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THE IMPLICATION OF LACK OF CHEMISTRY PRACTICAL EXPERIENCE IN SECONDARY SCHOOL ON POST SECONDARY SCHOOL CHEMISTRY STUDENT

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15/43669/GM/D/6

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DEPARTMENT OF EDUCATION,

DIRECTORATE OF DEGREE PROGRAMME, FEDERAL COLLEGE OF EDUCATION (TECHICAL) GOMBE IN AFFILIATION WITH ABUBAKAR TAFAWA BALEWA UNIVERSITY BAUCHI

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BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATION DIRECTORATE OF DEGREE PROGRAMME, FEDERAL COLLEGE OF EDUCATION GOMBE WITH AFFILIATION TO ATBU IN PARTIAL FULFILLMENT FOR THE AWARD OF (B.TECH) CHEMISTRY EDUCATION

FEBRUARY, 2020

DECLARATION

I declare that the research work "The Implication Of Lack Of Chemistry Practical Experience In Secondary School On Post Secondary School Chemistry Student" of Yobe State is my original work under the thorough supervision of Malam Sani Sambo

All source that have been used or quotes that have been indicated are acknowledge by means of complete references

Godiya Alambazam

15/43669/GM/D/6

CERTIFICATION PAGE

This is to certify that the project have been duly supervised and approved as having meet the requirement for the award of degree certificate in chemistry education in federal college of education (technical) Gombe in affiliation with Abubakar Tafawa Balewa University Bauchi.

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DEDICATION

This research work is dedicated to my beloved children, my husband (Mr. Dauda Shehu) and parent, may God bless our generation.

ACKNOWLEDGEMENT

All praise be to almighty God who protect me and grant me the opportunity to carried out this research work successfully.

Most importantly I will like to express my special gratitude to my beloved family and parent for their in measurable support and guardians at all time may God reward them abundantly.

I wish to express my profound thanks and appreciations to our lecturers and at the same times my supervisor Mal. Sani Sambo who took his precious time to go through the whole work and make the necessary corrections. After useful suggestion and strong encouragement which make my research work successful one. May God reward them abundantly.

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Lastly, my sincere appreciation goes to my friends, course mate and all my well wishers who assisted me directly or indirectly during the course of my study.

ABSTRACT

This focused on the implication of lack of practical experience in studying chemistry in secondary school (a case study of Yobe State). Three tertiary institution were selected from Yobe state of the study the data was obtained using questionnaire whereby 120 students were sampled for this were analyzed using descriptive statistics and table frequency and percentage were used to present the finding. Based on the finding of this research it shows that learners miss opportunity to investigate and engage in chemistry practical or are reduced and so the effectiveness of chemistry teaching diminishes timetabling difficulties arise which make the sequence and frequency of chemistry practical and learning more difficult to manage. All these are negative implication of lack of practical to the study of chemistry in secondary school as reflected. Based on the finding of this research work the researcher came up with some recommendations more practical work should be used when teaching and learning chemistry in senior secondary schools of Yobe state. This requires that chemistry teachers undergo intensive in-serve training in teachers should have significant practice in base and higher order science process skills so that new teachers are more confident to use practical work when they teach chemistry and other science to improve quality if chemistry practical. The number of leaner in chemistry classroom need to be reduced. This could be done by separating large classes. This implies that more chemistry teachers be employed. More classrooms and laboratories built and equipped an action which can be addressed by the ministry of education.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Chemistry is the branch of science that deals with the study of the composition and properties of matter, changes in matter, the laws and the principles that govern these changes. Chemistry is one of the subjects that are offered in Nigerian secondary schools curriculum, it is an important part of what is called science and an active and continually growing science that has vital importance to our world in both realm of nature and the realm of society (Anaso, 2010).

According to Kauffman and Szmant (2009), chemistry is characterized is the most utilitarian of all the experimental science. For example, in Nigeria, a good secondary school education pass grade in chemistry is a prerequisite for joining medical and agricultural professional courses.

Since the chemistry is a science that has the most direct and dramatic impact in our lives and the science that shapes the world we will live in tomorrow. The performance of students in the subject is a major concern to any developing country (Khan et al, 2011).

Over the years, many have argued that science cannot be meaningful to students without worthwhile practical experiences or practical in the school laboratories (Hofstein and Naaman, 2009). Typically, the term practical means experiences in school setting where students interact with materials to observe and understand the natural world. Practical are designed and conducted to engage students individually or in the small group.

Since chemistry is a practical science, teaching and learning of chemistry should involve practical. Chemistry practical is an essential part of effective science education and science educators have suggested that, there is a rich benefit from using laboratories activities in teaching and learning (Miller, 2009). Therefore, the lack of practical to the study of chemistry is a great setback to the study of science and chemistry in particular, which can definitely lead to the poor academic achievement to the students.

Anaso (2010), reports that researchers had observed that the lack of chemistry practical to the chemistry students result in poor communication as well as observat5ional skills, this gives rise to students poor performance. Also, good quality of chemistry practical helps in developing students understanding of scientific process and concepts.

Practical is an essential feature of secondary science education, hence high proportion of chemistry lesson time in secondary schools is given to the chemistry practical with assumption that it leads to the distinctive attainment in students (Abrahams and Miller, 2009). In countries with a tradition of chemistry in school chemistry teaching (such as UK), chemistry practical is often seen by teacher and others (particularly scientists) as central to the appeal and effectiveness chemistry learning (Abrahams and learning). Although many science teachers believe that students chemistry practical leads to better learning and indeed better performance because we all understand and remember things better if we have done them ourselves (Miller 2009). Many educators have expressed concern about their effectiveness in promoting learning. For example, Abimbola's (2011) research on appraisal of the role laboratory practical concludes that continuing to accord central role to laboratory work in science teaching does not seem reasonable and feasible any more in the developing countries. Due to arguments such as these and taking

into consideration of the relatively high demand for resources and time, then the effectiveness and the usefulness of chemistry practical as a teaching and learning strategy has to be addressed.

Although chemistry courses at all levels have included chemistry practical where students follow procedures directing them to mix chemicals, make measurement, analyze data, and draw a logical conclusion. Shakhashiri (2009) argues that the chemistry practical often consists of what is generally described as "cook-book" exercise and often dull and routine, rather than engaging or inspiring. According Abimbola (2011), science teachers do not usually find it convenient to make chemistry practical the centre of their instruction. They usually complain of lack of materials and equipment to carry out chemistry practical and at the same time, it is possible that some of these material and equipment may be lock up in the school laboratories stores without teachers being aware of their existence.

Although the importance of chemistry practical in school science is widely accepted, it is also important that the nature of chemistry practical be supportive to learning (Dillon 2009). For many students, what goes on in the laboratory in form of chemistry practical is said to contribute little to their learning of chemistry or to their learning about chemistry and its' methods. (Miller, 2009).

Although learners benefits through engagement with concepts in chemistry practical through interaction, hand-out activities and application in science. Miller (2011) pointed out that, good quality chemistry practical work promotes the engagement and interest of students as well as developing a range of skills, science, knowledge and conceptual understanding.

According to Shawulu (2014), the use of practical was used in solving problems of secondary school students learning difficulties in chemistry. However, the results are not encouraging. This

indicates that there is single reliable and multi-purpose approach that can be regarded as the best. This study therefore, sought to show the effectiveness of the practical in the study of chemistry.

Poor academic achievement in chemistry could be attributed to many factors. Among which teachers strategy itself was considered as an important factor. This implies that the mastery of chemistry concepts might not be fully achieved without chemistry practical. The teaching chemistry without practical might certainly result in poor academic achievement.

1.2 STATEMENT OF THE PROBLEM

The appropriate role and the reality of what is actually achieved by the chemistry practical especially with continued decline in performance in the subject. Despite the wide spread use of chemistry practical as a teaching and learning strategy in school chemistry, and the view that increasing its amount would prove chemistry learning, some science educators have raised questions about the effectiveness of using practical. Although, chemistry practical often occupy a massive share of curriculum time and resources, doubt have been raised about their effectiveness or their real educational value, as students continue to perform poorly in the subject. Some educators however when the student that are tough chemistry theoritycally without the practical aspect don in the laboratory, will not learn properly. The implication of this means that the role of the laboratory on the academic achievement of the students in chemistry is being ignored, in addition to that must student learn the subject without the practical aspect due to lack of well equipped laboratory consequently, the student will.

1. lack acquisition of scientific skills
2. lack scientific research environment
3. learn chemistry poorly

4. lack problem solving skills.

The solution to the above mentioned effect constitute the problem of this study. Therefore this study sought to find out the implication of lack of practical to the study of chemistry in secondary schools in Yobe, Yobe State

1.3 PURPOSE OF THE STUDY

The purpose of the study is to investigate the implication of lack of practical in the study of chemistry in secondary schools, on post secondary school chemistry student in Yobe State.

1.4 AIMS OF THE STUDY

This study aimed at achieving the following objectives. These were to:

i. Establish whether learning chemistry using chemistry practical perform better than those learning without practical.

1.5 OBJECTIVES OF THE STUDY

The objective of this study is to:

i. Find out the implication of the nature of chemistry practical on students who study of chemistry in secondary schools.

i. Determine the implication of frequency of chemistry practical received in secondary schools.

ii. Examine the implication of quality chemistry mastery in post secondary schools and how it relates to chemistry practical experience.

RESEARCH QUESTION

e following research questions were formulated in the course of this study:

i. Does the use of practical in secondary schools develop scientific attitude in student towards learning of chemistry

i. What is the relationship between the frequency of practical in secondary schools and the performance in chemistry of post secondary school students.

i. To what extent in the level of mastery of chemistry as a subject is related to the practical experience in post secondary school student.

6 RESEARCH HYPOTHESES

r the purpose this study, the stated in null and alternate forms, which are hypothesis were

$H_{ø1}$ There is significant difference between the use of practical in secondary school and scientific attitude development in learning chemistry in post secondary school student.

$H_{ø2}$ There is significant different between the frequency of practical and performance in chemistry in post secondary school student.

$H_{ø3}$ There is significant difference between the level of mastery of chemistry and practical experience in post secondary school student.

HA_1 There is no significant difference between the use of practical in secondary school and scientific attitude development in learning chemistry in post secondary school student.

HA_2 There is no significant different between the frequency of practical and performance in chemistry in post secondary school student.

HA_3 There is no significant difference between the level of mastery of chemistry and practical experience in post secondary school students.

1.7 SCOPE OF THE STUDY.

The research focused on the implications of lack of practical experience in the study of chemistry in senior secondary schools of Yobe State.

1.8 SIGNIFICANCE OF THE STUDY

The result of this study is beneficial to all stakeholders in science education. The stakeholders include chemistry students, Teachers, Parents, school, administration, Curriculum planners, Examination bodies, Fellow Researchers, Government, Non- governmental organization and the entire society.

On the part of students, the results of this research will hopefully promote the ideas that the chemistry is both a process and product of science by arousing their interest in practical chemistry.

On the part of students, the result of this research will convince the teacher that practical chemistry is most essential for teaching and learning of chemistry. Hence for improving that academic performance of the student s.

On the part o f the parents, the result on this study will motivate parents to provide basis requirement for chemistry practical to their children.

On the part of school administration the result of this study will hopefully give insight to school administration on the effective teaching and learning strategies as well as the equipment and materials needed for effective practical classes. Thus, the administrators use this result to provide

or request from the Government appropriate laboratories facilities and communicate with chemistry teachers to improve their proficiency for the achievement of organizational objectives.

To the curriculum planners to see the need for reviewing the content of chemistry and recommend the effective method of instruction for teaching chemistry practical as well as emphasize on necessary content that must involve aspect of practical classes.

On the part of the examination bodies, the result of this study will provide a frame work to the examination bodies i.e. WAEC, NECO and NABTEB on which the council will reevaluate their goals and objectives so that chemistry practical will be in line with what the curriculum demanded of students.

This study is also significance to the researchers. It gives the insight and encourages the researchers to investigate the effect of practical and recommend the possible solution to the problems.

The result of the study could make the Government through the ministry of education to realize the needs for the provision of practical equipment of chemistry and science at large to the schools and also employ the professional teachers to reduce the effect of lack of practical to the study of sciences and chemistry in particular.

On the part of Non-governmental organizations, the study will hopefully beneficial to Non-governmental organizations in knowing the specific area to contribute towards improving practical sciences and practical chemistry in particular.

On the part of the society, the findings of this study will highlight the society on the usefulness and values of things and from what and where the basic materials for day-to-day activities are made.

1.9 DEFINATION OF THE TERMS.

Practical: Refers to the experiments carried out by the learners themselves or with the help of the teacher during the learning.

Secondary school: Refer to an institution that offers educational experience to students for three years after UBE educational system .frequency of chemistry practical, refer to the number of lesson per week or team planned involving chemistry practical.

Quality of chemistry practical: Refer to the degree of learner involving in the practical.

Resources for chemistry practical: Refer to the laboratories, the equipment, apparatus and reagent necessary for chemistry practical.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter deals with the review of the related literature. The review is to be done under the following sub headings:

2.1 Theoretical framework

2.2 Nature of school chemistry practical

2.3 Implications of chemistry practical on academic performance

2.4 Quality of school chemistry practical

2.5 Frequency of school chemistry practical

2.6 Availability of facilities and equipment of school chemistry practical

2.7 Influences of teachers attitude toward chemistry practical in secondary schools

2.1 THEORITICAL FRAMEWORK

The theoretical framework of this study is based on the constructivists learning theory as postulated by John Dewey who noted that human generated knowledge and meaning from the experiences (Aggarwal, 2009). The theory describes learning as an active internal process of constructing new understanding. It says that people construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences. The learner must play an active role in taking on new knowledge. He or she has to make sense of the

experiences and discourse of the chemistry class and use it to construct meaning. This is the constructivists' view of learning (Miller, 2010).

This study is asking how this happens in secondary school chemistry practical and how effectively this arguments other forms of communicating (verbal, pictorial, symbolic) that teachers might use.

According to Miha (2010), constructivists provide perspectives on teaching and learning science in classrooms, with a view to improving the effectiveness of sciences teaching in enhancing students learning. This study identifies nature, quality and frequency of chemistry practical as major parts of learning environment which its lack influenced the construction of chemistry knowledge in secondary school students.

Miha (2010), also reveals that the emphasis of learning activities means two things: students-centered and laboratory centered teaching. The center of instructional activities is the students themselves, so teacher-centered teaching does little good in students learning processes. Activities such as performances of experiment and discussion about the result with peers can help students to build understandings. The nature, quality and frequency of the laboratory chemistry practical are crucial in constructing new knowledge and concepts by students. During laboratory activities, students have opportunities to learn the procedures and skills that are facilitating conceptual changes that may leads to increased knowledge and performance in chemistry.

2.2 NATURE OF SCHOOL CHEMISTRY PRACTICAL

Practical work had a central and distinct role in chemistry education. One of the features of chemistry as a sciences subject in school is that, it involves practical works in the laboratory.

It is not difficult to see why, the aim of chemistry practical is to increase our understanding of the composition, properties and change that take place in matter. Claims and explanation in chemistry should be supported by observation of data (Hofstein, 2009, and Miller, 2010).

Brooks (2011) asserts that, the preparation of chemistry practical involves the process of providing equipment, location of materials to be used before the implementation of the experiment. Directing the activity of chemistry practical is the responsibilities of chemistry teacher in conducting the experiments, doing observation on students' experimentation and analysis of laboratory findings and outcome is also part of the teachers' activity (Hauvelen, 2011).

According to the ●rokpo (2012), there are two extreme thought regarding the importance of chemistry practical. The first one is that, in traditional approaches, little opportunity is given to student's initiatives or circumstances. In this approaches, all laboratory procedures are carefully listed in the manual and frequently the students is simply asked to fill in a well planned report template. At the end of a practical, the students have no real opportunity of understanding or learning the process of doing chemistry. The second one is that, a student is given an opportunity to engage in deep learning. This would provide a student an opportunity in identifying the main objectives of the work and in planning and executing it, of identifying the conceptual and practical difficulties encountered, recording and discussing the result and observations and of suggesting practical alterations, precautions and improvement (Souza and Watts, 2009).

Chemistry practical should be conducted in such a way that they interact with ideas, as much as phenomena themselves. It is necessary for teaching to focus upon scientific ways of

talking and thinking about phenomena rather than the phenomena themselves (Leach and Scott, 2013). Teacher can employ a wide variety of teaching strategies to engage students' minds in learning. Reports emphasize that teaching sciences with the help of chemistry practical makes chemistry to be more enjoyable and stimulating students than teaching the same subject matter only through teaching (Hofstein, 2009). Students have a lot of benefit from chemistry practical which may include increase the student's interest and abilities in the subject as well as their achievement in chemistry (Pavesic, 2011).

2.3 IMPLICATION OF CHEMISRTY PRACTICAL ON ACADEMIC PERFORMANCE

Chemistry practical have been and are being used in chemistry teaching to support theoretical chemistry instruction. The success of any given chemistry practical task depends on the intended learning objectives of chemistry practical tasks can be divided into two categories. for example categories A and B. In categories A. the chemistry practical tasks should enable the learners to;

i. Identify objectives.
ii. Learn facts.
ii. Identify phenomena.

In category B, the chemistry practical tasks enable learners to;

i. Learn a concept.
ii. Learn a relationship and
iii. Learn a theory or model (Miller. 2010).

The science educator's criticism on chemistry practical is a task with objectives in category (B) and not those in category (A). Miller (2010), describes the tasks with objectives in category (A) as being effective as many other forms of instruction. The role of chemistry practical is to help student make links between two "domain" of knowledge; the domain of objectives and observable properties and events; on the other hand the domain of ideas.

(Miller, 2010). The learning objectives of category (B) above are more strongly involved in chemistry practical than those in category (A). Students are unlike to grasp a new scientific concept or understand a theory or model (category (B) objectives) as a result of any single chemistry practical task, however well designed. Students acquire deeper and more extended understanding of an abstract idea or set of idea in a gradual process, hence the need for frequent and varied practical activities. Based on the roles of science laboratory in science teaching and learning, it implies that schools without laboratory where students can carry out chemistry practical would end up producing students who would have no knowledge of chemistry practical required by West African Examination Council (WAEC) and National Examination Council (NECO) to pass the Senior Secondary School Certificate Examination (SSCE). Consequently, these students will lack requisite requirement qualification for courses like medicine, engineering, agriculture science and many others related careers (Omiko, 2013).

The chief examiners, National Ministry of education reports that, the WAEC and NECO, 2010, 2014 and 2015 indicate poor performance of students in science subjects particularly chemistry.

2.4 QUALITY OF SCHOOL CHEMISTRY PRACTICALS

The quality of chemistry practical varies considerable around the world. Most curricula specify that practical and investigative must be carried out by students. However, there is a gap between policy and practice, between what is written in curriculum documents, what teachers say they do, and what students actually experience (Hofstein and Clough, 2009). Hodson (2011), found that the lesson objectives stated by teacher frequently failed to be addressed during actual lessons. This is a case under utilization of the opportunities provided by practical activities. If teachers do not select appropriate chemistry practical, this may end up in laboratory work of doubtful quality. Such an approach is demotivating for students and leads to the poor use of teaching and learning resources which may end up to contributing to the poor performance of students in the chemistry.

2.5 FREQUENCY OF SCHOOL CHEMISTRY PRACTICAL

Teachers usually control the frequency and some extent, the quality of chemistry practical in secondary schools. The volume and variety of chemistry practical in secondary schools has lessened overtime (Ofsted, 2009). In many situations, the cause of this is the focus on teaching for examination, which has squeezed out some types of chemistry practical. Many teachers complain that, with pressure to get through the syllabus, they cannot find room for many chemistry practical (Dillon, 2010).

Practical in chemistry is expensive, particularly the cost of replenishing apparatus and chemicals. When combined with insufficient budgets to provide enough technical support, material and equipments and lack of time to prepare chemistry practical, the frequency of performing practical definitely suffers (Dillon, 2010). Apart from being expensive on resources and time, students' laboratory experiments are more difficult to plan or organize and supervise

(Twoli, 2012). National endowment for science technical and arts(NESTA, 2014), survey of sciences teachers in UK on factors affecting teachers use of chemistry practical, they however found that, 64% lacked time for experiment, while many teachers said that, safety roles had put them off. 87% of respondents said learning which allowed more experiment and scientific enquiry should have a more significant impact on performance.

2.6 AVAILABILITY OF FACILITIES AND EQUIPMENTS OF SCHOOL CHEMISTRY PRACTICAL CHEMISTRY

The place of experimental work in laboratories has always assumed a high profile at all level of chemistry study (Reid and Shah, 2013). Laboratory classes are an ideal place to integrate the active learning approach. Science laboratories have long played a unique role in science education, providing an opportunity for inquiry-based investigative learning (Hofstein, 2011). These classes provide an opportunity for hands-on experiences designed to helps students further understanding the concepts learned in the classroom. The modern laboratory provides students opportunity to learn specific procedures and instrumentation and to develop skills such as problems-solving and communication (Reid and Carnduff, 2010). There is a clear need for the standard of accommodations to be improved and improvement of laboratory stock. If the nature and quality of chemistry practical are to improve, then there is a continuing need for the upgrading refurbishment of laboratories, and for new laboratory to be built in secondary schools (Ofsted, 2009). Some barriers to effective chemistry practical associated with facilities include too many students in chemistry classes and associated with behavioral problems, insufficient funding devolved to sciences departments, under resources and old fashioned laboratories in secondary schools. So the lack of practical to the study of chemistry is heavily on the nature, quality and frequency of chemistry practical.

2.7 INFLUENCES ●F TEACHERS ATTITUDES TOWARD CHEMISTRY PRACTICAL IN SECONDARY SCH●●LS.

Based on the above discussions, it also observed that, teachers' attitudes influence the academic performance of the students. It is therefore imperative to examine the factors influencing the teachers' attitudes toward teaching practical chemistry. Sylvester (2●10), held that, the factors like location of schools, educational qualifications of the teachers, and years of teaching experiences of the teacher have impact on their attitude towards teaching chemistry practical as well as job satisfaction.

Teferi (2014), outlines the factors influencing teachers attitudes towards teaching chemistry practical as follows:

i. **Leadership style:** a school principal as an educational leader influences hers for successful operation of teaching and learning in secondary schools. This implies that the schools principals are the most visible and directly accessible representative of the school who highly influence the job performance of teachers. Thus, teachers Job performance can be positively 0r negatively influenced by theirs principal leadership style.

According to Adeyemi (2●10), the relationship between the principals' leadership style and the teachers' job satisfaction shows positive result when the teachers satisfy with the leadership of the principals.

ii. **Working environment:** teachers working condition affect their ability to provide quality education. Many aspects of educational policy and school life go into teachers perceptions of their employment. The condition of infrastructure, availability of test books and learning

materials heavy workloads of teaching and class size all influences the performance and attitude of teachers (Horrywong, 2009).

ii. **The teacher's competency:** competency is the potentials or ability of a person in handling their jobs and producing the best results (Teferi, 2014). Practical chemistry is a very challenging aspect which requires only well-trained and intellectual teachers for handling practical classes (Jimmy, 2015). Most of the available teachers are not competent enough to handle the subject. This makes it difficult for such teachers to give detail explanation about the required concept and in handling practical classes.

iv. **Teachers' personality**: Rao (2011), suggested those teachers' personal characteristics that they believe about school subjects and how they are best taught and how they are trained. A teacher is observed a certain rules guidelines in his day-to-day work. Any amount of preparation on his part and a lot of motivation on the part of the students too, will leads them on nowhere if the above rules or guidelines are not kept in mind in a classroom situations (Teferi, 2014).

v. **Job satisfaction**: According to Gould and Lee, (2010), wide range of factors influences teachers' job satisfaction. The main factors found to contribute to job satisfaction is working with children whereas job dissatisfaction was primarily attribute to work overload, poor pay and perceptions of how teachers are viewed by the society leads to the job dissatisfaction with in turn influence teachers attitude towards given awful time to chemistry practical. Another factor is the general notion of teaching as a second choices profession with many of the teachers only committing themselves to it at a stage when they know that they cannot change their profession. Majority of the teachers at the initial stage of their teaching career do not expect to stay in teaching profession for than few years. They considered it as stepping stone to other occupations (Gould and Lee, 2010).

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 INTRODUCTION

This study deals with the description of the method and procedures that were used in carrying out this research study. The description is organized into the following sections;

3.1 Research design

3.2 Target population

3.3 Sampling and sampling techniques

3.4 Research instruments

3.5 Procedure for data collection

3.6 Method of data analysis.

3.7 Validity and reliability of the instrument.

3.1 RESEARCH DESIGN

Kumar (2009) defines a research design as a plan, structure and strategy of investigating to obtain answer to research or hypothesis formulated. This study adopted the used of descriptive survey research design. Kumar (2009) refers descriptive survey research design as the best method which includes the use of questionnaire interview. The survey research design is used because there is no manipulation of independent variables by the researchers. The research used questionnaire to show the implication of the lack of practical to the study of chemistry in secondary schools.

3.2 TARGET POPULATION

Target population or universe of the study is all the members or objects involved in the study (Kumar, 2009). The population of this study comprises forty students who were taking chemistry and ten chemistry teachers in the selected tertiary institutions of Yobe State. Making total of one hundred fifty population.

3.3 SAMPLING AND SAMPLING TECHNIQUES.

A simple random sampling is a sampling techniques in which each member of the population has an equal probability of being selected (Gravetter, 2011).This study adapted the use of simple random sampling where by the 40 students who were taking chemistry, and ten chemistry lectures were selected randomly from the three tertiary institutions of Yobe State.

3.4 RESEARCH INSTRUMENT

The instrument for this study was questionnaire. Two sets of questionnaire were used in the study, questionnaire for chemistry teachers and questionnaire for students. The questionnaires were used to solicit information on the teaching and learning experiences during secondary schools chemistry lessons involving chemistry practical and those that do not involving practical. They were structure to capture information required on the implication of the lack of practical to the study of chemistry. Students and teachers view were sought on several areas that affect the use and lack of chemistry practical in the study of chemistry.

3.5 PROCEDURE FOR DATA COLLECTION

The questionnaire for the students and the teachers were administered by the researchers. The completed questionnaires were collected immediately to ensure a high return rate at a spot from the respondents.

3.6 METHOD OF DATA ANALYSIS.

The data generated from questionnaire was ordered, coded, categorized, classified and ordered as per themes and objectives of the study. The analysis and discussion were done under various themes as spelt out in the study objectives and hypothesis formulated

3.7 VALIDITY OF THE REASEARCH INSTRUMENT

Validity of the research instrument is the ability of an instrument to measure what is designed to measure. The judgment that an instrument is measuring what it is supposed to measure is primarily based upon the logical link between the questions and the objectives of the study (Kumar, 2009). In this study, the researchers used the project supervisor, departmental lecturers and the other two experts are to assessed the relevance of the content used in the research instruments and necessary modification are made base on their feedback.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.0 INTRODUCTION.

This chapter presents the results obtained on the "implication of lack of practical to the study of chemistry in secondary school on post secondary school chemistry student " (Case study of Yobe State).

4.1 RESPONSE RATE

The study targeted a total of 40 students and 10 chemistry lectures.

Table 1 shows the response rate of instruments used in this study.

	Students Questionnaire	Lectures Questionnaire
FCE(T) Potiskum	40	10
Federal Polytechnic Damaturu	40	10
College of Education Gashua	40	10
Total distributed	120	30
Total returned	115	30
% returned rate	96%	100%

Table 1 shows the representation of the response rate of the questionnaires, out of the 120 students' questionnaires distributed. 115 questionnaires were returned. On other hand, 30 lectures' questionnaires were returned as it distributed to the lectures.

Table 1 indicates that an average of 96% of students' questionnaire and 100% of lectures' questionnaire were returned.

Table 4. 2 RATING STUDENTS ACADEMIC ABILITY.

The table 2 what is the rate of student's academic ability in chemistry practical in secondary schools?

Academic ability of students in chemistry practical	Very low	Low	Average	High	Very high	Total
Frequency	8	10	15	8	7	50
Percentage	16.67%	20.83%	31.25%	16.67%	14.58%	100%

Table 2 shows that 31.25% of the respondents were at average, 20.83% were at low, 16.67% were at very low, however 16.67 were rated high and 14.58% were rated very high perfonnance. These findings indicated that the students were of average ability implies that chemistry practical can easily be introduced during the teaching of chemistry and that may help in improving performance. This findings is in line with that of Hof'stein(2009) who reveals that the students has low academic ability in chemistry and can attributed to inadequate time provided for chemistry practical.

Table 3 What is the nature of students' attitude towards chemistry practical in senior secondary schools?

Student's attitude towards chemistry practical.	Negative	Not sure	positive
Frequency	12	16	20
Percentage	25.0%	33.33%	41.67%

The table 3 shows the attitude of students towards chemistry practical. The result shows that majority of the students with 41.67% have positive attitude toward chemistry practical. while 33.33% were not sure and 25.0% have negative attitude toward chemistry practical. The implication of not being sure about the attitudes toward chemistry practical could be attributed to inclusion of other sciences subject practical such as chemistry, physics and biology. This finding is in line with that of Miller(2010), which reveals that of that secondary school students have a positive attitude toward chemistry practical implies that the students can easily be molded by chemistry teachers.

Table 4 what is the adequacy of chemistry teaching and learning resource in secondary schools?

Adequacy of chemistry laboratory	Disagree	Not sure	Agree
Frequency	17	8	23
Percentage	35.42%	16.67%	47.92

The table 4 shows that, the majority of respondent (47.92%) agreed with the adequacy of chemistry laboratory in schools, while 16.67% were not sure and 35.42% disagreed. This finding shows that most secondary schools have adequate laboratory for chemistry practical. This

finding is in line that of Omiko(2013), which explains that schools without laboratory where students can carry out chemistry practical would end up producing students who would have no knowledge of chemistry practical required by West African Examination Council (WAEC) and National Examination Council (NECO) to pass the Senior Secondary School Certificate Examination (SSCE). Consequently, these students will lack requisite requirement qualification for courses like medicine. engineering, agriculture science and many others related careers

Table 5 what is the adequacy of chemistry practical reagent and apparatus in senior secondary schools?

Adequate chemistry practical reagents and apparatus	No	Not sure	Yes
Frequency	16	11	21
Percentage	33.33%	22.29	43.75

The table 5 shows adequacy of chemistry reagents and apparatus. The findings of this study shows that the majority of the respondents (43.75%) agreed with the adequate provisions of chemistry practical and reagent in secondary schools, while 22.29% were not sure and 33.33% disagreed with the adequate provision of chemistry practical and reagent. This implies that the lack of practical chemistry in secondary school cannot be attributed to the adequate of chemistry practical reagent and apparatus. This finding concur with the findings of Ofsted(2009) which expresses that inadequate of volume and variety of chemistry practical reagents and apparatus in secondary schools has lessened the academic status of individual students and vice versa.

Table 6 what is the adequacy of qualified chemistry teachers in senior secondary schools?

Adequate qualified chemistry teachers	Disagree	Not sure	Agree
Frequency	21	13	15
Percentage	43.75%	27.08%	31.25%

The table 6 shows that the majority of the respondent (43.75%) were disagree about the adequacy of qualified chemistry teachers in secondary school .31.25% were agree while only 27.08% were not sure with the adequacy of qualified chemistry teachers in secondary school. This shows that lack of qualified chemistry teachers play a significant role in determining the students' performance in chemistry practical. This findings is in line with that of Miller(2010), who reveals that the students good ability in chemistry laid on the availability of qualified teachers.

Table 7 Does the adequate time provided for chemistry practical in senior secondary schools?

Adequate time for chemistry practical	Disagree	Not sure	Agree
Frequency	18	13	17
Percentage	37.50%	27.08%	35.42%

The table 7 (see page 33) shows that the majority of the respondents 37.50% were disagreed with the adequate time provided for chemistry practical, 35.42% were agreed while the remaining 27.08% were not sure with the adequate time provided for chemistry practicals. This findings is in line with that of Ofstein(2009), reveals that timetabling difficulties arise which make the sequence and frequency of chemistry practicals and learning more difficult to manage.

Thus inadequate time for chemistry practical heavily influence the students performance in chemistry.

Table 8 Is the chemistry practical possess the halfway of student understanding chemistry?

Chemistry practical is a halfway of student understanding chemistry.	Disagree.	Not sure	Agree
Frequency	9	12	27
Percentage	18.75%	25.00%	56.25%

The table 8 above shows that the majority of the respondents (56.25) agreed that the chemistry practical as half ways of understanding chemistry, while 25.00% were not sure and 18.75% were disagreed. This implies that the chemistry practical improve the students achievement\performance and understanding of chemistry in secondary school.). This reflects the findings of Hofstein(2011) who reveals that chemistry practical is an ideal one half of understanding chemistry and integrate the active learning approach.

Table 9 Does the chemistry practical drills and practices for passing examination in senior secondary schools?

Chemistry practical drills and practice on for passing examination.	Disagree	Not sure	Agree
Frequency	5	25	18
Percentage	10.42%	52.08%	37.50%

The table 9 shows that the majority of the respondents(52.08%) were not sure on the fact that chemistry practical drills and practice only for passing examination,37.50% were agree and the remaining 10.42%were disagreed with the fact that the chemistry practical drills and practices only for passing examination in secondary school. Dillon(2009), state that teachers are

being required to achieve better examination results and one response to this has been to focus more on 'book learning' which is more easily managed than chemistry practicals.

Table 10 Does the large number of student is an obstacle to the chemistry practical in senior secondary school?

Large number of students is an obstacle to the chemistry practical.	Disagree	Not sure	Agree
Frequency	9	11	28
Percentage	18.75%	29.92%	58.33%

The table 10 shows that the majority of the respondents (58.33%), agreed with the fact that the large number of students is an obstacle to the chemistry practical, while 29.92% were not sure and the remaining 18.75% disagreed. This is in line with the findings of Abrahams(2011) which reveals that small class experiment is most suitable whereby the teacher design chemistry practicals in such a way as to encourage learners discovery of information. Thus, the learners performed guided experiments in small groups engaging in hands on activities.

Table 11 Does chemistry practicals increase students understanding of chemistry in senior secondary schools?

Chemistry practicals increase students understanding.	Disagreed	Not sure	Agree
Frequency	12	9	27
Percentage	25.00%	18.75%	56.25%

The table 11(see page 36) shows that the majority of the respondents (56.25%) agreed with the fact that chemistry practical increase students understanding of chemistry, while 25.00% disagreed and 18.75% were not sure. This findings concur with the report by Lerman(2014) who

says, the methods which includes practicals help students to remember, understand and retain abstract scientific concepts.

Table 12 Does chemistry practical creates self confidence to the students in senior secondary schools?

Chemistry practical create self confidence.	Disagree	Not sure	Agree
Frequency	10	17	21
Percentage	20.83%	35.42%	43.75%

The table 12 above shows that the majority of the respondents (43.75%) agreed that the chemistry practical create self confidence to the student, while 35.42% were not sure and 20.83% disagreed. This is in line with that of Pavesic(2008), reports that students have a lot of benefits from chemistry practical which may include, students self confidence and ability in sciences subjects as wsll as their achievement in sciences.

Table 13 Does the chemistry practical increases students' achievement of good grade in tertiary institutions?

Chemistry practical increase students' achievement of good grade.	disagreed	Not sure	Agree
Frequency	9	15	24
Percentage	18.75%	31.25%	50.00%

The table 13 shows that the majority of the respondents(50.00%) agree with the fact that chemistry practical increase students achievement of good grade in tertiary institutions while 31.25% were not sure, and 18.75% disagreed. This can be tally with Pavesic(2008) research

which reports that, the students have a lot of benefits from chemistry practicals which may include, students self confidence and ability in sciences subjects as well as their achievement in their present field of studying sciences.

4.3 DISCUSSION OF MAJOR FINDINGS.

The findings of this study indicate that the students were of average ability in chemistry practical, this implies that practical can be used to teach the learners how to follow simple instructions which is important in developing basic science process skills like measuring, observation and recording.

The finding of this study in regards to the student's attitude towards chemistry practical implies that the students can easily be molded by chemistry teachers. The implication of this study suggests that teachers need to be far more aware that students attitude to chemistry practical need to be considered utilized. The findings of this on weather chemistry practical drills and practice only for passing examination confirmed the observation and findings made by other researchers. Pavesic(2008), reported that students have a lot to benefit from chemistry which may include, increasing students interest and abilities in chemistry and science subjects in general. McKee(2007), however, stated that meaningful learning is possible from given laboratory practicals if the students are given ample opportunities to operate equipment and materials that help them to construct their knowledge of phenomenon and related scientific concept, not only for passing examination but also constructing a skillful attitude in a workplace.

The findings of this study in regard to the adequacy of chemistry practical teaching and learning resources indicates that the chemistry teaching and learning resources such as chemistry laboratories, chemistry reagents and apparatus, qualified chemistry teachers, and time for

chemistry practical were almost adequate in secondary schools. This shows that most secondary schools were adequately equipped with chemistry practical. This implies that chemistry practical can be used as a chemistry teaching and learning method in secondary schools in Yobe State.

Ofsted (2009) reported that, in secondary school where the provision of sciences resources is less than satisfactory. This hinders teaching and learning of chemistry in a number of ways.

I. Learners are not be taught in specialist rooms

II. Learners miss opportunity to investigate and engage in chemistry practicals or are reduced and so the effectiveness of chemistry teaching diminishes

III. Timetabling difficulties arise which make the sequence and frequency of chemistry practical and learning more difficult to manage. All these are negative implication of lack of practical to the study of chemistry in secondary schools of Yobe state.

IV. The analysis shows that most secondary schools students have a fair attitude towards chemistry and chemistry practical.

In summary, this finding observed that, secondary school students' attitude to ward chemistry practical are generally speaking positive. The implication of the study suggests that teachers needs to be more aware that teacher's attitude toward chemistry practical's are positive, rather than seeing the student's attitudes as negative and unchanging.

The finding confirms that the lack of practicals to the study of chemistry decreases the students' performance in chemistry in senior secondary schools. They also confirm that the nature, quality and frequency of chemistry practical in teaching and learning of chemistry boost learner performance in chemistry. Therefore, use of chemistry practicals enhances students' knowledge and understanding in a better way compared to none use of the chemistry practicals. While it is

important to encourage use of chemistry practicals in the teaching and learning of chemistry, it is equally important to consider the nature, quality and frequency of the practical work. The study showed that exposure to various types of chemistry practicals had a significant positive effect on students' performance. Students have a lot of benefits from chemistry practicals. Chemistry practicals increase students' interest and abilities in science subjects as well as their achievement in science. This is because chemistry practical classes help students understanding theories and chemical principles which are difficult or abstract. Moreover, chemistry practicals offers several opportunities to students such as: developing scientific thinking and enthusiasm to chemistry, developing basic manipulative and problem solving skills, hands-on experience in using instruments and apparatus, and identifying chemical hazards and handling chemicals safely and other science process skills. To improve the quality of chemistry practical, it is important to consider reducing the number of learners in chemistry classrooms. This will imply that more chemistry teachers be employed, more classrooms and laboratories built and equipped. In terms of classroom routines, the activities and the exercises should be designed in a way that promotes making links between the practical and the theoretical. Enough time and attention should be dedicated to discussing and reflecting on the connections between the natural world and the ideas of chemistry. It can also be concluded from the study that irrespective of gender, students perform better in chemistry when chemistry practical are used in teaching and learning chemistry. The chemistry teachers should ensure that the students are actively involved in chemistry practicals and should give everybody opportunity to participate. This will go a long way to enhance students' knowledge during chemistry practicals

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.

5.0 INTRODUCTION

The aim of this study is to summarize and conclude the findings of the topic the implication of the lack of practical to the study of chemistry in post Senior Secondary school of Yobe State. In this chapter and attempt was made to explain the following:

5.1 Summary

5.2 Conclusion

5.3 Recommendation and

5.4 Suggestion for the further study.

5.1 SUMMARY

The researchers selected at random, One Hundred And Twenty Students from three Tertiary Institutions and thirty lecturer schools (F.C.E.T Potiskum, Federal Polytechnic Damaturu and College of Education Gahua) in Yobe state.

For the data to be collected two set of questionnaires (students questionnaire and teachers questionnaire) were used and administered to the sample population of the study. Their responses were used to determine the implication of lack of practicals to the study of chemistry in senior secondary schools on post secondary school students of yobe state.

From the tabulation and analysis to the answers supplied by the respondents to the item number one to twelve of the questionnaires were used to show the implication of lack of practical to the study of chemistry in senior secondary school in of Yobe State.

The analysis shows that most secondary schools students have a fair attitude towards chemistry and chemistry practicals. This finding suggests that secondary student's attitude to chemistry practicals are generally speaking positive. The implication of the study suggests that teachers needs to be more aware that teacher's attitude toward chemistry practical are positive, rather than seeing the student's attitudes as negative and unchanging. Teacher should consider the content being studied and create a more conducive classroom environment. The study established that chemistry practicals and student's performance in chemistry in senior secondary school in Yobe State.

5.2 Conclusion

The finding of this study confirms that the lack of practicals in secondary school decreases the students performance in chemistry in post secondary schools education. They also confirm that the nature, quality and frequency of chemistry practicals in teaching and learning of chemistry boost learner performance in chemistry. Use of chemistry practicals enhances students' knowledge and understanding in a better way compared to none use of the chemistry practicals. While it is important to encourage use of chemistry practicals in the teaching and learning of chemistry, it is equally important to consider the nature, quality and frequency of the practical work. The study showed that exposure to various types of chemistry practicals had a significant positive effect on students' performance. Students have a lot of benefits from chemistry practicals. Chemistry practicals increase students' interest and abilities in science subjects as well as their achievement in science. This is because chemistry practical classes help students

understanding theories and chemical principles which are difficult or abstract. Moreover, chemistry practicals offers several opportunities to students such as: developing scientific thinking a d enthusiasm to chemistry, developing basic manipulative and problem solving skills, hands-on experience in using instruments and apparatus, and identifying chemical hazards and handling chemicals safely and other science process skills. To improve the quality of chemistry practical. it is important to consider reducing the number of learners in chemistry classrooms. This will imply that more chemistry teachers be employed, more classrooms and laboratories built and equipped. In terms of classroom routines, the activities and the exercises should be desig ed in a way that promotes making links between the practical and the theoretical. Enough time and attention should be dedicated to discussing and reflecti ng on the connections between the natural world and the ideas of chemistry. It can also be concluded from the study that irrespective of gender, students perform better in chemistry when chemistry practical are used in teaching and learning chemistry. The chemistry teachers should ensure that the students are actively involved in chemistry practicals and should give everybody opportunity to participate. This will go a long way to enhance students' knowledge during chemistry practicals

5.4 Recommendations

Based on the findings, the study recommends the following:

(i) More practical work should be used when teaching and learning chemistry in senior secondary schools in Yobe State. This requires that chemistry teachers undergo intensive in-service training in practical work management and latest research to improve their practices. Pre-service training of teachers should have significant practice in basic and higher order science process skills so that new teachers are more confident to use practical work when they teach chemistry and other sciences courses. Also, teacher training colleges should train teachers to use hands-tools so that they can improvise, where possible, science equipment for practical work.

(ii) To improve quality of chemistry practicals, the numbers of learners in chemistry classrooms need to be reduced. This could be done by separating large classes into many small classes. This implies that more chemistry teachers be employed, more classrooms and laboratories built and equipped, an action which can be addressed by the ministry of education. (iii) For chemistry practicals to result in a significant positive impact on a students' ability to learn both the desired practical skills and also the underlying theory, it is recommended that students be given an opportunity to engage in deep learning. Deep learning provides opportunities in identifying the main objectives of the work and in planning and executing it, of identifying the conceptual and practical difficulties encountered, recording and discussing the results and observations and of suggesting practical alterations and improvements. (iv) It is also recommended that that there should be further scrutiny of the curriculum and learning standards for chemistry practical in secondary school chemistry and an in-depth study of teacher competence in the teaching of practical chemistry is suggested. (vi) The quantity and quality of practical work being undertaken in senior secondary schools in Yobe State, and any patterns of activity should be looked at. (vii) The impact of practical work for the study of chemistry and particularly how benefits can be maximized, and how far they extend across all types of learner should be further investigated. (viii) Training both pre-service and in-service in using practical activities needs to be refocused and supported by more effective resources than are currently available. (ix) The place of practical work highlight within the curriculum as part of enrichment and enhancement activities and outside the classroom and how this is changing over time.

(x) The Policy Makers should ensure that the relative strength of factors cited as barriers to practical work in senior secondary school such as the assessment system, teacher confidence, technical support, finances, and health and safety concerns should be addressed.

5.6 Suggestions for Further Research

Based on the findings of the study, further studies need to be carried out in the following areas:

(i) Investigate the effect of other independent variables such as the quality and expertise in scientific knowledge of secondary school chemistry teachers on performance in chemistry.

(ii) A further research to find out specifically what practical styles the students are being exposed to, in relation to students" performance in chemistry and on the basis of their gender.

(iii) The extent to which the usage of the computer in the classroom is building students" understanding of secondary school chemistry.

(iv) Further research is required on how to make the quality of chemistry practicals worthwhile in order to implement better and more efficient practices.

(v) To find out the difference of performance between the two gender (Male and Female).

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Chemistry Department,

Directorate of Degree

Programme, F.C.E (T) Gombe, Gombe State

Dear Respondents

We are final year students of the above named institution, conducting a research on ''The Implications of lack of Practical to the study of chemistry in senior secondary schools in Post Secondary School Chemist Student.

The information is strictly for academic purpose and is going to be treated with confidentiality.

Thank You

Yours Faithfully

TEACHERS' QUESTIONNAIRE

SSECTION A: DEMOGRAPHIC DATA

Gender: Male ( ) Female ( )

Age group: 30-40( ) 40-50( ) 50 and above ( )

Educational background: B.Sc ( ) M.Sc ( )

SECTION B: TEACHING/LEARNING RESOURCES

Please answer the questions by ticking (√) in the space provided

School:.....

(EX=Excellent, VG=Very Good, G=Good, F=Fair, P=Poor)

		EX	VG	G	F	P
1	How could you rate the attitude of your students toward chemistry practical?					
2	How could you rate your students in making accurate					

	observation during chemistry practical?					
3	How could you rate your students' ability to make accurate interpretations and prediction during chemistry practical?					

		Yes	No	Not sure
4	Do you have chemistry laboratory resources in your school?			
5	Does chemistry apparatus in your school are rated as adequate?			
6	Does chemistry reagents in your school are rated as adequate?			
7	Are the qualified chemistry teachers available in your school?			
8	Does your school provide adequate time for teaching chemistry practical?			

		100%	75%	50%	25%	0%
9	What percentage of your chemistry lesson is practical?					
10	How much of your chemistry lesson is students' chemistry practical?					

Keys: (SA=Strongly Agree, A= Agree, UD= Undecided, D=Disagree, DA=Disagree, SD= Strongly Disagree)

		SA	A	UD	DA	SD
12	Does Chemistry practical increases students understanding of chemistry?					
13	Does Chemistry practical create self-confidence to the students?					
14	Does Chemistry practical increases students' achievement of good grades in chemistry?					
15	Is the Large number of students an obstacle to chemistry practical?					
16	Does Chemistry practical drills and practices only for passing examination in your school?					
17	Does chemistry practical a halfway of students understand chemistry?					

STUDENTS' QUESTIONNAIRE

SECTION A: DEMOGRAPHIC DATA

Gender: male ( ) female ( )

Age: 15-16 ( ) 17-19( ) 20 and above ( )

Level: NCEI( ) NCE2( ) NCE3( )

Please answer the questions by ticking (√) in the space provided

School:.....

SECTION B: TEACHING/LEARNING RESOURCES

		Yes	No	Not sure
1	Do you have chemistry laboratory resources in your school?			
2	Does chemistry apparatus in your school are rated as adequate?			
3	Does chemistry reagents in your school are rated as adequate?			
4	Are the qualified chemistry teachers available in your school?			
5	Does your school provide adequate time for teaching chemistry practical?			
6	Does your chemistry teachers interested in devoting their time for chemistry practical?			

		100%	75%	50%	25%	0%
7	What percentage of your chemistry lesson is practical?					
8	How much of your chemistry lesson is students' chemistry practical?					

Keys: (SA=Strongly Agree, A= Agree, UD= Undecided, D=Disagree, DA=Disagree, SD= Strongly Disagree)

		SA	A	UD	DA	SD
	Does Chemistry practical increases understanding of chemistry?					
	Does Chemistry practical create self-confidence to the students?					
	Does Chemistry practical increases achievement of good grades in chemistry?					
	Does practical chemistry reduced syllabus coverage?					
	Does Chemistry practical drills and practices only for passing examination?					
	Ischemistry practical a halfway of understanding chemistry?					
	Isthe Large number of students an obstacle to chemistry practical?					