

Factors Influencing Effective Teaching of Chemistry: A Case-Study of Some Selected High Schools in Buffalo City Metropolitan Municipality, Eastern Cape Province, South Africa

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ABSTRACT The research study sought to investigate the factors that influence effective teaching of chemistry in the secondary schools in Buffalo City Metropolitan Municipality, Eastern Cape Province of South Africa. The relationship between the students and teachers responses to these factors was critically examined. The instrument used for data collection is a structured questionnaire developed from the literature review. It contains 30 items, where 15 items were for the students and the other 15 items were for the teachers. The instrument used the 4-point Likert format of strongly agree to strongly disagree and were administered to one hundred and twenty individuals comprising both students and teachers. Data were collected and analyzed using chi-square statistical tool. The result showed that there is no significance relationship in the responses of students and teachers to some of the factors considered.

However, some suggestions were offered on how the management of the schools, the government and the students involved could improve on the factors highlighted, in order to make the teaching and learning of chemistry more effective and interesting.

INTRODUCTION

Chemistry has become one of the most important discipline in the school curriculum, its importance in general education has gained world-wide recognition. This can be likened to the realizing of the importance of science and technology in the wide-world and hence, individual country sees the need to advance in science and technology. The benefit of learning and advancing in science and technology can be intrinsic and extrinsic. Thus, such has been identified with chemistry. Some developing countries are by and large technologically deficient nations and so depend very much on the importance of technology. There is inadequate development of agriculture, health, national and human resources for the benefit of the society. These bring about problems which lead to low level of development. However, problems encountered in teaching of chemistry subject, have posed major concern to science educationalists. This is because the teaching and learning of science have significant roles towards technological development in a developing nation in which South Africa is not exempted.

The performance of students in chemistry is closely related to their theoretical and practical knowledge in the subject. This however, depends solely on the subject at various classes and also on particular factors within and without the teaching and learning environment. Practical experience also contributes an integral part of chemistry science, the subject consist of many topics that can be verified experimentally. Academic achievements have come to be related to the way students are being taught which in turn depends on the factors that influence the effective teaching of the subject. The availability of laboratory equipments, chemicals and materials, laboratory personnel, working conditions in the laboratory and safety measures, good and enough recommended textbooks and accurate periods allocated for the teaching of the subjects and factors required to be studied and carefully controlled if effective teaching of chemistry could be achieved. In some of the developing countries such as Nigeria, Ghana,

Cameroon and Gambia, most of the schools equipment are highly installed and maintained by the proprietors or proprietresses because they financed the school through the money generated from the tuition fees before taken-over by the government. As a result, it was discovered that most of the students who attended the private missionaries' schools are purely from the rich families, then to bridge the gap between the rich and poor parents to ensure that all children have equal opportunities of enjoying equal schools' facilities, such as laboratory equipment, government came in to take-over some of these private missionaries school by ensuring that all the public schools exercise free education. Egbe (1984) in his report on the maintenance of school equipment said that the existing school before the introduction of free education had relevant laboratory equipment; this is because students were paying school fees and the schools were administered by proprietors such as private missionaries and the government. However, with the take-over of schools from proprietors by the government with the introduction of free education, schools now depend solely on the government for the provision of funds. This also lead to the increase in the number of students, thereby causing a lot of problems in the teaching-learning processes especially in the science and in the areas of practical's, chemicals and materials could not go round the student as a result of population explosion.

In the light of this, the researcher wants to look at the major factors influencing effective teaching of chemistry subject in secondary school which in turn increase or enhance the performance of students in chemistry both in theory and practical.

2. LITERATURE REVIEW

2.1 Concept of Chemistry Education

In the contemporary world, science and technology has become an integrated part of the human culture. Countries that ignore this significant truism are risking the future of its youth and its citizens. If today's youth are not properly equipped with the rudimentary knowledge of modern science, they will grow up only to discover that hap hard knowledge of science which is not sufficient to understand the sophisticated operation of the present information age in science and technology. The meaning of chemistry has been made clear by several institution and authors concerned with the interest of chemistry education in developing countries. Fafunwa (1969)

states that the education of a nation is generally evaluated in part by the quality of her teachers. The effective teaching of any subject depends to a great extent, on the teachers understanding of the nature of the subject. Balogun (1982) in his paper delivered at Science Teachers Association of Nigeria (STAN) conference wrote that “ideally no effective science education programme can exist without scientific apparatus”. They are indispensable to good science teaching and learning. Abdulkareem (1997) describes the teacher as the fulcrum of the educational lever. Ojibara (1998) emphasizes that the teacher is expected to be academically, physically and intellectually fit in society at large. He further intimated that the teacher skills, disposition and most especially teacher professional’s status could affect their efficiency at desirable behavior and enhance the academic achievement of the students. Awoniyi (1983) also contended that whatever the profession, there is need for training in order to create awareness of the problems of that profession. He stressed that such training, would improve the level of competence for dealing with such problems. This means that schools with stable, experienced and qualified teachers usually have better school facilities in terms of textbooks, equipments and the laboratories than that school which have difficulty in attracting experienced and qualified staff. Piaget (1963) in his series of experimental statements said, “for effective teaching and learning of a subject, there must be adequate learning and teaching facilities such as good and well-equipped laboratory, experienced and qualified teachers with good teaching methods”. Adeyegbe (1996) described practical chemistry as candidate’s ability to use manipulative skills, accurate and sharp use of five senses in a well co-ordinate manner and ability to apply the knowledge acquired to solve other problems. In order to achieve this, enough materials and conducive learning and teaching environment must be provided. The objective of science teaching in schools is to communicate the spirit of science to the pupils, which we cannot do effectively without science equipments. We also need to bear in mind that at least some of the pupils would or may need to become professional scientists, technologists and engineers, such pupils need the material to develop the necessary skills process the skills and eventually acquire it.

There are several methods used by chemistry teachers in presenting scientific information, principles and skills to students. Common methods include: demonstration method, discovery method, laboratory, trips, and discussion and project methods. In deciding on what method to

use, a good chemistry teacher must consider the size of the class, the material available, the period or time allocated for the lesson.

2.2 Equipment or Resources for Teaching Chemistry

Whatever a teacher seeks to achieve with his students, his aspirations will be influenced and in some instances limited by the teaching and learning resources available to him. Resources in this context refer to equipment and materials which the teachers can use to help the achievement of lessons objectives. The range of resources available to the teachers is quite enormous; however, attention will be focused on those resources which are at the disposal of every teacher who are to make the best use of them.

2.2.1 Reference Textbooks

Textbooks are important reference books that aid teaching and learning processes. It is an important single resource to the teacher that saves the teacher time in terms of planning. The text usually have study question, suggested activates and exercise included and in some cases, text questions for teacher use. According to Balogun (1982) most chemistry textbooks recommended for use in schools are not comprehensive enough and therefore hinder effective learning among students. This at times leads to the loss of interest in the subject as it would not serve the primary aim of setting up to a good foundation for the students on the subject. Textbook exposes student to a common learning experience. The text is a potentially valuable asset to teachers due to the support and self-confidence embedded therein

With reference to the Science Teachers Association of Nigeria STAN- Teachers Association Section (1986) in its working recommended some steps in selecting relevant textbooks for students. They include:-

- A teacher should at least use about two or three current textbooks in the preparation lesson.
- Topic books (Multi-media package) should not replace comprehensive textbooks but should be used with them.
- Questions and answers should be prepared from different textbooks.

- Difficult arising from the use of textbooks for a course syllabus which is independent of the scheme can be solved if the teacher teaches the content of the syllabus in the order he chooses and not in the printed order.

2.2.2 Chalkboard

This is a vital response for both teacher and students. It is relatively cheap, simple to use and flexible in terms of quick erasure, mistake may be rubbed out and corrected in which presentation are being made. The chalkboard enables the teachers and the class to work together with a high level student's participation. It has advantage of easy erasure, however, confers temporariness to what has been written. However, the chalkboard does not all display pictorial, material such as photography illustration the use of which introduces a grater element of reality into the classroom.

- To use the chalkboard effectively, the following point should be noted. The teachers should write legibly, large enough to be seen by all students.
- Where complicated diagrams are necessary, draw them on the chalkboard before the start of the lesson and cover up till they are needed. This save valuable teaching time and forestalls being temporally idle. Do not stand in line between pupils and chalkboard where this is unavoidable during actual writing or drawing use of a pointer to draw attention to part of the diagram and graph, this serves a dual purpose of allowing ease as well as enabling you to maintain eye contact with the class.

2.2.3 Charts

Charts may be regarded as visual aid embodying all form of drawing and photographs which can be mounted on chalkboard, they are relatively permanent and can be used and received over a period of years. As useable illustration, they present fact and information in a condensed form. They help students to visualize important points and to facilitate learning. Resources material is very important to the teachers because it aid in effective delivery of the subject. The use of textbook and visual aid enhance adequate understanding of the subject to following up what is required of their studies. It assists them to study effectively and also do well in their examination.

2.3 Factors Influencing Effective Teaching of Chemistry

A greater deal of work has been done in an effort to identify problem that are inherent in the teaching of chemistry in secondary schools. These factors influence the effective teaching of chemistry which in turn plays a vital role in the lives of the students as it affects their performance. These includes: physical classroom and laboratory: instructional arrangement and school management. The physical classroom and laboratory indicates the presence of good ventilation, availability of good chalkboard, preparatory room, enough chairs and tables, charts and clean environment. Other factors include presence of instructional materials in the laboratory such as apparatus and chemicals. The dissemination of information of students through bulletin boards, posters, and charts, if well organized and accessible to students will enhance easily assimilation and performance in their academics. Finally, the school management or organization is another vital factor that may be considered before expecting a good result from effective teaching of the students. The school management factor now include positioning of the school laboratory, school library, provision of essential services like water supply, light, food, vendors, counselor services and first aid services.

2.4 Effective Chemistry Laboratory

A lot of concern has been show about the poor condition in science laboratory in South Africa. To achieve the desired objective of effective teaching of chemistry in secondary schools, effective chemistry laboratory equipments has to be provided. But it is dish-eating to note that most of our schools do not have functional laboratories. Ali (1986), observed that infrastructure are often also stressed the insufficient or completely absent in many schools. He also stressed the point that effective science teaching is the gateway to attainment of scientific and technological greatness and this can be achieved via integrating theory with practical work. Laboratory programme is an integral part of chemistry teaching as it is used when:

- It is needed as a means of obtaining and learning scientific information.
- It is needed as means of verifying scientific principle, law or a theory that is already known to the students.
- It can be easily engaged with text books and other learning materials.

Practical work allows students to have experience that are consistent with the goals of science literacy. Emphasis has been placed on examination to the neglect of practical knowledge gained in the laboratory as observes by Okafor (1998). She pointed that effective laboratory facilities are not provided for the teachers. Onafo (1993) had observed that equipment, material and chemical are not stocked specifically for the teaching of chemistry and the outcome of such a situation is that most chemistry teachers handle the subject negligently and every superficially. Student activities are most completely neglected and demonstration classes are held not according to schedule but according to how convenient it is for the teachers. Abdulahi (1982) observed that an important ingredient for the effective science teaching is an appropriate items; of equipments and materials.

According to Rai (1985), a standard laboratory should make provisions for:

- Preparatory room with the following facilities, like storage shelves for chemicals; storage shelves for tools used for servicing maintenance; trolleys for moving equipment and chemicals about.
- Central storage room; where dangerous chemicals are kept.
- Resource room where students carry out their project work.
- Staff office for laboratory assistants and technicians
- Fume cupboard for preparation of poisonous gases

2.5 In-Service Training for Chemistry Teachers

This is a programme or training which enriches the experiences or skill of the full time worker needed to carry out their normal duties with a view to becoming more efficient on the job. In-service on the job education create form for further learning which expose the workers to new development and ideas in their area of study. It could also be refreshing courses which make the professional not to lose grips with their skills, attitude or knowledge. In some cases, the reward for such training is promoting to a new rank or the acquisition of better and higher status in essence of this view, absent of this training affect the teachers in delivery of its duties effectively.

2.6 Students and Government Attitude towards the Study of Chemistry

Teaching and learning is an encounter which demands voluntary contribution from the two parties to achieve greater result. According to Yager (1991), the key to success in any human endeavour is the desire of that person. This means that success or failure depends to a great extent on the interest or attitude of the people involved in such endeavour. The attitude of children in their school work is deeply affected by the degree of encouragement their parents give them and by their own level of emotional stability. Children often muddle their parent's attitude, where this happens, there is the tendency for them to exhibit positive or negative of encouragement by way of information or demonstration given or exhibited to them from the onset. Also the unfulfilled promise from the government are also the problems, where government promised some allowances for all science teacher and raise their moral but surprising, the promises were not fulfilled. So lack of encourage to teachers by the government also contributes to ineffective teaching of chemistry.

2.7 Teacher Qualification

The productions of qualified chemistry graduate at the university level constitute a vicious circle. Fafunwa (1971) says that qualify and quantity of teachers are both necessary as they are not mutually exclusive because it is not beyond human capability to produce quality in quantity. Goeting (1986) stressed that, if a mediocre group of teachers are appointed to teacher in a school, we should not hope for more than a mediocre result and performance may be terribly affected. He stressed further that in many schools, intelligent patrons insist that teachers of their children be selected on the basis of their professional qualifications, rather than a more personal preference or political consideration. A trained chemistry teacher needs to acquaint himself/herself with the aim of his/her subject and the best scientific method to be used. He or she cannot do the job alone, so he/she needs the help of an assistant. A qualified and experienced laboratory attendant or technicians is expected to be recruited by the government but the reverse is the case. Untrained personnel who do not go beyond the wall of senior secondary school are employed as laboratory attendants in most of our secondary schools today. Apart from quality, the quantity of chemistry teachers available in the schools is grossly inadequate and the few that are available are concentrated in the urban areas thus making those in the rural areas to be overloaded. Abdulkareem (1997) described that teachers are the fulcrum of the educational lever.

Ojibara (1998) emphasized that the teacher is expected to be academically, physically and intellectually fit in society at large. He further intimated that the teacher skills, disposition and most especially teacher professional's status could affect their efficiency at desirable behaviour and enhance the academic achievement of the students.

Teachers who lack knowledge and confidence may naturally attempt to avoid or minimize their difficulties through a variety of strategies, including avoidance of topics, heavy reliance on texts, and over-emphasis on practical activities which, overtime, may result in an impoverished science education for children (Lee 1995; Harlen1997; Holroyd 1997). Osborne et al. (1996) have discussed some pragmatic solutions to the problem of lack of expertise within the existing teaching force. However, sustained improvements in primary science will depend on improved teacher capability. So there is the need for the teacher to be knowledgeable and know how best knowledge could be developed and transformed. The knowledge utilization by teacher has been categorized by Shulman (1987) as:

- Knowledge of the science curriculum
- The content appropriate to it
- The pedagogy necessary to teach it.

These three are very essential to the science teacher as a weapon in the classroom.

2.8 The Environment and the Community Based Resources

It is almost impossible for a single school to have all the necessary facilities for science teaching, then it will be important for the science teacher to look into the environment for community based resourced. Durosaro and Fagbamiye (1998) stated that one of the purposes of education is to give the students the ability to appreciate good things and live in beautiful surrounding which give rise to pure thoughts and clean deeds. Jegede (2003) reported that failure in chemistry among the students could result in part from the nature and psychological classroom environment. It could well be that in chemistry classroom, interaction among teacher and their students are not conducive for desired performance. The feature of chemistry classroom in the college of education, schools, higher institutions where chemistry teacher education is taught may not be conducive for learning.

Ikeogi et al. (2002) summarize the following as ways to make more effective use of community based resources:

- Motivation of teacher resourcefulness. The teacher should be motivated to look inward to see alternative uses of community resources in the day to day instruction.
- An initiative for cordial-social community relationship. The community hosting every school should be made to accept their roles in conducive environment where the learning can take place.
- Retraining and workshop for science teachers. There is need for science teacher (chemistry) to be retrained for effectiveness.

3. RESEARCH OBJECTIVES

The purpose of the study is to determine the extent to which some factors have influenced the effective teaching of chemistry which is a foundation of science and technology. The study therefore investigates the adequacy of facilities available in chosen schools, the adequacy of periods allocated for the subject (both theory and practical) and the type of employed personnel for chemistry as well as the type of recommended chemistry textbooks used compared with the present syllabus.

4. RESEARCH METHODOLOGY

The study used the quantitative research design and survey research method of data collection. Five schools were selected in the Buffalo City Metropolitan Municipality area. The study involved twenty students and four teachers selected at random to respond to the questionnaire in each school making a total of one hundred students and twenty teachers in secondary schools in the Eastern Cape Province of South Africa in the Buffalo City Metropolitan Municipality selected town of East London. The factors considered in the research include: standard and equipped laboratories; enough science practical periods, relevant and recommended textbooks, teachers academic and professional qualifications. Data for the research study was collected through self-administered questionnaires and the use of random sampling method. The research

instrument used contains two questionnaires developed for the teachers and the students of chemistry in the selected schools. Questions related to the factors influencing effective teaching of Chemistry are usually insightful. Participants in the survey were assured strict confidentiality in order to obtain the necessary information. Responsive questions such as the names and contact addresses of the respondents were removed from the questionnaire. The questionnaire consisted of structured questions which made it easy for the respondents to indicate their views. The use of four-point likert scale questions enabled respondents to indicate their opinion on various factors influencing effective teaching of Chemistry in the Secondary Schools in Buffalo City Metropolitan Municipality in the Eastern Cape Province of South Africa. The likert scale is a scale in which respondents indicate their level of agreement with statements that express a favourable or unfavourable attitude towards a concept being measured, comprising of five categories (Cooper and Schindler 2003). Primarily five-point Likert scale consists of strongly disagree, disagree, neutral, agree, and strongly agree. But for the purpose of this study, four-point likert scale questions which consist of strongly disagree, disagree, agree, and strongly agree except for demographic questions were used. Data analysis included Statistical Package for Social Sciences (SPSS), using chi-square of goodness of fit test to confirm the authenticity of the data collected as the statistical tool. The empirical research for the study was conducted in the main survey.

5. RESULTS AND DISCUSSION

The instruments designed for this study were used to collect data for the study. A total number of one hundred students and twenty teachers were given the test items which were collected for analysis. The statistical result is presented in the table below, followed by a general discussion of the results.

Table I. Chi-square for the students and teachers' responses on the adequacy and inadequacy of good recommended textbooks

ITEMS	Student	Teacher	Total
Adequate good recommended textbooks	83 (81.7)*	15 (16.3)*	98

Inadequacy good recommended textbooks	17 (18.3)*	05 (3.7)*	22
	100	20	120

- Figure in the parenthesis are the expected score

From the result in the table I above, as for the teachers' response to the adequacy of good recommended textbooks of chemistry, the expected value of 16.3 is greater than the observed value of 15. This however, contradicts the values obtained in the response of student in which the observed value of 83 is greater than the expected value of 81.7. This shows that there is no relationship in the two responses. The observed value for the teachers' response to the inadequacy of good recommended textbooks of chemistry of 5 is greater than the expected value of 3.7. However, the students' response to inadequacy good recommended textbooks gave expected value of 18.3 which is greater than the observed value of 17. This shows that there is no relationship in the two responses. To confirm this further, the data were subjected to chi-square statistical tool and it was found out that the calculated value of 1.2662 is lower than the table value of 3.841 which shows that there is no significance relationship in the response of teachers and students as to the adequacy and inadequacy of good recommended chemistry textbooks.

Table II. Chi-square for the students and teachers' responses on the adequacy and inadequacy of practical periods for chemistry

ITEMS	Student	Teacher	Total
Adequate periods	33 (34.2)*	8 (6.8)*	41
Inadequacy periods	67 (65.8)*	12 (13.2)*	79
	100	20	120

- Figure in the parenthesis are the expected score

From the result shown in the table II above, 34.2 which is the expected value of students' response to adequacy of period allotted to chemistry is greater than the observed value of 33. Also, the expected value of 6.8 is lesser than the observed value of 8 for the teachers' response. As for the response of students to the inadequacy of period allotted to chemistry the observed value of 67 is greater than the expected value of 65.8 which is quite different from the response of teachers in which the observed value of 12 is less than the expected value of 13.2. Again, the overall expected value in the responses of students and teachers to the adequacy of period

allotted to chemistry and that of the responses of the inadequacy of period allotted is the same as the observed value. So, all these figures show that there is no significance relationship in the responses of students and teachers on the adequacy and inadequacy of period allotted to chemistry.

Using chi-square statistical tool, the value for the table above is 5.223 which is greater than the table value of 3.841 hence, it shows that there is no significance relationship in the responses of teachers and students on the adequacy and inadequacy.

Table III. Chi-square for the students and teachers' responses on the adequacy and inadequacy of chemistry laboratory

ITEMS	Student	Teacher	Total
Adequate chemistry laboratory	62 (64.2)*	15 (12.8)*	77
Inadequate chemistry laboratory	38 (35.8)*	05 (7.2)*	43
	100	20	120

- Figure in the parenthesis are the expected score

Looking at the results obtained from the data collected, the value calculated for the students' response to the adequacy of chemistry laboratory is 62 which is less than the expected value of 64.2, while in the case of teachers' response, the calculated value of 15 is more than the expected value of 12.8. Also, for the response to inadequacy of chemistry laboratory, the value calculated from the students' response which is 38 is more than the expected value of 54.7. However, in the teachers' response, the calculated value of 5 is less than the expected value of 7.2. These two results show that there is no relationship in the two responses that is teachers' and students' responses to the adequacy and inadequacy of the chemistry laboratory. When tested with chi-square statistical tool, the calculated value was found to be 1.0782 which is quite lower than the table value of 3.841 and as result, it shows that, there is no significance relationship in the responses of teachers' and students' as to the adequacy and inadequacy of the chemistry laboratory. The research questions showed that, lack of adequate practical periods, adequate laboratory facilities make the teaching of chemistry to be ineffective in most schools used for the research. This was supported by Piaget (1963) in his series of experimental statements said, "for effective teaching and learning of a subject, there must be adequate learning and teaching

facilities such as good and well-equipped laboratory, experienced and qualified teachers with good teaching methods”.

Adeyegbe (1996) described practical chemistry as candidate’s ability to use manipulative skills, accurate and sharp use of five senses in a well co-ordinate manner and ability to apply the knowledge acquired to solve other problems. In order to achieve this, enough materials and conducive learning and teaching environment must be provided. According to Comparative Education Study and Association Centre (CESAC 1978) students learn more from scientific lessons when they are given the opportunity to learn through doing the work themselves than when they are simply allowed to watch. Students enjoy measuring, manipulating apparatus, classifying data, designing experiments, hypothesizing and making inferences. Onafo (1993) had observes that equipment, material and chemical are not stocked specifically for the teaching of chemistry and the outcome of such a situation is that most chemistry teachers handle the subject negligently and very superficially. Student activities are most completely neglected and demonstration classes are held not according to schedule but according to how convenient it is for the teachers. Abdulahi (1982) observed that an important ingredient for the effective science teaching is an appropriate items; of equipments and materials.

It was also discovered that though available but not enough quantity of relevant textbooks to go round each of the students of chemistry makes the work to be cumbersome for the teacher and thus, ineffective. This is in support of Balogun (1982) that most chemistry textbooks recommended for use in schools are not comprehensive enough and therefore hinders effective learning among students. This at times leads to the loss of interest in the subject as it would not serve the primary aim of setting up to a good foundation for the students on the subject. Textbook exposes student to a common learning experience. The text is a potentially valuable asset to teachers due to the support and self-confidence embedded therein. The issue of personnel was not left out in the findings as most of the teachers handling the subject are not professionals on the job, though they are graduates. For instance, a Biochemist who had to teach chemistry in the secondary will not be as effective as a specialist in the subject itself and this is what operates in most of the schools visited. The few qualified and experienced teachers only have few opportunity of attending in-service courses, workshops and seminars.

This was supported by Ojibara (1998) emphasized that the teacher is expected to be academically, physically and intellectually fit in society at large. He further intimated that the teacher skills, disposition and most especially teacher professional's status could affect their efficiency at desirable behavior and enhance the academic achievement of the students. Awoniyi (1983) also states that whatever the profession, there is need for training in order to create awareness of the problems of that profession. He stressed that such training, would improve the level of competence for dealing with such problems. This means that schools with stable, experienced and qualified teachers usually have better school facilities in terms of textbooks, equipments and the laboratories than that school which have difficulty in attracting experienced and qualified staff.

In-service on the job education create form for further learning which expose the workers to new development and ideas in their area of study. It could also be refreshing courses which make the professional not to lose grips with their skills, attitude or knowledge. In some cases, the reward for such training is promoting to a new rank or the acquisition of better and higher status in essence of this view, absent of this training affect the teachers in delivery of its duties effectively.

6. CONCLUSIONS

The finding showed that, lack of adequate practical periods, adequate laboratory facilities make the teaching of chemistry to be ineffective in most schools used for the research. It was also discovered that though available but not enough quantity of relevant textbooks to go round each of the student of chemistry makes the work to be cumbersome for the teacher and thus, ineffective. The issue of personnel was not left out in the findings as most of the teachers handling the subject are not professional on the job, though they are graduates. Some of the respondents also highlighted that some of the teachers teaching chemistry in the high schools will not be as effective as a specialist in the subject itself due to inappropriate educational qualification to teach the subject and this is what operates in some of the schools. The few qualified and experienced teachers only have few opportunity of attending in-service courses, workshops and seminars. Most of the schools had no laboratory attendant and where present, they are just school certificate holders. This makes the teaching of chemistry ineffective because

the teacher has to over work himself/herself before presenting the lesson proper to the student. And this may even discourage the teacher in the area of practicals thus, affecting the whole module.

In addition, the finding also shows that only one school had 'First Aid' materials in their laboratory. This is also important and can make the teaching of the subject to be ineffective as little accident is always found to accompany chemistry practicals and to reduce such, both enlightenment programme and availability of certain drugs must be sought for. From the analysis of some of the high schools visited, it was discovered that, those schools with adequate facilities, like good and well equipped laboratories, relevant and recommended textbooks, few number of chemistry students, with enough practical periods enjoy effective teaching of the subjects by their teachers.

7. IMPLICATION OF THE STUDY

Generally speaking, the implications of this study are mostly relevant to the educators, teachers and government as well as some other policy-makers in order to make learning conducive and improve educational standard in the country. The educators will see the need to ensure that the areas of problem to both the teachers and students will be handled. The researchers may also locate gaps for research based on the suggestions for further studies.

8. RECOMMENDATIONS

Considering the findings and the conclusions drawn from this research, some recommendations were made for effective teaching of chemistry. These are:

- As practical is an integral part of the subject. Then there should be well-equipped laboratories with essential amenities like water system, electricity and fire extinguisher, to mention but few.
- Most importantly, teachers academic and professional qualifications should be based on the required discipline i.e. chemistry. Non-chemistry graduates should not be employed to teach

chemistry as this will affect the effectiveness of such teachers as he/she can easily run away from difficult topics.

- Another important factor is the employment of qualified laboratory attendants to help the teacher in preparation of laboratory for practicals. This will make the work of the teacher to be less cumbersome and thus promote effective teaching.
- Provision of relevant and up-to-date textbooks for both teachers and students will also promote effective teachings as the teacher can prepare ahead from different textbooks and the students can also read ahead of the class. Also the government should prevent the infiltration of those irrelevant and low standard textbooks into the schools.
- Enough periods must also be allocated to the teaching of the subject to encourage the student of the subject and to promote effective teaching. This is because the teacher would not need to rush over the topics in an attempt to beat time.
- Another important factor or suggestion is the issues of the teaching methods. The chemistry teaching methods must be re-oriented. The curriculum for chemistry must be properly addressed and the same of work must not be overloaded. Because what was discovered in the present scheme of work is that, it is overloaded and this does not call for effectiveness on the part of teachers. As a matter of fact, the classroom teachers should be involved in the drawing of scheme for the teaching of chemistry.
- Lastly, prompt payments of teachers' salaries, allowances and organization of seminar will promote effective of the subject.

9. LIMITATIONS AND AREA FOR FURTHER RESEARCH

The study focused on only a small sample size which was utilized in this study and did not cover a large sample size and also, it's included only some selected high schools in the area but did not cover all the high schools in the municipality area. This study investigates the factors influencing effective teaching of chemistry in high schools with a particular reference to Buffalo City Metropolitan Municipality, Eastern Cape Province of South Africa, using 180 respondents. Future researcher may repeat this study by using larger population such as a whole province or nation.

Also, future researchers should focus on such variables as improvisation of the science equipment, the role of counselors in advising the students of their choice; contribution of government policy and availability of industries.

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REFERENCES

- Abdulahi A 1982. *Science Teaching in Nigeria, Ilorin*. Atoto press Limited.
- Abdulkareem A Y 1992. Issues on the relevance of philosophical foundations of education to teacher effectiveness. *Nigeria Journal of Educational Foundations*, 3: 32 – 40. (*A Journal of the Department of Educational Foundations, University of Ilorin, Ilorin*)
- Adeyegbe O 1996. *Essentials of Practical Chemistry for Secondary Schools*. Ibadan: Macmillian Ltd.
- Ali 1986. The State of Infrastructural readiness of Anambra and Imo State Junior Secondary Schools for Integrated Science. In: A Okebukola (Ed): *24th Annual Conference Proceedings of STAN*. Ibadan. pp. 229-234.
- Awoniyi T 1983. *Principles and Practice of Education*. Evan brothers Ltd. London.

- Balogun T A 1982. Improvisation of Science Teaching Equipments. *Journal of Science Teachers Association of Nigeria*. 20:130-137.
- Cooper D R and Schindler P S 2003. *Marketing Research*, USA: McGraw-Hill Companies, Inc.
- Egbe T E 1984. Managing School Resources in a period of Decline (Role of Principal). Lecturer delivered at ANCOPSS Conference in Benin.
- Fafunwa B A 1971. *The Purposes of Teacher Education in Nigeria*. A Philosophy of Nigerian Education, Ibadan. Heinemann Educational Book Ltd.
- Fafunwa B A 1969. *Professionalisation of teaching. A philosophy of Nigerian Education*. Ibadan: Heinemann Educational Books Ltd.
- Harlen W and Holroyd C 1997. Primary Teachers' Understanding of Concepts of Science: Impact on Confidence and Teaching. *International Journal of Science Education*, 19: 93-105.
- Ikeoji C N; Agwuubike C C; Nmalada N A 2002. Community Based Resources in Teaching Agriculture in Secondary Schools-An Alternative Strategy for Sustainable Development in Africa. *STAN proceedings*, 41: 201-205.
- Jegede S A 2003. *The Effect of the Component Task Analysis Model of Instruction on Students' Performance in Chemistry*. Ph.D. Thesis (Unpublished), Ado-Ekiti: University of Ado-Ekiti.
- Lee O 1995. Subject Matter Knowledge, Classroom Management and Instructional Practice in Middle School Science Classroom. *Journal of Research in Science Technology*, 32: 23-40.
- Ojibara N L B 1998. *Teacher Classroom Behaviour and Pupils Academic Behaviour in Asa LGA Primary Schools*. Master's Thesis (Unpublished). Faculty of Education, Ilorin: University of Ilorin.
- Okafor P N 1998. Science literature. A Vehicle for National Development. *Journal of Technical Education Review*, 1: 74-88.
- Onafo S O 1993. *Developing Curriculum in Chemistry in Irowi (Ed) Curriculum Development in Nigeria*, Ibadan: Sam Bookman Publishers.
- Osborne J F; Driver R; Simon S 1996. *Attitudes to Science: A Review of Research and Proposals for Studies to Inform Policy Relating to Uptake of Science*. London, King's College London.
- Rai O M 1985. *Setting a Standard Laboratory*, London. Heinemann Books Ltd.
- Shulman L S 1987. Knowledge and Teaching: Foundations of the new reform. *Harvard Educational Review*, 57: 1-22.

STAN 1986. The Science Teachers Association of Nigeria, Volume 20: 108-114.

Yager R E 1991. The Constructionist learning Model: Towards real reform in science education.
The Science Teachers. 67: 53-57.