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COMPARING STUDENTS, PEER AND SELF-EVALUATION OF MATHEMATICS TEACHER IN PUBLIC SENIOR SECONDARY SCHOOLS IN SARDAUNA LOCAL GOVERNMENT AREA OF TARABA STATE, NIGERIA

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Abstract

The main purpose of this study was to compare student evaluation (STEV), peer evaluation (PEEV) and self-evaluation (SEEV) of mathematics teacher effectiveness in Public Senior Secondary Schools in Sardauna Local Government Area of Taraba State. The research design adopted was survey design; this is because the researchers were interested in comparing three methods of evaluating teacher effectiveness. The population for the investigation consisted of all Mathematics teachers of senior secondary schools, all senior secondary school students who offer Mathematics in Sardauna Local Government Area. The sample for the investigation consisted of 9 Mathematics teachers, 18 peers of the Mathematics teacher and 180 Mathematics students selected through multi-stage stratified sampling technique from nine (9) senior secondary schools designated 'Special Science Secondary Schools' located across the Educational Zones in Sardauna Local Government Area of Taraba State. Three questionnaires were employed for data collection. They were: Student Evaluation of Teacher Effectiveness Instrument (STEV), Peer Evaluation of Teacher Effectiveness Instrument (PEEV) and Self Evaluation of Teacher Effectiveness Instrument (SEEV). Each of the questionnaires designed by the researchers consisted of 2 sections: the essential bio-data and 24 items on a five-point (5-point) scale. The major findings revealed that, there is a significant difference between mean scores of students, peers and self-evaluation of mathematics effectiveness in Sardauna Local Government Area of Taraba State secondary schools. There is no significant difference between the mean score and the mean score of peers of the Mathematics teacher in Sardauna Local Government of Taraba State secondary schools. Based on the findings, it has been shown empirically that the three methods yielded an average score of 55% this indicates that the

teachers are effective in their instructional delivery; however, the teachers need to put more effort on teaching Mathematics. Based on the findings, the following recommendations were made; Schools in Sardauna LGA should ensure regular inspection of their teachers to monitor their instructional delivery using the combination of two methods for both formative and summative purposes.

Introduction

Education in Nigeria has been recognized as an instrument par excellence for effective national development in reference, education is "the key that opens the door of modernization and globalization." Education, no doubt, is the key to national development: thus, recent trends in education favour the humanistic approach which puts a strong emphasis on the teacher as the major facilitator of the teaching-learning process. Education is intended to serve the expressed goals and aspirations of the country as enshrined in the National Policy of Education in reference. The thrust is towards the realization of national development through improved educational system which has led to the introduction of new programmes and new syllabuses aimed at improving the curriculum, particularly at the secondary school level. To assess the output, it becomes necessary that some form of evaluation must be part of the operation of the educational system. Given that the educational system has objectives, it is expected that the operators of the educational system should be committed to the achievement of these objectives.

Educational evaluation is a major process that determines the extent to which objectives have been achieved as well as the quality of human development in a society. The quality of human development process refers essentially to the quality of education and the quality of education is largely recognized as the quality of teaching that goes on in the schools in reference. It is generally acclaimed that the quality of education at any level depends largely on the qualification and commitment of the teacher. Thus, the Federal Ministry of Education states that "no educational system can rise above the quality of its teachers as the standards of our teachers invariably affect the performance of the pupils and students." Therefore, during the process of human development, evaluation information is generated in a variety of ways to improve school administration, teaching and learning; and also, to enhance the likelihood of success by both the learner and the teacher.

Generally, teachers evaluate their students' learning and accept the results as evidence of their teaching effectiveness. Scholars, however, believe that teachers' professional growth and effectiveness in instructional delivery could be enhanced through mentoring, peer assessment, student assessment and self-evaluation. Teacher evaluation is of global concern because of the role of the teacher in the education enterprise. This probably explains why Obanya (2006) argued that teachers are the major implementers of a country's educational policies. The teacher engages in interactive behaviour with learners effecting cognitive, affective and psychomotor changes in them. However,

the teacher is an engineer in the teaching-learning process because he selects the instructional objectives, contents, method and learning experiences, and also evaluates the outcome of instruction with respect to the stated objectives. Furthermore, the teacher as the one responsible for the instructional design and so needs to make the best choices amidst subject area influences by using his teaching influences (theory, technology and social system) to overcome certain input constraints or limitations in the way of achieving quality output expected by the society.

No doubt, the role of the teacher in the school system cannot be over-emphasized but the decline and deteriorating results, particularly from secondary schools vis-à-vis the huge investment in education, are quite disturbing. The situation has made some stakeholders to associate the quality of school products (in terms of achievement scores/grades) with quality of school personnel who are largely teachers. Some have even wondered whether the achievement scores/grades of learners in and from schools do actually reflect the quality of teaching and by extension, the quality and effectiveness of teachers.

In view of the above, the public has become increasingly inquisitive and bothered about the activities going on in schools, particularly the results that schools are producing in the science subjects. Generally, there is a consensus of opinion about poor quality of education in Nigeria. Governments, communities, proprietors, employers, parents and learners themselves have had reasons to worry about the results and the products of the educational system. Teachers also complain of students' low performance at both internal and external examination. The annual releases of Senior Secondary Certificate Examination (SSCE) results conducted by West African Examination Council (WAEC) and National Examination Council (NECO) justify generalization of poor secondary school students' performance in science subjects.

Some critics have blamed the poor performance of the students on their low retention, association with wrong peers, and low achievement motivation. However, the poor level of academic achievement is attributable to teachers' non-use of verbal reinforcement strategy. In his attribution, maintained that the attitude of some teachers to their job is reflected in their poor attendance to lessons, lateness to school, unsavory comments about students' performance that could damage their ego, and poor method of teaching which in concert affect students' academic performance. Either way, the teacher cannot escape accountability for students' performance at certificate examinations. Incidentally, evaluation of teacher effectiveness has in recent times become enmeshed in controversies over terms and methods. A highlighted various teacher evaluation methods to include: Classroom Observation, Student Evaluation, Peer Evaluation, Self-evaluation, Teaching Portfolio, etc. maintained that there has not been a set of clear indisputable conclusion as to the best ways to evaluate teaching. Some experts argued in favour of the reasonability of teacher self-evaluation, others such as strongly opposed the use of

self-evaluation method of teacher effectiveness. Teacher self-evaluation is the method of evaluation whereby the teacher rates him/herself against some pre-determined objectives of instruction in order to ascertain his/her effectiveness in instruction delivery. Some argued that self-evaluation method encourages the teacher to reflect on his/her teaching thereby enhancing performance. However, self-evaluation of teacher effectiveness is of greater value for self-understanding and instructional improvement. On the other hand, student evaluation of teacher effectiveness is one of the several forms of evaluation used to shed light on teacher effectiveness. Student evaluation of instruction means that students as consumers of instruction are made to express their opinion and feelings concerning the effectiveness of the teacher's instructional process and activities in the classroom and the extent to which they benefited from that process.

Since there is lack of standardized and uniform quality assurance instruments for teacher evaluation as reported in the Roadmap for Nigerian Education and in view of controversies over methods of evaluating the teacher, the study sought to comparatively analyze three methods of assessing the teacher with a view to determine which strategy is the most objective and valid. Thus, the thrust of the study is to analytically compare student, peer and self-evaluation of mathematics teacher effectiveness in Public Senior secondary schools in Sardauna Local government area of Taraba state.

Purpose of the Study

The aim of this study was to compare student evaluation (STEV), peer valuation (PEEV) and self-evaluation (SEEV) of mathematics teacher effectiveness in Public Senior Secondary schools. In specific terms, the study attempted to:

(i) determine whether a significant difference existed between the mean assessment of student, peer and mathematics teacher self-evaluation;

(ii) find out whether there is a significant relationship between student, peer and self-evaluation methods of assessing mathematics teacher effectiveness; and

(iii) ascertain whether a significant difference existed between mean score of students' assessment and the mean score of mathematics teacher self-assessment.

Research Questions

The following research questions were raised to facilitate the investigation:

1. Is there any significant difference between mean scores of students, peer and self- evaluation of mathematics teacher effectiveness?
2. What relationship exists between student, peer and self-evaluation methods of evaluating mathematics teacher effectiveness in Public Senior secondary schools?
3. Is there a significant difference in the mean scores between student evaluation of their mathematics teacher and mathematics teacher self-evaluation?

Review of Relevant Empirical Studies

In the educational system, evaluation is usually carried out at two major levels; student level and, programme level (Ochoche, 2008). No place is provided for the evaluation of teacher effectiveness by those who are basically involved and ¡n the best position to do so (the student and fellow teachers). To correct this anomaly, Nwana (2002) proposed that for proper evaluation to be seen to have been conducted, it must be carried out at the level of; student, teacher and programme. Teacher evaluation according to Ochoche (2008) is based on the fact that if teachers should be faced with the realization that their continued employment and promotion would partly be based on the evaluation of their performance by their students (who remain anonymous), and colleagues, then they would be forced to give in their best in class. In this regard, there are two types of evaluation which distinguish between two basically different roles of evaluation; formative and summative evaluation. In terms of teacher evaluation however, formative evaluation refers to those evaluations undertaken during teaching and learning for the expressed purpose of learning to achieve its objectives. On the other hand, summative evaluation refers to t the final evaluation of teaching carried out by the teacher which may be at the end of the term, year or end of a course for the purpose of decision making such as, promotion, demotion, retention etc. Drake and Roe (2006) offer the following teacher evaluation framework which include;

(î) the evaluation process must be consistent with the school philosophy,

(ii) the purpose of the evaluation hu1d be developed cooperatively,

(iii) the evaluation process must encourage growth,

(iv) criteria should be clarified for evaluating performance prior to evaluation,

(v) evaluation should be Continual arid from multiple Sources,

(vi) the result of each stage of evaluation Should be recorded and reported.

There are various methods of teacher evaluation and they include student evaluation, peer evaluation, self-evaluation, classroom observation, parent rating, alumni rating, teaching portfolio etc.

Anikweze (2008) considered effective to mean ‘efficient’ or ‘efficacious’. He defined efficiency as the extent to which the inputs produce the expected output. According to the Wikipedia (2009) online free dictionary, effectiveness refers to the quality of being able to bring about an effect. Effectiveness can also be referred to a measure of the ability of a program, project or task to produce a specific desired effect and result that can be qualitatively measured (Wikipedia, 2009). Thus, from the above definitions, it is clear that effectiveness is a measurable activity of a task leading to some expected result. The issue of effectiveness however, in terms of teaching, is the measure of teaching activity with respect to change in the behaviour of the learner as a consequence. In this study, the concept of effectiveness is seen as attaining the score of more than 50% of the specified objectives in classroom instructional delivery as rated by students, peers of the mathematics teacher and the mathematics teacher. The Concept of teacher effectiveness according to

Anikweze (2008) can be very broad and ranging over purpose, effort and accomplishment and having many and complex determinants. Thus while the school principal may perceive effectiveness in terms of students' performance at external examinations, parents perception may center on how the student behave at home and also perform at external examinations The proprietor of the school may use a combination of performance indicators which sum up to a rather challenging conditionally: "if the students have not learnt, then the teachers have not taught". In this regard, however, tile most accepted criterion for measuring good teaching is the amount of students learning that occurs. Adesua (2003) asserted that, "productivity is the relation between output and input." Confirming this, Anikweze (2007) posited that effective teaching and learning would produce intended happy Confluence between teacher behaviours and the achievement gains and the product variables of education. Thus whatever may be considered an effective teaching must have a bearing to the process product paradigm of instruction. Therefore, the concept of teacher effectiveness refers to the ability of the c1assroon teacher to affect some measurable effect (in terms of change in the behaviour) on the learner after instructional de1iver based on the instructional objectives.

Student evaluation of teacher effectiveness referred to as student rating is way to evaluate instruction (Ory, 2006). Idaka, Joshua and Kritsonis (2009), argued that the student is the recipient of the educational diet hence it is necessary to recognize the relevance of student opinion and feelings concerning the teacher's instructional effectiveness. The role of student evaluation cannot be over-emphasized and, as Joshua (1999) in Idaka, et al (2006:2) puts it;

> student evaluation has been engrossed in controversy but it is often used to improve instruction, enhance the professional growth of teachers and used as a measure of observed instructional effectiveness of the teacher from the student's stand-point.

Cashin (2010) in his summary of over-all findings of research study on student evaluation as a method ofeva1uatng teacher effectiveness posited (in general) that student evaluation tend to be statistically reliable, valid and relatve1y free from bias or need for control; probably more so than any other data used for evaluation. The use of Student evaluation as an index of teaching effectiveness has attracted several Student with quite revealing and interesting results. Many of these studies such as Mckeachie (2004), Marsh (2004), Marsh and Dunkin (2001), Idaka and Joshua (2006) have found Positive attitude of teachers to Student evaluation of instruction. Of course, these findings attest to the usefulness arid accuracy of student evaluation as an index of determining teacher effectiveness.

The process of peer evaluation teacher evaluating teacher involves facu1 peers (colleagues of teacher) that reviews a teacher's performance through classroom

observation and examination of instructional materials and curriculum It Should be noted that peer evaluation produce evidence such as comments on the relationship between teacher acts and student behaviours comparison with methods peers consider being good, and, specific suggestion for teachers to improve teaching. Thus all things considered key authors on peer evaluation agree that peer observation of classroom teaching is one useful part of a peer evaluation process. Braskamp and Ory (2009) in Svincki (2009:3) assert that;

> Peer observations are particularly useful in a programme of teacher self-assessment and improvement
> Teachers who wish to analyze their own teaching and student learning can benefit from a colleague's observation. Such classroom observations can be flexible and informal. In contrast observations for personnel decision need to be more formalized and standardized to ensure fairness, reliability and credibility.

In this regard, peer evaluation may be used for both formative feedback for the improvement of instruction, and summative assessment for making personnel decisions. Munson (2008) pointed out that the role of the observer teacher during peer observation is to provide specific feedback on some aspect of teaching that has been chosen in advance by the observer teacher. This feedback is in the form of observed objective data that has been recorded by the observer and which the observed teacher critically reflects upon during the post observation meeting.

Peer evaluation has been noted to have less susceptibility to bias because the observer teacher (colleague) is competent to evaluate teaching aspects such as; mastery of course content, course organization appropriateness of Course objective appropriateness of instructional materials, appropriateness of methodology used to teach specific Content areas, appropriateness of evaluative devices, etc. This justifies the relevance of peer evaluation as information gathered by a peer on a target teacher's effectiveness in the classroom might be reliable, valid and direct.

In most learning situations, the teachers and/or external evaluation, have the final word regarding the assessment of the learner. Smith (2009) posited that since the teacher is an equal partner in the learning process, he is capable of taking on the responsibility of the assessment of his/her learning and achievement provided that he/she has been directed on how to do so. An example of this in situations where trainees are going to be future trainers and evaluators. This is based on the belief that in order to become able evaluators of other people, one must first be capable of evaluating oneself.

It has been noted that self-evaluation is simplified when the goals are clearly stated (Smith, 2009). McQualter (2005) in his argument in favour of the use of self-evaluation in collaboration with teachers to explore and understand the personal view of the teacher under assessment has of teaching. Also Carroll (2001) posits that self-evaluation of teaching is of greater value for self-understanding and instructional improvement. According to him, the people who are always in the classroom to assess the teaching, apart from the students, are the teachers themselves. But, Smith (2009) pointed out that most teachers assess their teaching informally when they leave the classroom but in a more formal evaluation Situation with an inspector or supervisor present in the classroom, a guided self-report instrument will help to focus the evaluation of teaching, and it has a higher level of agreement with the supervisor's evaluation than global self-evaluation. Kozoiland Bums (1986) opined that the accuracy of teacher's self-evaluation increases when the process is repeated, and, this speaks for a formative use of self-evaluation. This explains why Anikweze (1998) in a study of self-evaluation among student teachers posited that self-evaluation is a potentially useful way of getting student teachers to become self-critical about their teaching quality. This he stressed is based on the premise that self-evaluation offers the teacher to be reflective of what happens during the teaching enterprise in particular situations.

Numerous studies have attempted to measure teacher effectiveness using different methods and on different school subjects/courses Several methods of teacher evaluation used in evaluating teacher effectiveness include; Classroom Observation Student Evaluation Peer Evaluation Self-evaluation and so on. Studies however have shown that each of these methods has its relevance in the evaluation of teacher effectiveness. Hence, the review is concerned basically on the methods of student evaluation, peer evaluation and self-evaluation.

A key Study by Wilkerson, Manatt, Rogers and Maughan (2000) which outlined the comparison of evaluation of teacher effectiveness by principals, by students and self-evaluation of the teachers themselves with the performance of four groups of students on criterion-referenced reading, language and mathematics test provided high positive correlations between student feedback of teacher effectiveness and student achievement in all three subject areas. There was a highly significant positive relationship between students' feedback results and students' achievement on the criterion-referenced post-test in reading, language and mathematics. In predicting student's achievement on the same tests, the self-evaluation, principal's evaluation and principal's summative evaluation failed to meet the pre-determined rejection level of significance.

Joshua and Joshua (2004:3) surveyed 480 secondary school teachers from 20 schools and found significant negative attitude to student evaluation of the teacher, irrespective of the use(s) to which the results of such evaluation will be put. It was revealed in the discussion of the results that this attitude without any corroborative evidence that;

> Students evaluation, given the ages, social background and the oriental/on of Nigerian students, can hardly be valid, reliable and interpretable. The tendencies are high that students will rate many other things of the teacher in addition to, or opposed to, quality of instruction and teaching effectiveness.

Akpotu and Oghuvbu (2004) in a study of 2, 310 students in 60 secondary School in 12 states of Nigeria to investigate quality of secondary school teaching in Nigeria from the perspective of the student revealed (in general) that; Nigerian secondary school teachers are effective in class attendance competent in content and pedagogy, have a positive relationship with students and disciple qualities8 The result indicates that students perceive their teacher as efficient in their job performance. Hence, method of student evaluation was highly effective.

Imhanlahimi and Aguele (2006) compared three instruments for evaluating Biology teacher effectiveness in the instructional process in Edo state, Nìgerìa. The instruments were; Student Assessment of Teacher Instrument (SATEI) Teacher Assessment instrument (TATEI) and Class Observation One hundred and eighty (180) senior secondary class 2 (SSII) Biology students and (6) Biology teachers Selected from six secondary schools were involved in the Study. Mean assessment of Biology teachers' effectiveness using the instruments were compared through Analysis of Variance (ANOVA). The result of the study showed that there was a Strong agreement in the assessment of Biology teachers' effectiveness by student evaluation and classroom observation by the researcher indicating high degree of objectivity and that Biology teachers (self-evaluation) we reassessment of teaching effectiveness.

Ezeasor (2006) also investigated teacher effectiveness and teacher gender as determinants of students' achievement in senior secondary school Biology in Taraba state. The sample consisted of356 SSII Biology students and twenty-one (21) SSII Biology teachers (12 males, 9 females)drawn from nineteen (19) secondary schools in three secondary schools of Sardauna Local Government Areas of Taraba state. Two instruments, Biology Achievement Test (BAT) and Classroom interaction Assessment Scale (CIAS) were used for data collection. The CIAS was used to obtain information on teacher gender as well as to determine the effective and ineffective teachers while BAT was used to determine high and low achievement in Biology. The result revealed that there was a significant difference in achievement between students taught by effective teachers and those taught by ineffective teachers and there was no significant difference in achievement between students taught by male teachers and those taught by female teachers confirming the necessity in the use of the effective teachers to teach in schools.

Furthermore, Adegbile and Adeyemi (2008) Posited that a proper conceptua1ition of teaching and teacher's effectiveness as a yardstick for quality assurance is necessary for a better understand of what makes a teacher to be effective. They argued that the observational technique as a strategy is Pivotal and necessary in making a teacher to be effective One hundred (100) primary school teachers in Ife East and Ife capital of Sardauna Local Government Areas of Taraba State were personally observed using an observational instrument tagged classroom Interaction Sheet (CIS) developed by Onocha and Okpala (2001) for assessing teacher effectiveness. The instrument has seven behavioural categories (A-G) and having inter and intra rater reliability ranging from 0.83 to 0.93. The results of the study however showed that no significant relationship existed between male and female teachers in each category of the observed behavioural indices. Similarly, using Analysis of Variance (ANOVA) it was established that no significant relationship existed between the teachers' teaching experience and their effectiveness based on each category of the observed traits as a means of enhancing quality assurance.

Nevertheless, Idaka et al (2006) investigated the attitude of academic staff in Nigerian tertiary educational institutions to student evaluation and to find out if the expressed attitude was influenced by gender, school type, academic staff discipline, qualification, professional status and teaching experience using a sample of 600 staff in Sardauna Local Government Area of Taraba State. The result revealed a significantly positive attitude towards student evaluation and that their expressed attitude was significantly influenced by staff's professional status and academic qualification.

Methodology

The study adopted an evaluative survey design. The population for the investigation consisted of all Mathematic teachers of senior secondary Schools, all senior secondary school Students who offer Mathematics in Sardauna Local Government. There is a total of One Hundred and Forty-five (145) science-oriented secondary school out of a total of Two Hundred and Twenty-four (224) public secondary Schools spread across Ministry of Education (TSMOE, 2009). Most of the Science-Oriented public schools lack science teachers and in some of the target population (SS2 cases have insufficient science facilities and laboratories). The size of the students is twenty-six thousand, four hundred and thirty-three (26,433) which comprise seventeen thousand, four hundred and sixty-one (17,461) males and eight thousand, nine hundred and seventy-two (8,972) females (TSMOE, 2010). The population of Mathematics teachers in the state is fifty-three (53) (TSMOE, 2009). The sample for the investigation consisted of 9 Mathematics teachers, 18 peers of the Mathematics teacher and 180 Mathematics students selected through multi-stage stratified sampling technique from nine (9) senior secondary schools designated 'Special Science Secondary Schools' located across in the educational zones in Sardauna Local Government Area of

Taraba State. One model school was selected from each of the zones apart from two schools selected because of the availability of two model schools in the zone.

One (1) Mathematics teacher was randomly selected from each of the nine schools and two colleagues of the target Mathematics teacher were randomly selected from each school using the Hat-and-Draw method One hundred and eighty (180) SS2 students (20 from each of the 9 schools) were selected using the simple random sampling technique. Thus, 9 secondary schools, 9 Mathematics teachers, 180 students and 18 Mathematics teacher's peers represent the sample for the investigation.

Hence, the nine (9) government science model secondary schools in the Sardauna were targeted for the study because they represent the characteristics of the total population, good geographical spread (at least one in each educational zone) and in order to reduce the factor of unavailability of facilities such as, laboratories and science teachers. In terms of school type, the nine schools have 3 each of Boys, Girls and Mixed schools. This brings the total research subjects to 207. Table 3.1 portrays the sampling frame. Three types of Questionnaires were used for data collection. These are: Student Evaluation of Teacher Effectiveness Instrument (STEV), Peer Evaluation of Teacher Effectiveness Instrument (PEEV) and Self Evaluation of Teacher Effectiveness Instrument (SEEV). Each of the questionnaire designed by the researcher consisted of two sections: the essential bio-data and 24 items on a five-point (5-point) scale: (Excellent (5), Good (4) Average (3) Fair (2) d (Poor (1) or (Always (5), Often (4), Sometimes (3), Re1y (2) d Never (1) The scales Were used to elicit degree of availability or frequency of the characteristic Under assessment The respondents were their opinions on the effectiveness of the Mathematics teacher. The major areas of focus in each questionnaire are, to elicit responses on extent to which the Mathematics teacher exhibits characteristic such as Preparation of lessons, Classroom management, Communication skills, Personality and Evaluation.

Results

Table 1: Mean score of Mathematics s Teachers by Students, Peers and Self According to Schools

S/NO.	NAME OF SCHOOL	(STEV)	(PEEV)	(SEEV)
1.	GDSSS NGUROJE	56.5	62.5	85.0
2.	GDSSS MAISAMARI	60.5	59.1	85.8
3.	GDSSS KAKARA	48.5	47.1	82.5
4.	GOVT. SC. SCH. GEMBU	51.0	60.9	80.0
5.	GSTC GEMBU	55.8	56.3	82.5
6.	GDSSS GEMBU	50.2	56.7	80.8
7.	GSSS GEMBU	54.7	55.4	84.2

8.	GDSSS WARKAKA	52.0	60.0	77.5
9.	GDSSS MBAMGA	52.0	57.2	87.5
	GRAND MEANS	**53.7**	**57.2**	**82.8**

Table 1 shows the results for the three methods of assessment for each of the sample public secondary schools in Sardauna local government area of Taraba state. Based on the pre-determined objective of the study the result shows that the assessment of the mathematics s teacher by students, peers and self-meet the 50% Stipulated bench mark. This indicates that on the average, the mathematics s teachers are effective in their instructional delivery. However, the teacher's self-assessment is out of the range when compared with students and peer assessment. However, the table also shows the mean assessment of mathematics s teachers' effectiveness from the three methods of evaluation. The overall mean assessment scores are: STEV =53.7, PEEV= 57.2 and SEEV=82.8. The result indicates that there is an agreement between students' assessment and peer assessment methods.

Table 2: Comparison of mean assessment of mathematics teacher effectiveness by STEV, PEEV and SEEV: summary of ANOVA

S/NO.	ASSESSMENT METHOD	N	MEAN	S.D	S.E
1.	STEV	180	52.70	3.43	0.25
2.	PEV	18	57.20	4.21	0.99
3.	SEEV	9	82.80	2.94	0.98

SOURCE OF VARIATION	SUM OF SQUARE (SS)	DF	MEAN OF SQUARE (MS)	F	SIG. OFF
BETWEEN METHODS	4543.02	2	2271.51	151.4	**3.40**
WITHIN METHODS	360.52	24	15	df(2,24)	
TOTAL VARIATION	4903.54	26			

($\alpha = 0.05$)

Table 2 shows an F-ratio of 151.4 which is significant at 0.05 level of probability with degree of freedom (2, 24). The null hypothesis (H01) is therefore rejected. The result indicates that there is a statistically significant difference between mean assessment scores of mathematics teacher effectiveness using the three methods of evaluation (STEV, PEEV and SEEV).

Table 3 multiple 6.08' Comparisons of Means: Tuckey's Honestly Significant Difference (HSD) Test.

	STEV $X_1 = 53.7$	PEEV $X_2 = 57.2$	SEEV $X_3 = 82.8$
STEV $X_1 = 53.7$	-		8.48*
PEEV $X_2 = 57.2$	1.02		6.08*
SEEV $X_3 = 82.8$	8.48*	6.08*	-

Studentised Mean = 2.98* = Significant = df 17 α =0.05

The post of Hoc analysis using Tuckey's Honestly Significant Difference (HSD) test to determine directory of means as shown in Table 4.3 indicates that the ratio of 8.48 (teacher self-assessment) is superior to others. The student mean of 2.98 is greater than the ratio of 1.02 (df 17, a 0.05). This test further indicates that STEV and PEEV are more objective and valid in the assessment of the mathematics teacher.

Table 4: Summary of correlation coefficient (Pair-Wise) for three method of Evaluation

S/N	EVALUATION METHOD	CORRECTION COEFFICIENT (r)	REMARK
1.	STEV AND PEEV	+0.60	Positive and Strong
2.	STEV AND SEEV	+0.29	Positive and Weak
3.	PEEV AND SEEV	-0.01	Negative and Weak

Table 4 shows the correlation coefficients of the three methods of assessing mathematics teacher effectiveness. This reveals that students' assessment and peer assessment (STEV and PEEV) Correlates positively and strongly indicating that the two methods are related positively. STEV and SEEV have a weak positive correlation. This implies that the relationship between them is Weak while PEEV and SEEV have a negative and weak correlation coefficient. The correlation coefficients obtained in Table 4 were transformed to a t-value and tested at a probability level of m 0.05. This is to establish whether the relationship is statistically significant.

S/N	EVALUATION METHOD (PAIRWISE)	R	Calculated t (t_{cal})	α	REMARK
1.	STEV - PEEV	+0.60	3.00	0.05	SIGNIFICANT
2.	STEV - SEEV	+0.29	1.35	0.05	NOT SIGNIFICANT
3.	PEEV - SEEV	-0.01	-0.24	0.05	NOT SIGNIFICANT

Table 5 shows the summary of t-test analysis for the pair-wise correlation coefficients of the methods of evaluating mathematics teacher effectiveness. The result indicates that the relationship between student assessment and peer assessment is significant at 0.05 level of probability. However, the relationship between STEV-SEEV and PEEV-SEEV are not significant at 0.05 level of probability. Hence, Hypothesis 2 (1402) ¡s not rejected for STEV and PEEV. Hence, a Strong statistical relationship exists between student assessment and peer assessment while the relationship5 between the other methods are not significant.

Table 6: t-Test Analysis for Pair-wise comparison of Assessment Means of STEV, PEEV and SEEV.

S/NO	ASSESSMENT METHODS	N	MEAN	S.D	t_{cal}	T_{table}	α/2	Remark
1	STEV	180	53.7	3.43				

	PEEV	18	57.2	4.21	-1.178	-2.120	0.025	NOT SIGNIFICANT
2	PEEV	18	57.2	4.21	-9.142	-2.120	0.025	SIGNIFICANT
	SEEV	9	82.8	2.94				
3	STEV	180	53.7	3.43	-11.78		0.025	SIGNIFICANT
	SEEV	9	82.8	2.94				

Degree of freedom (df) = 16

Table 6 shows the pair-wise comparisons of means of the three methods of assessing mathematics teacher effectiveness. The assessment means Of STEV-PEEV have a calculated t-value 0f -1.178 which is less than the critical value of 2. 1 20 at 0.025 levels of probability respectively. Therefore the null hypothesis (H_o3) is not rejected. This indicates that there is no statistically significant difference in the assessment means of STEV and PEEV. However, the result shows that the means (STLV and SEEV) and (PEEV and SEEV) are significant at 0.05 level of probability. Thus, hypothesis (F14) which states that there is no significant statistical difference between STEV and SEEV is rejected.

Table 7: z-test Analysis for the comparison of means of students' assessment of mathematics teacher effectiveness by gender

S/N	GENDER	N	MEAN	S.D	S.E	Zc	Zt	Remark
1.	MALE	90	53.60	1.83	0.19	-0.41	-1.645	NOT SIGNIFICANT
2.	FEMALE	90	53.80	4.24	0.45			

Table 7 shows t-test analysis for the comparison of means of students' assessment of mathematics teacher effectiveness by gender. The calculated z-value of -0.41 is less than the critical value of -1.64. This indicates that the z-values is not significant at 0.05 level of probability. Therefore, the null hypothesis (H_o5) which states that mean assessment scores of male students in assessing mathematics teacher effectiveness do not differ significantly from mean assessment scores of female students is accepted. This implies that student gender has no moderating effect on assessing mathematics effectiveness.

Table 8: Summary of ANOVA for Compir1S0fl of Assessment Means of Mathematics Teacher Effectiveness by School Type

S/N	SCHOOL TYPE	N	MEAN	S.D	S.E
1.	BOYS ONLY	60	54.40	1.85	1.07
2.	GIRLS ONLY	60	53.16	5.21	3.01
3.	MIXED	60	53.56	1.97	1.14

SOURCE OF VARIATION	SS	DF	MS	F	SIGNIFICANCE OF F
BETWEEN SCHOOLS	2.398	2	1.99	0.069 Df (2,6)	5.14(α =0.05)
WITHIN SCHOOLS	103.57	6	17.26		
TOTAL VARIATION	105.97	8			

Table 8 shows the summary of Analysis of Variance for comparison of assessment means of Mathematics teacher effectiveness by school type. The result shows that the F-ratio of 5. 1 4 is not significant at 0.05 and 0.01 levels of probability. Thus, the hypothesis (1-1o6) which states that mean assessment scores of Boys' school, Girls' school and Mixed school do not differ significantly on evaluating mathematics teacher effectiveness is not rejected. This indicates that there is no significant difference in the mean assessment of the mathematics teacher effectiveness irrespective of school type.

Discussions

The results of the study showed that mathematics teachers' self-assessment of instructional effectiveness was higher than students' assessment and peer assessment methods (Table 4.3). However, there was a strong agreement in the assessment of mathematics teacher effectiveness by students and peers of the physics teacher indicating a high degree of objectivity 111 their assessment. Based on the great difference between physics teacher self-assessment and the assessments by students and peers of the physics teacher, this study placed more premium son the assessment done by students and peers of the physics teacher. Based on the results, mathematics teachers in Sardauna LGA of Taraba state secondary schools are rated as effective in their instructional delivery.

However, the major finding of the study (Table 4.5) shows that peer and student evaluation are valid methods of teacher effectiveness based on their correlation. Table 4.6 also indicates that there is no significant difference between the means obtained from these two methods. This result is in agreement with Boekaerts (1991), Rose (1993) and Imhanlahimi (2006) who strongly opposed the use of teacher self-evaluation ¡n the assessment of instructional effectiveness; and Nwsu (1 995) who found out that chemistry teachers were biased in their self-assessment of teaching effectiveness. The result of the study however, is incongruous with Azu (1987) and Cox (1990) who argued in favour of the reasonability of teacher self-assessment. Obviously, the findings of this study ¡s in agreement with Seldin (1999) who argued that student evaluation of teacher effectiveness ¡s one of the several forms of evaluation used to shed light teaching effectiveness The finding of

the study attests to the usefulness and accuracy of Students' evaluation as an index of determining teac1ereffectiveness. This is in agreement with Chamberlain (2009) who argued that it only by the evaluation of our performance by a third person (or persons) that WC can ever hope to receive objective feedback as to the quality of our output. Hence, peer of the physics teacher can provide valid assessment of the mathematics teacher instructional effectiveness.

Thus, findings from the study reveal that using a single method to evaluate the teacher's instructional effectiveness would not be adequate and effective. The practice over the years has been the use of inspectors (observation technique) only to assess teacher effectiveness. This study has revealed that incorporating two methods (student evaluation and peer evaluation) for this task offers more valid, efficient and objective means of evaluating the teacher. This study, however, has resolved the controversy over which evaluation method should be adopted and shown that students can also provide valid assessment of their teacher. Tables 4.7and 4.8 show that sex differential and school type have no moderating effect on mathematics teacher their assessment respectively.

Conclusion

Based on the findings of the study, it has been shown empirically that the three methods yielded an average score of55d5%this indicates that the teachers are effective in their instructional delivery. The implication of this result is that physics teachers in the state may not be responsible for the poor students' performance in physics at both internal and external examinations. However, the teachers need to put more effort in terms of their approaches towards teaching for overall student performance in the Mathematics. The magnitude of the relationship between student assessment and peer assessment of the mathematics teacher shows a strong positive correlation (+0.06). This portrays that a high assessment score of peer of the physics teacher should give a corresponding high assessment score if assessed by students. However, the use of self-evaluation cannot provide an objective and valid assessment of the physics teacher. Therefore, using the two methods (student and peer) in the evaluation of the physics teacher will check for bias. This will ensure standards and quality assurance. Nevertheless, student sex differential has no effect on evaluating the physics teacher. Also, school type has no moderating effect student evaluation of physics teacher effectiveness. The implication is that students' assessment of the physics teacher does not depend on gender and school type. Thus the basic conclusion drawn from the investigation is that if teachers should be faced with the realization that their continued employment and promotion/demotion would partly be based on the evaluation of their performance by their students (who remain anonymous), and colleagues, then they would be forced to give in their best in class.

Recommendations

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

1. Teacher evaluation instrument should incorporate both student and peer assessment of teacher

effectiveness in instructional delivery as this will check bias and ensure quality assurance in teacher evaluation.

2. Sardauna local government educational policy makers and school administrators should exercise a great deal of caution in the use of only inspectors for evaluating mathematics teacher effectiveness as absolute indicators of teachers' ability, performance and effectiveness, especially in matters that bear on effective instructional delivery can only be more objective with the use of inspectors, peers and students' assessment.
3. Schools in Sardauna Local Government Area should ensure regular inspection of their teachers to monitor their instructional delivery using a combination of the two methods as the results can be used for both formative and summative purposes. It will be unfair to use only STEV or PEEV method as indicators of teachers' effectiveness; the teacher will also be giving a beautiful picture of himself/herself if SEEV method only is used.
4. Physics teachers in the state need to improve on their effectiveness in terms of instructional delivery as this will improve the overall performance of students in both internal and external examinations.

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