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Senior Secondary School Students' Assessment of Chemistry Teachers' Effectiveness in Teaching Chemistry in Kogi State, Nigeria

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Abstract:
The study investigated the Senior Secondary School (SSS) Students' assessment of chemistry teachers' effectiveness in teaching chemistry. The sample contained two hundred and forty (240) SSS III students randomly selected from twenty-five (25) Senior Secondary schools. A 32 – item questionnaire on students' assessment of chemistry teachers' effectiveness in teaching chemistry (SACTETC) was developed, validated and used as an instrument for data collection. Frequencies and percentages were used to answer research questions. Results showed that chemistry teachers were ineffective in their use of teaching methods, instructional materials, communication skills, practical activities, evaluation techniques among others. It was recommended that chemistry teachers should be constantly assessed by their students in order to provide the necessary feedback for effective classroom instruction and there should be regular inspection of chemistry teachers by school administrators to ensure effective use of innovative teaching strategies among others to improve classroom delivery of chemistry lesson.

Keywords: *Assessment, Chemistry, senior secondary, Students, Teachers effectiveness and Teaching.*

1. Introduction

The ultimate goal of any instructional activity is to ensure effective teaching and learning. The Chemistry teacher plays a very important role in both teaching and learning effectiveness. This is because at the classroom, the teacher is responsible for translation and implementation of the laudable chemistry education programmes. Contributing on the importance of chemistry teachers, Nwosu (1998) maintains that how well students understand chemistry depends upon what the chemistry teacher believes, knows and does. Therefore, the chemistry teacher remains the one who enable students to learn pleasurably and he/she is expected to have high and positive effectiveness. Bandele & Oluwatayo (2014) while quoting senate committee on teaching and learning; New York University (2000) defined teaching effectiveness as activity which brings about the most productive and beneficial learning experience for students and motivates their development of learning. Oshodi (2007) identified the following as evaluating factors for teachers' effectiveness: teachers' communication ability, teachers' enthusiasm, teachers' appearance, teaching aids/materials, teachers' ability to recognise each student, teachers' expression and gesture. Nwosu (1998) specifically suggested that the evaluation of chemistry teachers' effectiveness should centre on lesson planning, use of teaching/learning aids, evaluation technique, personality traits, teachers' attitudes to students and work, and teacher's involvement in practical and co – curricular activities. From the foregoing, effective chemistry teachers are expected to: master the subject well, communicate effectively, use appropriate teaching methods and materials, have positive attitudes to the students and their work, have positive personality traits and evaluate the students adequately.

A brief survey of literature shows: Nwosu (1998) carried out a study on constructing profiles of effective and ineffective teachers in secondary school chemistry. Seven hundred and fifty (750) senior secondary school chemistry students were used. The students responded to the questionnaire tagged the students rating of teachers' effectiveness instrument (*SRTEI*). The results showed that ineffective teachers were poor in the following dimensions: Lesson planning, teaching technique, use of question, use of teaching/learning aids, evaluation techniques, personality traits and teachers' attitudes to work, Ibole (2000) carried out a research using students' perceptions of science teachers and the teaching of science as an index for enriching science instruction. The researcher utilized a multiple choice format for respondents to indicate whether they agree or disagree. The results of the students' perception of various actions of their science teachers in science classes showed that: teachers do not explain different concepts, do not use local materials in teaching, do not allow students to express their views, do not encourage students to perform experiment, etc. Oshodi (2007) carried out research on students' assessment of science teachers' effectiveness for sustainable development. In the work, students were allowed to assess the effectiveness of their science teachers in teaching – learning process. The results showed that the teachers: did not use variety of teaching methods, did not involve the students in active participation of lessons, did not improvise the needed material resources and did not engage the students on pre-teaching and post-teaching evaluation. Aduloju and Obinne (2015) carried out a study on the assessment of chemistry teachers' effectiveness by chemistry students. Two hundred (200) students were sampled for the study from Benue State. Result showed that students agreed that their teachers cover a large part of the

syllabus before the examination and generally that there was significance difference in the opinion of students on their teachers' effectiveness. It was recommended that students should be involved in the assessment of their teachers for promotion and guidance.
From the above literature review, it is clear that chemistry teachers can be assessed by their own students. The teaching and learning process is an interaction between a teacher and the students. The teacher must engage the students in absorbing, understanding, retaining and applying knowledge. This cannot be done without taken into cognisance, feelings of the students who are consumers of the teachers' lesson and are in good position to assess their teachers. Consequently, this present study is seeking ways of allowing students to assess their chemistry teachers' effectiveness in teaching and learning chemistry.

1.1. Purpose of the Study

The purpose of the study is to assess chemistry teachers' effectiveness in teaching chemistry using their students. Specifically, this study is set out to determine from the assessment of the students:

1. The effectiveness of the teachers in terms of their knowledge of the subject matter.
2. The effectiveness of the teachers in terms of their use of teaching methods.
3. The effectiveness of the teachers in terms of their use of instructional materials.
4. The effectiveness of the teachers in terms of giving out assignments to students.
5. The effectiveness of the teachers in terms of their communication skills.
6. The effectiveness of the teachers in terms of their attitudes to work.
7. The effectiveness of the teachers in terms of the involvement of students in practical activities.
8. The effectiveness of the teachers in terms of evaluation technique they use.

1.2. Research Questions

The study was guided by eight research questions.

1. How effective are the chemistry teachers in their subject matter?
2. How effective are chemistry teachers in their use of teaching methods?
3. How effective are chemistry teachers in their use of instructional materials?
4. How effective are chemistry teachers in their giving out assignments to students?
5. How effective are chemistry teachers in their communication skills?
6. How effective are chemistry teachers in their attitudes to work?
7. How effective are chemistry teachers in their involvement of students in practical *activities*?
8. How effective are chemistry teachers in the use of evaluation techniques?

2. Methods

This was a survey research carried out in Idah Local Government Area of Kogi State, Nigeria. The population of this study comprised of all SSIII students in twenty-five (25) Senior Secondary Schools (*SSS*) from Idah Local Government Area of Kogi State. Eight SSS were selected, using simple random sampling technique. Only SSS III chemistry students were considered because of the length of time they spent in the school and their level of maturity which will add value to their opinions. Thirty (30) SSSIII chemistry students were selected randomly from each of the eight senior secondary schools. Hence a total number of 240 SSS III students of mean age of 17 years took part in the study.
The instrument for data collection was 32 – items questionnaire divided into eight (8) sections of 4 – items each, titled ***students' assessment of chemistry teachers' effectiveness in teaching chemistry (SACTETC)*** developed by the researcher. The instrument contains statements in relation to chemistry teachers' effectiveness as follows:

- Knowledge of subject matter (1, 2, 3, 4)
- Use of teaching methods (5, 6, 7, 8)
- Use of instructional materials (9, 10, 11, 12)
- Assignments to students (13, 14, 15, 16)
- Communication skills (17, 18, 19, 20)
- Attitudes to work (21, 22, 23, 23)
- Practical activities (25, 26, 27, 28)
- Evaluation techniques (29, 30, 31, 32)

The questionnaire was of Yes/No variety to get response of the students on the effectiveness of their chemistry teachers. The instrument was face validated by three experts: One specialist in measurement and evaluation and two specialists in chemistry education. Their corrections were effected before the final questionnaire was constructed. To establish the reliability of the instrument, 40 copies of the instrument were administered to chemistry teachers of Igalamela/Odolu Local Government Area who were not part of the sample used for the study. Their responses were subjected to a reliability analysis using Cronbach alpha which gave a coefficient of 0.86. The value was considered high enough and reliable for this study.
On method of data collection, the researcher administered the instrument on the respondents in their various schools with the assistance of their chemistry teachers. A total of two hundred and forty (240) questionnaires were collected back from the respondents and used for data analysis.
Frequency and percentages were employed for data analysis.

3. Results

The findings of this study are presented in Tables 1, 2, 3, 4, 5, 6, 7 and 8 of 4 –items questionnaire for each table, all totalling 32 – items.

S/No	Items	Yes		No	
		Number	%	Number	%
	Knowledge of the subject matter				
1.	The teacher knows the subject.	165	69	75	31
2.	The teacher is well prepared to teach.	158	66	82	34
3.	The teacher clarifies the lesson to the students' understanding	110	46	130	54
4.	The teacher gives the students notes that are comprehensive	142	59	98	41

Table 1: Frequency and percentage of responses of students on their chemistry teachers' knowledge of subject matter.

Table 1 shows that many students (69%, 66% and 59%) responded positively that their teachers were effective in their knowledge of the subject, their preparation to teach and their giving students comprehensive notes respectively. The students (46%) however responded negatively that their teacher clarifies the lesson to their understanding.

S/No	Items	Yes		No	
		Number	%	Number	%
	Use of Teaching Methods				
5.	The teacher uses variety of teaching methods.	42	18	198	82
6.	The teacher elicits students' active participation during his/her teaching.	60	25	180	75
7.	The teacher encourages the students to ask questions and engage in group discussion.	65	27	175	73
8.	The teacher makes good use of the chalkboard while stating the lesson summary.	90	37	150	63

Table 2: Frequency and percentage responses of the students on their chemistry teachers' assessment in terms of the use of teaching methods.

A close look at table 2 shows that the students (18%, 25%, 27% and 37%) responded negatively in terms of his/her teachers' effectiveness in the use of teaching methods. This reveals that majority of the students opined that their teachers are ineffective in the use of teaching methods.

S/No	Items	Yes		No	
		Number	%	Number	%
	Use of Instructional materials.				
9.	The teacher often uses instructional materials.	72	30	168	70
10.	The teacher teaches the students how to use the instructional materials.	56	23	184	77
11.	The teacher improvises instructional materials in absence of standard ones.	89	37	151	63
12.	The teacher teaches the students on how to improvise instructional materials.	34	14	206	86

Table 3: Frequency and percentage responses of students on their chemistry teachers in terms of their use of instructional materials

The results of table 3 reveals that percentages of the students who answered yes in the four items dealing with teacher's effectiveness in the use of instructional materials were low (30%, 23%, 37% and 14%) respectively. This implies that the students were negative about the teacher effectiveness in the use instructional materials.

S/No	Items	Yes		No	
		Number	%	Number	%
	Assignments to students				
13.	The teacher gives class and take home assignment.	160	67	80	33
14.	The teacher gives holidays assignment/project.	75	31	165	69
15.	The teacher marks all the scripts and give same to students.	168	70	72	30
16.	The teacher makes the necessary corrections and ensure that the students effect the corrections.	92	38	148	62

Table 4: Frequency and percentage responses of students on their chemistry teachers giving out assignments to students.

Table 4 shows interesting dimensions, as high percentage of the students (67% and 70%) opined that their chemistry teachers give take home assignments and mark the scripts and return the same to students respectively. On the other hand, low percentage of the students (31% and 38%) opined that their chemistry teachers do give holidays assignment and ensure that they effect the necessary corrections. This implies that the students are positive about item 13 and 15 and negative about item 14 and 16.

S/No	Items	Yes		No	
		Number	%	Number	%
	Communication skills.				
17.	The teacher employs good speech in delivering his/her lesson.	119	48	129	54
18.	The teacher takes time to explain his/her lesson.	88	36	154	64
19.	The teacher uses appropriate questions to sustain student's attention in the class.	95	40	145	60
20.	The teacher asks thought provoking questions to named students.	87	36	153	64

Table 5: Frequency and percentage responses of students on their chemistry teacher's communication skills.

Table 5 also shows interesting dimension as majority of the students (54%, 64%, 60% and 64%) opined that their chemistry teachers were not effective in their communication skills.

S/No	Items	Yes		No	
		Number	%	Number	%
	Chemistry teachers' attitudes to work.				
21.	The teacher is kind, friendly and gentle manly.	164	68	76	32
22.	The teacher has good sense of humour.	160	67	80	33
23.	The teacher is punctual to school and classes.	190	79	50	21
24.	The teacher attends his/her lesson always and do not wait to be reminded.	186	78	54	22

Table 6: Frequency and percentage responses of students on their chemistry teachers' attitudes to work.

Table 6 shows that majority of the students (68%, 67%, 79% and 78%) opined that their chemistry teachers were effective in terms of their attitudes to work.

S/No	Items	Yes		No	
		Number	%	Number	%
	Practical activities				
25.	The teacher encourages students to do practical works.	104	43	136	56
26.	The teacher enlightens the students on safety precautions/good laboratory habits.	98	41	142	59
27.	The teacher ensures good conditions of the apparatus before they are used for practical exercises.	84	35	156	65
28.	The teacher encourages the students to wear hand gloves and laboratory coats during practical exercises	110	46	130	54

Table 7: Frequency and percentage responses of the students on their chemistry teachers' involvement of students in practical activities.

Table 7 reveals that the percentages of students 43, 41, 35, 46 who answered yes, on items that deals with encouraging students to do practical work were low. This implies that the students have negative responses in terms of their teachers encouraging them to participate in practical activities.

S/No	Items	Yes		No	
		Number	%	Number	%
	Evaluation techniques				
29.	The teacher begins his lesson by assessing the students on previous knowledge.	30	13	210	87
30.	The teacher assesses the students during the lesson.	44	18	196	82
31.	The teacher assesses the students at the end of the lesson.	90	38	150	62
32.	The teacher appropriately times and sets examination questions.	208	87	32	13

Table 8: Frequency and percentage responses of the students on chemistry teacher's evaluation techniques.

Table 8 result shows that the percentages of the students (13%, 18% and 38%), who answered yes on the items 29, 30 and 31 respectively were low, indicating that chemistry teachers were ineffective in the use of the evaluation techniques in evaluating their lessons. On the other hand, the students (87%), answered yes, indicating that the teachers were effective as far as timing and setting of examination questions are concerned.

4. Discussion

4.1. Teachers' Knowledge of the Subject Matter

The result of data analysis shows that the students sampled opined that their chemistry teachers were effective with respect to their knowledge of the subject matter. That is to say that the teachers possess adequate knowledge of the subject matter, adequately prepare their lesson plans and comprehensively give notes to the students. The students' assessment here, might not always mirror the reality,

as the students may be limited in knowledge to technically assess knowledge of the subject matter. The students may take at the surface value that since their teachers had high academic qualifications and are experienced, they are knowledgeable in the subject matter.

4.2. Teachers' Use of the Teaching Methods

The result of the data analysis also shows that the sampled students opined that their chemistry teachers were ineffective in the use of appropriate teaching method as most of their chemistry teachers do not use variety of teaching methods or elicit students' active participation or encourage students to ask questions and make good use of the chalkboard. This finding is in agreement with the finding of many science educators, that the prevalent method of science instruction has been found to be mainly expository rather than innovative teaching methods that are activity – based (Nzewi and Okeke 1990, Ali 1997, Ibe and Nwosu 2003, Mankilik and Umaru 2011, and Achimigu 2013). In the same vein, Aniodoh and Egbo (2013) pointed out that the popular method of instruction in Secondary School is expository method, which is verbal presentation of subject matter and one way teaching operation where the teacher says everything and students take down notes. There is need for chemistry teachers to use innovative teaching methods such as guided discovery, inquiry, field trip, demonstration, scaffolding, concept mapping, etc. Since the opinions of the students here agreed with the findings of good number of science education researchers mentioned above, chemistry teachers should no longer take their students for granted during chemistry instruction.

4.3. Teachers' Use of Instructional Materials

The result of data analysis also shows that instructional materials are not adequately used for instruction, neither are they improvised in absence of conventional ones. The importance of instructional materials in effective teaching of chemistry cannot be over emphasised. Soyibo and Ezeiroma (1987) pointed out, that instructional materials, when appropriately utilized in teaching science, make learning more concrete, real and permanent. It is in realisation of this, that Okoye, Okongwu and Nweke (2015) observed that government at various levels have been making efforts to enhance effective teaching of chemistry by the provision of science equipment. Chemistry teachers should endeavour to utilize these instructional materials and they should equally improvise them in the absence of standard ones.

4.4. Teachers' Assignments to Students

Result also shows, that most of the teachers, assessed gave home work and marked all the scripts and returned the same to the students, but few teachers give holidays assignment or take the pain of ensuring that students effect the teachers' corrections. Therefore, chemistry teachers are effective in giving take home assignment, marking and returning students' scripts but ineffective in giving holiday's assignment and ensuring that students effect the teachers' corrections.

4.5. Teachers' Communication Skills

The responses of sampled students reveal that their chemistry teachers do not effectively communicate to the students during chemistry lessons. And effective communication leads to effective teaching. This means that the students are lost during chemistry instruction and therefore do not participate actively in the lesson.

4.6. Teachers' Attitudes to Work

The responses of the sampled students reveal that most of the teachers have positive attitudes toward their work. Nwosu (1998) pointed out that effective chemistry teachers are found to possess positive attitudes toward their duties and are enthusiastic about their teaching job. The finding of this study is supportive of the finding of Igboegwu, Egolum and Nnoli (2012) that teachers exhibited great enthusiasm and positive attitudes toward classroom teaching and learning. It is also interesting to note that the students' assessment of their teachers agreed with the above researchers and chemistry teachers have to live up to expectation in their classroom instruction.

4.7. Teachers' Practical Activities

The result of data analysis also shows general opinion among the students sampled that their chemistry teachers do not encourage them to participate actively in practical activities. Effective use of practical activity ensures quality chemistry lesson delivery (Achimugu 2013). Therefore, effective chemistry teachers are those that involve students in practical works.

4.8. Teachers' Evaluation Skills

The responses of sampled students also reveal, that majority of their chemistry teachers, hardly involve themselves in pre-lesson, during lesson and post-lesson evaluation of their students. Therefore, the chemistry teachers are ineffective in evaluating their students and this leads to students' shallow knowledge of chemistry as there is no effective interaction between the teacher and the students. However, the teachers are good in setting and timing examination questions. These students' assessment on their teachers call for sober reflection of the teachers to always endeavour to live up to expectation in their evaluation skills so as to carry their students along.

5. Conclusion

This paper critically looked into the students' assessment of chemistry teachers' effectiveness in teaching chemistry. The results showed that chemistry teachers did not use variety of methods and instructional materials, there was no improvisation of needed materials, majority of the teachers exhibited poor communication skills and hardly encourage their students to participate actively in practical activities among others. Generally, from the finding of this study, students can objectively assess their chemistry teachers' teaching effectiveness especially when they are exposed to the appropriate measuring instruments. This justifies the choice of students to collect data for this study. However, the outcome of students' assessment may be that many chemistry teachers take their students for granted and so they go to the classroom to teach without adequate preparation, which lower their effectiveness and therefore, chemistry teachers should no longer take their students for granted in teaching and learning chemistry. The observed low level of chemistry teachers' effectiveness in the classroom delivery of chemistry lessons in most of afore-mentioned factors, calls for all stakeholders to contribute meaningfully to bring a change in the execution of chemistry teaching and learning and hence the recommendations below.

6. Recommendations

This paper recommends that:

1. Chemistry teachers should be constantly assessed by their students and the feedback should be used by the teacher to improve the teaching and learning of chemistry
2. Chemistry teachers should use a variety of innovative teaching strategies to ensure effective classroom delivery of chemistry lesson.
3. Chemistry teachers should also use a variety of instructional materials during chemistry lessons and they should endeavour to improvise the needed materials for effective teaching and learning.
4. There should be regular inspection of chemistry teachers by school administrators to ensure that the right methods, right communication skills, right materials, right practical activities and right evaluation techniques are used in teaching and learning chemistry.

If, the recommendations above are faithfully implemented, chemistry teachers would be effective and this will in turn, enable the students to develop positive attitudes toward chemistry education and hence better academic performance of chemistry students in chemistry.

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