

Students' Evaluation of Mathematics Teachers' Preparedness for Effective Instruction (A Case Study of Kano State Secondary School Mathematics Teachers)

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Abstract: *This study is a survey type which investigated Kano State Secondary School mathematics teacher's preparedness and effectiveness from students' point of view. Four areas were chosen namely; knowledge and teaching of subject matter, teaching method, instructional materials and lesson evaluation. Students' assessment technique was used to assess the effectiveness of secondary school mathematics teachers in the teaching/learning process. Questionnaire which was subjected to reliability coefficient test was administered to 354 students in Junior Secondary Three (JS 3) and Senior Secondary three (SS 3) who were ready for junior WAEC and SSCE. The students were randomly selected from 211 secondary schools within the fourteen educational zones of Kano State. The selection of the schools was done using proportion sampling technique. While simple random sampling technique was adopted during the administration of the questionnaire in the sampled schools. The major instrument used for data analysis was Likert 5-point scale. Four research questions were raised to guide the study. Descriptive analysis of the scores was carried out. The result of the study showed that in all the 21 statements in the four areas of teaching under study, only two were retained, that is, 5th item on subject matter knowledge and the 8th item on methodology of teaching. This indicates that secondary school mathematics teachers ineffectiveness is due to inadequate preparation for lessons. Based on the findings of the study it is recommended among other things that teachers of mathematics should equip themselves with appropriate instructional strategy.*

Keywords: *Instructional materials, Teachers' effectiveness, Teachers' preparedness, lesson evaluation*

I. Background Of The Study

The teacher is the most important variable in a pupil's learning, (Lerner, 1997). This means he is the key element for any successful instruction. A mathematics teacher should therefore be sufficiently equipped with all the necessary knowledge and skills that will enable him function effectively. Thus, the subject matter expertise he demonstrates, the various teaching strategies he uses, the kind of instructional materials and evaluation techniques employed in teaching are all the factors that determine the teaching effectiveness. In line with this, Sadker and Sadker (2005) assert that efficient teachers not only demonstrate mastery of the subject they teach but also are adept in the methods of teaching and understand student development. Similarly, the Incorporated Association of Assistant masters in Secondary Schools (1960) noted that one of the several ways by which a teacher could command the respect of his pupils is through his knowledge of the subject matter. It is by this that a mathematics teacher can immediately be in a position to give a satisfactory answer to sometimes awkward questions that may be asked of him. Fajemidagba (1998) in his research work on mathematics Teacher Education in Nigeria affirmed that there are relationships between the knowledge of content of mathematics and the ability to communicate that content to learners. Lerner (1997) was of the view that the ability to use language in communicating one's thoughts is central to learning and this ability includes both listening and talking.

Backhouse, Haggarty, Pirie and Stratton (1999), advocated the need for using materials in teaching mathematics in schools. They noted that up to secondary school level, the vast majority of learners may need concrete materials to develop mathematical ideas. Fajemidagba (1998), pointed out that even at the university level, models and manipulative devices, such as paper folding, egg carton and pebbles are essential in mathematics teaching. These materials according to him can be used in teaching mathematical concepts such as parallelism and perpendicularity.

It is in line with these viewpoints that the researcher deems it necessary to use students to assess and evaluate mathematics teachers' effectiveness at the secondary school level. This method among others like (peer review, self evaluation, teaching portfolios and classroom evaluations, is one of the several techniques of evaluating teachers' effectiveness. Doyle (2002) asserted that students are in a good position to report on the extent to which students' – teacher interaction was productive, informative, satisfying or worthwhile. Murray (1994) in his study of student evaluation of teaching concluded that students' ratings tend to be reliable, valid, relatively unbiased and useful. If secondary school mathematics teachers are to be effective, improve and

become well informed about their professional responsibilities, students' assessment will essentially provide highly acceptable clues.

According to Derek Bok as cited in Doyle (2002), teacher effectiveness is "an act of faith" on the parts of the students and the teachers to do their best. Oshodi (2000) defines teacher effectiveness as the ability of a teacher to produce desired results among his students in the course of instruction. He further remarked that it is concerned with the relationship between the characteristics of the teacher, teaching acts and their effects on the learner. Also Dunkin (1997) described teacher effectiveness as the degree to which a teacher achieves desired effects upon students.

II. Statement Of The Problem

The learning of mathematics requires a lot of efforts from both the students and the teachers. Specifically, the teacher is the key figure that influences students' rate of achievements in the subject. Teacher's level of preparedness in both subject matter and pedagogy is of paramount importance. Okebukola as cited in Ojo and Maiyanga (2007) stated that teacher preparation is comprised of three components. The first is called content knowledge which is the knowledge of the subject matter or content of the teaching subject. The second is referred to as pedagogic knowledge which is the knowledge of the art of teaching and the third is called pedagogic content knowledge which is the knowledge of how to teach the content. The knowledge of these components assists mathematics teachers greatly in sorting out the kind of information they need in teaching. Lack of adequate knowledge in these areas can deter good teaching and can create great problems for the mathematics teacher in his professional assignment. Many mathematics teachers at the secondary level teach without taking cognizance of these vital aspects of teaching which eventually lower their effectiveness even when assessed by their students (Oshodi, 2007). Therefore, the problem of this study can be stated as follows: to what extent do secondary school mathematics teachers prepare in terms of subject matter knowledge, method of teaching, use of instructional materials and evaluation of lessons?

PURPOSE OF THE STUDY

The purpose of the study is to investigate the effectiveness of secondary school mathematics teachers in terms of subject matter and pedagogical variables using the students' judgment. The four areas of concern are; subject matter knowledge, method of teaching, instructional materials and evaluation of lessons. The study would also proffer recommendations to the identified problems based on the findings.

RESEARCH QUESTIONS

1. Do secondary school mathematics teachers communicate mathematics subject matter adequately to students during lessons?
2. Do secondary school mathematics teachers use methods of teaching at students' level of understanding?
3. Do secondary school mathematics teachers use adequate and relevant instructional materials during lessons?
4. Do secondary school mathematics teachers evaluate students' learning process continuously?

SCOPE OF THE STUDY

The study covered only JSS3 and SSS3 students in Kano State Secondary Schools for easy accessibility to data. These were used because they are ready to write external examinations and have attained some reasonable level of understanding of what the questions are aimed at eliciting.

METHODOLOGY

DESIGN

This study employed a survey research design. The raw scores were collected, analyzed and differences were revealed based on the statements contained in the questionnaire.

POPULATION

The target population of this study consisted of all the JSS3 and SSS3 students of secondary schools in Kano State. The population was estimated to be eighty two thousand three hundred and fifty (82,350). The table below shows the distribution of population in the educational zones of Kano State

Zone	No. of Schools	Total no. of students
Bichi	64	3203
Dala	84	10728
Dambata	60	3657
Dawakin kudu	62	7100
Gaya	50	1449
Gwarzo	52	3732

Zone	No. of Schools	Total no. of students
Karaye	60	4018
Kura	35	2878
Minjibir	59	6423
Municipal	76	9501
Nassarawa	65	13578
Rano	28	2026
Tudun Wada	53	3074
Wudil	36	2725
Private	269	8258
	1053	82350

Source: Kano State Ministry of Education KERD – List of schools with examination number and number of candidates for basic education certificate examination 2014

SAMPLE AND SAMPLING

The students were randomly selected from 211 secondary schools within the fourteen educational zones of Kano State. The sample size for this study was determined from Krejcie and Morgan (1970) table. Considering the population size of 82350 students, the sample size was found to be 354 which were considered to be adequate.

INSTRUMENTS

A twenty one item questionnaire structured by the researchers was used for data collection. The questionnaire sought information from respondents about teachers' adequate communication of subject matter knowledge, use of appropriate methods of teaching, use of instructional materials and evaluation of lessons. Out of the 21 items, 6 focused on teachers' subject matter knowledge, 7 addressed teaching approaches, 2 drew attention to the adequacy and appropriateness of instructional materials and 6 items referred to lesson evaluation.

VALIDITY OF THE INSTRUMENT

The instrument was adjudged to be adequate, reliable and relevant by two experts of mathematics education. After preliminary testing was done in two schools, their observations were noted and corrections were effected as some items were removed and others modified.

Pearson's product moment correlation coefficient (r) was found to be 0.71 which was further subjected to reliability test using the Spearman-Brown formula. The reliability coefficient was found to be 0.83. This indicated that the instrument was reliable.

STATISTICAL TECHNIQUES

The mean as one of the statistical averages was used to analyze the data for answering the research questions raised for the study.

III. Results Of The Data Analysis

Table 3: Results of the data analysis (Table codes: SA-strongly agree, A-agree, U-undecided, D-disagree, SD-strongly disagree)

A. Subject matter knowledge											
S/N	Statement	SA	A	U	D	SD	$\sum FX$	$\sum F$	$\bar{X} = \frac{\sum FX}{\sum F}$	X_{crit}	Decision
1	My mathematics teacher is always prepared before coming to school	81	58	5	124	82	982	350	2.80571429	3	Reject
2	My mathematics teacher has a good knowledge of Mathematics	55	87	13	76	102	916	333	2.75075075	3	Reject
3	He always applies mathematics to real life situations	65	70	20	66	129	926	350	2.64571429	3	Reject
4	My mathematics teacher always improvises teaching materials when not available	32	63	44	60	150	814	349	2.33237822	3	Reject
5	The teacher solves relevant problems during lessons	180	75	51	18	15	1404	339	4.14159292	3	Retained
6	My mathematics teacher discusses topics reasonably and confidently	41	35	41	107	110	792	334	2.37125749	3	Reject
B. Method of teaching											
S/N	Statement	SA	A	U	D	SD	$\sum FX$	$\sum F$	$\bar{X} = \frac{\sum FX}{\sum F}$	X_{crit}	Decision

Students' Evaluation of Mathematics Teachers' Preparedness for Effective Instruction (A Case Study..

7	He allows full class participation in solving problems in class with his guidance	30	25	38	68	176	676	337	2.00593472	3	Reject
8	The teacher always revises each topic before starting a new one	13	85	55	45	16	1286	336	3.82738095	3	Retained
9	The teacher uses a lot of demonstrations to explain mathematical problems during lessons	43	30	41	66	162	752	342	2.19883041	3	Reject
10	The teacher's questions are clear and specific	52	38	92	64	156	972	402	2.41791045	3	Reject
11	The teacher's questioning method allows students to think deeply	38	21	70	56	157	753	342	2.20175439	3	Reject
12	He gives students enough time to ask and answer questions	40	38	34	99	127	779	338	2.30473373	3	Reject
13	The teacher distributes questions evenly across the class during lessons.	54	27	37	124	91	828	333	2.48648649	3	Reject
C. Use of instructional materials											
S/ N	Statement	SA	A	U	D	SD	$\sum FX$	$\sum F$	$\bar{X} = \frac{\sum FX}{\sum F}$	X_{crit}	Decision
14	My mathematics teacher always uses relevant materials during lessons	22	15	42	124	124	668	327	2.04281346	3	Reject
15	The instructional materials he uses are always adequate	30	36	56	37	184	720	343	2.09912536	3	Reject
D. Evaluation of lessons											
S/ N	Statement	SA	A	U	D	SD	$\sum FX$	$\sum F$	$\bar{X} = \frac{\sum FX}{\sum F}$	X_{crit}	Decision
16	The teacher evaluates students' performance continuously	15	23	40	57	204	605	339	1.78466077	3	Reject
17	My mathematics teacher always gives students exercises to solve during lessons	18	17	26	169	109	683	339	2.01474926	3	Reject
18	He always gives adequate assignments for students to solve at home	28	14	50	44	212	646	348	1.85632184	3	Reject
19	He marks students' exercises and assignment regularly	40	25	65	130	93	848	353	2.40226629	3	Reject
20	My mathematics teacher always returns answer scripts to students after marking	31	16	55	133	109	759	344	2.20639535	3	Reject
21	The teacher always makes corrections to the exercises and assignments after marking.	23	21	21	54	230	600	349	1.71919771	3	Reject

IV. Discussion On The Findings

The table above shows the responses of three hundred and fifty four students on the effectiveness of secondary school mathematics teachers in the area of teacher's knowledge of the subject matter of mathematics, methodology of teaching, use of instructional materials and evaluation of lessons. The items were analyzed by using a five-point Likert scale. The mean (\bar{X}) responses of respondents on each item (statement) was calculated and compared with criterion referenced mean (X_{crit}) on the Likert scale. From the table above, it is clear that only two out of the twenty one statements are retained, that is, item 5 on subject matter knowledge and item 8 on methodology of teaching. This is because the calculated value of \bar{X} in each of the statements is greater than their criterion referenced means (i.e. $\bar{X} > X_{crit}$). On the other hand, all the rejected statements have their calculated means less than the criterion referenced means (i.e. $\bar{X} < X_{crit}$). Furthermore, it is worth noting that though students responded that their teachers solve relevant problems during lessons, however, they do not prepare well for lessons; have good knowledge of subject matter; explain the relevance of the mathematical topics to students' daily lives; improvises mathematics teaching materials and discuss topics reasonably and confident. The fact that a teacher solves relevant examples does not guarantee that the students are learning. The students might as well be admiring "the expert" doing his thing on the board. Problem solving teachers hardly take their children along and so miss the track of good mathematics teachers.

On method of teaching, it is quite clear from the table that secondary school teachers revise the topics taught to students before starting a new one. However, the negative response of students to six statements is an indication that mathematics teachers in the secondary school are inadequately skilled in this area. For example, the clarity of teacher's question partly depends on the language used. No matter the amount of knowledge a teacher possesses in his discipline, it would be too difficult for students to understand the concepts being

transferred to them if the language used is inappropriate. Moreover, when a teacher asks students vague questions, they are more likely to give malevolent feedback. According to Orlich, Harder, Callahan and Brown (2010), to be an effective questioner, one must be able to pose clear, concise and succinct questions. Boyer in Elliot, Kratochwill, Cook and Travers (2000) claimed that teacher's ability to employ language clearly and efficiently is one of the several characteristics that made them highly effective. This implies that mathematics as a critical thinking subject requires individual teachers to be proficient in asking questions.

Furthermore, the result showed that all the students had expressed negative opinions on statements for instructional materials. That is, the instructional materials secondary school mathematics teachers used during lessons were irrelevant and inadequate. Here, the inadequacy of teaching materials would mean that either these materials are not available or are not used in most of the secondary schools or both. The result is in agreement with the findings of Augie (2006) who reported that shortage of mathematics teaching materials is one of the problems facing the teaching of mathematics at the secondary school level. Students' responses to statements on evaluation of lessons also revealed that their mean-values were greater than their respective criterion referenced means. This indicated that secondary school mathematics teachers have a lukewarm attitude towards monitoring of students' learning progress.

V. Recommendations

In order to enhance teaching effectiveness at the secondary level, the following are recommended;

- a) Mathematics teachers in secondary schools should undergo training in order to gain necessary knowledge and skills that will help them to link the subject matter content with pedagogical content.
- b) At the beginning of each lesson, mathematics teachers should help students to get ready by explaining the objectives of each lesson in simple and clear language.
- c) Mathematics teachers should always engage students in exercises, assignments and homework to help them understand what they have learned in class.
- d) Teachers of Mathematics should use different strategies in Mathematics class and should use a variety of examples.
- e) Students should be given plenty of opportunity to participate fully in solving problems in the class with teacher's guidance.

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