

**ASSESSMENT FOR LEARNING AND MATHEMATICS ACHIEVEMENT IN
PUBLIC SECONDARY SCHOOLS IN NAIROBI COUNTY, KENYA.**

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**A RESEARCH PROJECT SUBMITTED AS PART OF REQUIREMENTS
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UNIVERSITY OF NAIROBI**

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DECLARATION

Candidate's affirmation

I affirm that this is my original work and no copies of it have been submitted in part or whole to either an institution or for some award.

Sign.....

Date.....

ASEWE GEORGE OTIENO

REGISTRATION NUMBER E58/83444/2015

Declaration by the Supervisor

This research work has been surrendered to Nairobi University with my personal endorsement as the supervisor.

Sign.....

Date.....

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DEDICATION

This work is devoted to my family as a whole.

ABBREVIATIONS/ACRONYMS

FA	-	Formative Assessment
AFL	-	Assessment for Learning
SA	-	Summative Assessment
AOL	-	Assessment of Learning
OECD	-	Organization for Economic Co-Operation and Development
CERI	-	Centre for Educational Research and Innovation
UON	-	The University of Nairobi
NACOSTI	-	The National Commission for Science, Technology and Innovation
UK	-	The United Kingdom
NCSM	-	National Council of Supervisors of Mathematics
AMTE	-	The Association of Mathematics Teacher Educators
KCSE	-	Kenya Certificate for Secondary Education
KNEC	-	Kenya National Examinations Council

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ABSTRACT

Paradigm shift in educational evaluation as well as assessment in educational system is to ensure that assessment achieves its basic purpose and objective, which is to improve students' learning. This leads to real life competencies, better discourse in discipline area, more collaborative learning, self-evaluation principles, and better assessment for learning pedagogic practices. The study's purpose was to determine if assessment for learning makes a difference in learner's mathematics performance. The study's objectives were: a) to determine if feedback provision to learners has an effect on their achievement in mathematics; b) to assess if active involvement of students improves their performance in mathematics; c) to establish the challenges encountered by instructors when implementing AFL in mathematics; d) to determine if self-assessment has an influence on the student's math attainment. The outcomes of the study provide information to teachers concerning their teaching success which is essential for modifying their teaching method to suite the learners, helps administrations in identifying difficulties encountered by educators when implementing the assessment for learning and therefore hence provide adequate facilities and approaches in enhancing their teaching process which may finally improve overall school performance, the findings assists curriculum developers in evaluating the curriculum and put emphasis on AFL practices, enable the teachers to know the learners views and incorporate them in their teaching by developing appropriate approaches to meet the learner's needs and the outcomes sustain and strengthen learners' effort and motivation in order to build up the self-esteem of low achieving learners. The research was directed by constructivist theory which is a philosophical theory about how it is the learners come to know things. The study employed descriptive design in form of questionnaire and quasi-experimental, utilizing pretest posttest equivalent group. Pretest and posttest were from surds and commercial arithmetic II topics respectively. The target population involved the public high schools within Nairobi County while the research population was math teachers and learners of form three. Sampling technique of purposive was utilized to obtain 5 public secondary schools with average performance. Content and face validities were used to validate the instruments and test-retest approach was utilized for reliability estimation. Statistical Package for Social Sciences (SPSS version eleven.5) was utilized for data analysis by comparing the mean scores of the control and experimental groups. The outcomes were organized into charts and graphs. According to outcomes where the experimental group showed an improvement of +7.675 as mean score, it was concluded that AFL contributes significantly to learner's achievement in mathematics.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This section provides project's overview.

1.2 Background to the Study

Paradigm shift within the instructional evaluation's field and assessment in educational system is to make sure that assessment achieves its basic purpose and objective, that is to boost students' learning. This results in real world competencies, higher discourse in discipline space, and a lot of cooperative learning, self-evaluation principles, and higher assessment for learning (AFL) pedagogical practices. AFL requires total student engagement. Instructors act as guiders by showing the learners the direction and additionally participate in analysis at the side of learners. The learners themselves typically set goals and evaluates themselves therefore on examine if the set goals are being achieved. This analysis process of self-regulated learning helps to boost the method of learning by dynamic the tactic of learning and teaching regularly. Feedback from assessment for learning can change academics to grasp the potency of their strategies of instruction, the students' performance and to additionally confirm the world of subject and dimness of their learners. However, Black and Wiliam (1998) in their study discovered that AFL includes a disproportionate valuable result on low achievers. They cited that, "while AFL will facilitate each learner, it produces tight results once applied to below average achievers by that specialize in specific challenges with their effort and providing them with a robust understanding of what's not right and the way to form it right."

AFL involves activities like teacher observations, students' discussions, student and teacher questioning, self-assessment, peer-assessment, group work, projects, displays and check review sessions. AFL takes place once a check is planned and given to push learner learning instead of to live student learning (especially for grading or accountability purposes). Once each academics and students use the proof gathered from the assessments to regulate learning and instruction, such assessments become "formative assessment" (Naiku, 2010). Olutola et al (2016) in their analysis recommends that college directors, academics and alternative instructional stakeholders mustn't believe exclusively on the info derived from assessment of learning that

primarily categorizes students into sensible and uninteresting people solely. But, maintain balance in two kinds of assessment therefore on bring home the bacon quality and basic purpose of assessment in schools and to adapt to the simplest practices by faculty academics worldwide. They additionally cited that formative analysis may be a sort of structured testing procedure that's dead whereas teaching and learning are on-going with a read to evoke enhancements via feedback.

Assessment for learning happens in any respect stages of the educational method. It provides immediate feedback to each academics and students that accentuates strengths, ascertains challenges as well as pointing to subsequent steps; per se, it's formative in nature. It encourages all students to learn responsibly and become active in their own learning for higher performance and improvement in teachers.

AFL is predicated on a spread of data sources like portfolios, works current, teacher observation, and conservation so on. Neither grade nor score is given in AFL. Keeping of records here is absolutely descriptive and subjective (Olutola et al, 2016). AFL must propel a modification to higher learning a lot of therefore to assist the learners to spot the gap between their learning and therefore the target goal. AFL doesn't happen when the top of instruction however throughout it at each stage of learning. This makes the learners establish their weaknesses associated request intervention at an early stage than at the top of the programme. It additionally permits learners establish their strengths and maintain it or request a tougher tasks so as to become more adept. AFL permits learners to require charge of their own learning for higher educational action. What's common to most studies is that the proven fact that AFL permits for a diagnosing of learners' learning difficulties. However, most of them are can't be applied because of the challenges which originate from mastery learning.

In several nations, steerage records are established to assist instructors in applying a lot of organized observe of AFL. In England, AFL program was started in elementary school and pre-school levels in 2000. In Scotland, likewise, educators are inspired to use AFL in their teaching- learning practices. New Zealand similarly has based mostly its National Assessment Strategy, applied in 1999, on AFL. AFL is additionally perceived because the most precarious assessment approach in several cities of North American nation. Nations like Germany, Finland, Kingdom of Spain and Kingdom of Sweden additionally emphasize the importance of AFL and therefore the significance

of continuous assessment of every learner victimization dissimilar assessment approaches as well as verbal feedback, portfolio assessment and interviews (OECD, 2005).

The NCTM Standards (2014) quoted that reasoning is critical in learning arithmetic associated involves examining mathematical patterns to envision if any generalizations are often created supported an rising pattern. Based mostly in their own explorations, students got to create conjectures regarding any generalizations they could see and check those conjectures. Meanwhile, students often need to share their opinions with some learners in order to validate those views. This can be associate integral a part of learning math through understanding (Fonkert, K., 2010). Due to the longitudinal character of the event of those skills, it's necessary to form a schoolroom setting that's contributing to those sorts of discussions as a daily a part of the classroom. Within the application of any mathematics learning activity, it's necessary for academics to develop their concepts of what it suggests that to show arithmetic in such the way that they'll support the method standards inside their school rooms a day. The importance of a schoolroom setting to stimulate and develop productive classroom discourse cannot be stressed enough; it's not enough to allow the scholars activities and allow them to "loose on the activity." Picollo's and his friends (2008) analysis has underscored that teacher-guided learning is a vital element of the schoolroom setting. However, Ihendinihu (2013) in his study counseled that instructional developers ought to integrate within the plans periods when the weak learners are going to be given more time for mastery and create more activities that will keep the quick learners busy throughout the lesson, considering real view that students learn at totally varied rates. He later established that mastery learning technique is found to be effective for improving learner's performance in mathematics and aids to bridge the gap between low and high achieving learners.

In 1983, the National Commission on Excellence in Education revealed a nation in danger that brought attention to a decline in Kenyan mathematics performance and warned the country of the dire consequences of performance in the subject (Mark, 2014). North American nation has fallen from high 10 in international scientific discipline performance standings and it absolutely was graded behind several Asian economies, as well as Singapore, China and Japan, similarly as countries like European country, Ethiopia and Somalia in 2006 (OECD, 2018). The report free by WAEC in

Gregorian calendar month 2014 indicated a uniform call mathematics performance in Federal Republic of Nigeria in 2014 compared to the previous 5 years. KNEC (2017) report additionally indicated that learners have created insignificant mathematics improvement for the last 5 years. As an example, mathematics alternative A had a mean of 25.3% in paper 1 and 24.7% in paper 2 while mathematics alternative B had a mean score of 8.23% in paper 1 and 9.454% in paper 2 in the five consecutive years. This shows a poor performance in mathematics since no year had even a mean score of 30%. Mathematics Alternative B has marked even very poor performance for the past five consecutive years with an average mean score of less than 10%. The dismal performance in KCSE mathematics for five consecutive years were presented in tables that follow.

Table 1.1: Candidates' math Alt A performance from 2013-2017

Year	Paper	Candidate	Maximum Score	Mean Score	Standard Deviation
2013	1	444774	100	28.12	24.67
	2		100	27.03	22.91
	Overall		200	55.15	46.71
2014	1	481286	100	24.54	20.77
	2		100	23.50	23.16
	Overall		200	48.04	42.94
2015	1	520274	100	25.53	20.39
	2		100	28.23	22.81
	Overall		200	53.76	40.87
2016	1	570398	100	23.74	21.24
	2		100	17.84	21.09
	overall		200	41.56	41.20
2017	1	609525	100	24.40	22.03
	2		100	26.47	22.43
	overall		200	50.95	43.46

Source: The Year 2017 KCSE Examination Report

Table 1.2: Students' performance in math alt B from 2013-2017

Year	Paper	Candidate	Maximum Score	Mean Score	Standard Deviation
2013	1	1104	100	9.89	12.98
	2		100	7.44	9.94
	overall		200	17.29	21.96
2014	1	1293	100	13.71	12.68
	2		100	11.16	13.28
	overall		200	24.76	24.71
2015	1	1387	100	9.35	11.76
	2		100	7.26	12.53
	Overall		200	16.58	22.72
2016	1	1611	100	9.37	11.28
	2		100	8.02	10.60
	overall		200	17.18	20.67
2017	1	1486	100	7.07	8.58
	2		100	13.39	13.56
	overall		200	20.20	20.26

Source: The Year 2017 KCSE Examination Report.

1.3 Statement of the Problem

As a result of the position and placement of mathematics in the society and its role in logical thinking desired today in the 21st century, and the fact that its performance regarding academic attainment is low as indicated in table 1.1 and 1.2 of KNEC (2017) report, there is a need to review and come up with a way to reverse this effect and also to change the way of assessment as argued in the write up. It is believed that rethinking assessment to AFL that leads to feedback that is related to the new thinking will result in increasing and improving mathematics performance. It is therefore intended in this research to determine whether assessment for learning makes a difference in learner's mathematics performance.

1.4 Purpose of the Study

The research intended to determine if assessment for learning makes a difference in learner's mathematics performance.

1.5 Research Objectives

Research objectives intended to be achieved here include:

- i) To determine if provision of feedback to learners has an effect on their achievement in mathematics.
- ii) To assess if active involvement of students improves their performance in mathematics.
- iii) To establish the challenges encountered by teachers when implementing AFL in mathematics.
- iv) To determine if self-assessment has an influence on the learner's performance in mathematics.

1.6 Research Questions

Research questions envisioned to be answered here include:

- i) Does effective provision of feedback to learners has an effect on their achievement in mathematics?
- ii) Does active involvement of students improve their performance in mathematics?
- iii) What challenges are encountered by teachers when implementing AFL in mathematics?
- iv) Does self-assessment has an influence on the learner's performance in mathematics?

1.7 Significance of the Study

Firstly, the findings offer specific teachers with intimate feedback about precise aspects of their instruction as well as providing educators with reliable indication about the excellence of their teaching that can be used for purposes such as professional certification and promotion. This will provide the teachers with information which will help in modifying the teaching methods and in coming up with the best instructional methods for students. Secondly, the findings of the study are necessary to institution administrations in identifying the difficulties long-faced by the educators when implementing formative assessment and therefore offer adequate facilities and approaches in enhancing their teaching method which can finally improve overall school performance. Thirdly, the findings are also important to the curriculum developers in evaluating the curriculum and put emphasis on AFL practices. Fourth, the findings will enable the teachers to know the learners views and incorporate them in their teaching by developing appropriate approaches to meet the learner's needs. Last but not least, the outcomes sustain and strengthen learners' effort and motivation and help build up the self-esteem of low achieving learners.

1.8 Limitations of the Study

While conducting research, the scientist never had control on the respondent's attitudes. This might have made the research findings unrealistic since the respondents might just have given information to please the researcher. The researcher therefore insisted on the need for the respondents to be honest in giving the information and assured them of total confidentiality. The study was additionally restricted to mathematics teachers and students in form four in seven secondary schools; the sample was so not be a real illustration of all secondary schools in Republic of Kenya. Furthermore on the limitation of the study, students performed dismally between 2013 and 2017 in KCSE mathematics enthused this study are inaccessible for the study, as they're out of faculty and can't so be used for the analysis study. Finally, the researcher applied all the variables in one class. This made it difficult for the researcher to clearly see the variable that caused improved performance in math.

1.9 Delimitations of the Study

Effect of AFL on students' math attainment in secondary institutes within the county of Nairobi was the single study's focus. Because of big variety of

institutions in Republic of Kenya, research was conducted solely from seven high schools since they seemed to be accessible to the man of science than alternative schools. The study was centered on mathematics as a result of it absolutely was believed to push power necessary for millennium development goals. The research was triggered by 2013 to 2017 mathematics achievement from the KNEC reports for whose students are already out of school and their performance could not influence greatly the current students. Pretest and posttest were given to ascertain the effect of AFL on learner's mathematics performance.

1.10 Basic Assumptions of the Study

There was a conjuncture that each mathematics teacher was well trained and had smart mastery of the topic content. Additionally, it was the assumption of this study that all the various textbooks that were used in the mathematics classroom were of acceptable quality and that the time allocated to the topics of study is equal in all cases. It absolutely was additionally assumed that every learner had a constant entry behavior which any variations in learning could be a direct results of the schoolroom experiences with that students act. It was also assumed that the respondents provided correct responses to the form.

1. 11 Definition of the Key Terms

Assessment is a systematic technique for aggregation knowledge regarding the learner's action.

Assessment for learning is a technique of learning where learners are completely involved in learning and continuous feedback is given them so as to identify their weaknesses and strong points.

Academic performance denotes the ability of the student to attain his or her educational goals.

Mathematics means a science of logic reasoning and problem solving.

Teacher is an individual whose work is to impart knowledge to the learner, mainly in a school.

Learner is one who receives the instructions from the teacher.

Formative feedback is the information given to learners during assessment for learning.

Self-assessment is where the learners are given the opportunity to assess themselves.

Active involvement of scholars is wherever learners are totally concerned in learning and their views are incorporated in learning method.

Challenges are setbacks in carrying out assessment for learning

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

Chapter's purpose was assessment related literature about the effect of AFL on learners' performance in mathematics. The chapter covers the following sections, that is, literature on AFL and mathematics performance, relationship between AFL and learner's mathematics performance, effective provision of feedback and academic performance, and active involvement of learners and academic performance as well as the challenges that the educators encounter when implementing AFL. The section also covers the theoretical framework, conceptual framework as well as identifying the researcher gap existing in the literature.

2.2 AFL and Mathematics Performance

AFL is outlined by Earl (2003) as an approach for gathering information and providing proof regarding student learning with an aim of determining the level of students in learning, the objectives they need to achieve and how to achieve those objectives. It happens when educators use the feedback regarding student's to give information about their teaching-learning process. In mathematics, AFL will take the shape of day-after-day work (e.g homework, quizzes, participation at school and presentation).

The feedback from AFL is employed to regulate either learning or teaching as well as satisfying pupil's learning needs. Once instructors see how students are learning and the difficulties they face, they will make tutorial changes, like re-teaching, attempting different tutorial approaches, or giving additional opportunities for trial. These activities will result in improved learner performance in math. Assessment for learning doesn't raise the ultimate students' performance in a subject; in its place it adds to learning through feedback providing. The results of AFL are ne'er used for final pass or fail call. If this can be done then the learners could try and hide their weaknesses and also the main aim of formative assessment is lost (Dandekar, 2015).When AFL is employed for diagnostic functions, it improves the educational performance of the scholars on arithmetic and additionally alters them to grasp the contents of the topic higher than the employment of additive take a look at solely. Additionally, formative takes a look at function as a foundation for locating out bases of challenges in the subject area. During diagnosis process, teachers are able to identify learner difficulties and find remedial measure so as to improve the process of learning.

Learners who don't seem to be exposed to AFL do not show any significance difference in their math performance score (Olagunju, 2015).

Ihendinihu (2013) cites that sufficient formative assessment utilization gives schoolchildren ample time to prepare for the final tests and this increases learner commitment to learning which then results to better performance in math. Reasoning is important in learning arithmetic associated involves examining mathematical patterns to examine if any generalizations are often created supported rising pattern. Grounded in their own probes, learners have to be compelled to build conjectures regarding any generalizations they may see and take a look at those conjectures. Meanwhile, students ought to discuss their reasoning with others frequently and make a case for their principle for creating those assertions. This can be associated with integral as part of learning math with understanding (Fonkert, 2010). Attributable to longitudinal character of the event of those skills, it's necessary to make a class atmosphere that's contributive to those styles of discussions as an everyday a part of the classroom.

Within the application of any math learning activity, it's necessary for academics to develop their concepts of what it suggests that to show arithmetic in such the way that they will support the method standards inside their lecture rooms a day. The importance of a schoolroom atmosphere to stimulate and develop productive classroom discourse can't be stressed enough; it's not enough to convey the scholar's activities and allow them to "loose on the activity." Picollo's and his friends (2008) analysis have stressed that teacher-guided instructional method is a vital part of schoolroom atmosphere. According to consultants, student's ability to self-regulate is vital talent for productive learning.

Pupils who are additional self-regulated are more practical learners: they're more persistent, capable, assured and better achievers. So as to realize this proficiency, students should have transparent information of the goals for every lesson, their position in respect to these goals, and effective methods for bridging the gap between the two. Self-regulation happens as students' live their progress against explicit goals (Nicol & Macfarlane, 2006). However, there's still confusion on whether or not self-regulated learning ought to improve student's learning or the scores in arithmetic tests.

Ihendinihu (2013) in his study advised that math educators have to be compelled to be inspired to embrace mastery learning ways throughout learning to nurture students retention and learning of mathematics concepts. He later established that mastery teaching seem to be effective for raising learner's math attainment and aids to bridge the gap between low and high ability learners.

The blame for dismal mathematics performance has been on instructors for not having adequate skills. Internationally, institutions with higher performance in mathematics are more likely to receive additional rewards like funds and different items such as learning materials and textbooks than those which show poor performance. Moreover, a better performing school is likely to receive adequate extremely skilful and experienced instructors than a poor performing one. The timetable for the school should offer slow learners longer time for mastering mathematics ideas and keep the quick learners eventful. Educators have to be compelled to develop scientific discipline interest in learners at associate early age by incorporating additional sensible and concrete skills. This makes the long run scientific discipline performance higher.

2.3 Provision of Effective Feedback and Academic Performance

Educators may deliver written or verbal feedback to learners. Investigators have revealed that most efficient feedback needs to be definite, well-timed and knotted to clear standards. Educators are supposed to regulate their instructional approaches in order to meet the needs acknowledged within an evaluation process. Ideally, data collected in evaluation and assessment practices is necessary to figure approaches for development at each level of the learning scheme. In the classroom, educators collect info on learner's understanding and alter teaching method in order to meet approved learning requirements. In institutions, the administrators utilize the data to ascertain areas of weakness and strength and to cultivate strategies for development. At strategic level, the officers utilize the information collected through regional or national exams, or by observing school's achievement, to help in the allocation of funds in support and training for institutes, or to develop broad primacies for education (OECD, 2005).

Feedback is the backbone in AFL. However, feedback is effective most when given in time, and when is tightly tied to standards concerning prospects and includes exact proposals on how to increase imminent achievement and to realize educational

objectives (Herman, 2013). Formative response is contributory to a learner's education experience. AFL is effective if it is well-timed, practicable, subjective, and motivational and relates criteria of testing. In spite of its importance, research however proposes that learners are discouraged from involving in the process of feedback because of reasons related to absence of motivation including difficulty to relate and reflect on the comments of the feedback. Getting feedback is intrinsically related to feeling. In a situation when there's either poor performance or when learners feel discomfiture, anxious, guilty, lack self-assurance, discouraged or confused, formative assessment remains to be an effective motivating factor. Consequently, for the teacher to engage learners in feedback process, one must take into account learners' tactics and feelings for exciting motivation. Insufficient time remains to be a big challenge to the implementation of formative feedback. Producing personalized, timely, and detailed feedback requires substantial effort and time, particularly for classes that are large. Weighty workload on teachers and an amplified learner numbers can cause poor quality feedback. Feedback is fundamental to learner learning. Therefore, efficient and innovative tools that can support the instructor in the action of AFL are necessary. Nevertheless, thorough feedback and tailored comments require a lot manual labor. Reducing the teacher's workload is also very essential (Hatziapostolou & Paraskakis, 2010).

One technique of supporting learners' learning is by providing effective feedback. Effective feedback which is one of the formative evaluation practices is a great factor influencing learner learning. It helps learners identify their weaknesses and advice on better ways to overcome them. When providing written feedback, it is important to emphasize areas that need more revision (Bruno & Santos, 2010). Educators, mentors and peers are individuals who may provide feedback to learners for their work. Feedback can be verbal, written or technological (Nielsen, 2015). Balan (2012) in his research revealed that students believe that feedback is very effective for problem solving. Heritage, (2013) cited that the instructor obtains data when learning is happening, and utilizes the results to advice learners in the next course of action. This way, teachers' procedural and direct feedback delivery become conditional based on results gotten. He also suggested that in order to address feedback by marking, educators need to be aware of study findings which have recognized that while learners' achievement can be bettered through feedback comments, the assigning of marks or

grades has an undesirable influence because learners normally ignore commentaries when marks are given.

An assessment practice may assist learning when it offers information that educators and their learners can utilize to evaluate and adjust teaching-learning activities. If the results of a test are used to adjust the instructional process in order to meet learners' needs, then the assessment is formative in nature (Balan, 2012).

2.4 Active Involvement of Students and Academic Performance

Teachers applying AFL have modified the classrooms' culture, golf stroke the strain on serving to learners feel harmless in taking risks and creating mistakes and develops assurance within the teaching house. School work with learners from backgrounds rather than their own. Teachers move frequently with learners and involve them within the valuation method as well as equipping them with necessary tools in order to evaluate their own tasks. Educators additionally make the learning process clear by stating learning goals together with their learners. They also adjust the teaching techniques so as to meet the expectations of their students. (OECD, 2005).

Children learn well when they actively participate in learning activity. The educator can't do training for pupils; the spheroid should be positioned at the pupil's court if we want to avoid what is described by John West as 'learners going back to school to search for instructors working'. As long as pupils are undertaking the learning act, there'll be a balance between what the teacher teaches and what the schoolchild learns. Most often, the learner is actively involved as the teacher observes what the learner is doing. Sharing educational aims with pupils is the beginning of remodeling the content as the teacher understood into methods that during which it'll turn out to be understood by pupils. Deliberating with the students on what they're to discover is the principle that supports the act of sharing education objectives. Discovery is additionally just one a part of the method of guaranteeing that kids create progress. For discovery to be effective, kids need to interact with the lesson. Motivation is meticulously linked to learning act. The more the learner accomplishes difficult learning activities the higher he/she feels regarding himself/herself and also the more seemingly she/he is going to learn. Success is most beneficial when it is associated with test. Succeeding in an act that we already know isn't as satisfying as success in a task that stretches us. Conversely, if pupils are rarely involved in lessons, they're going to shortly stop learning. In lessons

the training activities ought to permit kids to succeed however additionally embrace a progressive level of challenge that stretches those activities (Lee, 2006).

Formative evaluation shapes how students learn in many ways. Firstly, it puts stress on teaching-learning method where learners are fully engaged in the learning process. Secondly, it builds learners evaluation skills for self-assessment. Thirdly, it enables learners understand how they learner different subjects and contents. In the evaluation process, teachers come to know which methods of teaching are effective and why. Teachers also share data obtained from the assessment with other teachers. This allows them come up with varied ways to meet needs of different learners. Summative outcomes when provided in a conducive learning atmosphere, can be used for formative purposes. Summative tests may have negative impact on low achieving learners. Ultimately, formative assessment's aim is to lead learners towards the act of their "learning to learn" abilities ("metacognitive" approaches). Learners armed with good language and tools for learning are able to apply them in real life situations. They also develop a sense of inquiry which makes them handle strange issues which they are not familiar with. (CERI, 2008).

2.5 Challenges Encountered by Teachers when Implementing AFL

Some challenges featured by the educators within the adoption of assessment for learning (AFL) include the challenges of applied constraints like time, resources and large number of schoolchildren. Explicitly, educators believe that varieties of AOL are time economical and have bigger price since they serve answerableness demands and summative needs (Mabry et al, 2003). Short period category periods, as an example those who are but forty minutes, typically curtail sustained learner engagement, room discussion and opportunities for reflection. To boot, an outsized learner entry during a category will create a challenge for providing constructive feedback to open-ended queries and learners' comes (Mantsose, 2012).

Many educators lack a correct comprehension of AOL and formative assessment. This unstable understanding is among the challenges academics face when they attempt to develop AFL tasks for his or her room (Educational analysis, 2016). Learners prefer instructors' feedback to feedback from the peers and believe that the responsibility of mastering the subject matter is for the teacher and not them. Professional beliefs toward instruction, assessment and learning represent another contest for implementing AFL.

Asian academics consider that learners master the content in their textbooks through drilling and memorization methods of learning only. They also prefer being given the right answer to discovering answers by themselves (Yuankun, 2015).

Learners with poor tutorial performance were created to believe that the sole manner they may learn math was thru memorization of the content matter in textbooks. Those kind of beliefs cause assessment for learning functions tense and rigid. As they contradict AFL principles wherever the learner's thinking and involvement within the education method are the foremost necessary proof of fine learning and teaching. Asian schoolchild learning clashes with principles of AFL particularly in peer assessment (Christopher et al, 2012). Lam (2013) suggested that use of summative assessment as AFL may advance student learning especially through self-evaluation. All the same, low achieving learners are in intimate with constant noticeable influence as high performing arts students. Students normally cease from asking queries when they are not so sure about the answer to avoid embarrassment during formative evaluation. They also don't know how to conduct self and peer evaluations. It seems difficult for them to relate their tasks with those of peers (Ibid, 2015).

School authorities who don't support educators in their attempt to carry out AFL practices pose a challenge to its implementation which results to advance effects on math attainment. Similarly, some institutions don't provide educators with enough independence to permit them to be artistic in their own teaching. Academics which are appetent of conducting AFL find it hard to cope with the tight school timetable. Whereas formative strategies to assessment and teaching typically reverberate with consultants and policy makers, there are many obstacles to its implementation. These include: a lot of tensions between AFL and summative examinations to make schools accountable for student performance; Inconsistency between tests and evaluations at institute, policy and class levels; and also the fears that assessment for learning is thus long and resource-intensive (OCDE, 2005).

Even though AFL concentrates on increasing student's learning supported by pertinent feedback gotten from completely different learners' desires, a much bigger variety of scholars per room would make it harder for the teacher to implement AFL. Educators need to pay a lot of attention and time thus on give feedback. It's impractical and trying for educators inside the restricted period of a forty minute category. The other

shortcomings of AFL are the extra work and long nature this assessment applies. The interface between these issues and also the three stages of discourse obstacles creates plenty of tension in makes an attempt to implement AFL in Asian classroom. Therefore, most Asian educators within the researches reviewed, were not ready to incorporate AFL into their daily teaching process (Nguyen & Ahmad, 2016).

The pressure between AFL and summative tests is one in all the challenges featured by academics in effecting AFL. Too often, summative tests forever control what happens within the classroom. Educators are a lot of pressured to show to the check than inculcating authentic skills into the learners. An absence of association between general, college and room approaches to assessment and analysis. Frequently, data collected through regional or national observance systems or in formative evaluations, is treated as unhelpful or impertinent to teaching and philosophy (CERI, 2008).

Teachers aren't well ready to satisfy the strain of formative assessment thanks to lean coaching. Challenges are significantly bulbous in preparation for assessment, mistreatment varied assessment ways, involving oldsters in assessment, decoding assessment outcomes and handling overcrowded categories. The educators' assessment practices also are plagued by college context, their backgrounds and availableness of resources. The challenges in effecting AFL are resided in time constraints, policy interpretation, homework, plenty of paper work, coming up with and mistreatment varied strategies of assessment, ways that of applying AFL, learners with special talents, mistreatment blue blood assessment, act AFL effectively, and help from the officers of the department, parental involvement and lack of team work (Mantsose, 2012).

2.6 Self-Assessment and Academic Performance

Self-assessment makes learners responsible for their own learning by allowing them to take charge of their own learning process. It also puts them at the Centre of their own learning thereby increasing their performance. The major effect of individual-assessment on learners' math attainment is a sign that learning/education is internalized well and quicker when schoolchildren fully participate in the assessment and fully become accountable for their individual learning. Scholars develop expertise to utilize standards to their individual tasks and evaluate whether these standards are met. It aids schoolchildren to interrelate well with their educator as well as the subject. It also

motivates learners to mirror on their contribution and role to the development of their personal work. Schoolchild's responsibility and status change from passive student to active student and evaluator. Assessment therefore is seen not just as a penalty but then as an instrument to which achievement can be enhanced (Stiggins, 2008).

Self-assessment puts the accountability of learning squarely on shoulders of the scholars. It needs them to rely on their work and their behavior. Through self-assessment students begin to rely on however they learn and kind goals to boost their own learning. Self-assessment is very important as a result of it reminds students that they're accountable for their own learning. This stress on responsibility provides students with a way of possession. It ultimately provides them an alternative and forces them to decide on between operating through a method to achieve success and selecting to continue doing constant things that haven't worked. Self-assessment provides another manner of viewing their progress and may provide students a path to success if they believe that they'll succeed. One issue that's mutualistic with self-efficacy is self-assessment (Ramdass & Zimmerman, 2008).

Scholars who are able to use self-evaluation increase their competence in arithmetic. When students have more mathematical competence, their self-efficacy increases. One problem that often occurs with students when they are evaluating themselves is that they are not always accurate. One drawback that usually happens with students after they are evaluating themselves is that they're not always corrects. Students who are underachieving often give themselves low evaluations. Some students overestimate the competence of their abilities, some underestimate the competence of their abilities, and some have an accurate assessment of their competence level. It is possible that underachieving students give themselves poor evaluations as a self-defense mechanism because they have low self-confidence (ibid, 2008)

Self-assessment simply means that the learners check the answers from the list of answers and grade themselves. It is more precisely refers a procedure thru which schoolchildren 1) assess and evaluate their thoughts and behavior during learning process and 2) categorize approaches that advance their skills and understanding i.e. learners evaluate their task in order to increase achievement as they recognize inconsistencies between present and anticipated achievement. This feature of self-evaluation aligns narrowly with standards oriented learning, which offers strong goals

and standards that can ease learner self-evaluation. Extensiveness of standards oriented teaching offers a perfect setting in which cut off scores for achievement and standards for gauging schoolchild results, when conceptualized by learners, provide knowledge required for individualized-assessment. Lastly, individualized-assessment detects further educational targets and teaching approaches learners can apply in order to improve attainment. In standards-oriented teaching, learner self-assessment increases his or her motivation and involvement in learning activity. Properly executed, learner individualized- assessment may encourage motivation that intrinsic, internally directed effort, mastery goalmouth alignment, and also extra meaningful knowledge acquisition. Its immeasurable influence on learner achievement in both schoolroom assessments and high-stake testing permits learners to control their learning and set their own standards of achievement (James & Jessica, 2008).

For educators, student individualized-assessment progresses cognizance of metacognitive approaches. Instructors and schoolchildren learn those skills as soon as they identify strong learning goalmouths and articulate evaluation standards that allow learners assess their individual task. Those activities involve pupils as they participate actively in learning and become well connected and dedicated to learning results. Learner self-assessment similarly mandates teachers learn how to pass evaluative accountabilities to their learners thru scaffolding and demonstrative setting of goal, assessment, approach adjustment as well as reflection. Scaffolding requires learners to be completely involved in learning as the teacher acts as coach to guide learners learn from experiences of their own (Joyce, Weil & Calhoun, 2005). Self-assessment can occur when students are able to judge their own performance and identify areas that they still need to work on in order to get the desired grade for their performance (McMillan & Hearn, 2008).Educators frequently gather scores which fill their own records and prioritize them than scrutiny of learners' tasks to identify learning requirements, but then learning and teaching needs to be more collaborating. By assessing, instructors gain information about their learners' achievement, progress and problems with learning in order to adjust their teaching to meet needs of their apprentices. These needs vary from one pupil to the other and are very unpredictable (Black & William, 1998).

Student self-assessment is associated analysis of a student's own work merchandise and processes in room settings. It ought to come back as no surprise that each academics and students would like coaching before they'll interact with self-assessment as a tutored and learned ability. New skilled development materials and courses are required that transcend the exhortation to use student self-assessment. These resources got to guarantee academics are attentive to the idea and analysis base for self-assessment and supply techniques that are fitly sequenced for the ability level students have during this ability. Till academics abandon a straightforward approach (e.g., mistreatment smiley-face self-rating scales for effort and satisfaction), it's unlikely self-assessment can fulfil its promise. Once academics have associated applicable understanding, they're going to train students in developing realistic self-evaluations for the express purpose of guiding their own learning. As luck would have it, the analysis proof makes it copiously clear that the standard of student self-assessment improves with coaching which increased outcomes arise (Stiggins, 2008).

Self-assessment is outlined as learners evaluating their own work, supported on proof and clear criteria, so as to boost future performance (Hotard, 2010). Rolheiser & Ross (2001) as quoted by Hotard (2010) cited that academics ought to develop self-assessment that involve learners within the method of deciding, that encourages learners to deliberate regarding the excellence of their action, that brings out correct setting of goal, which are combined with teaching. By learners self-assessing their performance inside an ability, they become a lot of truthful regarding the help they have. This can improve their tutorial action by sanctioning them to induce the instruction required to prove mastery of necessary skills. Self-assessments measure student's learning on concluding events, pretests and posttests. It is not possible for every student to assess himself or herself in the schoolroom (Price, 2016).

Self-assessment is associated influential learning tool. Learners are fortified to require half in associated careful, systematic, and legitimized method that ropes learning. The learners take possession of their own learning. Self-assessment participation prevents unfair analysis. Learners are extremely engaged and impelled after they comprehend the standards and criteria. By participation, learners become a lot of cooperative and able to peer judge and support every other's learning. Self-assessment has been found to own a profound impact on students' performance within the room. Assessment involves 2 inter-related activities. Firstly, there's a knowledge development as well as

gratefulness of the suitable standards which can be used in any given task. Students learn one thing and apprehend what counts nearly as good work. Second, there should be a capability to form judgments regarding whether or not or not the work concerned will or doesn't meet these set standards (Kicken et al., 2009).

2.7 Summary of the Literature and the Research Gap

Academic action is sometimes measured through AFL or AOL. OCDE (2015) disclosed that AFL has a number of benefits. First, it improves learner performance. Second, it brings fairness in outcomes. Third, it raises learners' capability to find out. In schools, the leaders utilize the data to establish areas of weakness and strength and to cultivate ways for development (OECD, 2005). However, Hatziapostolou & Paraskakis (2010) within their analysis cited that learners are discouraged from involving in the method of feedback thanks to reasons associated with absence of motivation furthermore as problem to relate and replicate on the comments of the feedback. Some challenges featured by the educators within the adoption of AFL embrace the challenges of applied constraints like time, resources and sophistication size (Torrance & Pryor, 2001). The many main result of individualized-assessment is that, it makes learning internalized as well as ensuring that learners are total involved in the learning process. It also creates a sense of responsibility in students which then result to better math attainment (Omorinola & Adewale, 2014). But one drawback that usually happens with students after they are evaluating themselves is that they're not always correct (Ramdass & Zimmerman, 2008).

2.8 Theoretical Framework

Constructivist theory that could be a school of thought regarding how it's the learners come back to understand things (epistemology) steered the study. Constructivism is an educational model unfolding the technique of knowledge construction. Information construction is a lively, instead of passive method. Constructivists are certain that data mustn't simply be placed into learners' brains; instead it ought to be made through vigorous involvement of the learners within the learning method. Constructivism emphasizes prominence of the instruction context, schoolchild previous data, and interaction amongst the learners and also content that is to be learnt. Within the constructivism viewpoint, knowledge is made by the students through their interfaces with environment. Not like a normal style of education where the educator plays a lively role within the learning/teaching atmosphere, and pupils passively accept the

information, constructivists believe that training ought to target the learner (Thenjiwe et al, 2012). Many various approaches of teaching are employed by mathematics instructors round the sphere. One in all these approaches is constructivism. This approach is associate innovative instruction technique. The spirit of constructivism has captured active learning event known as 'learning through doing', knowledge acquisition thru expertise, and learning by action, pupil-centered education, peer collaboration as well as cooperative learning (Prideaux, 2007).

Constructivism evades teacher-centered instructional method. However, the teacher acts as a coach in guiding learners discover their individual knowledge. Constructivists emphasize that learners should be totally involved in instructional process rather than just receiving information. They further suggest that learning place needs to be democratic where learners give their views and they teacher simply guides the learning process. Additionally, they suggest that learning should be learner- centered and engaging whereby the educator's role is to facilitate events and in the process, learning is autonomous and learners are responsible for their own undertakings. Constructivist teaching put a lot of stress upon sensory effort, one that has been overlooked in many decades by several ancient educators. Constructivism learning has proven to be very effective for learners with special abilities. For example, autism and disorder in information processing. However, constructivism might have some limitations. It eliminates grading within the old-style manner and instead puts a lot of value on learners critical their own development, which can result to learners dwindling behind however with no formalized grading as well as evaluations, academics mightn't apprehend that the student is troubled to learn. Due to the fact that evaluation is missing, knowledge might not be creating by learners as constructivism proclaims instead just be plagiarizing what other fellow learners do. One more disadvantage is the fact that it can make learners frustrated and confused especially when they lack capability to make abstracts and relationships between the knowledge they possess already and the one they individually learn (BrightHub Education, 2019).

2.9 Conceptual Framework

Conceptual framework shows scientist's synthesis of literature so as to expound on an incidence and highlights actions needed in the study based on the past comprehension of other researchers' opinions and observations on subject of study (Patrick & Regoniels, 2015). The abstract framework is that the researcher understands on

however the variables within the study relate. Supported the literature analysis, the subsequent abstract framework was developed.

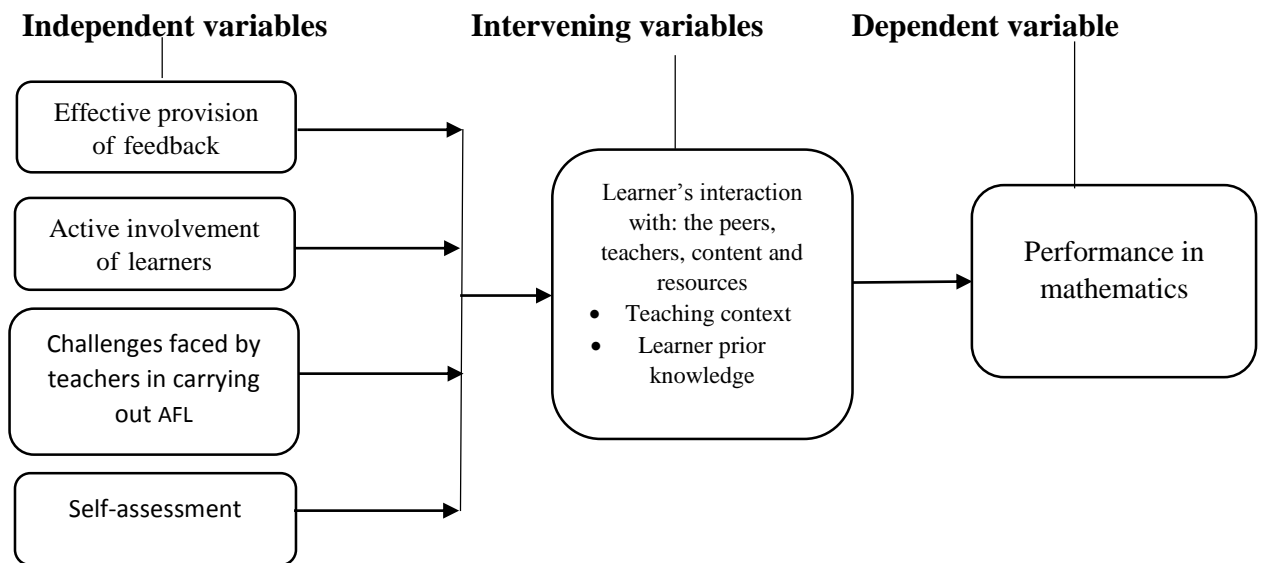


Figure 2.1: Conceptual Framework

Source: The researcher (2019)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is referred to as an organized and scientific means of solving a research problem. This section covers study's design, the target populace, sampling procedure, instruments for gathering data, data types, study's pilot, reliability and validity of the instruments. It also spells procedure for gathering data, their analysis as well as ethical concerns.

3.2 Research Design

Descriptive case study and quasi-experimental designs utilizing pretest and posttest equivalent cluster were applied for this study. Descriptive design in form of questionnaire for 18 teachers of mathematics from five selected schools for the study was used to assess the challenges encountered by educators in carrying out assessment for learning (AFL). Quasi-experimental design in form of pretest-posttest for experimental group and control group was administered to test if effective provision of feedback to learners has an effect on their achievement in mathematics, and assess if active involvement of students improves their performance in mathematics as well as to find out if self-assessment has an effect on the learners' mathematics performance. Descriptive case study design is preferred due to the fact that it stipulates the limits of study, and it significantly contributes to the thoroughness of the completed study and the benefit of pretest posttest design is that it permits many comparisons (Kothari, 2004).

3.3 The Target Population

Mugenda and his colleague Mugenda (2003) refer to populace as the quantity of items with favored features, generating the study's creation. The focus populace for the research included government's secondary schools within Nairobi County while study population was mathematics educators as well as form three learners from six secondary schools within the same County. As per the ministry of education, Nairobi County has 172 secondary schools whereby each school is having an average of 28 teachers (principals, deputy principals and teachers) contributing to 2016 teachers and 25,800 form three students.

Table 3.1: The Target Population

	Experimental group	Control group	Issued with pretest & posttest/ questionnaire	Given test and retest for reliability testing (questionnaire)	Total
Number of secondary schools	2	2	4	1	5
Number of form three students	40	40	80	-	80
Number of mathematics teachers	6	6	12	6	18

Source: The researcher (2019)

3.4 Sampling design

The researcher adopted purposive sampling technique to select five secondary schools with an average performance in mathematics. These included one secondary school which was used for reliability testing of the questionnaire. The design was selected by the researcher because he already had some prior knowledge about the performance of these schools in mathematics and the main benefit of purposive sampling is that it is easier to get a sample which shares particular characteristics.

3.5 Data Collection Instruments

Questionnaires and pretest-posttest equivalent group were utilized collecting the data. Questionnaires were meant for mathematics teachers on challenges faced by them in carrying out AFL and they were administered through answer and return immediately method. Pretest from surds, and posttest from commercial arithmetic II were administered after the incorporation of self-assessment, effective feedback provision and learners' active involvement in AFL.

Table 3.2: Research instruments

Research objective	Instrument
To determine if effective provision of feedback to learners has an effect on their achievement in mathematics (students).	Pretest and posttest
To assess if active students' involvement improves their mathematics performance (students).	Pretest and posttest
To examine the shortcomings educators encountered when implementing AFL in mathematics (teachers).	Questionnaire
To find out if self-assessment has an influence on learner's mathematics performance (students).	Pretest and posttest

3.6 Instrument validity

Pilot research was for the purpose of ascertaining the questionnaire's validity. The pilot study was done through administering the questionnaire to the mathematics teachers in one of the schools that was not for the study. All the deficits that were eminent were fixed for the betterment of the instrument. Content and face validities were applied to ascertain the questionnaire's validity. The tests as well as the questionnaire were also taken to the supervisor for face validity who critiqued the work and then the researcher made corrections as was recommended.

3.7 Instrument reliability

Test and re-test approaches was applied in approximating instrument's reliability. Same questionnaire was administered two times to identical cluster of respondents which were carefully chosen for that function and were not part of the study. To establish if a questionnaire was reliable, the researcher calculated the Alpha Coefficient using a formula of Cronbach Alpha defined as follows:

$$\text{Reliability } = \alpha = \frac{n}{n-1} \left(1 - \frac{\sum S_j^2}{S_j^2} \right)$$

α - Reliability.

n - Sample size.

$\sum S_j^2$ - Summation of variance of the sample.

S_j^2 - Variance of the sample.

A questionnaire can be reliable if (α) is greater than 0.7 (Kothari, 2004). The reliability of the questionnaire was found to be 0.821 which was above 0.72 that (Mugenda & Mugenda, 2003) recommends for a decent reliability.

3.8 Data Collection Procedure

The authorization for carrying out the research was first acquired from the head of psychology department at the UON, NACOSTI, and the Nairobi County office of education, the Kamukunji sub county office and principals the chosen secondary schools of the government then the researcher proceeded to carry out the research. Questionnaire was planned for only mathematics teachers. The researcher administered the questionnaire personally through drop and pick immediately. The pretest was given during the first week of second term and the posttest in the sixth week of the same term the after the incorporation of the variables by the researcher himself. The pretest was given to 80 form three students in the first week and the posttest was given to the same group in the sixth week of the second term. The pretest and posttest were in form of questions from surds, and commercial arithmetic II respectively. They were administered to form three students of different schools. The control group was taught in a normal way whereas experimental group taught by the researcher while incorporating variables meant for the study. The questions summed up to forty marks each and the scores from the tests were compared to see if there were some differences after the intervention. The marking scheme for both papers was prepared before the tests were given. The researcher also managed to book the dates for the appointment by the principals of the selected schools.

3.9 Data Analysis

Both qualitative plus quantitative strategies were applied for analyzing data. Committal to writing was done to quantitative information that was collected by the utilization of form. Pc was then used for descriptive statistics computations. The applied math Package for Social Sciences (SPSS version eleven.5) was utilized in running descriptive statistics as well as percentages and frequency so that quantitative data could be presented into pie charts, tabular form and graphs depending on research queries. SPSS was suitable since it's quick, flexible and provide precise analysis making conclusions dependable. Qualitative data obtained were arranged into themes depending on the objectives and then presented in descriptive form together with numerical presentation. Qualitative data helped to reinforce quantitative one.

3.10 Ethical Consideration

The scientist ne'er disclosed the names of neither the respondents nor the faculties wherever they are available from and warranted the respondents that the study was strictly tutorial and utmost confidentiality was ascertained. It was absolutely clarified that participating in this research was not by compulsion and respondents were at liberty to withdraw whenever they wished during the period of conducting research. Information utilized in the study was anonymously coded and couldn't thus be derived back to individual respondents.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

The section deliberates on exploration of data, arrangement and explanations of the outcomes. The research aimed to examine the influence of assessment for learning (AFL) on mathematics performance in government’s secondary institutions within the county of Nairobi. The intention of the results was to respond to research questions. Data gathered were coded and reports organized into graphs, pie charts and tables, and analyzed thereafter.

4.2 Response Rate

The rate of return is defined as the amount of questionnaires brought back after they had been given to the respondents. The researcher targeted a sample of 5 schools, 80 form three students and 18 mathematics teachers. The researcher delivered 18 questionnaires to mathematics teachers. However only 16 questionnaires were collected back. Out of the 80 form three students targeted to be given the pretest, 40 did the pretest while 36 did the posttest. The 4 students who never did the posttest were claimed to have been sent home for school fees, indiscipline cases or just absent for unknown reasons. These rates were considered passable for data examination because they exceeded 85.0% return rate as recommended by (Mugenda & Mugenda, 2003). The below table summarizes the findings.

Table 4.1: Pretest, Posttest and Questionnaire Rate of Return

Respondent	Sample	Returned	Percentage
Form three students			
Pretest	40	40	100
Posttest	40	36	90
Mathematics teachers	18	16	89

This indicates that 89% of the questionnaires were returned and 100% and 90% of the form four students did the pretest and posttest respectively which was adequate as suggested by Mugenda (2003) in his statement ‘rejoinder of 70% remains to be sufficient for analyzing as well as reporting data.

4.3 Background Information

4.3.1 Frequency of giving a test

Table 4.2: Frequency of giving a test

Mode of assessment	Frequency	Percentage
Every day	2	12.5
Weekly	4	25
Monthly	7	44
Termly	1	6
Yearly	2	12.5
Never at all	0	0
Total	16	100

In order to determine if the teachers implement AFL practices in their teaching, those answering the questionnaire were requested to signpost how often they assess learners. Majority of those who answered the questionnaires indicated they assess them monthly (44%), followed by weekly (25%), every day and yearly tied at 12.5%. Few of them indicated that they assess them termly (6%) while none of them (0%) never assesses the learners. This shows that all teachers handling mathematics do use tests in teaching and learning. However, the report indicated that few of them use assessment for learning as this should happen every day during the learning process. Some of them hinted that the pressure to cover the syllabus hinders them from implementing assessment for learning on a daily basis.

4.3.2 Performance in Mathematics

For learners' mathematics performance within secondary schools of the government to be known, those answering the questionnaires were requested to illustration level of their learners' performance in mathematics. Responses were put in a scale of five whereby: 1- Very good, 2- Good, 3- Average, 4- Below average, and 5- Poor. Figure 4.1 below illustrates the study findings.

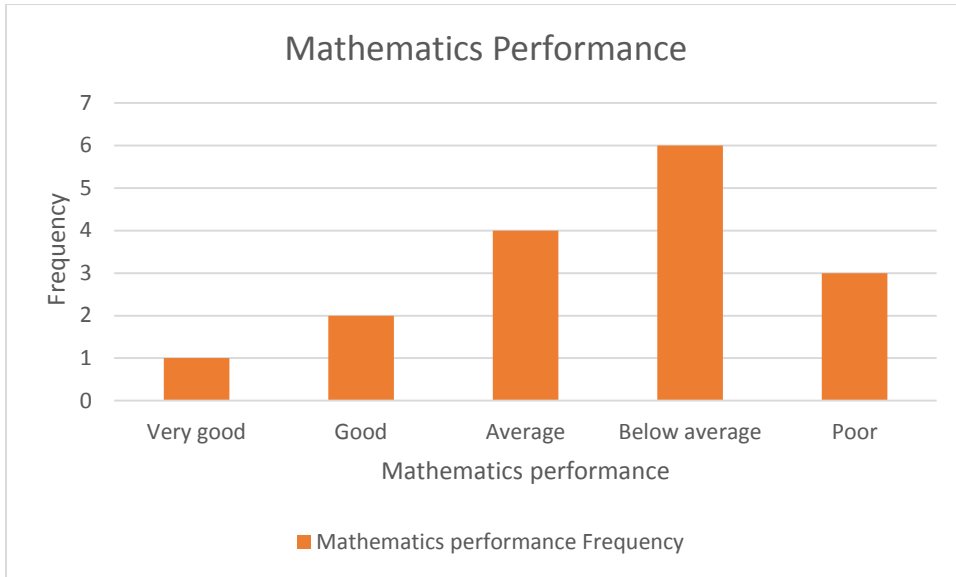


Figure 4.1 Performance in Mathematics

The report shows that mathematics performance in Kenyan secondary schools is still wanting with most of the learners performing below average (frequency = 6), followed by average achievers (frequency = 4), poor achievers (frequency = 3), good achievers (frequency = 2), poor achievers (frequency=3) and very good achievers with a frequency of 1. In overall, it shows that mathematics performance is below average and the research was of great significance to find out if assessment for learning could bring some difference in performance.

4.3.3 Employing AFL in Mathematics Teaching

In order to investigate if educators teaching mathematics do employ assessment for learning in teaching mathematics, respondents were requested to indicate whether they employ AFL or not and the figure below summarizes the findings. The answers were ranked on a likert scale of two point whereas: 1- Yes, 2- No.

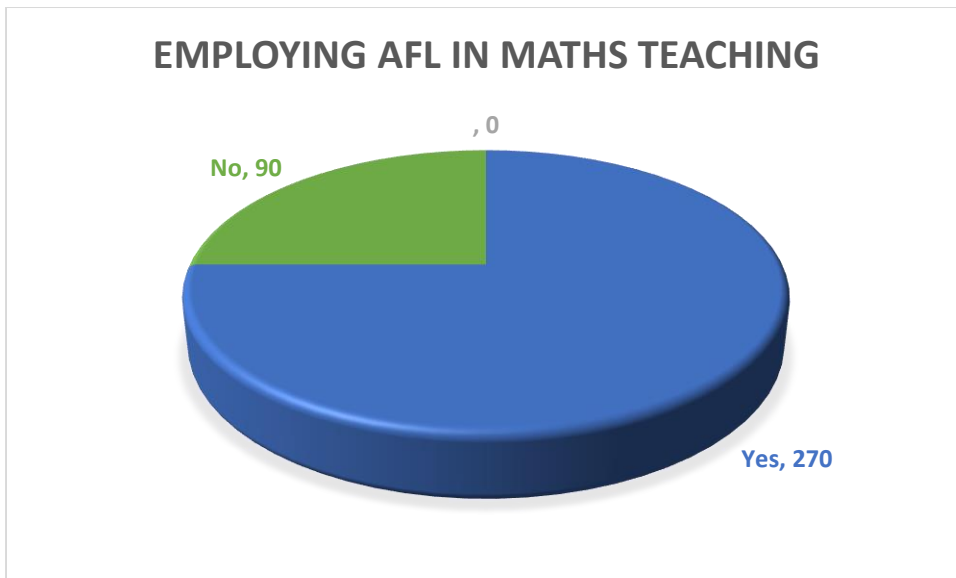


Figure 4.2 Employing Assessment for Learning in Teaching Mathematics

The discoveries point out that majority of those who answered questionnaires (270 degrees) do employ assessment for learning while few of them (90 degrees) cited that they do not employ it in their teaching. The ones that do not apply it in their teaching practices mentioned that it has a lot of challenges and that is why they do not use it. Even the rest who apply it also concurred with the fact that it has a lot of challenges and that is why they do not employ it to the fullest in the teaching approaches. This indicates that it is essential to know the challenges which they face and how they can be fixed.

4.3.4 Forms of AFL Employed in Mathematics Teaching

As part of the study, the researcher wanted to know forms of assessment for learning that are employed by the instructors in their teaching practices. Responses were placed on a scale of seven points whereas: 1- Self-assessment, 2- Quizzes, 3- Questioning, 4- Homework, 5- None of the above, 6- All and 7- I don't know. The results were gathered and were summarized as shown in the figure below.

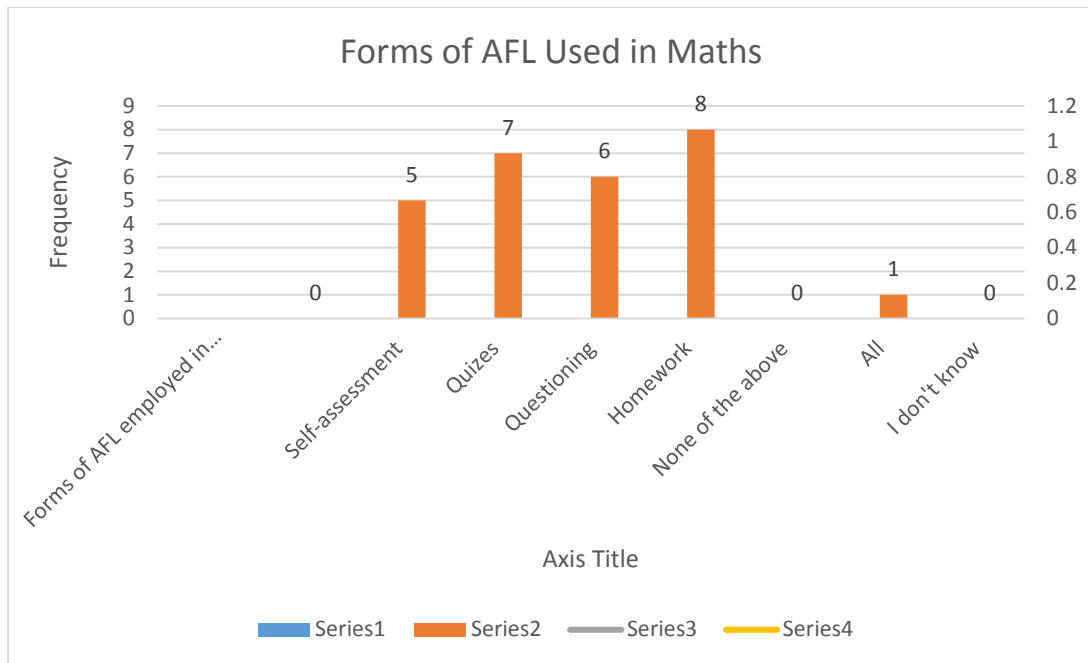


Figure 4.3 Forms of Assessment for Learning Employed In Teaching Mathematics

According to figure 4.3 above, majority of those who answered the questionnaires (4) with a frequency of 8 do use homework as a form of AFL, followed by quizzes (2) with a frequency of 7, then questioning (3) with a frequency of 6 and self-assessment (1) with a frequency of 5. Small number (6) with a frequency of 1 uses all the forms of assessments listed above while none of them (5) with a frequency of 0 doesn't employ any. All of them (7) knew the forms of AFL they do use. This shows that it is being used in Kenyan secondary schools and it could be because of the challenges that educators do experience in implementing it is what hinders its effectiveness and not causing better performance in mathematics.

4.3.5 The Indicator of a Good Assessment

As part of background information, open ended queries was asked to investigate the instructors understanding indicators of a good performance and varied responses were given.

Table 4.3: Indicator of a Good Assessment

Variables	Frequency	Percentage
1	3	18.8
2	2	12.5
3	1	6.3
4	2	12.5
5	1	6.3
6	1	6.3
7	1	6.3
8	5	31.3
Total	16	100

Most of the respondents (31.3%) did not know the indicator of a good performance. This was followed by 18.8% of the respondents who cited that a good assessment is a valid test. 12.5% of the respondents indicated that a good assessment is within the range of learners and 12.5% of the respondents also agreed that a good assessment is within the syllabus. 6.3% mentioned that a good assessment is one that gives a normal curve while another 6.3% indicated that a good assessment is one that is given to students in daily learning and teaching process. The same percentage (6.3%) also mentioned that a good assessment is one which brings out real weaknesses of learners and the level of understanding. Another 6.3% of the respondents cited that a good assessment is a well performed assignment and oral questioning. This indicate good understanding of assessment indicators though some sensitization like seminar is needed to enable some instructors to understand the indicator of a good assessment.

4.4 Challenges Encountered By Educators in Carrying Out AFL

In order to identify the difficulties encountered by educators when implementing AFL in mathematics, those who were answering the questionnaires were queried to show level of their agreements with issues pertaining to problems encountered by instructors when implementing AFL in math. Rejoinders were placed on a scale of 2 where: 1- agree and 2- disagree in table 4.4 that follows.

Table 4.4: Challenges Encountered by Educators in Carrying out AFL

Statement	Mean	SD
I always have enough resources to carry out formative assessment	1.5625	0.5125
I always have enough time to apply formative assessment approaches	1.625	0.500
Large class size hinders me from implementing formative assessment	1.25	0.44721
Large class size affects the quality of feedback I give to learners	1.1875	0.40311
I comprehend distinction concerning summative assessment and AFL	1.3125	0.47871
My students do appreciate the use of formative assessment	1.6250	0.5000
My students do have a positive attitude towards formative assessment technique	1.6250	0.5000
The school authorities support me in implementing AFL	1.3125	0.47871
My school do give me enough independence to be creative in my own teaching practice	1.25	0.44721
There is always more pressure to teach to the test than inculcating authentic skills to the learners	1.3750	0.500
Insufficient teacher's training is a major hindrance to meeting the demands of formative assessment	1.75	0.44721
School context influences your assessment practices negatively	1.5	0.51640
Teacher's background influences assessment practices	1.6875	0.4871
Learners with special abilities make it difficult to execute assessment for learning tasks	1.1875	0.40311

Table 4.4 summarizes the findings on the challenges faced by teachers in carrying out AFL in mathematics. Most respondents (mean = 1.5625) were in agreement that lack of resources has a great challenge to them implementing assessment for learning. On whether teachers always have enough time to apply formative assessment approaches, a large number of the respondents (mean = 1.625) disagreed that they do have sufficient time in implementing AFL. This shows that majority of schools still lack enough resources and sufficient time to fully implement AFL (Torrance & Pryor, 2001). Moreover, mainstream of the interviewee (mean = 1.25) were in agreement that large class size is one of the challenges they face when they are trying to implement AFL and this also affects the quality of feedback they give to their learners (mean = 1.1875). However, a huge number of the respondents (mean = 1.3125) disagreed with the fact that insufficient understanding of assessment of learning and AFL poses a challenge to them implementing AFL. This is contrary to Educational research (2016) which

suggests that many educators lack a proper comprehension of the distinction between summative and formative assessment.

The study also signposted that most learners do not appreciate the use of AFL (mean = 1.6250) and they also lack a positive attitude towards AFL technique (mean = 1.6250). This suggests that a learner negative attitude towards AFL where learners just believe that it is only what comes from teachers that is correct is hindering the implementation of AFL. This is in line with Yin & Buck (2015) who emphasize that mastery of the content matter is the responsibility of the educator and learner's role is to receive information from the teacher. Moreover, most of the respondents mentioned that they normally lack a strong support mostly from the authorities concerned in their struggle to execute formative assessment techniques (mean = 1.3125). However, majority of them agreed that authorities give them sufficient independence in order to be creative in teaching (mean = 1.25). This concurs with Leong (2014) which suggests that school authorities don't support educators' attempts at AFL.

The study also revealed that there is always more pressure to teach to the test than inculcating authentic skills to the learners (mean = 1.3750). This is in agreement with OCDE (2005) which cites that there is always apparent tensions between AFL and summative examinations to hold institutes accountable for learner achievement. Most of the respondents (mean = 1.75) also disagreed that lack of proper teacher training is not a major hindrance in meeting demands of AFL. This suggest teachers have adequate skills to carry out AFL practices which contrary to Mantsose (2012) which showed that educators are not prepared in meeting AFL expectations because of inadequate training. However, it was evident that school context and teacher's background do not influence the instructor's assessment practices negatively (mean = 1.5 and 1.6875 respectively). These findings disagree with Mantsose (2012) which found out that the educators' assessment practices are affected by school context and their backgrounds.

In conclusion, the study discovered that learners with special abilities make it difficult to execute assessment for learning tasks (mean = 1.1875). This supports one of Mantsose (2012) findings that indicate that the challenges in carrying out AFL are resided in learners with special abilities.

4.5 Other Challenges in Carrying Out Assessment for Learning

In order to investigate if there are other difficulties encountered by instructors in implementing assessment for learning, respondents were asked kindly to indicate if they experience other challenges a part from the ones listed. The findings were presented in figure 4.4 below.

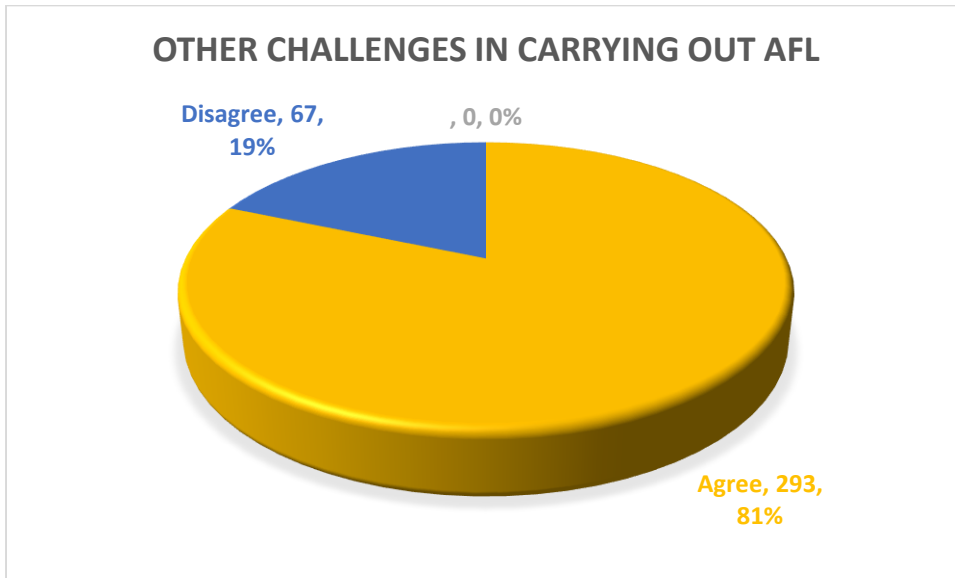


Figure 4.4: Other Challenges in Carrying out AFL

The study discovered that most (293 degrees, 81%) respondents agreed that they have other challenges they do experience a part from the ones listed while some (67 degrees, 67%) of the respondents disagreed that they don't experience other challenges. This depicts that there are still more challenges to AFL that impact learner's mathematics performance. The respondents were further requested to list some of these challenges and they cited the following: a) Some learners don't do the work they are given; b) Irregularity in learner's attendance; c) Truancy among the learners; d) Cheating during the assessment and; e) improper revision by the learners.

4.6 Overcoming the Challenges in Carrying out AFL

In order to establish what the teachers do so as to overcome AFL challenges, respondents were requested to cite their action towards overcoming these shortcomings and varied answers were given such as: a) Emphasizing the need to accomplish any task

given to the learners; b) Use of positive reinforcement e.g. rewards; c) Timely syllabus coverage; d) Giving learners with special needs more time to complete the given tasks; e) Improvising learning materials; f) Giving tasks based on learners abilities; g) Advising learners on the importance of assessment tasks and punishing the learners who fail to complete the tasks given; h) Liaising with administration to provide adequate learning materials and; i) Splitting large class into groups. This indicates that instructors are trying to do what they can to overcome the challenges in implementing AFL though success has not been made because mathematics performance is still not good. It is hoped that in future these interventions may be effective if put into action and the performance in mathematics may become better.

4.7 Recommendations for Other Teachers

The respondents were asked to list some of the recommendations for other teachers on how they should assess their classes. The recommendations listed by them included: a) examinations to be based on the ability of the learners; b) harmonizing the set paper to ensure that all that have been taught is tested; c) group the learners into ability groups and allow them to perform the tasks according to their pace of learning; d) encourage learners on the importance of class tests; e) tests should be have valid objectives to identify learners challenges; f) give students random tests to measure students' performance and; g) divide students into groups. These answers suggest that the educators are still focusing more on teaching to the test than inculcating authentic assessment among the learners.

4.8 Learners' Performance in Pretest and Posttest

Table 4.5 shows the students' performance in pretest as well as posttest. The researcher conducted the tests to the students on specific areas of concern which include surds and commercial arithmetic in pretest and posttest respectively. Posttest was given after incorporating the variables such as effective provision of feedback, active involvement of learners and self-assessment by the researcher.

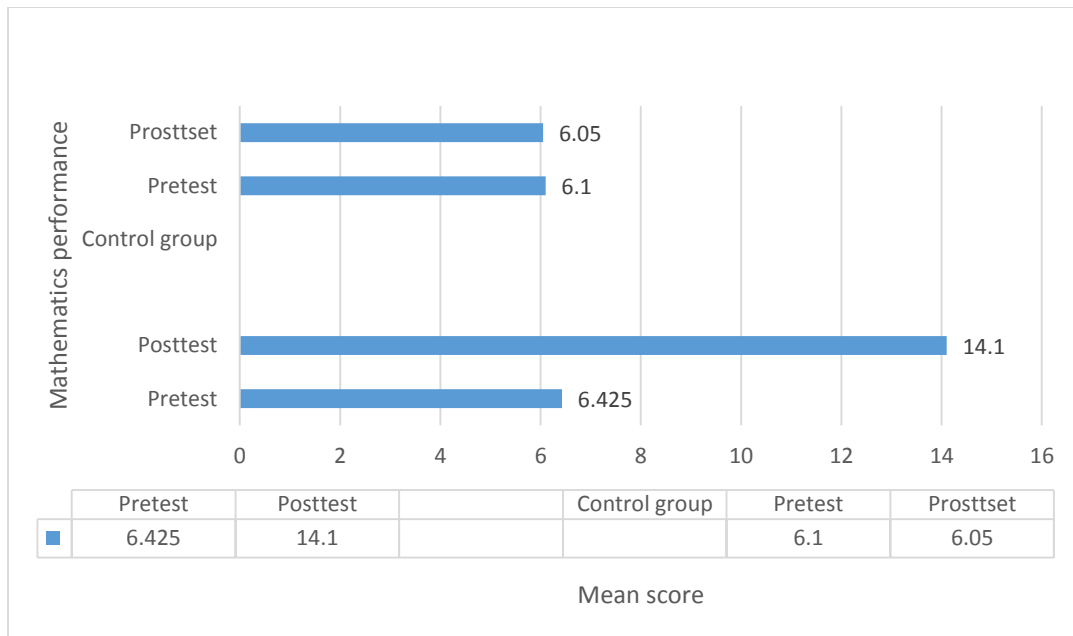


Figure 4.5: Learners’ Performance in Pretest and Posttest

The findings of the study are shown in appendix VI. The researcher calculated the mean score of students to find the average performance. The students’ a mean score in pretest before the intervention of the variables was 6.425 while after the intervention the mean was 14.1. After the intervention, an improvement of +7.675 was recorded. The mean for control cluster was 6.1 in pretest and 6.05 in posttest which was a fall of 0.05. In comparison to the experimental group, there was a greater improvement than a control set. This signposts that effective provision of feedback, active involvement of learners and self-assessment has a significant effect on learners’ mathematics performance. This supports Ramdass & Zimmerman (2008) argument that the significant influence of individualized-assessment towards learners’ mathematics achievement shows that internalization of learning is faster and better when learners are actively allowed to participate in their individual assessment as well as permitted to be responsible for their personal learning thus improving learner’s performance. The most significant way to motivate student is through effective feedback provision. Learners will study most efficiently when learning is actively involving them and not perceived as passive receivers of information (Lee, 2006). This means that if teachers can implement the assessment for learning practices effectively then the learner’s performance in mathematics will improve significantly.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The section illustrates the study's discoveries summary on influence of AFL on learner's math achievement in public secondary institutions within Nairobi County. The findings' summary, deductions and recommendations are discussed here. This part is consequently organized into deductions and recommendations.

5.2 Summary of the Findings

Investigation discovered that educators do assess their learners monthly, weekly, every day, yearly and termly. The study also found out that all teachers handling mathematics do use tests in teaching and learning. Some of the tests used by teachers include homework, quizzes and self-assessment. The study established that the performance in mathematics is below average and the research was of great significance to determine if assessment for learning could bring some difference in performance. The findings affirmed that educators do employ assessment for learning approaches though some argue that it has a lot of challenges. This is why the performance in mathematics is still below average and if these challenges are overcome then the performance will be better. The research also revealed that assessment for learning is being used in Kenyan secondary schools and it could be because of the challenges that educators do experience in implementing it is what hinder its effectiveness and not causing better performance in mathematics. Founded on the outcomes, it is apparent instructors understand the indicator of a good assessment. However, some sensitization like seminar is needed to enable some instructors to understand the indicator of a good assessment. The findings also revealed that lack of resources, insufficient time to apply formative assessment approaches, large class size, learner's negative attitudes towards AFL, lack of support from the school authorities, more pressure to teach to the test and learners with special abilities do pose a challenge to the implementation of AFL. On the other hand, the findings identified that lack of independence that allow teachers to be creative in their own teaching, lack of proper teacher training, large class size, school context and teachers background do not contribute to the challenges encountered when putting AFL into practice.

Moreover, it was found that teachers still face other challenges such as learners not doing the work they are given, irregularity in learner's attendance, truancy among the learners, cheating during the assessment and improper revision by the learners. The study established that teachers are trying to do their level best to overcome the challenges they are facing though they still need more support. It was also revealed that active involvement of learners and individualized-assessment have great constructive influence on learner's math performance.

5.3 Conclusions of the Study

From research's discoveries, a conclusion was made that all teachers handling mathematics do use tests in their instruction. Another conclusion was that teachers do face some challenges when trying to implement assessment for learning. It can also be concluded that teachers understand the indicators of a good assessment. The conclusion could also be made that lack of resources, insufficient time to apply formative assessment approaches, learner's negative attitudes towards AFL, lack of support from the school authorities, more pressure to teach to the test and learners with special abilities are certain challenges in the implementation of AFL. It is concluded that lack of independence that allow teachers to be creative in their own teaching, lack of proper teacher training, large class size, school context and teachers background do not contribute to some of the challenges encountered when implementing of AFL. Further conclusion was that learners not doing the work they are given, irregularity in learner's attendance, truancy among the learners, cheating during the assessment and improper revision by the learners are shortcomings encountered when implementing AFL by the teachers. Finally, the study concluded that effective feedback provision, active learner involvement and self-assessment improve learner's performance in mathematics.

5.4 Recommendations for Policy

Grounded on study's discoveries, this research suggested that school authority should support professionals and parents in order to get enough resources for the implementation of AFL. It is also suggested that the content of the syllabus should be reduced so that the pressure to teach to the test can be reduced and the teachers will have sufficient time to inculcate skills which are relevant to real life experience into the learners. The study additionally recommends that more time needs to be spent by the teachers with their learners so as to change their negative attitude towards AFL since

this derails the implementation of AFL. Learners should also be grouped according to their abilities for effective execution of AFL approaches. It is also suggested that educators need to ensure that their lessons contain varied approaches to make ideas clearer, offer opportunities for self-governing schoolroom tasks, and motivate learners who have understood new concepts to assist their colleagues.

It is further recommended that the educators should work very closely with the administration, learners and parents to prevent irregularity in learner's attendance and truancy among the students. Learners should also be monitored closely during assessment for learning in order to prevent cheating and identify the learners with special needs for grouping purposes. Teachers need to revise the content thoroughly to raise the learner's confidence when doing the test.

It was also recommended that active involvement of students is necessary because it promotes skills needed to think critically and solve problems. Additionally, professionals should encourage learners to use self-assessment because it helps in developing vital meta-cognitive abilities which result to a variety of significant learner abilities. Decent feedback needs to be knotted to explicit standards regarding prospects of learners' performance, therefore making the knowledge process clearer, and demonstrating "learning to learn" skills for learners. Accreditation is not the purpose of AF; it requires providing straight feedback concerning the teaching and learning processes and may be helpful to both learners and educators.

5.5 Recommendations for Research

The research examined influence of assessment for learning (AFL) on mathematics attainment in secondary schools within Nairobi County, Kenya. It is proposed that further study needs to be carried out on the female high school students' attitudes towards mathematics as a subject in Kenya. The research suggests that, a repeat of the same study with focus to more counties in Kenya is necessary. The same research can also be repeated in the same county so that the consistency of the outcomes that revealed the pervasiveness of mathematics achievement can be identified. The same research may also be repeated with other subjects.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER TO RESPONDENTS

GEORGE ASEWE
P.O BOX 174 00100
NAIROBI, KENYA.

Dear Respondent,

RE: DATA COLLECTION

I am a student at the University of Nairobi (UON) pursuing Masters of Education in Measurement and Evaluation. I am currently conducting a Research Study on **“Assessment for Learning and Mathematics Achievement in Secondary Schools in Nairobi County, Kenya”** to fulfill the requirements of award of degree of masters of education in measurement and evaluation.

You have been selected to participate in this study and I would highly appreciate if you assist me in responding to all questions as completely, correctly and honestly as possible. Your response will be treated with utmost confidentiality and will be used only for research purposes of this study.

Thank you in advance for your co-operation.

Yours Faithfully,

George Asewe

APPENDIX II: QUESTIONNAIRE FOR MATHEMATICS TEACHERS

Assessment for learning is a technique of learning where learners are completely involved in learning and continuous feedback is given them so as to identify their weaknesses and strong points.

PART A: BACKGROUND INFORMATION

1. How often do you give a test to your learners?

Everyday Weekly Monthly
Termly Yearly Never at all

2. How is the performance of your learners in mathematics?

Very good Good Average

Below average Poor

3. Do you often employ assessment for learning approaches in teaching mathematics?

Yes
No

4. Which forms of assessment for learning do you employ in teaching mathematics?

Self-assessment
Quizzes
Questioning
Homework
None of the above
All
I don't know

5. What's the indicator of a good assessment? Or is there any?

.....
.....
.....

PART B: CHALLENGES ENCOUNTERED BY EDUCATORS WHEN IMPLEMENTING AFL

Tick the most applicable answer from the table below

	Question	Agree	Disagree
6	I always have enough resources to carry out formative assessment		
7	I always have enough time to apply formative assessment approaches		
8	Large class size hinders me from implementing formative assessment		
9	Large class size affects the quality of feedback I give to learners		
10	I comprehend the distinction concerning summative assessment and AFL		
11	My students do appreciate the use of formative assessment		
12	My students do have a positive attitude towards formative assessment technique		
13	School authorities support me implement AFL		
14	My school do give me enough independence to be creative teaching		
15	There is always more pressure to teach to the test than inculcating authentic skills to the learners		
16	Insufficient teacher training is a major hindrance in meeting AFL demands		
17	School context influences your assessment practices negatively		
18	Teacher's background influences assessment practices		
19	Learners with special abilities make it difficult to execute assessment for learning tasks		

22. What do you do to overcome the challenges identified above?

.....
.....
.....
.....
.....

23. Do you have any recommendations for other instructors on how they should assess their classes?

.....
.....

THANK YOU FOR YOUR PARTICIPATION

APPENDIX III: PRETEST**SURDS: 40 MINS: 25 MARKS**

Name.....Admin no.....Class.....Date.....

Instruction**Respond to entire questions**

1. Simplify $\frac{10\sqrt{3}}{\sqrt{5}}$ (2mrks)

2. Simplify $3\sqrt{2x} - 5\sqrt{8x} + \sqrt{72x}$ (2mrks)

3. Simplify $\sqrt{3} (3 + \sqrt{2})$ (1mrk)

4. Simplify $(\sqrt{20} - \sqrt{5})(\sqrt{20} + \sqrt{5})$ (3mrks)

5. Simplify $\frac{2\sqrt{3}}{5} + \sqrt{108}$ (2mrks)

6. Simplify $\frac{\sqrt{147}}{4} \div \frac{\sqrt{27}}{2}$ (2mrks)

7. Express $(\sqrt{6} - 2\sqrt{3})$ in the form of $a + b\sqrt{c}$ (2mrks)

8. Express $(5\sqrt{2} - \sqrt{2})(\sqrt{2} + \sqrt{3})$ in the form of $a + b\sqrt{c}$ (2mrks)

9. Write $\sin 45^\circ$ in the form $\frac{1}{\sqrt{a}}$ where **a** is a positive integer. Hence simplify (3mrks)

10. Simplify $\frac{3}{\sqrt{5}-2} + \frac{1}{\sqrt{5}}$ leaving your answer in the form of $a + b\sqrt{c}$ where a, b and c are rational numbers (4mrks)

11. Simplify $\frac{\sqrt{15}}{\sqrt{5}-\sqrt{3}} - \frac{\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ (3mrks)

12. Simplify the expression $\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$, giving your answer in the form of a + b (3mrks)

13. Simplify $\frac{\sqrt{3}}{\sqrt{3} - \sqrt{2}}$ (3mrks)

14. Simplify $\frac{5}{\sqrt{5} + \sqrt{3}} - \frac{3}{\sqrt{5} - \sqrt{3}}$ (3mrks)

15. Simplify $\frac{4}{\sqrt{5} + \sqrt{2}} - \frac{3}{\sqrt{5} - \sqrt{2}}$ (3mrks)

16. Solve and leave your answer in surd form $\frac{\cos 30 - \cos 60}{\sin 60 - \tan 60}$ (3mrks)

17. Rationalize the denominator and simplify the answer completely $\frac{\tan 60}{1 + \frac{1}{\cos 45}} +$

$\frac{2 + 5 \tan 60}{\tan 60 - \frac{1}{\sin 45}}$ (4mrks)

END

APPENDIX V: POSTTEST – COMMERCIAL ARITHMETIC II – 35mins

Name.....Admin no.....Class.....Date.....

Instruction

Answer all the questions in the spaces provided after each question

1. The laptop's purchase price was Ksh. 60,000. Ksh. 7500 deposit was paid then Ksh 6000 every month for 11 months followed in form of hire purchase.

a) Compute:

i) The value of laptop paid in form of hire purchase; (2marks)

ii) The % hire purchase cost increase in relation to the cash value. (2marks).

b) A firm was given a 5% reduction when buying 25 laptops of the same kind on cash.

Compute amount that the firm paid (2marks)

2. Omondi deposited sh 4500 in a bank which paid compound interest of 12% per annum. Calculate the amount after 2 years (2marks)

3. Find the compound interest on sh 21000 in 5years at 15% (4 marks)

4. Calculate the annual simple interest on € 1600 invested at a rate of 4% p.a (2marks)

5. A farmer bought a machine at sh 11 0000. If the depreciation rate is 15% every year, compute

(a) Machine's cost after three consecutive years (3 marks)

(b) Years it make take for value to fall to Ksh 55 000 (5 marks)

6. Salesman sold a new motor cycle at sh 24000. The depreciation rate was 5% quarterly. What was the value of the motor cycle after 3 years? (4 marks)

END

**APPENDIX VI: STUDENTS SCORES IN PRETEST AND POSTTEST FOR
EXPERIMENTAL AND CONTROL GROUPS**

Experimental cluster				Control group			
Student's code	Pretes t x <u>25</u>	Posttes t x <u>25</u>	Gain/Los s	Student's code	Pretes t x <u>25</u>	Posttes t x <u>25</u>	Gain/Los s
1	21	25	+4	1	02	03	+1
2	16	25	+9	2	04	04	0
3	15	20	+5	3	05	06	+1
4	13	25	+12	4	07	05	+1
5	01	04	+3	5	00	01	+1
6	05	14	+9	6	09	08	-1
7	04	15	+11	7	04	03	-1
8	02	09	+7	8	06	07	+1
9	01	01	00	9	12	12	0
10	09	19	+10	10	01	02	+1
11	03	20	+17	11	10	11	+1
12	03	20	+17	12	06	07	+1
13	05	18	+13	13	02	03	+1
14	01	05	+4	14	01	02	+1
15	01	06	+5	15	05	04	-1
16	03	03	00	16	08	07	-1
17	09	20	+11	17	09	09	0
18	10	19	+9	18	00	02	+1
19	07	06	-1	19	08	07	-1
20	05	08	+3	20	09	10	+1
21	06	13	+7	21	03	03	0
22	06	08	+2	22	17	16	-1
23	00	06	+6	23	08	07	-1
24	04	11	+7	24	06	05	-1
25	04	16	+12	25	12	10	-2
26	04	14	+10	26	10	11	+1
27	09	11	+2	27	11	09	-2
28	09	11	+2	28	16	15	-1
29	03	17	+14	29	06	05	-1
30	03	16	+13	30	04	05	-1
31	01	11	+10	31	02	03	-1
32	02	13	+11	32	06	04	-2
33	03	06	+3	33	07	08	+1
34	01	09	+8	34	02	03	+1
35	03	17	+14	35	08	06	-2
36	12	19	+7	36	02	03	+1
37	14	21	+7	37	01	02	+1
38	06	18	+12	38	09	08	-1
39	16	22	+6	39	04	03	-1
40	17	23	+6	40	02	03	+1
Average	6.425	14.1	+7.675		6.1	6.05	-0.5

THIS IS TO CERTIFY THAT:
MR. GEORGE OTIENO ASEWE
of THE UNIVERSITY OF NAIROBI,
123-100 NAIROBI, has been permitted to
conduct research in Nairobi County

Permit No : NACOSTI/P/19/44822/28759
Date Of Issue : 2nd April, 2019
Fee Received : Ksh 1000

on the topic: **ASSESSMENT FOR
LEARNING AND MATHEMATICS
ACHIEVEMENT IN SECONDARY SCHOOLS
IN NAIROBI COUNTY, KENYA.**

for the period ending:
1st April, 2020



**Applicant's
Signature**

**Director General for Science,
Technology & Innovation**

