EFFECTS OF FORMATIVE ASSESSMENT PRACTICES ON TEACHING AND LEARNING CHEMISTRY IN PUBLIC DAY SECONDARY SCHOOLS IN TURKANA CENTRAL SUB-COUNTY, TURKANA COUNTY, KENYA

BY

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A Research Project Report Submitted in Partial Fulfillment of the Requirements for the Award of a Post Graduate Diploma in Education of the University of Nairobi

2018

DECLARATION

This research project is my original work and has not been submitted for any award in any other university.

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This research project has been submitted for examination with my approval as university supervisor.

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DEDICATION

To my Mother, Mrs. Teresia Mong'are Mochama, my wife Edinah Wepukhulu and children.

ACKNOWLEDGEMENT

I appreciate the guidance by my Supervisor Dr. Anne Aseey; the entire group of lecturers for the post-graduate diploma in education in the University of Nairobi for their support in imparting in me the teaching skills and knowledge; my family, friends and relatives for their individual and group support in this academic journey.

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ABBREVIATIONS AND ACRONYMS

KICD	Kenya Institute of Curriculum Development
KII	Key Informant Interview
KNEC	Kenya National Examinations Council
PAG	Pentecostal Assemblies of God

ABSTRACT

This project proposal presents complete findings on the study on the Effects of Formative Assessment Practices on Teaching & Learning Chemistry in Public Day Secondary Schools in Turkana Central Sub-County, Turkana County, Kenya. Participants were form three students within the ages of 17-18 years, with girls making the majority population at 54%. Day schools make up to 25%. All the day schools in the Sub-County did poorly in the inclusion of formative assessments into their teaching tools. Overall utilization of formative assessment in the Sub-County was at 34%. Most of formative assessment results were generally for grading purposes. The learners in the sub-county were fairly doing well in the utilization of the results for learning. The head teachers in general were found to offer little guidance on appropriate formative assessment practices, hence leaving teachers to use results for student grading and promotion to next levels of learning. The parents on the other hand were found to have negligible influence on formative assessments. They rarely review learners' work. Given the lack of commitment of head teachers, Boards of Management, government agents, teachers and learners; it was confirmed that the practices on formative assessment have had negative impact on teaching and learning process. It is herein recommended that similar studies should be undertaken among boarding schools in Sub-County to ascertain the relationship of formative assessment practices. The government should increase her education quality surveillance to ensure that students are evaluated within the learning scope. There should be periodic in-service teacher training on formative assessments, student performance measurement and evaluation techniques.

CHAPTER ONE

INTRODUCTION

1.1 Background

Education is a purposeful or deliberate activity that is geared towards achievement of a range of objectives which vary from country to country. Some common objectives of education include the instillation of knowledge into individuals so that they can be able to think rationally and independently, realization of economic benefit both to the state and individuals, and the formation of a sustainable community.

Evidently, education seeks to achieve a goal that will be beneficial not only to individual learners, but to the society at large. Philosophers have continually explained that education serves economic, political, social and moral ends. Therefore, governments across the globe have strived to use schooling as a means of strengthening national identity and inculcating citizenship values.

Assessment is also a necessary tool for student learning performance records. These records inform the validity of the students' preparedness for promotion to higher grades, guidance and counseling needs, parents/guardians feedback means, assessment of the effectiveness of the teaching strategies and student motivation tool. Hence, assessment process is centrally involved in the conduct and improvement of education (Gage, L. N. (1974).

Most teachers and learners focus on examination tests instead of acquisition of knowledge and skills (Bloom. S. B, 1975). This dependence on examination scope has been instituted in the policy implementation tools, for instance, the Kenya National Examinations Council examination (KNEC) syllabus and the complimentary Kenya Institute of Curriculum Development (KICD) syllabus. The KNEC syllabus has been found to be more popular than the KICD one, leading to sprouting of numerous test series publications at the expense of instructional materials' development by the curriculum development support institutions, especially the publishers. The end-result being production of secondary school leavers that are not well equipped for effective higher education and/or job placements.

Evaluation problems manifest on the linkages between the instructional objectives evaluation and the non-complimentary curriculum objectives evaluation. That's why sometimes students perform well in formative examinations but fail to shine in final national examinations.

Studies on assessment processes are limited by insufficient descriptive information on assessment practices in schools. Schools usually concentrate on a few aspects of an assessment processes. They fail to consider what a variety of assessment system serve in schools and classrooms. This study forms part of the much-needed determination of practical assessment processes and their effects in teaching and learning.

1.2 Statement of the problem

British researchers Paul Black and Dylan Wiliam are believed to be the founders of formative assessment. In 1998, Black and Wiliam published two important works on formative assessment. Black and William (1998b) suggest that if formative assessment is well applied in the classroom, learning would improve.

The Ministry of Education in Kenya has considered learners' performance in both formative and summative assessment as a teacher's accountability measure for effective teaching.

Currently, student performance in final examinations has been wanting. Some suggest a number of factors that hinder good performances. Such factors include insufficient teaching / learning facilities, teachers' motivation, learners' entry behavior and many others. Little has been mentioned about learners' preparations for summative examinations. Being considered among the foundation tools for good performance in summative examinations, the effectiveness of formative assessment practices need to be examined to determine the current practices that have informed the previous student performances in view of finding possible remedies for any gaps identified, in order to enhance the education process.

1.3 Purpose of the study

The study has provided information on chemistry formative assessment practices, their contribution to teaching and learning.

1.4 Study objectives

1. To determine formative assessment practices on teaching and learning chemistry
2. To evaluate utilization of formative assessments on teaching and learning chemistry
3. To evaluate the students' satisfaction on teachers' chemistry formative assessment competencies.

1.5 Research questions

1. What are formative assessment practices in this school?
2. How are formative assessments used in the Chemistry teaching and learning process?
3. Are students satisfied with teachers' Chemistry formative assessment competencies?
    a. Utilizing formative assessment in teaching
    b. The application of diverse assessment methods
    c. Providing feedback to students on formative assessment results
    d. Utilization of formative assessment results by learners
    e. Students' participation in formative assessment
    f. Written Feedback
    g. Oral feedback

1.6 Study significance

Study findings have potential to improve secondary school chemistry teaching and learning. The findings would boost the understanding of the effect of learning stakeholders' involvement chemistry performance.

The findings may assist teachers to help their learners to become more confident and optimistic in their chemistry learning, hence enhancing a positive sense of their ability in chemistry. Teachers may use the results of the study to change their teaching methods and strategies for the benefit of students. Education policy makers can formulate new policies in the secondary schools. The study can help secondary school students to improve their chemistry skills to achieve their academic potential. This study adds to the formative assessment knowledge in the scholarly works.

1.7 Study delimitations

Geographical area of study was limited to Turkana Central Sub-County day secondary schools only. The chosen geographical boundary was purposely delimited to accommodate limited budgetary allocation. It was also on assumption that formative assessment practices are similar across all secondary schools in Kenya and that such sample was to provide a true picture of formative assessment practices in Kenya day secondary school. The target population was the chemistry subject teachers and their respective students. The study involved only chemistry teaching and learning process

1.8 Study limitations

Limitations included:

a. Exaggerations by Chemistry teachers. This was identified earlier in the pilot stage of the study wherein teachers were found to select all alternatives given in the questionnaire to show how superior they are on formative assessment practices. This limitation was reduced by orally framing the same questions to invoke open ended responses that were coded to match the alternatives provided.

b. The learners had lived perceptions on the effectiveness of their teachers' formative assessment practices. They thought that they would provide negative bias as a punishment to the unpopular teachers and positive bias as a reward for popular teachers. This bias was reduced by explicit description of the study and declaration that the study had nothing to do with teacher rewards. This was further reinforced by guiding learners on interpreting the true meaning of each question before they could select alternatives.

c. Access limitations were identified among the Ministry of Education officials, the head teachers and the Chemistry teachers. All thought it was a spying exercise for the Teachers' Service Commission for rewarding/punishing teachers. Some Ministry of Education officials were not willing to own up the authority to authorize the researcher to proceed with data collection. However, this limitation was eliminated by sufficient explanations, identification and introductory letter from the University of Nairobi.

1.9 Assumptions of the study

1. Formative practices are uniform among secondary schools in Kenya
2. All the information that will be provided would be true
3. At least 75% of the target respondents will be available for the study
4. The researcher report will be used by the stakeholders.

1.10 Operational definition of terms

Effects: a change, result, consequence or outcome as a result of action on a phenomenon.

Formative assessment: All activities leading to interim gauging of learners' grasp of instruction objectives (Huhta, 2010; Shepard, 2005 and Crooks, 2001). Assessment is used in this project report to mean evaluation too.

Learning: Learning is acquisition or change of behavior.

Teaching: imparting knowledge or instructing someone on new behavior or intended behavior change.

Practices: the use of acquired behavior to achieve set objectives

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In-depth understanding of formative assessment as a distinct teaching & learning aid for improvement of teaching process and learner's achievement is herein discussed. The chapter describes the logical differences between formative and summative assessments, roles of formative assessments, formative assessment practices, and position of formative assessment in the teaching learning process and finally description of both the conceptual and theoretical frameworks of the study.

2.2 Formative and summative assessment

Formative assessment is meant to provide instructors and learners opportunity to adjust programs as instruction progresses in order to make education effective (Michael Scriven's, 1967; Popham, W. J., 2008). It is a planned process that provides evidence for positive instructional change as well as learning adjustments.

2.3 Chemistry assessment process

Figure 1 depicts typical assessment process in a learning institution. It shows that the process is initiated by proper planning. Planning includes measures for evidence collection that would demonstrate that learning took place; actual formative assessment, reporting and learning adjustments based on evidence.

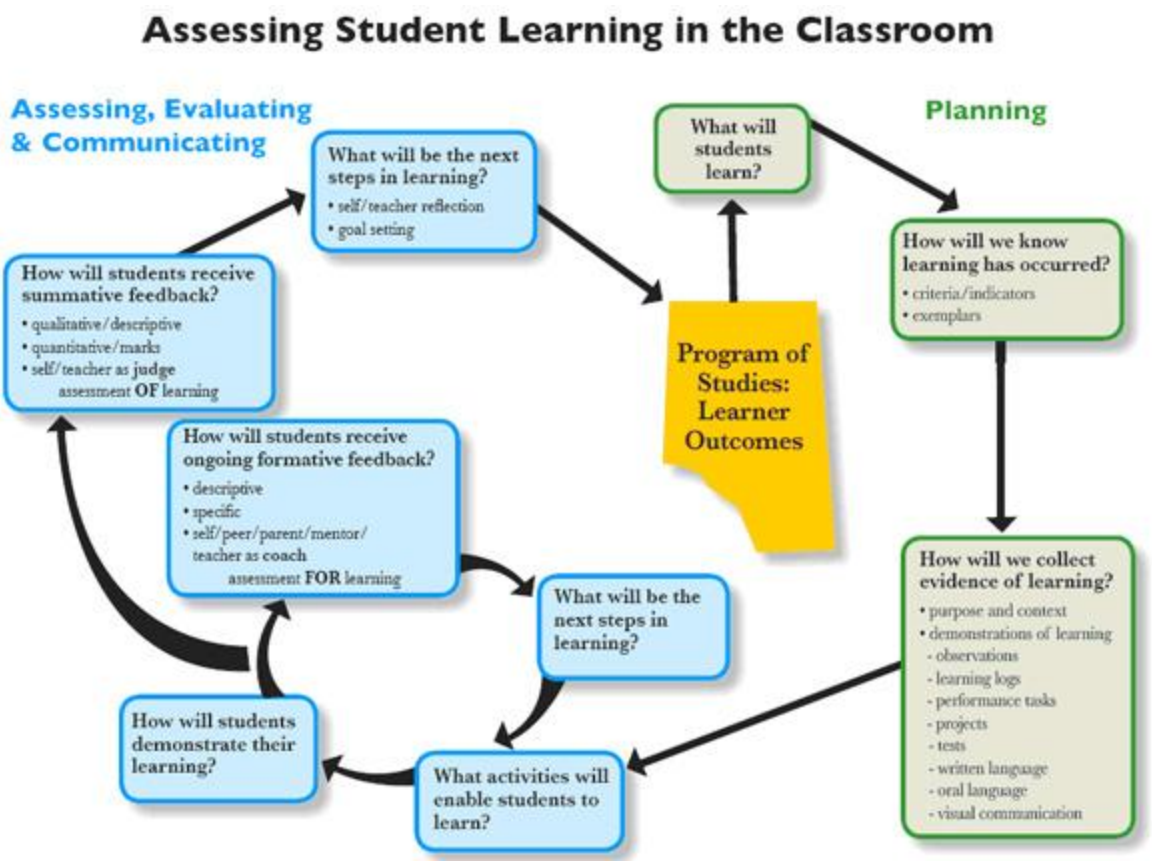

Figure 1: Formative assessment process (adapted from http://www.learnalberta.ca)

2.4 Formative assessment practices

Currently, institutions have developed a variety of teaching and learning practices. However, much of the practices concentrate on use of commercial tests as formative assessment tools. Not much attention has been given on teacher-led, learner focused assessment practices (Black and William, 1998a). Some of the well documented practices include: anecdotal notes, observation checklists, rating scales, rubrics, conversations, portfolios, question and answer.

2.5 Utilization of formative assessments on teaching and learning Chemistry

The recent testing practices in Kenya schools continue to be used as a mechanism for learner performance grading at the expense of learning diagnosis. This this method has been too dominant. This practice need to transform to learning utilization type of assessment (Crooks, 1988). Grading based assessment has already reduced teachers' ability to effectively design and utilize formative assessments. They neither carry out peer review of classroom student learning findings (Hall et al., 1997; Senk et al., 1997; Duschl & Gitomer, 1997; Rudman, 1987; Mavromattis, 1996).

Despite the immediate previous practices, new approaches towards learning focused assessments are slowly emerging. Such assessments have improved student performance in summation evaluation. The utilization of formative is important when instruction goals are well defined (Sadler, 1989; Ames, 1992). The following section describes briefly the use of formative assessments.

2.5.1 Providing feedback to students

Feedback can be a verbal statement; description of students' specific misunderstandings or errors and Showing students how they can adjust their approach to the task (Clariana, 1993; Cohen, 1985).

2.5.2 Encourage self-assessment and goal setting.

Formative assessments help learners to carry out self-evaluation and goal setting (http://www.ascd.org).

2.5.3 Motivated to learn

The assessment strategies influence student learning by making the task clear and demonstrate task relevance. Hence, enabling students to foresee success potential (Marzano, 1992).

2.6 Government Policy/school policy on formative assessments

In Kenya, the main function of the national examinations Council is to regulate, administer and supervise summation examinations for basic and mid-level tertiary education in Kenya. The Council is also responsible for the research on educational assessments as well as examinations' policy development (KNEC Act 2016). Despite KNEC's overall role on examinations regulations, nothing much has it done to regulate formative assessments in Kenya. Its hands off role in formative assessments have left schools without any guidance on formative assessments policy guidance.

2.7 Theoretical framework

Learning is a behavioral change anchored on operant conditioning theory. Operant conditioning is based on the study of B.F. Skinner who argued that much of human behavior can be explained classically, but the more complex learning needs another type of conditioning which he termed as operant conditioning; while others called it instrumental conditioning. Operant conditioning generally works to change behavior through application of positive and negative reinforcement. Features of operant conditioning include:

- Shaping: use of selective reinforcement directed towards acquisition of predetermined behaviour.
- Reinforcement: A stimuli that elicits behavior change
- Extinction: diminishing of behavioural qualities
- Spontaneous recovery: re-learn of already diminished behaviour
- Contiguity time difference between end of response and installation of reinforcer
- Number of trials: repetition of stimuli that reinforce behavior change or adaptation.

Learning objectives need to be focused on expected behavior. They should be well ordered from simple to complex. Motivation of students may be through reinforcers. They include praise and grades in the classroom, the principle of immediacy reinforcement should be enhanced. This is usually achieved through provision of prompt feedback to formative assessment findings. Feedback and other formative assessment practices serve as motivating factor in learning. A teacher's praise for observed positive behavioural change leads to intrinsic motivation of the; learner, enhancing learning performance. A student who performs well in a given problem tends to put more effort in learning. Reinforcement is used to encourage students to display an interest in Chemistry learning (Skinner, 1961). Formative assessment provides information necessary to guide the teacher in formulating supportive instructional methods which are motivating to the learner.

2.8 Conceptual framework

The study provided a synthesis of practices on the formative assessment of students in schools. A conceptual framework was developed to highlight key elements of the formative evaluation process. Within the conceptual framework the features of formative assessment processes were considered. Intervening variables in formative assessment were also reviewed.

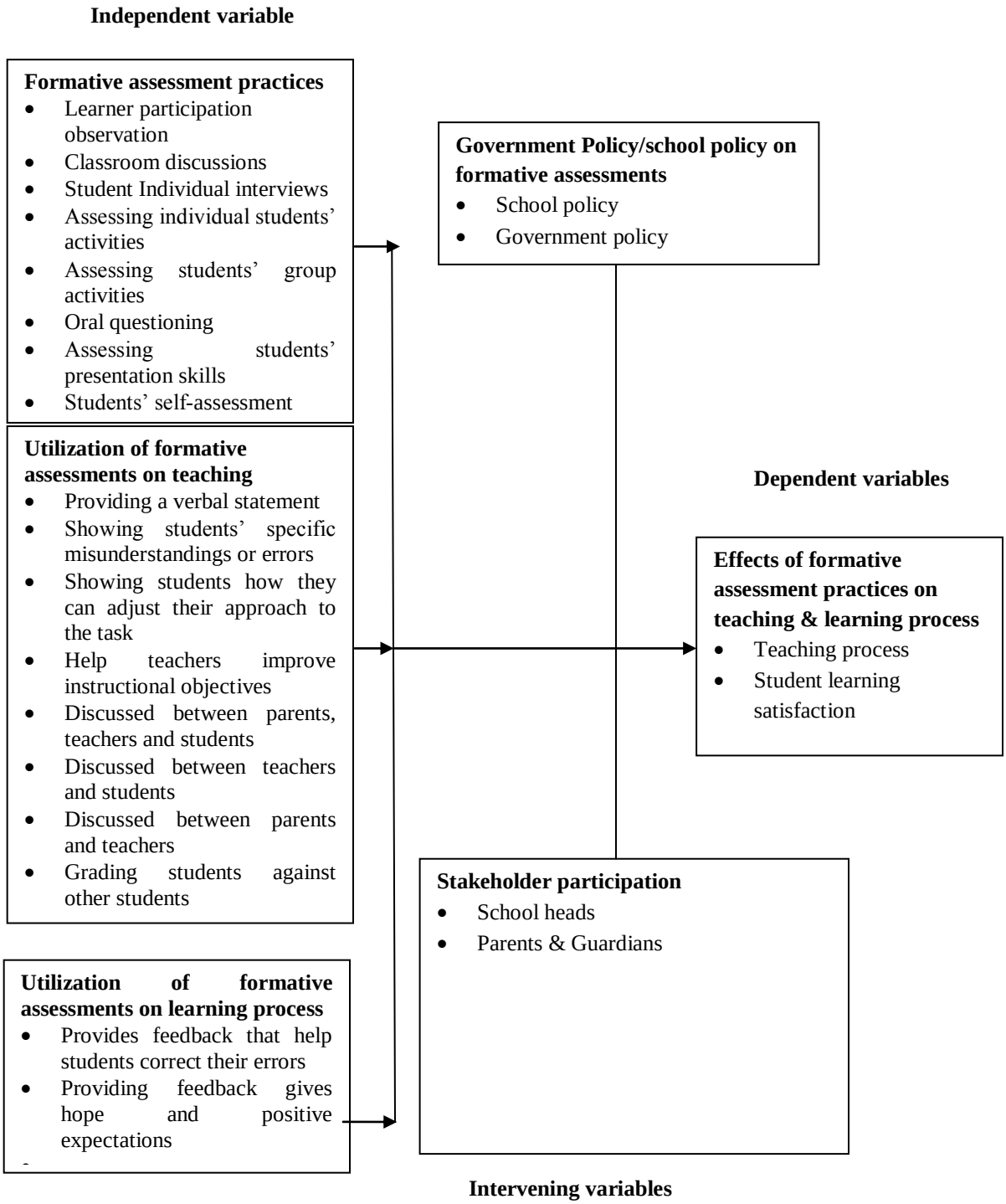

Figure 2: Conceptual framework on effects of formative assessment on teaching and learning Chemistry.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The project involved eight stages: study planning, data collection tools design, sampling design, data collection, data processing, data analysis and report writing. Preliminary study plan was accomplished with development of problem statement, research objectives, research questions, target population, coverage, literature review, research design, timelines and budget. This chapter describes the entire study design, data collection and presentation methods.

3.2 Research design

The study adopted description, prediction and explanation, using observational and survey methods (Jackson, S.L., 2009). This study employed naturalistic observation of the teaching learning process to ascertain formative assessment practices, the teachers' competencies in formative assessment, the utilization of the formative assessment in teaching and learning

3.3 Target population

The target population was public secondary schools in Turkana Central Sub-County. The schools are listed in table 1 below:

Table 1: Schools in Turkana Central Sub-County

1	Lodwar High	Public	Boys	Boarding
2	Eliye Boys	Public	Boys	Boarding
3	Kerio Boys	Public	Boys	Boarding
4	Lodwar Girls	Public	Girls	Boarding

5	Nakulio Girls	Public	Girls	Boarding
6	Comboni Girls	Private	Girls	Boarding
7	Talent High	Public	Mixed	Boarding
8	Salvation Nawoitorong	Public	Mixed	Boarding
9	Moi High Kalokol	Public	Mixed	Boarding
10	St. James	Private	Mixed	Boarding
11	Trans Africa	Private	Mixed	Boarding
12	St. Stephen	Private	Mixed	Boarding
13	St. Kevin's	Public	Mixed	Day
14	PAG Lodwar	Public	Mixed	Day
15	Lotulel High	Public	Mixed	Day
16	Loiyo High	Public	Mixed	Day

3.4 Sample size and sampling pprocedure

The population of learners in Kenyan secondary schools is homogeneously receiving instructions from the same pool of teachers. The same teachers have lessons spanning from form one to form four. Hence, it was statistically sound to randomly select one of the streams of the form 3 learners in each day school and use it as a student sample size for the specific school. This was achieved having pieces of paper written the stream names, folded and put into a box. An independent research assistant was asked to freely mix the folded pieces of paper and select one piece at random. The choice of form 3 class was purposefully selected for this is the class assumed to have moderate unbiased capacity to evaluate formative assessment.

The teacher responsible for teaching Chemistry in the selected stream was purposefully selected as the key interviewee.

3.5 Data ccollection instruments

The research instruments included: Desktop literature review schedule, participant survey questionnaires, key informant interview (KII) guides, direct observation guides, data processing and analysis software.

3.5.1 Desktop literature review

Desktop literature reviews entailed the use of the internet, libraries and other resource centres to review the documents that contain relevant information on the study topic. Such reviews formed the basis for the study, conceptual framework design as well as filling gaps on information that may not be readily provided by the field respondents.

3.5.2 Participant questionnaires

The questionnaires collected data that was individually sourced, confidential and independent of group influence. The data provided precise information for further extrapolation and generalization.

3.5.3 Key informant interview (KII) guides

KII guides contained questions for selected respondents with presumed firsthand knowledge on formative assessments. The in-depth interviews were loosely structured to allow free flow of ideas and information. The researcher framed questions spontaneously, probed for information and took notes.

3.5.4 Direct observation guides

The guides were used for collecting data on what was on-going at the schools.

3.5.5 Data processing and analysis software

The researcher made use of spread sheets and word processing packages to record analyze and present data.

3.6 Validity

Validity refers to estimation of whether the data collection instruments is collecting the data that is ought to be collected in order to correctly represent the phenomena under study. Content validity implies that the instruments include relevant interview questions, discussion guides and observation guides that collect data that is sufficient to answer most issues under investigation. This was achieved through use of more than one data collection instrument and use of multiple respondents. Construct validity was applied through breakdown of data collection instruments into sections that ensured that each concept under study was defragmented into categories that could easily be collected from relevant levels of participants. For instance, learners dealt with satisfaction survey while teachers were involved with teaching planning, teaching process and formative assessment practices.

3.7 Reliability

Reliability of the project was carried out through testing of data collection tools to ensure that the instruments yielded similar results when they were re-used within short period

interval between application periods. Test – retest method was applied wherein a pilot study was carried out wherein the same instruments were applied to the same respondents within a 10 day interval. The results of the pilot helped re-state the questions.

3.7 Pilot testing of the data collection instruments

A pilot study of 1 Chemistry teacher and 20 students and 1 teaching process observation was carried out before the main study at Lodwar high school. The selected respondents were excluded in the final study to avoid chances of bias.

3.8 Operational definition of vvariables

Table 2: Operational definition of Variables

Variable	Type	Indicators	Type of analysis
Formative assessment practices	Independent	• Learner participation observation • Classroom discussions • Student Individual interviews • Assessing individual students' activities • Assessing students' group activities • Oral questioning • Assessing students' presentation skills • Students' self-assessment	Descriptive statistics
Utilization of formative assessment in teaching	Independent	• Providing a verbal statement • Showing students' learning challenges • Showing students adjustments on task approach • Help teachers improve instructional objectives • Discussed between teachers and students • Discussed between parents and teachers • Grading students against other students	Descriptive statistics
Utilization of formative assessment in learning	Independent	• Feedback that help students correct their learning challenges • Feedback that promotes positive expectations	Descriptive statistics
Stakeholder participation	Intervening	• School heads • Parents & Guardians	Descriptive statements
Government Policy/school policy on formative assessments	Intervening	• School policy • Government policy	
Effects of formative assessment practices on teaching & learning process	Dependent	• Teaching process • Student learning satisfaction	Descriptive

3.9 Ethical considerations

The study plan took into consideration scientific research procedure including the development of the concept note and proposal. The researcher sought authorization by the University of Nairobi to carry out the study through an introduction letter confirming the researcher as student at the University. The researcher also developed an introduction letter that was given to the participants assuring them the purpose of the study and final utilization of the information sought. Absolute confidence was assured in the study. There was no discrimination of participants.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

To carry out the study, the researcher got approval from the University of Nairobi, the Sub-County Director of Education, Turkana Central and the target school. Prior arrangements included reconnaissance visits to the schools and arrangement with school principals and school subject coordinators.

The teacher Questionnaire sought information on formative assessment practices, use of formative assessment in teaching and learning process. Student Questionnaire determined the learners' satisfaction levels on the formative assessment practices of their respective Chemistry teachers while the classroom observation checklist determined the inclusion of formative assessment in the teaching and learning tools.

Data cleaning, editing and entry was done on a Microsoft excel software. The software helped carry out basic statistical analysis. Each questionnaire data is tabulated, analyzed and interpreted in this section of the report.

4.2 Sampling

The research classified the 16 schools in the study region classified as shown in table 5:

Table 3: Classification of Schools in Turkana Central Sub-County

No.	**School type**	**No. of schools**	**%**
1	Public schools	12	75
2	Private schools	4	25
	Total	**16**	**100**
1	Boarding schools	12	25
2	Day schools	4	75
	Total	**16**	**100**
1	Boys Boarding schools	3	18.75
2	Girls Boarding schools	3	18.75
3	Mixed Boarding schools	6	37.5
4	Mixed Day schools	4	25
	Total	**16**	**100**

Public schools were the majority at 75% while day schools constituted only 25%. The boarding schools constituted 75% of the secondary schools in the sub-county. Boarding schools are the majority. This can be attributed to the need to safeguard student learning during the migratory missions of the Turkana pastoral community. Day schools constituted only 25%. Since the day schools were only, the researcher decided to include all in the study sample. The total population was 780 learners. A sample of 258 students and 8 Chemistry teachers were selected using online sampling calculator (https://www.surveymonkey.com).

4.3 Demographic characteristics of respondents

4.3.1 Respondents ages and gender

The ages of the respondents have been categorized in the table 3 below:

Table 4: Respondents' ages

Age	**Percent**
Below 14 Years	5%
15-16 Years	26%
17-18 Years	56%
Above 18	13%

The table shows a skewed distribution of age, with largest percentage of respondents being between 17 and 18 years. At form three, these students must have joined standard one at the age of 7 between 7 & 8 years while those above 18 years must have joined from age 8 years and above. This age bracket confirms the perception that pastoralist communities take their children to school at older ages compared to recommended average school age children in Kenya of 6 years.

Table 5: Respondents' gender

Gender	**Percent**
Male	46%
Female	54%

It is evident that majority of the respondents are female and lie within 17-18 years. This is attributed to high enrolment rate of girls and late entry of Turkana children into formal education. Furthermore, the difference in enrolment of girls and boys is minimum. This could be explained by the fact that the schools are located in urban and sub-urban regions of Lodwar town. Such location has a different statistical data compared to rural areas where boys are much more than girls. Pastoral Turkana community prefer educating boys than girls.

4.3.2 Response rate

During the data collection day, all participants were asked to give consent that they were willing or not willing to participate. Those who consented were allowed to respond to the study enquiries on the spot without any delay. All targeted participants returned all the tools and hence response rate was 100%. This was a great response rate that helped the researcher have enough responses for analysis.

4.4 Formative assessment practices on teaching and learning chemistry

4.4.1 Teachers' responses on formative assessment practices in teaching Chemistry

The study collected the following data (Table 6) on formative assessments on teaching learning chemistry in Turkana Central sub-county. The study determined what were the formative assessment practices practiced by Chemistry teachers in Turkana Central Sub County. The questions asked were very object, i.e. determining whether the practice is practiced or not.

Table 6: Teachers' responses on formative Assessment practices on teaching chemistry

Teacher's Interview Response Matrix		School				
		St. Kevins	PAG Lodwar	Lotulel	Loiyo	Overall % Yes
What are formative assessment practices for teaching chemistry subject in this school?						
a	Classroom learner participation observation	YES	YES	NO	NO	50
b	Classroom discussions	YES	YES	YES	YES	100
c	individual interview with students	NO	NO	NO	YES	25
d	Assessing individual student's activities	YES	YES	YES	YES	100
d	Assessing students' group activities	YES	YES	NO	YES	75
f	Oral questioning	YES	YES	YES	YES	100
g	Assessing student's presentations	NO	YES	YES	YES	75
h	Student's self-assessment	YES	YES	YES	YES	100
I	Students peer assessments	NO	YES	YES	YES	75
	Overall % YES	67%	89%	67%	89%	78%

It was observed that PAG Lodwar and Loiyo secondary schools performed very well in overall best practices in formative assessments in teaching Chemistry. The two schools embraced classroom discussions, individual learner activities evaluation and student self-assessment

However, the classroom learner participation was very poor for Loiyo secondary school whereas PAG Lodwar didn't provide learner centered formative assessments. St. Kevin's and Lotulel needs special attention on improving formative assessment practices. Overall, sub-county day schools have relatively sufficient best formative assessment practices.

4.4.2 Classroom observations on formative assessment practices in teaching Chemistry

Class room observation used a checklist that solicited information on inclusion of formative assessment in the personal timetable, Chemistry syllabus, schemes of work, lesson plans, student performance register and checking of student exercise books. The responses expected were either "yes" or "no". Table 7 presents the findings.

It was observed that all the day schools in the Sub-County did poorly in the inclusion of formative assessments into their teaching tools. Despite the syllabus' declaration of formative assessment in every topic, 75% of the schools included assessment programs in the teachers' timetable while 50% included in the lesson notes. Those schools that tried to include were however, inclined towards grading of learners and not necessarily for use in diagnostic teaching process.

Table 7: Formative assessment classroom observations

Review teacher's teaching tools to ascertain inclusion of formative assessment in teaching.		School				
		St. Kevins	PAG Lodwar	Lotulel	Loiyo	Overall % Yes
a	Personal timetable	NO	YES	YES	YES	75
b	Syllabus for Chemistry	YES	YES	YES	YES	100
c	Schemes of work (Approved & Updated)	YES	NO	NO	NO	25
d	Lesson plans (Updated)	YES	NO	NO	NO	25
e	Records of work per week	NO	NO	NO	NO	0
f	Lesson notes (updated)	NO	NO	YES	YES	50
g	Performance register	YES	YES	NO	NO	50
h	Subject analysis for the national examinations	NO	NO	NO	NO	0
i	Marked/checked learners' exercise books	NO	NO	NO	NO	0
	% Overall YES	44%	33%	33%	33%	36%

4.5 Utilization of formative assessments on teaching and learning chemistry

4.5.1 Utilization of formative assessments on teaching Chemistry

The researcher sought to determine how formative assessment is used in teaching chemistry. Key uses evaluated included: feedback provision, verbal statements, corrections of student errors, guide on task approaches, improvement of instructional objectives, discussions with parents, teachers and students as well as grading of students. Table 8 shows the responses obtained from teachers.

Table 8: utilization of formative assessments on teaching chemistry

How are formative assessments used in the Chemistry teaching process?		School				
		St. Kevins	PAG Lodwar	Lotulel	Loiyo	Overall % Yes
a	Providing feedback					
i	Providing a verbal statement	YES	NO	NO	YES	50
ii	Showing students' specific misunderstandings or errors	NO	NO	NO	YES	25
iii	Showing students how to adjust approach to the task	NO	YES	NO	YES	50
iv	Help teachers improve instructional objectives	NO	NO	YES	YES	50
b	Discussed between parents, teachers and students	NO	YES	NO	NO	25
c	Discussed between teachers and students	YES	YES	NO	NO	25
d	Discussed between parents and teachers	NO	YES	NO	NO	25
e	Grading students	NO	YES	NO	NO	25
	Overall %	25%	63%	13%	50%	34%

Utilization of formative assessment in teaching chemistry was good for PAG Lodwar secondary school, scoring 63% whereas the other schools scored sparingly. Overall utilization was at 34%. This indicates that the results of assessments are sparingly applied in the sub-county. Close qualitative interrogation of the Chemistry teachers indicated that most of the results are generally for grading purposes since most of them are under pressure to complete the syllabus in record time. Hence, limiting time to guide learners on the weak areas identified.

4.5.2 Utilization of formative assessments on learning chemistry

Learning of Chemistry is promoted by effective formative assessments. Learners were asked to state how they use the assessments. The main product of any assessment to learners being feedback, the learners was asked how they utilize the feedback. The main objective options provided for selection was that feedback help students correct learning challenges and promotion of positive expectations. The responses are presented in table 9.

Table 9: Utilization of formative assessments in Learning Chemistry

How are formative assessments used in the Chemistry learning process?		School				
		St. Kevins	PAG Lodwar	Lotulel	Loiyo	Overall % Yes
a	Provides feedback that help students correct their learning challenges	YES	YES	YES	YES	100
b	Providing feedback promotes positive expectations.	NO	YES	NO	YES	50

The learners in PAG Lodwar and Loiyo secondary schools demonstrated that any feedback provided helped them correct errors and gave them positive attitudes towards Chemistry learning. The other two schools' learners were not fully sure on how the formative assessment results have been used in learning. Overall, the learners in the sub-county are fairly doing good in the utilization of the results for learning.

4.6 students' satisfaction on teachers' chemistry formative assessment competencies.

Students' satisfaction is among the critical objectives in learning. Satisfaction motivates learners to work towards attaining set performance targets. They need to be sure that the way they are evaluated is reliable and true representation of their learning ability. The study sought to gauge students' satisfaction on the following key areas:

1. Utilizing formative assessment in teaching
2. The application of diverse assessment methods
3. Providing feedback to students on formative assessment results
4. Utilization of formative assessment results by learners
5. Students' participation in formative assessment
6. Written Feedback
7. Oral feedback

The results of the study are represented in the following tables 2 to 6. The figures are comparative charts that depict the relative proportions of responses of the interviewed students

Table 10: St. Kevins Sec. School level of student satisfaction

Satisfaction	Utilization by teacher	Diversity of methods	provision of Feedback	Utilization by learner	Student participation	written feedback	Oral feedback
Excellent	11	11	8	14	20	10	12
Above average	16	8	16	10	20	15	12
Average	22	28	23	23	12	23	21
Below Average	5	7	7	7	2	6	9
Total	54	54	54	54	54	54	54

The table shows that most learners had an average satisfaction of the way the teachers practiced formative assessment of chemistry teaching and learning at St. Kevin's, except for student participation that was found to range between above average and excellent satisfaction. However the learners seemed to have mixed thoughts on oral feedback.

At PAG Lodwar secondary school, level of satisfaction was between average and excellent for most of the variables. Utilization of the formative assessment by the teacher was almost indifferent among the learners. The learners had divergent satisfaction levels. But almost half of the learners felt that oral feedback was above average.

Table 11: PAG Lodwar Sec. School level of student satisfaction

Satisfaction	Utilization by teacher	Diversity of methods	provision of Feedback	Utilization by learner	Student participation	written feedback	Oral feedback
Excellent	17	18	13	27	12	14	8
Above average	16	9	21	12	23	21	32
Average	15	29	17	8	17	16	8
Below Average	12	4	9	13	8	9	12
Total	60	60	60	60	60	60	60

The case for Lotulel showed a significant difference from St. Kevin's and PAG Lodwar. 25% & 27.5% students felt that oral and written feedback were of below average satisfaction respectively. Diversity of methods and utilization by learners were very indifferent among learners.

Table 12: Lotulel Secondary School level of student satisfaction

Satisfaction	Utilization by teacher	Diversity of methods	provision of Feedback	Utilization by learner	Student participation	written feedback	Oral feedback
Excellent	18	19	19	19	14	7	21
Above average	25	19	26	17	26	19	19
Average	17	16	14	15	18	23	12
Below Average	9	15	10	18	11	20	17
Total	69	69	69	69	69	69	69

Loiyo secondary school learners provided unclear rates of satisfaction for 6 formative assessment practices. This shows that the learners were not very sure of how to rate their Chemistry teachers on these practices. However, they were able to rate them well on utilization of the assessment results whereby 77% felt that the utilization was within average and above average.

Table 13: Loiyo Sec. School level of student satisfaction

Satisfaction	Utilization by teacher	Diversity of methods	provision of Feedback	Utilization by learner	Student participation	written feedback	Oral feedback
Excellent	7	23	18	23	16	15	19
Above average	21	15	23	13	20	23	23
Average	29	18	15	21	14	21	15
Below Average	18	19	19	18	25	16	18
Total	75	75	75	75	75	75	75

Generally, majority of students in the sub-county felt that the formative assessment practices were average. The only issue the student presented was the inability of the teachers to fully utilize the results for furthering their teaching planning and processes.

Table 14: Turkana Central Sub-County Day Sec. Schools level of student satisfaction

Satisfaction	Utilization by teacher	Diversity of methods	provision of Feedback	Utilization by learner	Student participation	written feedback	Oral feedback
Excellent	53	71	58	83	62	46	60
Above average	78	51	86	52	89	78	86
Average	83	91	69	67	61	83	56
Below Average	44	45	45	56	46	51	56
Total	258	258	258	258	258	258	258

4.7 Stakeholder participation

The direct Stakeholders identified in the study include the parents and the head teachers of the schools. The head teachers supervise implement the policies formulated by both the Ministry of Education and the Board of Management of schools. The head teachers were found to influence formative assessment practices through observation of teaching & learning process, review of learners' records and discipline of both learners and

teachers. The head teachers in general were found to offer little guidance on appropriate formative assessment practices, hence leaving teachers to use results for student grading and promotion to next levels of learning.

The parents on the other hand were found to have negligible influence on formative assessments. They rarely review learners' work. Instead they work with head teachers to finance informal remedial coaching.

4.8 Government Policy/school policy on formative assessments

The government policy is clear on formative assessments under the Education Act 2013 and other related legislations. However, enforcement is lacking. The few Quality Assurance officers rarely follow up on the individual teacher formative assessment practices. Moreover, the Boards of Management of the day secondary schools rarely discuss formative assessments. They only concentrate on summative evaluations.

4.9 Effects of formative assessment practices on teaching & learning process

The effectiveness of education is determined by formative assessments. Effective teacher will promote student satisfaction in learning and hence productive learning process. Students form main stakeholder. Their satisfaction provides legitimate indications of student academic performance (Theall & Franklin, 2001).

It was confirmed that the practices on formative assessment have had negative impact on teaching and learning process. Teaching was only focused on syllabus completion

irrespective of learner's knowledge and skill transfer. The methods used are somehow appropriate but utilization of the results is skewed towards grading rather than improvements towards attainment teaching/learning objectives.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of findings, conclusions, recommendations and possible areas for further study. The findings presented are wholly within the confines and delimitations of the study.

5.2 Summary of the findings

The majority of the participants were within the ages of 17-18 years, with girls making the majority population at 54%. It was observed that all the day schools in the Sub-County did poorly in the inclusion of formative assessments into their teaching tools. Despite the syllabus' declaration of formative assessment in every topic, 75% of the schools included assessment programs in the teachers' timetable while 50% included in the lesson notes. Those schools that tried to include were however, inclined towards grading of learners and not necessarily for use in diagnostic teaching process.

Overall utilization of formative assessment in the Sub-County was at 34%. This indicates that the results of assessments are sparingly applied in the sub-county. Close qualitative interrogation of the Chemistry teachers indicated that most of the results are generally for grading purposes since most of them are under pressure to complete the syllabus in record time. Hence, limiting time to guide learners on the weak areas identified.

Overall, the learners in the sub-county are fairly doing well in the utilization of the results for learning. Generally, majority of students in the sub-county felt that the formative

assessment practices were average. The only issue the student presented was the inability of the teachers to fully utilize the results for furthering their teaching planning and processes.

The head teachers were found to influence formative assessment practices through observation of teaching & learning process, review of learners' records and discipline of both learners and teachers. The head teachers in general were found to offer little guidance on appropriate formative assessment practices, hence leaving teachers to use results for student grading and promotion to next levels of learning.

The parents on the other hand were found to have negligible influence on formative assessments. Enforcement of government policy on formative assessment is insufficient. The few Quality Assurance officers rarely follow up on the individual teacher formative assessment practices. Moreover, the Boards of Management of the day secondary schools rarely discuss formative assessments. They only concentrate on summative evaluations.

Given the lack of commitment of head teachers, Boards of Management, government agents, teachers and learners; it was confirmed that the practices on formative assessment have had negative impact on teaching and learning process. Teaching has been only focused on syllabus completion irrespective of learner's knowledge and skill transfer. The methods used were somehow appropriate but utilization of the results was skewed towards grading rather than improvements towards attainment teaching/learning objectives.

5.3 Conclusions

Effectiveness of educational evaluation as a tool for teaching and learning has been hindered by the low technical capacity by curriculum implementers to develop clear measurement tools based on pre-determined instructional objectives. Most teachers have not been able to effectively develop measurement tools for diagnostic, formative and summative evaluations. There is current over-reliance on commercial test papers for evaluations without many considerations on what has really been covered during period under evaluation of the teaching and learning experiences. The feedback from such tests renders the students' motivation decline, not necessarily because of incomprehension of the learning but because the test sometimes covers outside the evaluation scope. This is a great disappointment to the learners and the parents/guardians.

Thus, there is urgent need for periodic in-service teacher training on formative assessments, student performance measurements and evaluation techniques. According to Jay McTighe and Ken O'Connor (2017), this would involve skills upgrade that would enable teachers.

5.4 Recommendations

It is herein recommended that similar studies should be undertaken among boarding schools in Sub-County to ascertain the relationship of formative assessment practices in order to guide overall policy direction on formative assessment for the Sub-County and maybe the whole Turkana County.

5.5 Suggestions for further research

This study has strengthened past researches in formative assessments. Areas for further research would include study of effects of formative assessment practices on teaching & learning chemistry in boarding secondary schools in Turkana County; the role of feedback on improving Chemistry performance in Kenya secondary schools and impact of student perceptions on teacher's formative assessment practices.

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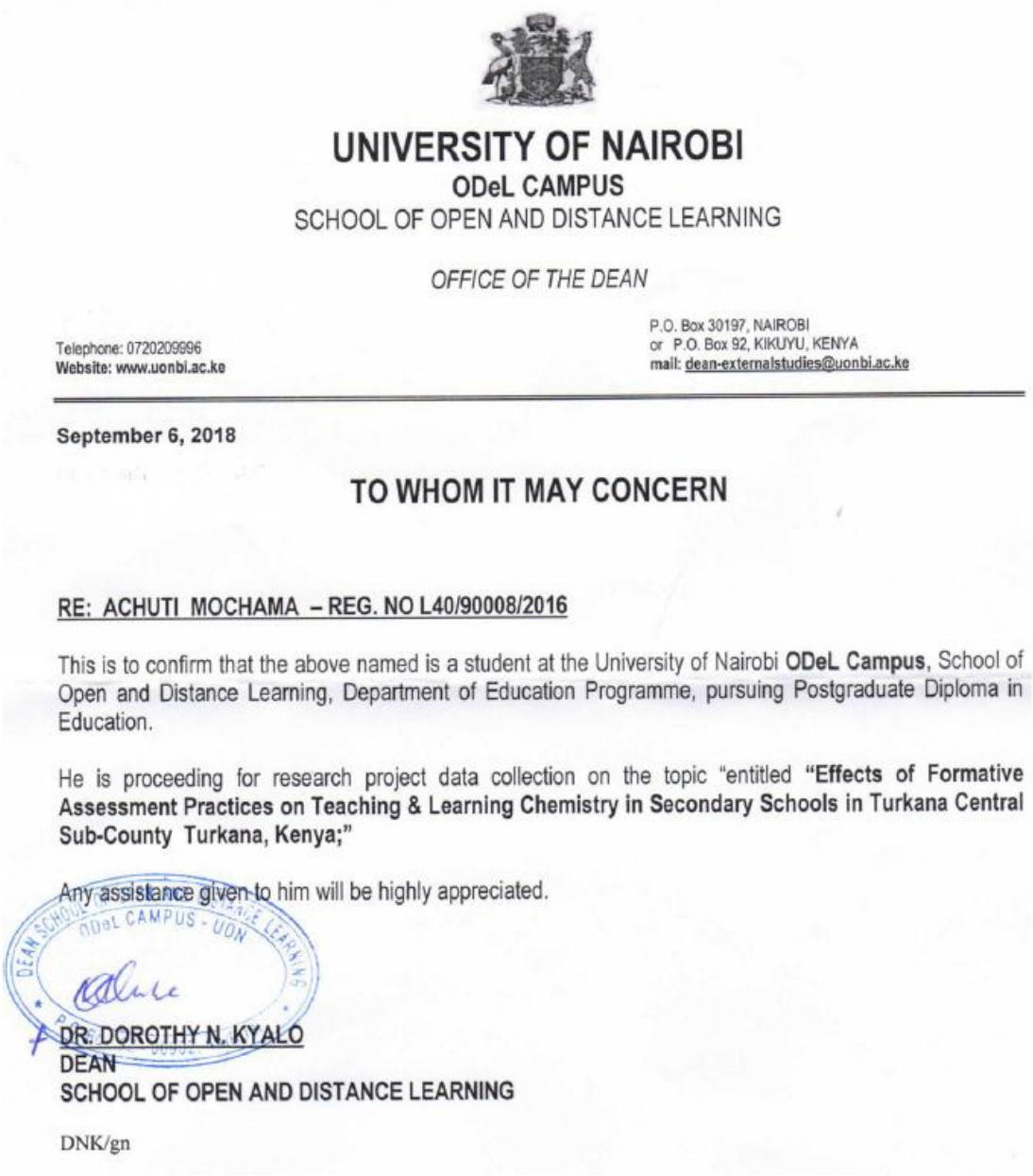
APPENDICES

Appendix I: Introduction letter



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September 6, 2018

TO WHOM IT MAY CONCERN

RE: ACHUTI MOCHAMA – REG. NO L40/90008/2016

This is to confirm that the above named is a student at the University of Nairobi **ODeL Campus**, School of Open and Distance Learning, Department of Education Programme, pursuing Postgraduate Diploma in Education.

He is proceeding for research project data collection on the topic "entitled **"Effects of Formative Assessment Practices on Teaching & Learning Chemistry in Secondary Schools in Turkana Central Sub-County Turkana, Kenya;"**

Any assistance given to him will be highly appreciated.

DR. DOROTHY N. KYALO
DEAN
SCHOOL OF OPEN AND DISTANCE LEARNING

DNK/gn

Appendix II: Letter of Introduction by Researcher

Dear Respondent,

RE: Study participation consent
I am a PGDE student at the University of Nairobi. As part of the requirement for my fulfillment of the PGDE program, I am undertaking a research project to determine the "Effects of Formative Assessment Practices on Teaching & Learning Chemistry in Public Day Secondary Schools in Turkana Central Sub-County, Turkana County"

In this regard, I am kindly requesting for your participation in the study. Your response will be highly appreciated.

It will not be necessary to write your name on this questionnaire. All information received will be treated with strict confidence. In addition, the findings of the study will be used solely for academic research purposes and to enhance knowledge in the field of education.

Thank you.

Yours faithfully

Achuti Mochama
Reg. L40/90008/2016

Appendix III: Student Questionnaire

You are required to respond to all questions.

Gender: Are you Male ☐ or Female ☐

Your age in years [tick appropriately] 12 - 14 ☐ 15-16☐ **17**-18☐ and above 18 ☐

School:

_____Form_____

What is the level of satisfaction of your chemistry teacher's Chemistry formative assessment utilization in the following? Tick one that applies.

1. Formative assessment in teaching
   Excellent_____Above average___Average_____Below average___
2. The use of diverse assessment methods
   Excellent_____Above average___Average_____Below average___
3. Feedback response to students on formative assessment results
   Excellent_____Above average___Average_____Below average___
4. Usage of formative assessment by learners
   Excellent_____Above average___Average_____Below average___
5. Learners' participation in formative assessment
   Excellent_____Above average___Average_____Below average___
6. Providing Written Feedback
   Excellent_____Above average___Average_____Below average___
7. Providing Oral feedback
   Excellent_____Above average___Average_____Below average___

Appendix IV: Teachers' Interview Guide

A. Preliminary details

School Name:
Year/term:
Teacher's Name & TSC no:
Tel No:
Years in Service:
Subject Specialty:

B. Interview guide

1. What are formative assessment practices for chemistry subject in this school?
    a. Classroom learner participation observations
    b. Classroom discussions
    c. Individual interviews with students
    d. Assessing individual students' activities
    e. Assessing students' group activities
    f. Oral questioning
    g. Assessing students' presentation skills
    h. Students' self-assessment
    i. Students' peer assessment

2. How are formative assessments used in the Chemistry teaching process?
   Possible responses:
    a. Providing feedback to students
        i. Providing a verbal statement
        ii. Showing students' specific misunderstandings or errors
        iii. Showing students how they can adjust their approach to the task
        iv. Help teachers improve instructional objectives
        v. Discussed between parents, teachers and students
    b. Discussed between teachers and students
    c. Discussed between parents and teachers
    d. Grading students against other students

3. How are formative assessments used in the Chemistry learning process?
   Possible responses
    a. Provides feedback that help students correct their errors
    b. Providing feedback gives hope and positive expectations

Appendix V: Observation Schedule

A. Preliminary details

School Name:
Year/term:
Teacher's Name & TSC no:
Tel No:
Years in Service:
Subject Specialty:

B. Observation guide

The researcher shall carry out the following:

1. Classroom observations on teaching/learning process
    a. Classroom discussions
    b. Individual interviews with students
    c. Individual students' activities
    d. Oral questioning
    e. Students' self-assessment
    f. Students' peer assessment

2. Review teacher's teaching tools to ascertain inclusion of formative assessment in teaching
    a. Personal timetable
    b. Syllabus for Chemistry
    c. Schemes of work (Approved & Updated)
    d. Lesson plans (Updated)
    e. Records of work per week
    f. Lesson notes (updated)
    g. Student performance register