

**AN ASSESMENT OF PRACTICAL INTERGRATION IN ENHANCING
TEACHING AND LEARNING OF CHEMISTRY IN HIGH SCHOOLS IN
KANDUYI SUBCOUNTY, BUNGOMA COUNTY KENYA.**

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DECLARATION AND APPROVAL

This Research Project Report is my original work and has not been presented for use in any University

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L40/6791/2017

This Research Project Report has been submitted for examination with my approval as University supervisor.

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DEDICATION

This work is dedicated to my dear husband Nixon Nyongesa and my son Ian Barasa for their love and support throughout the research period.

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LIST OF ABBREVIATIONS AND ACRONYMS.

K.C.S.E:	Kenya Certificate of Secondary Education
T.S.C:	Teachers Service Commission
C S M:	Catholic School Management
C.R.E:	Christian Religious Studies
B.O.M	Board of Management

ABSTRACT

The project intended to find out how practicals are integrated in teaching and learning of chemistry in high schools found in Kanduyi sub-county, Bungoma county .A case study carried out in the following schools; St.veronica Ranje high school, St.Teresa Sio high school and The Sacred Heart Wamalwa Kijana high school. Project questions were raised and the responses were obtained through the use of questionnaires that the teachers and students filled. The information obtained through the questionnaires was analyzed and statistically compiled, the results showed that students were much aware of the integration of practical's into teaching of chemistry and its role in improving the overall chemistry results. The encouraging results indicate that enhancing practical lessons would improve on the level of technology in sciences in educational system and the interest of each student in chemistry. Also the integration of practical's in teaching and learning showed improved level of understanding as well as good performance in chemistry. Schools which often incorporated practicals in teaching of chemistry recorded good performance in the national exams compared to those who did not carry out frequent practical lessons. Since it has been found that practical's have a positive impact when integrated in the teaching and learning of chemistry, the study recommends that it should fully be integrated in the teaching and learning of the subject. The research done revealed that practical are not frequently conducted and if done then it was mostly a large class demonstration. Due to large class demonstrations most learners are not able to interpret and make accurate observations during practical lessons. Therefore teachers are recommended to us small group class experiment to ensure each learner participates fully instead of using majorly large group class experiment lessons. The teachers should use the learner-centered approach in doing the experiments. The demonstration experiment by the teacher should be minimal where possible. The school should build a spacious chemistry laboratory to accommodate all the students well and equip the laboratory with enough equipments and reagents.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The emphasis in performance of sciences in Kenya is very high. This is because the science subjects are very vital in career choice institutions of higher learning especially the competitive courses. The research aims at determining how frequent practicals are done and the impact of its integration in teaching of the students in high schools therefore creating awareness on its importance in teaching and learning.

Chemistry is the foundation of the best performance in other subjects and overall points that determine the choice of a career. The best careers in Kenya have high entry points and one of the conditions is always the good performance in science subjects; chemistry being one of the sciences.

Chemistry being compulsory leaves Kenyan students with no option but to perform the subject. It is important to point out that improvements made in chemistry related fields such as medicine, industrial chemistry and pharmacy is as a result of researches done such as this one.

The influence of integration of the practical in teachings and learning at secondary school is very essential because the final chemistry examination in Kenya (K.C.S.E) is always accompanied by practical. Based also on the underlying principles to understanding of sciences, such as chemistry that is observation of data and drawing conclusion, integration of practical is necessary so that chemistry subject is understood. Chemistry being a science and given that science forms the basis for scientific enquiry, there are general intellectual skills that are required to learn the concepts, making valid inductive inferences and learning broad theories which are acquired through integration of practical in teaching of chemistry.

However, it's unfortunate that in Kanduyi sub-county and entirely in Kenya as a country, secondary school students are not given the required appropriate skills by the school, teachers and government. It has been observed that students are performing poorly in practical examinations leading to overall poor performance in sciences.

1.2 Statement of the problem

Teaching of science particularly in Kanduyi Sub- County is faced with more problems which include; High levels of scarcity in terms of science teachers, Low quality of available teachers who are teaching sciences in Kanduyi secondary schools, most are not T.S.C registered, inadequate facilities in our secondary school laboratories and complete lack of laboratories by some schools.

Currently there has been acute shortage of qualified science teachers, who can impart the required knowledge and skills in the field of science. Results have indicated that the method of teaching in the laboratories using practical's helps in increasing the scientific skills. This in turn helps our country Kenya in solving technological problems through innovations and inventions.

Based on the above problems, this project aims at determining the impact of integrating practicals in chemistry within Kanduyi sub-county; with case studies of St. Veronica Ranje high school, Sacred Heart Wamalwa Kijana high school and St. Teresa Sio high school.

1.3 Purpose of study

The study implores the impact practicals has in learning and teaching of chemistry within Kanduyi sub-county having St. Veronica Ranje high school Sacred Heart Wamalwa Kijana high school St.Teresa Sio high school as a case study.

1.4 Objectives of the study

1. To determine the effect of practical chemistry in Kanduyi sub- county secondary schools.
2. To ascertain the frequency of practical lessons in the teaching of chemistry in Kanduyi sub-county.
3. To determine the problems hindering effective integration of practicals in learning of chemistry within Kanduyi sub- county.
4. To suggest solution to the challenges encountered by the students doing chemistry subject with regards to practical's in Kanduyi Sub- County

1.5 Research questions

- i. What is the impact of integration of practical's into teaching of chemistry?
- ii. What are the problems hindering teaching of chemistry practicals?
- iii. What possible recommendations or solution should be employed to problems of teaching chemistry subject using laboratory method?
- iv. What role does practicals play in learning of chemistry?

1.6 Significance of the study

This project aims at gathering useful information concerning the impact of integrating practical's in secondary schools within Kanduyi .

The project will make recommendations that will help in improving the learning outcomes . The project also serves as a means of getting more information for further research.

1.7 Scope of the study

Findings from students doing chemistry at St Veronica Ranje, Sacred Heart Wamalwa Kijana and St. Teresa Sio high schools. The scope also delimited on the frequency of the practical lessons in chemistry subject per week in the selected schools, the problems hindering the effective chemistry practicals, the effect of the chemistry practical on the academic performance of chemistry in the school and possible solutions to these challenges.

1.8 Limitations of the study

The major limitations are delays by some of the respondents in the process of collecting data because they were suspicious of actual motive of the study. Some students imagined that the process meant to analyze whether they always attend the practicals. This was handled by assuring them that the information will not serve any other purpose apart from the intended one which is research. Inadequate resources to print the questionnaires was also a challenge, this was resolved by requesting the school administration to help in providing the papers for the project.

1.9 Assumptions of the study

They include:

- i. Chemistry in the sampled schools is examinable.
- ii. Chemistry practicals have an effect on the students performance.
- iii. It was also assumed that use of practicals is the best method of imparting knowledge in science subjects
- iv. Use of experiments does not affect learners negatively

1.10 Definition of the Key Terms

Etimology

Is the study of the origin of words and the way in which their meanings have changed throughout history.

Objective analysis

This is the type of analysis that seeks to evaluate based upon relevant facts, regardless of feelings.

Scientific method

A method that has characterized science since the 17th century consisting of systematic observation, measurement, experiment & formulation of hypothesis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter looks at what other researchers did in regard to practical integration in enhancing teaching and learning of chemistry worldwide. The chapter focuses on the history of science, nature of science, chemistry as a science, development of science, history of chemistry, need, importance and factors affecting of the achievement of secondary education chemistry in relation to studying in the laboratory, theoretical framework and conceptual framework.

2.2 Meaning of science

Etimology: Science is a Latin word scientia meaning knowledge. Burne (2007) stated that science is the study of anything that can be examined, tested and verified. Science is a branch of knowledge that deals with the study of living and non-living things on the earth's surface.

According to Burnie (2007) science is a systematic knowledge of the physical or material world gained through observation and experimentations.

Greek philosophers looked at the world and tried to explain how it works. The work done by Empedocles (494 – 434 BC) confirmed the existence of four elements; earth, fire, water and air which was seconded by Aristotle's work in (384 – 322 BC).

On the other hand Antoine Van Leeuwenhoek (1632 – 1723) made microspores which he used to do his own observations. In 1661 Robert Boyle (1627 – 1691) laid the foundation of modern chemistry by publishing skeptical chemist, he rejected Aristotle's idea that the world is made up of four elements. Apart from that Boyle also came up with the Boyle's law which states that "The volume of a given mass of a gas is inversely proportional to its pressure at constant temperature".

Other advances were made during the 18th century. For instance, in 1766 Henry Cavendish (1810) isolated hydrogen and studied its properties, Daniel Rutherford (1749) discovered nitrogen and discovery of oxygen was by Joseph Priestley in 1774.

In 1756 carbon dioxide was discovered by Joseph Black (1728 – 1799). In 18th century Antoine Lavoisier (1743 – 1794) discovered that during combustion, oxygen combines with substances and that oxygen was responsible for rusting of materials.

Major advancements were made in the 19th century whereby scientists such as John Dalton (1766 – 1844) published his atomic theory stating that an atom is the smallest particle of an element that can take part in a reaction. A periodic table was later discovered by a Russian Dmitri who postulated that elements are arranged according to their atomic weight. Towards the end of the 19th century, scientists began to investigate the atom whereby Joseph Thomson was able to discover an electron.

During the 20th century, there was drastic improvement in science through the understanding of an atom. Later on the nucleus, the atomic mass and the electron was discovered by Rutherford which was followed by discovery of a neutron by Chadwick

2.3 Nature of science

The knowledge acquired in science accumulates as time goes by building on work performed earlier. Some of this knowledge such as counting dates back to the ancient civilization when scientific thoughts began. Knowledge such as the periodic table in chemistry dates back to not less than 100 years (1834 – 1907).

The properties of hydrogen was established in 1766, these properties stood the test of time since 1766 despite all the advances that have been made in chemistry world since then.

Scientists also make predictions of how things will behave based on existing knowledge. With time scientific knowledge piles up providing more and more insight in the understanding of science.

The discovery of the new world began a process of separation of church and science. Many would try to reconcile science & religion, but ultimately science would largely reject theology as a way of knowing the natural world. Cogito, ergo sum rejected religious authority in the quest for scientific and philosophical knowledge. He argued for a rational justification for a universal, quantitative understanding of nature. Although Descartes and other philosophers established spaces for Co existence between science and religion, it would be quite some time before Europe would embrace evolution. Up until Darwin, the predominant understanding of the world came from the Bible and church doctrine. Georges Cuvier (1769 – 1832) convinced others that extinction was a fact. He is known as the father comparative anatomy.

By the 1830's there was general recognition that fossils had been organisms. Further, it was apparent that older strata contained very simple animals. As one moved through time, the organisms became more and more complex. 18th century comparative anatomists noted that as animals went through embryonic development, it was difficult in the early stages to tell what type of animal it was. Darwin would use this to argue common descent. The theory of natural selection was later developed by Wallace (1823–1913) from which he drew some conclusion from Malthus as had Darwin. Herbert Spencer tried to apply evolution to human populations and demonstrate moral superiority of Europeans

2.4 Practical integration in the teaching and learning of chemistry in secondary schools.

Laboratories are an integral part in the teaching and learning of sciences in accordance to the findings by the researchers. Unfortunately from their findings most of the schools lack sufficient Barrows (2006) found out that in Saudi Arabia the provision of laboratory facilities in schools was very inadequate His findings were also consistent with those of Black (2003) who found out that Uganda most schools had no real laboratory making it difficult for learners to develop scientific skills. Balogun (2003) noted that 80% of failure of science students is due to the inability of the students to use the common chemistry apparatus before facing major examinations. Integration of practical during learning has its importance I the achievement of the set goals ad includes: acquiring scientific skills and techniques which according to Woolnough and Allsop(1985). Also according to (Woolnough & Allsop 1985, pg46) a hand-on experience leads to high understanding of the content. Pavelich & Abraham(1979) also stated that practical integration help the learners to acquire fundamental techniques and procedures.

2.6 A Conceptual Framework

A conceptual framework is an analytic tool that represents visually or graphically the main things to be studied. A conceptual framework looks at what is required in the course of the study putting in mind the work of the previous researchers. Mutai (2000), stated that a conceptual framework is hypothesized model identifying various variables and the relationship among them. Various aspects of chemistry were demonstrated in the study and they included nature, quality, amount of chemistry practical, and how they influence the performance of chemistry by learners

Independent variable

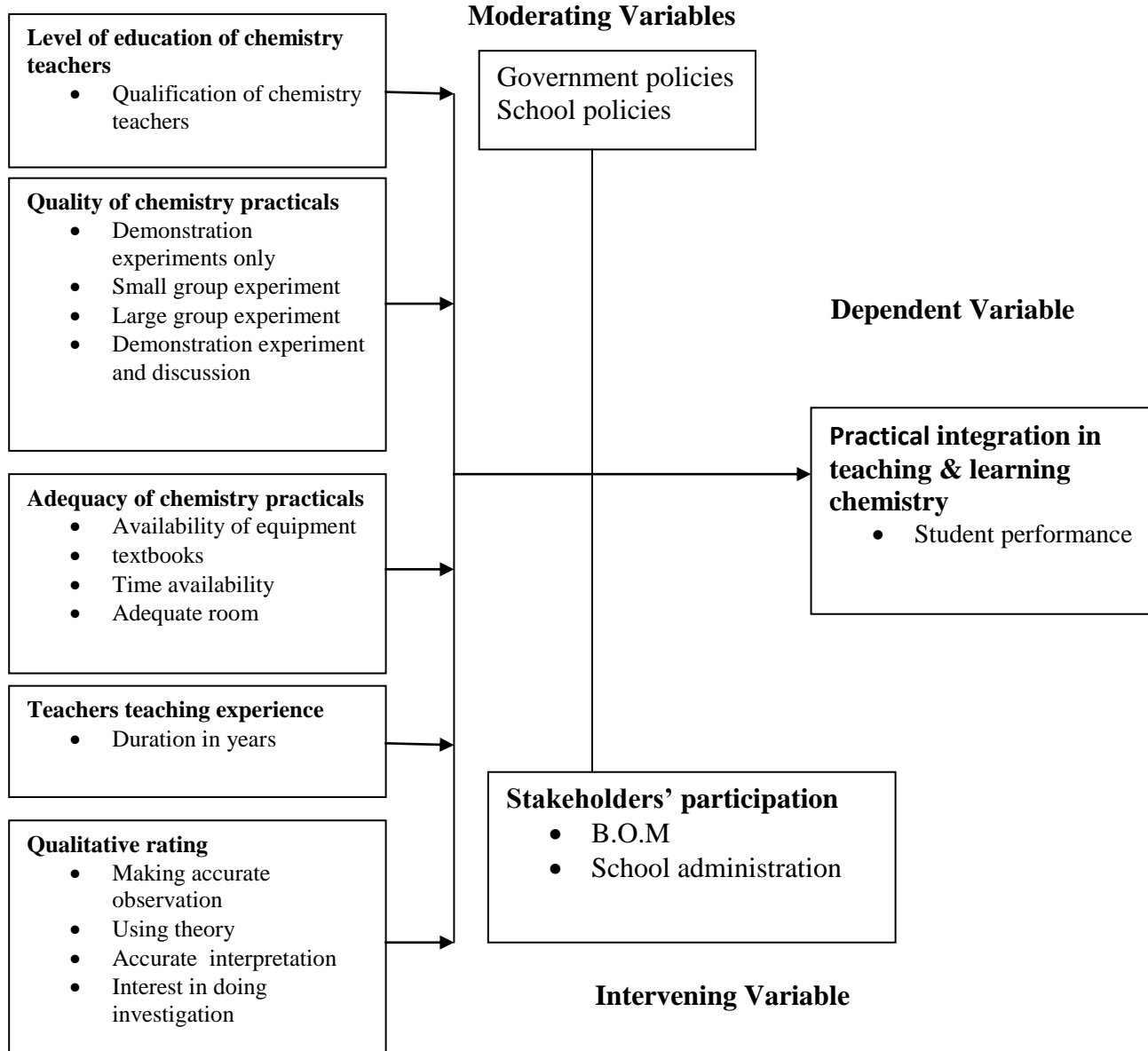


Figure 1: Practical integration in teaching and learning of chemistry

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter deals with the following; research design, study area, the target population, sampling size, sampling procedures, research instruments, validity and reliability of the research instruments then finally the methods of data analysis.

3.2 Research Design

Descriptive survey design was employed during this study. Since this design is used to obtain information about current status of phenomenon, it is preferred since it describes what exists without manipulating variables of the study. (Mugenda and Mugenda, 2003). Descriptive survey design is suitable for this study because it seeks to assess the influence of integration of practicals into teaching of chemistry at St. Veronica Ranje, St, Teresa Sio and Sacred Heart Wamalwa Kijana high schools.

3.3 Study area

The areas of study were St. Veronica, Sacred Heart Wamalwa Kijana and St. Teresa high schools which are found in Kanduyi sub-county. All the sampled schools are public schools, sponsored by the Catholic Church

The schools are build on a very strong Christian faith though learners from different faiths are admitted, they are all expected to adhere to rules of the catholic church while at school; for example attending the masses. The subjects taught at the school includes; Mathematics, Physics, Chemistry, Biology, CRE, Business studies, Agriculture, Computer studies, Geography, Kiswahili, English, and History. Compulsory subjects are Chemistry, Biology, English, Kiswahili and Mathematics

3.4 Target population

This consist of learners taking chemistry as one of their subjects in Kanduyi secondary schools. The head of department of science was also a target because the information about the syllabus covered and the general performance of the subject in the school was required. The subject teachers were also the target group of this project since they gave out information concerning the performances in Chemistry subject in the previous tests and exams.

3.5 Sampling size and sampling procedures

This section deals with the determination of the sample size, sample procedures ad the sampling techniques employed during the study. A good sample size should provide the characteristics of the whole population ad should be manageable

3.5.1 Sample size

The study group was 424. The sample size was 111 comprising of 1 head of department, 8 teachers (subject teachers) and 102 students as indicated below.

Table 1. The sample size from the target population

Respondents	Study group	Percentage	Sample size
Departmental heads	3	0.94	1
Teachers	21	4.94	8
Students	400	94.12	102
Total	424	100	111

3.5.2 Sampling procedure

This study employed purposive sampling techniques to determine the teachers to be sampled. This means that the units of analysis were selected intentionally. Stake (1995), points out that if a case is purposefully selected, and then it allows generalization of the findings. Similarly the cases were selected intentionally so that they could be used to predict similar results. The purposive sampling was used in sampling selected schools in Kanduyi sub-county because of its location in the target region. The researcher also applied purposive sampling to obtain one head of department and four subject teachers of chemistry.

Randomly the 102 students were sampled in the selected schools giving students equal chances of being selected.

3.6 Research instruments

Methods of gathering qualitative information are: Interviews, observations and document analysis (Gall, Burg & Gall, 1996). The study used interview guides to collect data from the department. This involved open ended questions where the respondent answered questions on his own terms and as much detail as he liked.

Document analysis was employed as a tool for obtaining relevant documentary evidence to support and validate responses given by the respondents, there were teacher's questionnaires and student's questionnaires that is 102 questionnaires for the students, 8 questionnaires for the subject teachers and a total of 110 questionnaires. There was one interview schedule for the head of department.

3.6.1 Questionnaire

Questionnaires were considered as research instruments in this study by the researcher, Ary Jacobs and Razavich (2007) in supporting the use of questionnaires as a research instrument indicates that questionnaire is less time consuming; as the same information may be written by a large number of people at the same time Sibaya (2005) stresses the importance of using questionnaire in researching when he said that they are essential scientific instrument for measurements and collection of particular kinds of data.

The teachers and students questionnaires were used to determine age, class, attitudes, perception and relevant information for the study. The sets of questions were designed to help reflect the influence of practical integration in teaching and learning of chemistry in Kanduyi. The study also employed the use of questionnaires for the subject chemistry teachers to check on factors that hinder the achievement of teaching using the practical method in chemistry and also the previous performance in the subject by the students. The researcher considered using questionnaires because questionnaires are more appropriate for collecting data for this particular study.

3.6.2 Interview schedule

Interviews are one of the most common techniques used to understand human interaction (Fontana & Frey, 2005). This study included a semi structured interview as one of the data gathering technique. Interview was conducted with the head of science department to collect information on the syllabus covered in chemistry subject and the readiness of the department to increase the frequency of chemistry practical's in the school

3.6.3 Pilot testing of the Data collection Instruments

A pilot test was carried out to ascertain the accuracy of the research instruments to be used in the main study. The respondents for the test included 1 chemistry teacher and 15 students from Wamalwa Kijana high school. The selected respondents did not take part in the main study to avoid chances of bias.

3.7 Validity and reliability of Research

3.7.1 Validity of research instruments

Validity refers to the appropriateness, meaningful and usefulness of the specific inferences researchers make on basis of data collected (Kathuri and Pals, 1993), validity of an instrument is in measuring what is set out to measure so that the difference in individual's score can be taken as a representative of true difference in the variable under study.

Mugenda (1999) describes validity of a measure as that which requires the use of professionals in a particular field which is highly sensitive. In a case study, validation is done through comparisons of the different kinds of evidence, Diesing, (1971).

3.7.2 Reliability of research instruments

Reliability is a measure of the degree to which the instrument yields consistent data after repeated trials (Mugenda and Mugenda, 2003). Reliability also signifies the extent to which the researcher can obtain similar results overtime, across constructs and whether there is consistency in test administration and scoring (Reswell, 2009). Split half method was used where the questionnaire items were divided into two: odd and even items and reliability co- efficient calculated using spearman rank order correlation formula.

The coefficient will indicate the extent to which the two halves provide the same results and hence describe the internal consistency of the test. Reliability measured with the composite reliability scores of 0.70 or greater (Hair, 2010) are desirable. In this study a coefficient of 0.895 was obtained and so the questionnaires were accepted as reliable (Mugenda and Mugenda, 199

3.8 Methods of data analysis

The collected data was analyzed to determine the return rates of the questionnaires. Editing was done to determine how relevant the responses were they were both classified as complete and incomplete instruments. Because the instruments were up to 80% complete none was discarded.

The responses obtained from the interviews were also analyzed and arranged as per the issues. The overall results obtained from both the questionnaires and interviews were recorded and presented using tables.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND PRESENTATION

4.1 Introduction

It was noted that 102 out of 120 students and 8 out of 9 teachers managed to fill the questionnaires satisfactorily. 5 questionnaires were spoilt. The response rate was quite high (92.4%), which can be attributed to the use of class representatives. Data was collected from 102 students, 8 subject teachers and 1 head of science department giving a total of 111 respondents.

4.2 Characteristics of the sampled population.

The schools which were used for research were mixed schools hence the respondents were both girls and boys with a few number of male teachers who were subject chemistry teachers, students' distribution by class, level of education of the chemistry teachers, gender of the population and the teaching experience of these teachers was taken into consideration.

Table 2: Sampled population

Form	Frequency	Percentage
Form 1	15	14.7
Form 2	22	21.6
Form 3	30	29.4
Form 4	35	34.3
Total	102	100

As shown 14.7% students were registered in Form One, 21.6% in Form Two, 29.4% in Form Three and 34.3% Form Four. This shows that students from all the classes in the schools were picked and there was a fair distribution.

Table 3: The level of education for the chemistry teachers.

Qualification	No. of chemistry teachers	Percentage
Diploma	1	12.5
Bachelor's Degree	4	50
Post Graduate	3	37.5
Total	8	100

The findings shown on table 3 indicates that majority of chemistry teachers at the school had bachelor's degree (50%) with only a small percentage (12.5%) having a diploma. Those with bachelor's degree and above made a larger percentage of (87.5%) reinforcing the idea that the information given by these teachers is reliable based on their qualification in the profession of teaching.

Table 4: Teachers' teaching experiences

Duration (years)	Frequency	Percentage
1 – 3	1	14.3
4 – 6	2	25.4
7 – 9	4	50.0
10 – 12	1	14.3
13 – 15	0	0.0
Over 15 years	0	0.0

The results indicate that 89.7% of the chemistry teachers in the sampled schools had the teaching experience of over 3 years. This means they have more information concerning the teaching of chemistry. They were therefore a good resource in the research carried out.

4.3 Effect of practical integration in teaching and learning of chemistry in Kanduyi Sub County High schools

Ways through which practicals affect learning and teaching are shown in the table5 below

Table 5

	SA		A		NS		D		SD	
	F	%	F	%	F	%	F	%	F	%
Teachers who use practical's in teaching of chemistry led to higher interests in their lessons.	5	62.5	2	25	1	12.5	0	0	0	0
Practicals improve the quality of learning and academic outcome.	4	50	2	25	0	0	1	12.5	1	12.5
Use of practicals has eased curriculum delivery leading to improved performance.	3	37.5	2	25	1	12.5	1	12.5	1	12.5
Practical integration in teaching makes learning enjoyable	6	75	2	25	0	0	0	0	0	0
Practical's have increased students motivation in learning and hence improved performance.	4	50	2	25	1	12.5	1	12.5	1	12.5
Use of practical's by students has led to the improvement of school performance in K.C.S.E	5	62.5	2	25	1	12.5	0	0	0	0

Key.

SA – Strongly Agree

A – Agree

NS – Not Sure

D – Disagree

SD – Strongly Disagree

data in table 5 shows that (87.5%) of the chemistry teachers are for the idea that practical's usage as a method of teaching increases their lesson interests. 75% agrees that the quality of learning and academic performance is improved through practical's. A relatively low percentage of teachers agree that practical's has eased curriculum delivery leading to improved performance only (62.5%). 25% of the teachers disagreed that curriculum delivery is eased by using practical's leading to improved performance. Practical integration makes the learning enjoyable (100%). 75% supports the idea that practical's has increased students motivation and hence improved performance. Only 12.5% disagree that use of practicals has led to the improvement of school performance in K.C.S.E. (87.5%) agree that use of practicals by students has led to the improvement of school performance in K.C.S.E.

4.4 Frequency of practical chemistry lessons at the sampled schools.

Majorly the rate at which practicals are done contributes immensely to the performance. Teacher mostly are the ones who control this frequency depending o the workload. The pressure of completing the syllabus o time makes teachers to concentrate on theory more than they do with practicals.

Table 6: Students' response regarding the frequency of practical lessons of chemistry at the sampled schools.

Frequency of adopting the following types of chemistry practical's		Don't know	Never	Occasionally	Frequently	Very Frequently
Demonstration experiment only	Frequency	0	0	10	50	42
	Percent	0	0	9.8	49.0	41.2
Demonstration experiment and discussion	Frequency	5	30	56	7	5
	Percent	4.9	29.4	54.9	6.9	4.9
Demonstration experimenting In the classroom	Frequency	2	7	14	32	47
	Percent	1.96	6.9	13.7	31.4	46.1
Small group class experiment lesson	Frequency	9	50	18	15	10
	Percent	8.8	49.0	17.6	14.7	9.8
Large group class experiment lesson	Frequency	7	0	25	20	50
	Percent	6.9	0.0	24.5	19.6	49.0

From the table 6, the information shows that (49%) and (41.2%) was frequently and very frequently used demonstration experiment only. Also the frequently used type of practical in the school is large group class experiment lesson 19.6 + 49, (68.6%). The type of practical which is rarely used in the school is the small group class experiment with only 14.7%) frequently used and (9.8%) that is very frequently used. The data also indicates that demonstration experiment in the classroom is frequently used as a method of teaching with a percentage of (46.1%) and 31.4%). The method of demonstration experiment and discussion not frequently adopted at the school.

4.5 Problem hindering integration of chemistry practical in the sampled schools.

The problems hindering the integration of chemistry practicals in the sampled schools were broadly categorized into two:

- (i) Adequate resources.
- (ii) Quality of the practical's used.

4.5.1 Adequacy of chemistry teaching and learning Resources.

The availability of learning ad teaching resources is paramount to the understanding good performance in any science subject. Adequate room well arranged with apparatus ad reagents are vital to the understanding of practical work.

Table 7: Adequacy of teaching and learning resources in the schools.

Teaching and learning resources in the school		Disagree	Not sure	Agree
Adequate chemistry laboratory (space and equipment)	Frequency	78	15	27
	Percent	65	12.5	22.5
Reagents and apparatus	Frequency	82	17	21
	Percent	68.3	14.2	17.5
Adequate relevant chemistry textbooks	Frequency	23	28	69
	Percent	19.2	23.3	57.5
Adequate time for chemistry practical's	Frequency	55	7	58
	Percent	45.8	5.8	48.3

(65%) of the respondents disagree that there is adequate chemistry laboratory facilities (space and equipment). A small percent of 22.5% agree that there is enough space and laboratory equipment. Also a larger percent of respondents do not agree to the statement that the school has adequate chemistry apparatus and reagent. This indicates that the school do not have enough chemistry apparatus and reagent as duplicated by (68.3%) of the respondents.

However, (57.5%) agree that the school has adequate relevant chemistry textbooks. On the issue of time for practical's a fairly a bigger percent of respondents (48%) agree that the time for chemistry practical's is adequate.

4.5.2 Quality of chemistry practicals used in teaching and chemistry.

This study looked at the ability of learners to make qualitative analysis when carrying out a practical

Table 8

Various aspects of Qualitative ratings		Very weak	Weak	Average	Strong	Very strong
Making accurate observations	Frequency	12	18	10	30	45
	Percent	10.0	15.0	8.3	25.0	37.5
Using theory when doing investigation	Frequency	26	52	12	11	09
	Percent	21.7	43.3	10.0	9.2	7.5
Keeping neat and accurate records	Frequency	05	07	20	56	32
	Percent	4.2	5.8	16.7	46.7	26.7
Ability to make accurate interpretations and predictions	Frequency	49	38	13	11	09
	Percent	40.8	31.7	10.8	9.2	7.5
Interest in doing investigations	Frequency	42	53	08	10	06
	Percent	35.0	44.2	6.7	8.3	5.0
Eagerness to investigate after school	Frequency	38	35	17	12	18
	Percent	31.7	29.2	14.2	10.0	15.0
Eagerness to relate observations to theory work	Frequency	42	28	23	17	10
	Percent	35.0	23.3	19.2	14.2	8.3

The information in table 8 indicates that most respondents (58%) are not eager to relate observations to theory work. They are also weak in showing eagerness to investigate after school (60.9%). The majority of students are unable to make accurate interpretations and predictions (72.5%). The information gathered also indicates that (65%) of students do not use theory while doing investigation. On the other hand majority of the students (62.5%) make accurate observations during their practicals. Also they keep neat and accurate records (73.4%).

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents the summary of the findings, conclusion, recommendations and suggestions for further research. The purpose of the study was to assess the impact of practical integration in chemistry in Kanduyi.

5.2 Summary of the findings

5.2.1 Effects of practical chemistry at the sampled high schools.

Out of the 8 chemistry teachers interviewed, 7 teachers agreed to the statement that the teachers who use practical's in teaching of chemistry led to higher interests in their lessons. It is seen in the data that 6 teachers out of 8 supports the idea that practical's improves the quality of learning and academic performance. Use of practicals has eased curriculum delivery leading to improved performance basing on the 6 teachers who agreed out of 8. Also practical integration in teaching makes learning enjoyable as depicted in the data showing all the 8 teachers agreed to this. The practical's have increased students motivation in learning and hence improved performance. Finally the use of practicals by students has led to the improvement of school performance in K.C.S.E.

5.2.2 Frequency of practical lessons in the teaching and learning of chemistry

The findings reveal that chemistry teachers at the school majorly applied demonstration experiment only during practicals. In case there was any practical that was done by students then it was in large group class experiment lesson. The teachers rarely applied small group class experiment. Demonstration experiment and discussion was occasionally used.

5.2.3 Problems hindering integration of chemistry practical's

Concerning resources in the school, it was found out that the school had enough relevant chemistry textbooks. However it lacked adequate chemistry laboratory equipment and space. It also lacks adequate chemistry apparatus and reagents.

On the issue of adequate time for chemistry practical's, almost half of the teachers sited inadequate time and slightly more than half sited that there was adequate time for chemistry practical's with only 5.8% being not sure of whether the time is adequate or not

The second factor that highlights the problems hindering integration of chemistry practicals in Kanduyi Sub-county high schools was the research findings on the quality of the chemistry practicals. The research findings revealed that majority of the students do not have the ability to make accurate interpretations and predictions. Also the students do not show interest in doing investigation as well as using theory when doing the investigation. There was lack of eagerness on the part of the students to investigate after school and the eagerness to relate observations to theory work. However, most of the students in the school were able to make accurate observations and keeping the records neat and clean.

5.3 Conclusion

Integration of practicals has a positive impact in the outcome of the learning leading to improved performance of the chemistry subject. It was realized that integrating practical in teaching and learning of chemistry makes learning enjoyable, improves and eases curriculum delivery, improves the quality of learning and finally leading to improvement in K.C.S.E performance.

There was no frequency in effective practical chemistry lessons in terms of small group class experiments and the discussion accompanying the demonstrations.

Inadequate chemistry laboratory equipment apparatus and reagents are some of the problems hindering effective integrations of practicals.

5.4 Recommendation

- (i) Since it has been found that practical's have a positive impact when integrated, I recommend that it should fully be integrated in the learning of the subject.
- (ii) The teachers should have frequent small group class experiment to ensure each learner participates fully instead of using majorly large group class experiment lessons.
- (iii) The teachers should use the learner-centered approach in doing the experiments. The demonstration experiment by the teacher should be minimal where possible.
- (iv) The school should build a spacious chemistry laboratory to accommodate all the students well and equip the laboratory enough equipment and reagents.
- (v) Large classes should be divided into smaller classes I order to improve o the performance in chemistry practicals.

5.5 Suggestions for further research

On the part of qualitative aspects of practical lessons, more research should be conducted to know why students are unable to interpret their results, also further research to find out the reason for lack of interest in doing investigations. Further research should be done on the willingness by learners to investigate and draw conclusions.

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APPENDICES

Appendix1: Letter of introduction

TO THE KANDUYI SUB-COUNTY
DIRECTOR OF EDUCATION,
BUNGOMA.

REF: PERMISSION TO CONDUCT RESEARCH IN YOUR SUB- COUNTY,

I am a postgraduate student at the University of Nairobi, taking a post graduate diploma in education. As part of the requirement for the award of postgraduate diploma in education, I am undertaking a research on ‘Assessment of practical integration in teaching and learning of chemistry’ in Kanduyi sub-county high schools.

In this regard I kindly seek your permission to conduct this research in your sub-county with a case study of Wamalwa Kijana high school, St. Teresa Sio and St. Veronica Ranje. The mode of collecting data will be use of questionnaires.

The information obtained will be private and confidential, and will be used solely for research purposes. Your assistance and cooperation will highly be appreciated.

Yours Faithfully

LYDIA NASWA WAFUBWA
L40/6791/2017

Appendix II: Teachers Questionnaire

(tick in boxes provided where applicable).

Section A: Demographic information

What is your gender? Male Female

1. What is your highest level of education

Diploma

Bachelor's degree

Postgraduate

2. For how long have you been teaching

1 year

2 years

3 years

More than 3 years

Section B: chemistry skill and knowledge

1. How do you rate the impact of chemistry practicals

	Impact of the practical		Tick the one that applies				
			SA	A	NS	D	SD
(i)	Teachers who use practical's in teaching of chemistry led to higher interests in their lessons						
		Frequency					
		Percent					
(ii)	Practical's improves the quality of learning and academic outcome	Frequency					
		Percent					
(iii)	Use of practical's has eased curriculum delivery leading to improved performance	Frequency					
		Percent					
(iv)	Practical integration in teaching makes learning enjoyable	Frequency					
		Percent					
(v)	Practical's has increased students motivation in learning and hence improved performance	Frequency					
		Percent					
(vi)	Use of practical's by students has led to the improvement of school performance in K.C.S.E	Frequency					
		Percent					

Key

SA – Strongly Agree

A – Agree

NS – Not Sure

D – Disagree

SD – Strongly Disagree

2. Which type of practical do you use in carrying out your objectives concerning practical chemistry? Choose appropriate method you frequently use.

Demonstration experiment only

Demonstration experiment and discussion

Demonstration experiment in classroom

Small group class experiment lesson.

Large group class experiment lesson

3. What are some of the problems hindering effective use of practical's in your teaching of chemistry at the school?

4. How do you rate the qualitative aspect of your students in terms of the practicals? (Tick the one that applies to your students).

Various aspects of qualitative ratings of the practical		Very weak	Weak	Average	Strong	Very strong
Making accurate observations	Frequency					
	Percent					
Using theory when doing investigation	Frequency					
	Percent					
Keeping neat and accurate records	Frequency					
	Percent					
Ability to make accurate interpretations and predictions	Frequency					
	Percent					
Interests in doing investigations	Frequency					
	Percent					
Eagerness to investigate after school	Frequency					
	Percent					
Eagerness to relate observations to theory work	Frequency					
	Percent					

APPENDIX III: QUESTIONNAIRE FOR THE STUDENTS

Instructions to the participants

1. Do not write your name on any part of this Questionnaire or indicate any personal details.
2. Tick appropriately.

Section A: Demographic information

1. Which class/Form do you belong?

- Form One
- Form Two
- Form Three
- Form Four

2. Do you learn chemistry as one of your subjects? Yes No

Section B: chemistry skills & knowledge

1. Which method do you use when doing your chemistry practical's and how often?

	Type of practical		Don't know	Never	Occasionally	Frequently	Very frequent
(i)	Demonstration experiment only	F					
		%					
(ii)	Demonstration experiment & discussion	F					
		%					
(iii)	Demonstration experiment in the classroom	F					
		%					
(iv)	Small group class Experiment lesson	F					
		%					
(v)	Large group class experiment lesson	F					
		%					

2. What are the problems hindering chemistry practical's from being done effectively?

(i) Laboratory space: Adequate Not sure Inadequate

(ii) Chemistry reagents: Adequate Not sure Inadequate

(iii) Laboratory equipment/apparatus: Adequate Not sure
Inadequate

(iv) Relevant chemistry textbooks: Adequate Not sure
Inadequate

(v) Time for chemistry practical's: Adequate Not sure
Inadequate

3. How do you rate yourself on the following aspects of qualitative part of chemistry practicals?

	Various aspects of qualitative ratings of practical		Very weak	Weak	Average	Strong	Very strong
(i)	Making accurate observations	F					
		%					
(ii)	Using theory when doing investigation	F					
		%					
(iii)	Keeping neat and accurate records	F					
		%					
(iv)	Ability to make accurate interpretations and predictions	F					