional behaviour produces the requisite results. Good teacher instructional behaviours often result in positive classroom interactions that invariably would improve students' academic achievement. It is also assumed that teachers who possess adequate professional and interpersonal skills are more effective in classroom instructions and thus improvement of students' academic performance. Quality education depends a lot on instructional behaviour of teachers. A teacher is one who imparts knowledge and who through that process, interacts with the students and effect changes in them. According to Armah et al. (2017), the systematic requirements of classroom setting depend on the structure of classroom interactions and classroom tasks since the teaching-learning process essentially involves the verbalization and manipulation of academic tasks. Ibok and Unoh (2019) stated that teacher instructional behaviours can reduce negative emotions among the students such as anger, sadness, dissatisfaction, boredom, fear and anxiety. Some teacher instructional behaviours that may influence students' academic performance in Mathematics are identified for this research study. These include lesson presentation and classroom management.

Lesson presentation is often seen as that act of imparting knowledge or transmitting information to a learner. Khan et al. (2017) defined lesson presentation as the transmission of message that involves the shared understanding between the contexts in which the communication takes place. According to Zagyváné (2017), 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. This implies that lesson presentation promotes students' motivation and increased their achievement in mathematics. Awofala (2017) stated that good lesson presentation leads to the performance of set objectives and also sustains the learners' attention in the learning of Mathematics.

Awofala and Lawani (2020) argued that teacher's adequate lesson presentation minimizes the chances of misunderstanding among students.

Semir (2018) stated that teachers' lesson presentation determines the degree of achievements of the students and enhances students' understanding of the concepts. When instructors communicate with their students in a supportive manner, they establish a classroom climate in which communication is efficient and characterized by few distortions, effective listening behaviours, and clear message transmission. Mensah and Nabie (2021), in their study, found that approach to teaching mathematics concepts significantly influences students' performance. Kamayubonye and Mutarutinya (2023) investigated the effects of teachers' quality on students' performance in Mathematics in Kamonyi District, Rwanda and found that teachers' lesson presentation significantly influences students' performance in Mathematics

In a study conducted by Iyamuremye et al. (2021) on the influence of teaching approaches on students' performance in Mathematics: A meta-analysis of Quasi-Experimental Studies in Africa, they found a significant influence of teachers' lesson presentation on students' performance in Mathematics. In addition to feedback, lesson presentation and collaboration has been found to be an important quality of teachers. Studies conducted by Rustam and Ramlan (2017), Ibok and Unoh (2019) agreed that for effective teaching to take place, the teacher needs to have good communication skills, good classroom management, updated knowledge and personality. A teacher with good presentation skills always makes things easier and understandable. To teach in accordance with the ability and capability of students, a teacher needs to present his/her lesson in the way it will motivate the students toward their learning process (Semir, 2018). Therefore, good lesson presentation of teachers are a basic requirement for bringing about academic success of students.

Classroom management skills can be seen as the teacher's ability to supportively manage time, space, resources, students' roles and students' behaviours to provide a climate that encourages the learning process. According to Malik and Rizvi (2018), classroom management are the ways in which students' behaviour, movement and interaction during a lesson are organized and controlled by the teacher to enable teaching to take place most effectively. A good classroom management allows the students to behave well and be motivated and focused, enhancing their interaction with the whole class. The basic purpose of classroom management skills is to encourage students towards learning and to promote their positive behaviours (Ibok & Unoh, 2019).

Dijk et al. (2019) examined relationship between classroom management and mathematics achievement: A multilevel structural equation model. Data included behaviour management subscale scores of the classroom assessment scoring system for 247 teachers. The results of the analysis indicate that teachers' classroom management skills have a significant direct effect on students' motivation and a significant indirect effect on students' Mathematics achievement. Tacadena (2021), in a study aimed to determine the relationship of classroom management and students' learning in mathematics, found that classroom management skills significantly relate with students' mathematics performance in schools.

Ahmad (2020) examined the influence of classroom management in Mathematics class: University Students' Perception, and found a significant influence of classroom

management on Mathematics performance. Abisola and Adam (2017) investigated effective classroom management and students' academic performance in secondary schools in Uyo Local Government Area. The survey design was adopted for the study. The result of the finding using Pearson Product Moment Correlation (PPMC) coefficient indicated that SS1 students in public secondary schools in Uyo Local Government Area differ significantly in terms of academic performance based on classroom management. Nisar et al., (2019) examined the association and connection between the classes managing practices and activities used by secondary school teachers and the students' academic achievement. Correlational research design was used for this study. A sample of 550 secondary school teachers was selected conveniently from 50 government schools of district Kohat; the result of the finding showed that secondary school teachers' classroom management practices significantly influence academic achievement of secondary school students. Similarly, Abdullah (2021) examined effective classroom management and students' academic performance in secondary schools in Yola South Local Government Area of Adamawa State and found classroom management as an important part of the teaching process which could enhance students' performance in mathematics.

Research questions

This study was guided by the following research questions:

i) How does teacher lesson presentation predict students' academic performance in Mathematics?

ii) How does teacher classroom management predict students' academic performance in Mathematics?

Hypotheses

The following null hypotheses were formulated, at 0.05 significant level, to guide the study:

Ho1: Teacher lesson presentation does not significantly predict students' academic performance in Mathematics.

Ho2: Teacher classroom management does not significantly predict students' academic performance in Mathematics.

Methodology

The study area was Calabar Education zone of Cross River State, Nigeria. The research design used for this study was the ex-post facto design. The researchers used this design because the independent variables which are teacher lesson presentation and classroom management techniques were variables that had occurred already and the researchers had no direct control over them. The population for the study consisted of all the senior secondary school II (SSS 2) students in Calabar Education Zone of Cross River State which made up of seven (7) Local Government Areas namely: Akamkpa, Akpabuyo, Bakassi, Biase, Calabar Municipality, Calabar South and Odukpani. There are eighty-five (85) public secondary schools and four thousand, two hundred and twelve (4,212) SSS 2 students which comprises of 2,354 (55.9%) females and 1,858 (44.1%) males. A multi-stage sampling technique, involving stratified, proportionate and simple random sampling techniques, was adopted in selecting 1225 SSS 2 students of the 2018/2019 academic session from 20 secondary schools. This included 542 male and 683 female respondents. The students were stratified based on schools, gender and local government areas. Out of a total of 85 public secondary schools, 20 (23.5%) schools were randomly selected for the study; from the selected schools in each local government, 29% of the total number of

students were selected using proportionate sampling technique; thus giving a total sample of 1,225 SSS 2 students for the study.

The instruments used for data collection include Mathematics Performance Test (MPT) for students' academic achievement in Mathematics, and a questionnaire titled Teachers' Instructional Behaviour Questionnaire (TIBQ). The questionnaire was made up of 12 items, with 6 items to measure each instructional behaviour. It was based on four point Likert Scale of strongly agreed, agreed, disagreed and strongly disagreed. Mathematics Achievement Test was made up of 40 items constructed by the researchers with help of two experts in Mathematics education. The items were constructed based on SSS 2 Mathematics syllabus with four options A, B, C, D. A correct answer attracts one mark while incorrect answer attracts 0mark. The instrument was face-validated by two experts in Measurement and Evaluation and two Mathematics Educators, both from the University of Calabar. Corrections were pointed out by the experts and adjusted by the researchers and the document was considered valid. The reliability of the questionnaire gives .84 for teacher lesson presentation and .82 for teacher classroom management while the reliability estimate of the Students' Mathematics achievement test was established through Kuder Richardson formula K-R20 which gave .81. Since the reliability index is above 0.50, the estimates were considered high enough for the study. The Statistical Package for Social Sciences (SPSS) computer programme was used to analyze the data collected. The hypotheses were tested using simple linear regression analysis.

Presentation of results

The result of the analysis is presented in tables 1 and 2. The hypotheses were tested at .05 significant level.

Ho1: Teacher lesson presentation does not significantly predicts students' academic performance in Mathematics.

To test this hypothesis, simple linear regression was applied with teachers' lesson presentation as the independent variable and students' academic performance in mathematics as the dependent variable. 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 represent the predictive power of the independent variable) in the prediction model. The results are given in table 1.

Table 1: Regression of students' Mathematics performance on teachers' lesson presentation

R-value = .093			Adjusted R-squared = .008		
R-squared = .009			Standard error = 5.231		
Source of variation	**Sum of squares**	**Df**	**Mean square**	**F-value**	**p-value**
Regression	298.608	1	298.608	10.706*	.001
Residual	34110.848	1223	27.891		
Total	34409.456	1224			
Predictor variable	**Unstandardized coefficient**		**Std coeff**	**t-value**	**p-value**
	B	**Standard error**			
Constant	30.582	.872		35.072*	.000
Classroom Presentation	-.173	.053	-.093	-3.272*	.001

*Significant at .05 level. P<.05}

The results in table 1 show that the R-value of .093 was obtained, giving a coefficient of determination of .009. This means that the variation in teachers' lesson presentation accounted for about .9% of the total variation in students' academic performance in Mathematics. The p-value (.001) associated with the computed F-value (10.706) was less than .05. As a result, the null hypothesis was rejected. This means that the teachers' lesson presentation does significantly predict students' academic performance in Mathematics, with both the regression constant (30.582) and coefficient (-.173) contributing significantly in the prediction model (t=35.072 & -3.272 respectively, p=.000 & .001 < .05). The prediction equation may therefore be written as:

$y = 30.582 - .173x$

where,

$y = \text{Students' Mathematics performance}$

$x = \text{Teachers' lesson presentation}$

The negative sign in the regression coefficient means that teachers' lesson presentation is a constraint in the prediction model.

Ho2: Teachers' classroom management does not significantly predict students' academic performance in Mathematics.

To test this hypothesis, simple linear regression was applied with teachers' classroom management as the independent variable and students' academic performance in mathematics as the dependent variable. 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 represent the predictive power of the independent variable) in the prediction model. The results are presented in table 2.

Table 2: Regression of students' Mathematics performance on teachers' classroom management

R-value = .046			Adjusted R-squared = .001		
R-squared = .002			Standard error = 5.299		
Source of variation	**Sum of squares**	**Df**	**Mean square**	**F-value**	**p-value**
Regression	72.012	1	72.012	2.565	.110
Residual	34337.445	1223	28.076		
Total	34409.456	1224			
Predictor variable	**Unstandardized coefficient**		**Std coeff**	**t-value**	**p-value**
	B	**Std.error**			
Constant	26.342	.906		29.075*	.000
Classroom Management	.087	.054	.046	1.602	.110

*Significant at .05 level.p<.05

Table 2 results reveal that an R value of .046 was obtained giving an R-squared value of .002. This means that classroom management accounted for .2% of the total variation in the students' academic performance in Mathematics. The P-value (.110) associated with the computed F-value (2.565) was seen to be greater than .05. As a result, the null hypothesis was not rejected. This means that teachers' classroom management does not significantly predict students' academic performance in Mathematics. The regression constant (26.342) contributes significantly in the prediction model (t = 29.07, P = .000 < .05) but the regression coefficient (.087) does not (t = 1.602, P = .110 > .05). The prediction equation is

$y = 26.342 + .087x$

Where y= Students' Mathematics performance

x=Teachers' classroom management

Discussion of findings

The result of the first hypothesis revealed that teachers' lesson presentation significantly predicts students' academic performance in Mathematics. The finding is in agreement with the finding of Zagyváné (2017), Awofala (2017) and Awofala and Lawani (2020) who argued that teacher's adequate lesson presentation minimizes the chances of misunderstanding among students and enhance students' performance. The finding is also in line with Kamayubonye and Mutarutinya (2023) who investigated the effects of teachers' quality on students' performance in Mathematics in Kamonyi District, Rwanda and found that teachers' lesson presentation significantly influences students' performance in Mathematics. The finding also agreed with the findings of a study conducted by Iyamuremye et al. (2021) on influence of teaching approaches on students' performance in Mathematics: A meta-analysis of Quasi-Experimental Studies in Africa. The authors reported a significant influence of teachers' approach and lesson presentation on students' performance in Mathematics. The finding also agreed with a study conducted by Rustam and Ramlan (2017), Ibok and Unoh (2019) who found classroom management skills as significantly influencing students' performance. Conclusively, teachers' lesson presentation significantly predicts students' academic performance but negatively predicts students' academic performance in Mathematics.

The finding of the second hypothesis revealed that teachers' classroom management does not significantly predict students' academic performance in Mathematics. The finding is in disagreement with the finding of Dijk et al. (2019) who examined relation between classroom management and mathematics achievement: A multilevel structural equation model and found teachers' classroom management skills to have a significant direct effect on students' motivation and a significant indirect effect on students' Mathematics performance. The finding contradicts the finding of Tacadena (2021), Ahmad (2020), Abisola and Adam (2017) who reported influence of classroom management on mathematics performance. The finding also disagreed with the finding of Nisar et al. (2019) who examined the association and connection between the classes managing practices and activities used by secondary school teachers and the students' academic achievement and found that secondary school teachers used moderate to high level of classroom management practices. Conclusively, teachers' classroom management singly does not contribute to students' poor academic performance in the study area.

Conclusion

Teachers' instructional behaviours are those activities, actions and expressions carried out by teachers for effective teaching. These teachers' activities or actions in classroom could affect students' academic performance either positively or negatively. Based on the finding of the study, it was concluded that teacher's lesson presentation significantly but negatively predicts students' academic performance in Mathematics while teacher's classroom management does not significantly predict students' academic performance in Mathematics. Therefore, teacher's lesson presentation is one of the very important factors and should be considered in order to enhance students' academic performance in Mathematics

Recommendations

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

i. Since teacher lesson presentation significantly predicts students' academic performance, teachers should improve their competence of lesson presentation through attending conferences, seminars and workshops of stakeholders in Mathematics education to enhance students' academic performance.

ii. Teachers should be flexible in expressing their classroom management styles to accommodate all set of students.

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