

**ASSESSING THE EFFECTIVENESS OF FORMATIVE ASSESSMENT IN
SECONDARY SCHOOLS IN KENYA:
A CASE STUDY OF FORM 3 CHEMISTRY STUDENTS**

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DECLARATION

I Victoria Atieno Owiti hereby affirm that the work given here is entirely mine, and that it has never before been submitted for consideration for any award or degree offered by a university.

Signature



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This project has been submitted for review with my permission in my capacity as University Supervisor.



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DEDICATION

I dedicate this dissertation to my husband and my two sons who have been my rock during the whole of this trip. Your encouragement and prayers was and will always be appreciated.

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First, I would want to express my gratitude to my supervisor, Dr. Karen T. Odhiambo. Throughout this time, she has not only provided me with helpful remarks and support, but she has also served as a source of motivation and inspiration for me. In addition, I would want to use this opportunity to show my appreciation to all of my professors for their direction and assistance with this project, as well as their patience in replying to my emails and queries while I was writing this research. Much appreciation also goes to my colleague students who encouraged me, interacted with me and guided me while writing this project.

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ABSTRACT

The goal of this study was to ascertain how well formative assessment helped students perform better in chemistry. The study's main goals were to find out if formative assessment planning affected students' performance in chemistry; to ascertain the impact of learners' performance in Chemistry on continuous assessment examinations; To ascertain whether formative assessment methods employed by teachers affect students' performance in Chemistry; to ascertain the impact of formative evaluation frequency on learners' performance in Chemistry; and to ascertain whether the use of formative assessment findings affects students' performance in chemistry. The study used explanatory sequential mixed method design. The study was conducted at Parklands Arya Girls High School. The target population will be 250 form three chemistry students, six chemistry teachers at Parklands Arya Girls High School. The study used a census sample strategy that included the entire population. In order to collect primary data for the investigation, we made use of questionnaires as well as tests of continuous assessment. In order to get permission to carry out the research, the National Commissions for Science, Technology, and Innovation were contacted and consulted. Within the survey was a request made to the principal to have the teachers come in for an introduction as well as a training on the confidentiality of the data. The questionnaires were dispersed utilizing the drop and pick later method of distribution. After a week had passed, the finished questionnaires were collected. The data were cleaned, coded, entered, and analyzed with the use of Statistical Package for the Social Science (SPSS) (SPSS, Version 21.0). The method of sampling for the research was a census, and it included the whole population in its coverage. Questionnaires and ongoing assessments were used to compile the study's foundational data. In order to acquire permission to conduct the study, the researcher contacted the National Commissions for Science, Technology, and Innovation. The questionnaire includes a request for the principal to meet with the teachers individually to introduce themselves and provide them with instruction on how to keep student information private. In this case, the questionnaire was filled out in full. Drop and pick later was the method used to distribute the questionnaires. The completed surveys were collected after one week. Processing, coding, entering, and analyzing the data all took place in SPSS 21.0, the Statistical Package for the Social Sciences. According to the findings of the research, educators used formative evaluation in their lesson plans and work schedules. The study found out that through utilization of diagnostic assignments with remediation improved learning tasks for students in terms of acquisition and retention. The study concluded that formative assessment was effective in improving student performance in chemistry at Parklands Arya Girls High School. Assignments test are employed as a method of formative evaluation to track students' advancement in their performance in chemistry, a subject that is fundamental to the educational process. Results are used from formative assessment to gauge student's mastery of practical skills in chemistry and to judge effectiveness in teaching. Teachers need to be encouraged to employ formative assessment in teaching chemistry so as to improve performance. Teachers should adhere to syllabus guidelines when planning for formative assessment. Teachers need to use assignments and tests as a formative evaluation strategy to gauge students' improvement in their performance in chemistry, which is a crucial component of the educational system. The teachers need to put in place classroom assessment and experiments. Self-assessment and peer assessment should be encouraged among students.

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CHAPTER ONE

INTRODUCTION

1.1 Background Information

In every educational endeavor around the world, evaluating students' academic progress is a fundamental stage since it tells us how well certain instructional objectives were met (Farai, Mapaire and Chindanya, 2018). Although testing is a proven method for gathering summative data, evaluation can also refer to drawing conclusions about student performance on "genuine" learning activities, whether the conclusions are drawn for summative or formative purposes (Darling-Hammond, 2017). Formative and summative evaluation strategies that are carefully thought out are essential to the continuous quality improvement of formal education. Learning happens within a system and in a context (American Institutes for Research, 2016).

Evaluation can have a formative purpose that aids both teachers and students in improving their learning. Formative evaluation is a strategy that may be used by both students and instructors to help pupils improve their knowledge while they are still in the process of acquiring that knowledge (Darling-Hammond, 2017). Formative assessment is diagnostic, showing what students don't know as well as what they can do. It has been demonstrated that formative evaluation is very effective at raising students' achievement levels, increasing the equality of their outcomes, and enhancing their learning capacity (AQAPUE, 2017).

When using formative assessment in the classroom, the course material or subject matter is dissected into granular levels for more effective teaching, each unit's goals are outlined, and valid, formative assessments are created and given, Students who are behind in a subject are

given the opportunity to catch up via group-based remediation before going on to subsequent topics, and once all of the modules have been covered, a final exam will be given. Students are able to more effectively study for examinations when a topic or course is broken down into more digestible chunks. In addition, because of the frequent testing, the students' involvement and dedication to the teaching-learning process are improved, which also contributes to an improvement in the students' overall performance. The use of formative assessment strategies has been of great assistance in elevating overall levels of student achievement (BOSTES, 2016).

According to Eurydice (2018), formative assessment is advantageous to instructors as well as students (to identify learning issues and recommend appropriate interventions). In addition, formative evaluation is beneficial to students (as means of locating the specific difficulties that the students are experiencing within subject matter content and forecast summative evaluation result). In order to overcome learning inadequacies, plan corrective action, help motivate students, and improve retention and transfer of knowledge are the three main goals of formative evaluation. They suggested that formative test responses from students may be examined to identify collective and individual flaws that needed to be fixed (Jenkinson and Benson, 2016).

A number of aspects go into planning for FA, including identifying the learning topics to be assessed and educating students on the regulations that must be followed during the assessment (Kitchen, 2019). Planning FA also entails deciding on the locations for the exams, how long they will last, and how they will be monitored (MacPhail, Halbert, and O'Neill, 2018). There is, however, a dearth of information regarding how Parklands Arya Girls High School pupils' chemistry performance is impacted by FA planning.

Formative assessment techniques include methods used to assess students after identifying the learning concepts to be assessed. Appropriate assessment techniques are employed by teachers to determine the quality of student feedback (Maghnouj, 2020). Self-assessment, teacher- and student-assessment, peer- and student-assessment, and evaluation based on students' actual performance are all examples of IA techniques (Maier, 2019). One of the independent factors of FA method explored in this research was the frequency with which teachers used each of these four forms of FA.

McClarty and Gaertner (2017) looked at how well cognitive entrance traits and formative exams reflected academic achievement in college students, and they discovered that formative evaluations were the most predictor of academic performance. Reported to show that A Joint Admissions Board of Admissions (JAMB) will be considered. Cognitive admissions characteristics [West African School Certificate (WASC) and College of Technology and University Entrance Examination (PCEE)] reported that it was not significantly associated with mathematics and academic performance, as was found in a similar study conducted with college of technology students by Ajogbeje (2019). Students who do well in mathematics on the WASC and PCEE examinations tend to place too much stock in their test results, which may have a negative impact on their overall performance in the subject. Results from semester-long assessments were the best predictors of long-term success in chemistry, according to the study.

The findings of the formative assessment are used to provide the student feedback after the instructor has evaluated the student's work in the following ways: It helps students improve on assessment problems, motivates them to study harder in class, fosters higher-order thinking, and

inspires them to take on more independent assignments (Ministère de l'Éducation Nationale et de la Jeunesse, 2017). Students' ability to self-evaluate and take responsibility for their own learning is bolstered via FA's emphasis on feedback (Muskin, 2017). Teachers use assessment data to inform instructional choices that benefit kids, their families, and other stakeholders (Peterson, 2018). This implies that with the help of FA, educators may modify and enhance their methods of instruction, boosting both students' enthusiasm for and aptitude in the science subject of chemistry. Therefore, this study aimed to provide information on how the use of results from FA affects the performance of chemistry students.

According to the Ministry of Education National and Youth (2017), Education for All (EFA) in Thailand calls for specific goals for quality improvement, which include the requirement to evaluate student success. This is why it was suggested in the 1992 White Paper on Education for National Integration and Development that schools establish a cumulative record card on continual internal review, which would include student performance in each class. Since then, teachers in secondary schools have been continuously assessing their students' progress toward their A-Levels throughout the year, rather than waiting until the conclusion of each semester or academic year.

The issue of secondary school students in Somalia performing poorly in mathematics has continued for a very long time. According to the data that is currently available, Somalia's secondary school pupils do as poorly in mathematics as children in other nations. Out of 270 pupils (in one school) who took chemistry in the academic year 1982–1983, 19 of them passed, according to a high school mathematics teacher. About 93% of attempts will fail as a

consequence of this. Average performance was also quite poor. There were 232 pupils from Mogadishu's Imam Shafi'i Foundation who appeared for their secondary school leaving exams in 2005-2006, and the school's examination board reports that 113 of them did not pass. In fact, this is responsible for over half of the explanatory power (48.7%). In Somalia, if a student earns less than a 50% on a given assignment, they are considered to have failed the course (Bridgeman, 2018).

To review the educational system in Uganda, the Education Policy Review Commission (EPRC, 2018) was established. The group recommended that the two years of Advanced Level (A Level) secondary school be preserved in order to give students who wanted to pursue further education more time to prepare. The same commission underlined the value of both final exams and ongoing assessment (EPRC 2018).

According to the Cross-Sectoral Assessment Working Group (2011), formative assessment's primary purpose is to help both students and instructors improve their knowledge and skills. As a result, FA is put at the forefront of all other elements affecting students' academic performance in chemistry (Kiplimo, 2020).

Because FA practice is an essential component of teaching and learning, poor performance in physics raises questions about how FA is carried out. In light of this, one can question whether the manner FA is practiced at Parklands Arya Girls has an impact on the pupils' subpar performance in chemistry. What was unclear was how the chemistry FA is planned, how the different Bloom's taxonomy cognitive domains are balanced in the chemistry FA tools, the extent

to which teachers use the different chemistry FA techniques, how the results of the chemistry FA are used, and how they affect Parklands Arya Girls students' performance in chemistry.

Based on these factors, the study was carried out in order to uncover additional details about the shortcomings of teachers' FA in chemistry and to suggest improvements. It is hoped that the study's recommendations will assist in resolving the issue of Parklands Arya Girls secondary school's subpar chemistry performance.

1.2 Statement of Problem

There is evidence that shows how much of an effect a well-articulated formative assessment model of assessment may have on students' performance across a variety of subject areas (Stinggins 2002). For example, Black and William's (2000) systematic study discovered that formative assessment aids in enhancing both student learning and student accomplishment. While research suggests that formative assessment improves student performance across the board and enables students to track their learning progress (Ogange et al., 2018; Hasim and Barnard, 2018), very little research has been done in the context of chemistry as a subject to determine the efficacy of this assessment strategy. Within the Kenyan context, there were no studies conducted to establish whether formative assessment is an effective classroom assessment strategy within Kenyan secondary school. Chemistry is an experimental subject that has to do with observation, recording and making intelligent inferences. Given the experiment nature of chemistry as a subject, it is important to determine whether formative assessment can help achieve optimal student achievement in the subject. Additionally, it is unclear whether or not students, particularly those learning Chemistry, believe formative testing to be helpful. The researcher proposed an experimental study to find out how students perceive the use of formative

assessment in chemistry and whether it is a useful tool for raising student performance in order to fill the existing gap in contemporary Kenyan literature on the effectiveness of formative assessment in Chemistry as a subject.

1.3 Purpose of the Study

The purpose of this study was to determine the effectiveness of formative assessment in improving student performance in chemistry.

1.4 Objectives of the Study

The study focused on the following objectives:

- i. To determine if planning of formative assessment influence student's performance in Chemistry.
- ii. To determine the influence of continuous assessment tests on learners performance in Chemistry
- iii. To find out the influence of frequency of formative evaluation on learners performance in Chemistry
- iv. To determine if techniques of formative assessment used by teachers influence students' performance in Chemistry
- v. To find out if the use of results from formative assessment influence students' performance in Chemistry.

1.5 Research Questions

- i. How do planning of formative assessment influence student's performance in Chemistry?

- ii. To what extent do continuous assessment tests influence learners performance in Chemistry?
- iii. To what extent do frequency of formative evaluation influence learners performance in Chemistry?
- iv. How does techniques of formative assessment used by teachers influence students' performance in Chemistry?
- v. How does feedback on formative evaluation influence learners' performance in mathematics?

1.6 Significance of the Study

This investigation of the efficacy of formative assessment in chemistry is significant since it helps determine the best teaching strategies. Closing the realization gap will require a deeper look at students and how they perceive their learning since formative evaluations are used in roughly 60% of Kenyan schools (Ogange et al., 2018). A deeper knowledge of how teachers employ formative assessments to enhance learning outcomes and how students view the assessment in terms of advantages and applications will be provided by the study. The results of this study could inform the design of professional learning opportunities for educators that help them adjust their methods to better serve the diverse needs of their students. This type of learning advancement has the ability to impart many qualities of a researcher onto the teaching profession, thereby changing how sciences are taught (Arrafii and Sumarni, 2018). The most successful and efficient formative assessment techniques will be made available to teachers, enabling them to use them.

1.7 Justification of the Study

Instead of examining how formative assessment impacts student growth and teaching strategies, the majority of studies on the subject have centered on how teachers use it in the classroom. Moreover, few studies have focused on how successful formative assessment is in the topic of chemistry, and even fewer have looked at how students feel about formative assessment (Ogange et al., 2018). According to Zeng et al. (2018), more research is required to examine the students' perceptions of formative assessment, particularly with the increasing popularity of formative assessment in science education. Without a doubt, there is more to learn about how students perceive and use formative assessment in their learning process. This lack of adequate research indicates a need for a new study and a more detailed examination at student perceptions, to understand the effectiveness of formative assessments (Dix, 2017). If formative assessment encompasses teachers/instructors changing their teaching practices based on student knowledge, then comprehending the how and why specific approaches of formative assessment are effective for students is vital.

1.8 Limitations of the Study

Since only one secondary school in Kenya participated in the study, it is possible that the sample is not representative of all secondary schools in Kenya. Therefore, the principal findings of this research may not be transferable to other secondary schools in Kenya. Due to the short time allotted for the research, it was also challenging to cover a significant portion of the population. Due to issues with the instruction language, some pupils could also be unable to grasp the questions. For such students, the researcher was ready to explain and interpret questions.

1.9 Delimitations of the Study

The study focused on secondary schools in Nairobi County and looked at how formative evaluation affected student achievement. The study was only done at a few secondary schools because Nairobi County has so many schools. This required employing questionnaires and tests to gather data from principals, deputy principals, teachers, and students. The study concentrated on the body of work that already exists on formative assessment.

1.10 Basic Assumptions of the Study

It is assumed that all teachers are well trained and have good mastery of the subject content. In addition, it is the assumption of this study that all the various textbooks that are used in the mathematics classroom are of acceptable quality and that the time allocated to the topics of study was equal in all cases. Additionally, it is thought that all students have similar educational backgrounds and that any learning discrepancies are directly related to the interactions that students have in the classroom. Although the study was conducted in a rural area, it is believed that external factors like the socioeconomic state of the community have the least impact on the learning surroundings. Furthermore, it was anticipated that the respondents gave truthful answers to the questionnaire, that all documents requested by the researcher would be produced, and that the end-of-term math exams would be legitimate and dependable.

1.11 Definition of Significant Terms

Assignments are tasks that students' teachers give them to accomplish outside of class time.

The continuous assessment test is a method that aims to offer information on the performance of pupils that, once analyzed, allows the evaluators to make further adjustments.

Direct Instruction- The teacher leads formal face-to-face academic instruction, telling, modeling, demonstrating, and teaching the ability that has to be taught. The instructor is the crucial word here since they control the learning environment and guide the lesson. The indirect instruction is what this definition defines as the opposite.

Educational administrators - refers to all individuals involved in overseeing educational programs in schools, including secondary school principals and the Ministry of Education's Inspectorate Department.

Evaluation- the capability of analyzing information to reach judgments, conclusions, and decisions.

Feedback is information on how people react to a product, how well someone performs a task, etc., used to inform improvement.

Formative assessment is to improve students' learning by allowing teachers and students to identify and respond to developments in student understanding while instruction is in progress.

Frequency the frequency with which something happens or is repeated throughout a specific time period, or in a specific sample.

Learner is someone who is learning about a specific subject or a specific skill.

Learning Resource is anybody who creates a situation that makes it possible for a learner to acquire knowledge, an attitude, or abilities.

Pedagogical Practices - These are common teaching techniques related to structuring the classroom and providing differentiated learning opportunities.

Performance - denotes the student's capacity for critical thought, logical reasoning, and problem-solving, which is demonstrated by the grade received on the mathematical tests.

Teacher assessment - refers to the procedure of gathering and giving the learner information about how well they performed on learning activities created and used by the teacher of the learners.

1.12 Organization of the Study

The report has five chapters. Chapter one outlines the context of the study including the background, statement of the problem, study objectives, research questions, significance of the study, justification of the study, limitations and delimitations, assumptions of the study and definition of significant terms.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The usefulness of formative assessment is discussed in this chapter in relation to the literature that is currently accessible. It explains how this field of study has changed recently. The review process includes selecting the most important data, reviewing it critically, and applying the conclusions to the study questions. Both the research design and the research objectives were influenced by the review's findings. The method used in this literature review essentially aims to determine what is known about formative assessments, specifically with regard to their efficacy in chemistry.

2.2. Concept of Formative Assessment

The phrase "formative assessment" is not new and has numerous definitions. According to Black and William (2018), formative assessment is the process through which educators and learners alike reflect on their performance and provide data that may be used to influence adjustments to instruction. Examinations, exams, and required readings are not the only things included in this broad category. Assessment is the process of gathering evidence of student learning via many means, such as portfolios, notebooks, talks, questions, interviews, work samples, and standardized examinations. They defined formative assessment as a kind of evaluation in which the findings are utilized to adjust teaching methods to better meet individual students' needs. The major difference between summative and formative assessment is what happens to the findings. The major difference between formative and summative assessment is what happens to the data once it has been collected. The results of these examinations are used to show the student where

they stand in relation to their peers and to what extent they have mastered the learning goals being tested. The information acquired via formative evaluation is used to pinpoint the areas in which the learner is deficient and provide solutions.

Assessment for learning, as defined by Stiggins and Chappius (2016), is a formative assessment methodology that incorporates students into the grading process by having teachers set learning goals for the class based on state or district benchmarks. After that, such goals become solid criteria for making decisions. Through role models of achievement and high-caliber work, as well as the use of descriptive rubrics, the students share and comprehend the vision of the successful outcome. The teacher gives the student feedback, either verbally or in writing, outlining where they are on the learning continuum for the target and giving them precise instructions on how to close the gap.

According to the CCSSO, formative assessment is a process through which instructors and students receive feedback to adjust ongoing teaching and learning in order to maximize students' achievement of targeted educational goals. This definition was employed in the present investigation. This study set out to investigate whether or not the practice of formative assessment may help more students reach their learning goals (Cowie & Moreland, 2015). The CCSSO was revised to include the five cornerstones of formative assessment: learning progressions, learning goals, descriptive feedback, self and peer evaluation, and collaboration (Cowie & Moreland, 2015). The initial wave of formative assessment studies looked at the data collected by the classroom educator, the school, or the district to better the previous school year's curriculum and/or instruction. It was emphasized that the primary end user of the data collected

would be the teacher. Heritage Publishing Group just released the first major research findings on this level of formative evaluation (2016). These results outlined the potential impact of formative assessment on education outcomes including student performance in tests.

Since the publication of the study by Shepard, Penuel, and Davidson (2017), there has been a renewed interest in the study of formative assessment and the student-centered version sometimes referred to as "assessment for learning." Instead of focusing only on the teacher as a user of formative assessment, this new wave of interest and study shifted the focus to the student as the main and most important consumer of the data collected. This marked a major departure from the earlier focus and study of formative evaluation. It is widely acknowledged that the most important findings from this second wave of research on formative assessment were published by Black and William (2018). They conducted a comprehensive meta-analysis on assessment and classroom learning.

They presented data from many studies that showed how giving students frequent feedback on their progress may lead to significant improvements in both individual and group performance. In addition to the formative evaluation strategies that were used by the instructors, they investigated the responsibilities that students play in both self and peer assessment. From the original collection of 681 publications that went into their metaanalysis, 250 were selected to be included. The results of this selection were reported in a later piece which was published and given the title "Inside the Black Box: Raising Standards via Classroom Assessment" (Black & William, 2018).

2.2.1. Attributes of formative assessment

Shepard, Penuel, and Davidson (2017) conducted a meta-analysis of studies on classroom assessment approaches. The study's overarching goal was to better understand how students' performance is related to classroom assessment procedures.

The review by Crooks compiled information on the effects of student evaluation in the classroom. According to Crooks, the assessment process that takes place in the classroom is "... to the extent as they are based on the kinds of activities that form an integral element of the courses in which the students are enrolled." There is a possibility that time will be spent on these responsibilities both within and outside of the classroom.

This description covers a broad range of activities, from professors asking students open-ended questions to formal tests they've developed and given to examinations that are an integral part of the curriculum (complete with additional questions and exercises) (cognitive and expressive).

His research on the value of classroom evaluation and how it impacts students has been summarized by Shepard, Penuel, & Davidson (2017). His analysis of the literature led him to the conclusion that student evaluation in the classroom affects their priorities for learning, their motivation to study, their sense of their own competence, their ability to determine what and how much to study, the consolidation of their knowledge, and the development of their learning strategies and skills. In his article, Crooks claims that student assessment "appears to be one of the most critical components shaping teaching." The process of evaluating students in a classroom is heavily dependent on the ability to recall individual bits of knowledge; nevertheless, studies have shown again and again that such fragments of information or specifics are simple to

forget in the absence of a reminder. Shepard, Penuel, and Davidson's (2017) evaluation of the literature revealed this larger setting or structure. More troubling is the emphasis placed on knowledge base data yet, based on Crooks' analysis, developing skills and habits are more important than amassing knowledge. The studies Crooks looked at show a discrepancy between the weight given to higher-order thinking, learning transfer, and the judgment of such thinking.

The formative assessment techniques of 24 instructors were examined in a study by Heritage (2016) to see how they affected student progress in UK schools. Training on the use of formative assessment as an intervention was provided to teachers over the course of many full and half days. Following the instructors were watched throughout the school year and after a review of their curriculum and lesson plans, the next step was to evaluate the degree to which formative assessment processes had been integrated into instructional preparation. Students' average scores increased significantly across all courses, as measured by their performance on the school's own locally administered standardized assessment and the "National School-Leaving Examination" (GCSE) taken by students in previous or concurrent classes. The data from pupils' success on both tests led to this conclusion. Accomplishment scores on standardized examinations administered by a national governing body were shown to coincide with the outcomes (Heritage, 2016).

According to a study that looked at the effects of using formative assessments in several Scottish primary and middle schools, it was discovered that students exhibited higher levels of responsibility for their own education, as well as higher levels of motivation, confidence, and overall academic achievement. Studying the effects of Project One of the Assessment for

Learning Development Programme was done by Andrade and Brookhart (2016) in a total of 16 primary schools and two middle schools in Scotland. Scottish national learning and education organizations have provided these educators with extensive professional development in formative assessment procedures via seminars, learning communities, and other means. Teachers were given discretion over whatever formative assessment procedures they wanted to use and track data for. It was hoped that at the end of the project, teaching strategies, parent engagement in their children's education, student engagement in their own education, teacher perspectives on assessment, school climate, and other factors would have all been enhanced. The research set out to quantify the degree to which these factors were deemed to have been affected by the project at hand. Self-evaluation, action plans, teacher diaries, and case study reports were reviewed; field excursions were taken to verify data; staff interviews and student observations were conducted; and courses were observed.

According to the data that was collected, the participants considered that the project had a favorable influence on students, instructors, and pedagogy, but that it had only a small effect on including parents. Based on the results of the final assessments, each of the 33 schools agreed that the initiative was a success. According to all of the data that was collected, it looked that 14 schools had implemented the strategies, 14 schools had made enough progress, and 5 schools appeared to have fallen short (Andrade & Brookhart, 2016).

The Gainesville School District in Georgia used standardized criterion-referenced competency tests to measure achievement on measures of Adequate Yearly Progress indicators in mathematics. According to research by Dix (2017), frequent formative assessments can predict

achievement on these indicators. Over the course of three years, Smith conducted study with 2,900 middle school students in one school system. After doing an analysis on the data, it was found that the outcomes of the quarterly posttest formative assessments were a trustworthy indication of improvements in the AYP measuring test administered by the state. If the quarterly score on the post-formative test goes up by one unit, one may reasonably predict an increase in the level of success attained by the students. The study model was able to correctly anticipate an impressive 84.87 percent of the outcomes for the participants (Arrafii and Sumarni, 2018).

2.2.2. Formative evaluation on learner performance

Any educational system must include an evaluation of pupils' development and their overall level of success. A valid formative test is used in the classroom to determine whether or not students have learned the material before moving on to the next unit of instruction, and then students who need extra help can receive it in small groups before moving on to the next unit. Finally, a summative test is given after the entire course has been taught and learned. According to Kiplimo (2020), providing students with the ability to break down a topic or course into more digestible chunks allows them to better prepare for recurrent examinations. In addition, the administration of these evaluations on a quarterly basis provides a mechanism for motivating students to participate actively in the teaching and learning process, therefore enhancing the students' academic standing. Therefore, the "6-3-3-4" system of education's requirement for regular testing of student aptitude substantially aids in determining how well pupils are doing and may also be used to enhance learning.

During the instructional process, the purpose of exams and other evaluation tools is to steer, guide, and track students' learning and progress toward achieving course objectives (Ajogbeje, 2019). Without proper knowledge of a student's current situation and the amount of his progress toward the fulfillment of instructional goals, teachers and students cannot function efficiently or successfully. Therefore, the tests administered on a regular basis as part of continuous assessment are meant to counteract the negative impacts of a single exam (summative test), which is often administered at the conclusion of a course of study. Particularly pertinent to the teaching-learning environment are aspects of continuous assessment such as the frequency with which teacher-learner accomplishments are reported, the implementation of instant feedback of student performance, and the focus on how the results of these in-course assessments should be coupled with those of terminal assessments to determine the particular learner's ultimate output.

According to Mory (2017), feedback is the details an instructor gives a student on how well they performed on a certain activity or test. He continued by saying that when such knowledge is given, the student in question starts to grasp his or her talents and might also start to have a different perception of himself or herself. Research has demonstrated that feedback offers two benefits: a reinforcing effect and information for correction (Mory) (2017). According to Ajogbeje (2019), part of the formative evaluation process is giving students feedback on their test results or performance. According to Kitchen (2019), there are two circumstances in which feedback does not fulfill its facilitative function. One, if the learner can access the feedback quickly before responding; and two, if the learner finds the course material to be extremely challenging. He continued by saying that in the absence of these circumstances, one would assume that studies based on both theories concurred that performance feedback aids in both

confirming accurate responses and identifying and correcting errors. Feedback's ability to correct responses is likely its most significant feature, and if given a choice, it is likely that feedback supplied in response to incorrect responses has the largest positive impact. Feedback was therefore employed in this study as a technique of enacting correction and bolstering students' learning.

In contrast to Eurydice's (2018) opinion, Kitchen (2019) said that feedback from exam results may have an impact on a student's motivation, self-confidence, and anxiety level. According to Jenkinson and Benson (2016), a person who receives feedback regarding a test they did well on may start to become interested in the subject and may continue to look into strategies for succeeding on other activities. On the other side, a poor performance review could have one of two outcomes. One possibility is that the pupils will use it to make corrections and work hard on upcoming exams. It so has a favorable effect on him. Two, the person may decide to accept defeat and could start to feel inadequate of the theme. He or she would thus keep doing poorly and start to lose interest in the subject of study. These studies' conclusions have an impact on secondary school teaching and learning. They emphasize the necessity for the educational system to implement a formative testing technique that is effective and includes feedback.

A person's perspective on a test also affects their performance on that exam, as stated by Kitchen (2019). He said he was willing to accept the results and take necessary action if the individual thought the test was correct. In contrast, he could try to explain away his talents if he thinks the tests don't fairly represent his true potential. Therefore, test results that don't reflect what students anticipate or think of themselves have a detrimental impact on their academic achievement.

According to MacPhail, Halbert, and O'Neill (2018), inadequate subsequent learning and inferior retention of what has been learned are both related to ignorance about performance on an earlier assignment. Maier (2019) further asserted that a lack of performance understanding the pupil may become anxious while working on a task. This is due to the fact that he or she would be unable to evaluate his or her aptitude and competency for the job. All of these findings have the implication that test feedback is effective inasmuch as the student believes the results reflect his objectives.

Test results only help students learn when they make an effort to do well and when they prefer to take ownership of their accomplishments and mistakes rather than placing the blame on outside circumstances. Information about a student's score alone might not be sufficient to improve performance if they have no set goals. BOSTES (2016) and Ajogbeje (2019) noted that the majority of the research studies they assessed included tasks that required straightforward calculations are incomparable to an academic subject's intricate requirements. While the technique used included dividing students in the sample into treatment groups based on factors like ability, pretest score, or prior performance, the sort of feedback students received on their performance in most of these research was skillfully led. The exercise was then handed to the students, and after they completed it, they received random feedback rather than a true score for their effort.

According to the treatment group, participants in some research received random scores (Bridgeman, 1974); in other studies, random phrases like "Excellent," "Good," "you have tried," etc. were used before a post-test was given and achievement levels were compared among the

experimental and control groups. Because of this, it's conceivable that some students received results that they thought didn't accurately reflect their aptitude, which hurt their confidence and performance on following exams.

Finally, research on how feedback affects subsequent performance on a task has shown mixed results. It's possible that the study's original point of view has to be expanded. It's possible that the feedback effect is influenced by other elements of the learning environment. The majority of our school systems frequently have teachers hoard student scripts in their offices, only to have them quickly distributed to market hawkers or burned after some time. Students occasionally receive comments on their performance following the completion of the relevant final exams. Such feedback is hardly ever helpful in boosting a learner's Chemistry performance.

2.3 Planning of Formative Assessment

Planning for formative assessment entails a variety of tasks, including laying out the guidelines and standards by which the assessment will be carried out and getting students ready for the test. Lesson plans and other professional documents used by teachers, such as programmes of work, also include planning for FA.

There are some guidelines that should be followed when preparing for FA, such as safeguarding the wellbeing and safety of students, according to the prescribed procedures, and grading students' work honestly and fairly (Nitko, 2004). In order to prevent any outside intervention that could jeopardize the validity and credibility of the assessment, teachers are required to inform the students of the established methods and conditions before administering the examinations.

The creation of test materials is a crucial area of interest in the planning for formative assessment. When giving evaluations, teachers must provide students with a certain set of tools so they can accomplish the assignments (Case, 2003). Enough paper, pencils, calculators, mathematical tables, tools, timers, and formulas are just a few of the supplies that need to be available. Additional supplies that kids might require should be kept on hand and made available as needed (Case, 2003).

Planning for formative assessment also entails getting students ready for testing (Nitko, 2004). According to Nitko (2004), in order for students to demonstrate their full potential on evaluations, instructors should provide them with the information they need, such as the date and time of the exam as well as the subject matter that will be graded on it. Students may be better prepared for standardized tests if their schools train them on test-taking tactics such as how to write replies that are clear and succinct, how to arrange their answers in an orderly fashion, and how to pay attention to both written and spoken instructions (Oosterhof, 2001 and Nitko, 2004). In addition, in order for instructors to be able to conduct out meaningful formative assessments using what is to be evaluated, they need to make sure that there is a relationship between what is to be taught, the learning result, and the ideas that will be taught (Tanner and Jones, 2003).

Wambugu (2009) found that the majority of respondents (73%) plan for FA after teaching a particular topic in his study on planning for mathematics assessments. In this instance, the majority of teachers (63%) use learning material rather than the topic's objectives as they need do

while planning for FA. The study also revealed that most instructors (53%) hardly ever plan for formative assessment in mathematics using plans of work.

The majority of respondents (mean=4.9) felt that FA is crucial for boosting students' success in the subject in a study similar to the one done by Njeru (2015) on the impact of continuous assessment exams on learners' performance in mathematics.

Another investigation by Opula (2012) found that the following factors—inadequate teacher numbers, a lack of laboratories, and a lack of reference materials—have an impact on students' subpar performance in the KCSE. Additionally, it was discovered that learners' performance in the KCSE was adversely impacted by teachers' inability to mark students' assignments due to work overload and learners' inability to complete their assessment activities.

The researcher aimed to gather data on a number of topics from the literature examined in this part in order to fill in the gaps in the body of knowledge. For instance, Wambugu's (2009) study on preparing for FA did not look at additional factors that should be taken into account, like adhering to the requirements of the curriculum, evaluating students after each lesson, providing learners with assessment tools, explaining the purpose of an experimental assessment before the experiment, and arranging FA in the lesson plan. The aforementioned variables were examined in this study.

Additionally, Njeru's (2015) study revealed that the majority of respondents (mean=4.9) concurred that FA influences students' performance in mathematics. On the other hand, nothing is known about how FA affects students' success in physics. This study aimed to fill in the gaps

with this knowledge. Finally, the impact of FA on students' performance on the KCSE was not explored in the material examined in this section. Therefore, the focus of this study was on how FA affect students' performance, notably in physics.

2.4 Continuous Assessment Tests

According to William and Black (2003), "continuous assessment exams are a strategy that aims to give evidence about students' performance (achievements)," which when understood helps assessors take measures for future improvements. The idea of using formative assessment in various contexts is one of the alternate methods of assessing and teaching. Continuous assessment assessments, which incorporate multiple methodologies, can improve teaching and learning by giving students a more targeted application. The technique of capturing data during a lesson in order to inform teaching and learning is known as continuous assessment. Both teachers and students must elicit, analyze, and use the evidence for it to be called formative (William, 2011). Summative evaluation, on the other hand, is used to assess learning and performance, give grades, and provide feedback programs. In order to decide what to do next, continuous evaluation assessments require gathering the best data about what the pupils have learnt.

The line separating instruction from assessment becomes more hazy in a classroom when tests used for continuous evaluation are used to enhance learning. Everything students do, including group discussions, seatwork, questions and answers, projects, turning in homework, and even sitting silently and acting perplexed, has the potential to reveal how much they comprehend (Leahy, 2005). When classroom practice is based on continuous assessment assessments,

teachers and students work together to establish norms for student learning, define what it means to make progress toward predetermined mathematics learning goals, and establish a shared vision of continuous and progressive development. An essential technique for concurrently enhancing student performance and classroom instruction is the continuous assessment test (Petit & Zawojewski, 2010).

An increasing corpus of studies emphasizes the use of classroom instruction's continuous assessment exams as a way to raise student achievement. Greater student achievement has been observed, according to Black and Wiliam (2002), in classrooms where teachers employ these strategies. A meta-analysis reveals same results (Ehrenberg, 2001). In instance, they claim that class size reduction has a four to five times smaller influence on student accomplishment than do continuous assessment exams. According to research by Clements, Sarama, et al. (2011), professional development centered on and the usage of learning progressions in education lead to improved student accomplishment. The results also imply that using continuous assessment exams with an understanding of learning progressions could improve the interpretation of proof of student effort to support learning and education.

The correct classroom climate must be maintained in order to successfully conduct continuous assessment testing for all pupils. Success must be encouraged in the classroom instead of rivalry. The teacher's conviction that all pupils are capable of success serves as the cornerstone of this culture. If the information from quizzes, homework assignments, class discussions, and any other form of assessment utilized for formative purposes is communicated to individual students in this kind of classroom, it can have a significant impact on their learning. Continuous assessment tests

should be used everyday, according to Chappuis and Chappuis (2008), who claimed that the purest form of formative evaluation entails "no final mark on the paper and no summative grade in the grade book."

2.5 Frequency of Formative Evaluation

The sort of assessment utilized determines how well students perform in any topic, therefore assessment must closely align with learning objectives. One of the most important decisions is the assessment type to choose. In order for assessment to be genuinely effective, it must also be "formative," which means it must identify and address the students' learning needs (Clements et al. 2011). Formative assessment is used in classrooms where teachers routinely and actively check for student knowledge. Because of this, teachers may tailor their lessons to the requirements of individual pupils and encourage their students to reach higher benchmarks. When students are involved, teachers help them build skills that will benefit their education.

In a review of 21 controlled trials, Fuchs and Fuchs (1986) looked at how frequently giving children formative feedback affected their academic performance from kindergarten through grade 12. Between two and five formative assessments per week were administered by teachers in these trials. The average effect size for classrooms that utilized formative assessments but did not systematically arrange the generated data was 0.26 S.Ds, while it was 0.70 for classrooms where teachers used student data to create individual progress reports and adjust instruction based on those reports.

Research on curriculum-based evaluation Fuchs, Fuchs, and Hamlett (1989) investigated the outcomes of giving students monthly or biweekly tests in reading, math, and spelling in addition to obtaining computer-generated graphs of their progress and advice on how to improve. Students in classes where instructors provided graphical reports on their progress and made recommendations for improvement made greater gains and had better outcomes than students in classes where instructors did not provide instructional suggestions or students in a control group. Teachers said that they were able to spend more time on individual students and on encouraging peer-to-peer learning as a result of using the assessment, reports, and instructional suggestions.

Bergan et al. (1991) studied the effects of an 8-week assessment and instructional planning system on 838 kindergarten students from low-income households. Students had to prove their knowledge of increasingly challenging activities in science, reading, and math for the examinations. Every two weeks, teachers gave the tests, and they worked with a researcher to analyse the results and develop lesson plans. Use of the exam significantly reduced special education referral and placement even in this brief time frame. In the experimental group, one out of every 17 pupils was referred to special education, and one out of every 71 was eventually placed. One of every 3.7 students in the control group received a referral, and one out of every 5 were placed.

The frequency of progress monitoring has a favorable effect on student outcomes, according to a study that looked at how progress monitoring affects the assessment of K–3 kids' literacy skills across a sample of 200,000 students (Hupert, Heinze, Gunn & Stewart, 2009). Smaller effect sizes were seen in areas where progress monitoring administrations were less frequent. Greater

effect sizes were observed in areas where progress monitoring administrations occurred in greater numbers. Effect sizes were highest in kindergarten for the infrequent progress monitoring condition (averaging 3 evaluations per year) (ranging from 0.26 to 0.71). Effect sizes ranged from moderate to high in the frequent situations (with the greatest gains occurring in grades kindergarten and first) (ranging from 0.40 to 1.25). Students' mathematical proficiency grows in tandem with the frequency of formative assessments.

2.6 Techniques of Formative Assessment

Teachers and students both benefit greatly from the information provided by formative assessment, making it an integral aspect of the educational process (Goodrum, Hackling, and Rennie, 2001). Therefore, quality and relevant formative assessment procedures should be employed for effective teaching (Nenty, 2005).

Teachers should use a variety of evaluation techniques during formative assessment to gauge students' comprehension of what has been taught (Ajogbeje, 2012). This can be accomplished by utilizing evaluation strategies like performance-based assessment, peer assessment, self-assessment, and classroom assessment.

2.6.1 Classroom Assessment

Classroom assessments (CA) entail a methodical procedure for gathering data regarding what a student is able to do, what he or she knows, and what they intend to do (Reynolds, Livingstone, and Wilson, 2009). Teachers may empower and motivate children to learn by using classroom assessment. Teachers can acquire data that can be utilized to provide constructive feedback to

students by utilizing a number of exam technologies. As a result, kids will learn more successfully. This information may also be utilized to assess each student's unique needs and enhance how instruction is delivered (Marriot and Lau, 2008). Additionally, McMillan (2008) discovered that it is crucial to evaluate pupils in the classroom since it helps with making quick decisions. This implies that educators must be in command of classroom assessment by knowledge of the frequency of doing it, selection of the assessment method, and timing of providing feedback to students.

2.6.2 Self-Assessment

Self-assessment is mostly used to help students to evaluate their own work by evaluating their learning's strengths and faults (McMillan and Hearn, 2008). Therefore, students may use self-assessment as a means of self-governance and self-tracking of development (Andrade and Valcheva, 2009). According to Ross (2006), for self-evaluation to be useful, both students and instructors need to talk about and agree on the criteria that will be used in the assessment and the process through which students will get feedback. McDonald and Boud (2003) provide further support for the importance of self-evaluation by arguing that students who get self-assessment training do better than those who do not. However, Andrade and Valcheva (2009) claim that positive relationships may be established between students' self-evaluations and their writing, communication, level of participation, and learner autonomy. Self-assessment in FA also provides students with the chance to become less dependent on their teachers, which is a very significant benefit (Andrade and Valcheva, 2009). Thus, the learner's own learning process is fostered via an increased awareness of its significance (Andrade and Valcheva, 2009).

2.6.3 Peer Assessment

The use of self-evaluation and peer assessment are both common FA techniques. Allows for student assessment of one another's progress in learning (Topping, 2005). Students may help each other improve by providing constructive criticism of their work via peer evaluation (Topping 2009). Since both the assessor and the evaluated learn from the process, peer assessment is often used in the classroom (Li, Liu, and Steckelberg, 2010). In classes when the student-to-teacher ratio is high, peer evaluation may be an invaluable tool. Peer assessment has been shown to increase learning, even when the feedback given by a single student to his classmates may not be as thorough as that given by the instructor (McLeod, Brown, McDaniels, and Sledge, 2009). Topping (2009) makes the case that, if well designed and implemented, peer evaluation has the ability to increase the quality of learning to a level comparable to that of the teacher's assessment. Peer feedback has a beneficial effect on metacognitive abilities like self-regulation, both when given and received. Since rating one's peers is likely to make students feel awkward, Topping (2005) argues that peer evaluation is enhanced when students are given the opportunity to contribute comments instead. Peer assessment is most useful when used in conjunction with other forms of assessment rather than as the only form of evaluation.

Another tactic employed in FA is peer assessment, which is utilized similarly to self-assessment. It allows pupils to assess the progress of their peers (Topping, 2005). Through peer evaluation, students can comment on the quality of the work of their classmates (Topping 2009). Because of the benefits it has for the assessor and the assessed, peer evaluation is often used as a kind of instruction (Li, Liu, and Steckelberg, 2010). In classes when there is a large number of students to teachers, peer assessment may be quite useful. Even if a student's input to his peers isn't as

detailed as the teacher's, peer evaluation still has the potential to improve learning (McLeod, Brown, McDaniels, and Sledge, 2009). Promoting this idea, Topping (2009) argues that, if well planned and executed, peer evaluation may improve learning quality to the same degree as the teacher's assessment. Peer feedback delivery and reception have a positive effect on metacognitive abilities like self-regulation. Topping (2005) asserts that peer evaluation can be improved by allowing students to offer feedback rather than assessing their peers because the latter is likely to cause them discomfort. Peer assessment should be used in conjunction with other assessment methods so that it is not the only type offered in order to increase its effectiveness.

2.6.4 Performance Based Assessments

Project-based assessment, often known as performance-based assessment or simply project, is another name for it. By requiring students to produce a final product, teachers can determine whether or not they have developed abilities that they can apply in the real world. According to Palm (2008), the abilities that students are required to exhibit are transferable outside of the classroom. One of the abilities to be evaluated is the ability to build models, conduct scientific experiments, and conduct research and write detailed reports (Darling-Hammond and Pecheone, 2009; Wren, 2009). Students are evaluated on practical ideas in physics. PBA, which goes beyond testing by giving both the student and the teacher the chance to comprehend the difficulties, is therefore a crucial instrument for evaluation in the subject actively engaged in a profession (Wiggins and McTighe, 2005).

Learners participating in any kind of PBA are required to accomplish a task that mirrors a challenge they would face in the real world. This aspect is shared by all types of PBA (Wiggins and McTighe, 2005). When combined with other assessment methods, such as peer and in-class evaluation, PBAs may help students understand the rationale behind, as well as the steps required to complete, a given practical activity. This information is essential for assisting teachers in determining the most effective ways to assist their students in learning (Falk, Ort, and Moirs, 2007; Shepard, 2009). In contrast to more traditional forms of testing, the findings of PBA may be obtained much more quickly, making it a very useful tool for formative assessment. PBA gives educators the opportunity to make adjustments and enhancements to their lessons, while the results of standardized tests may not be available for weeks or even months. This is due to the fact that PBA reacts immediately (Darling-Hammond and Pecheone, 2009; Wood, Darling-Hammond, Neill, and Roschewski, 2007). PBA is also student-centered, which makes it a critical tool for testing higher order thinking since it is a higher level of cognitive complexity (Wood, et al., 2007; Wren, 2009). Learners are also encouraged to be creative and innovative in their learning via the use of PBA (Wood et al., 2007; Wiggins and McTighe, 2005). Additionally, it provides them with a chance to show that they comprehend the lessons they have acquired (Darling-Hammond, 2009).

In a study to examine different methods teachers use to evaluate students in mathematics, Kwaka (2003) found that homework is the most common method of assessment (91.7%) whereas oral questions were only moderately used by teachers (66.7) during FA. The study also discovered that project work, which was typically used based on the topic, was a less frequently used (41.7%) FA strategy. It was shown that there was only a minimal association between classroom

assessment and students' performance in mathematics, despite the study's finding that the majority of teachers conduct classroom evaluation.

In a related study by Kemboi (2015), it was shown that the majority (58%) of math teachers occasionally use self-assessment. Similar to this, the majority of teachers (58%) do so occasionally. Additionally, a large percentage of teachers (45%) rarely use performance-based assessment as a method of evaluating students during formative assessment. According to a similar conclusion by Wabugu (2009), mathematics teachers seldom ever implemented competency-based evaluation. The extent to which classroom assessments, self assessments, peer assessments, and performance-based assessments are used was not discussed in the literature review, despite the fact that it outlines their use. In addition, mathematics rather than physics was the main topic of the literature review. As a result, our study tries to close this gap in the body of knowledge.

2.7 Utilisation of Feedback from Formative Assessment

The information a teacher or a learner receives regarding their comprehension of topics after using assessment tools is known as the results from formative assessment. Assessment feedback is another name for the results of FA. Teachers can use assessment feedback as correcting information, and students can work with peers as an alternative to difficult ideas. Because of this, evaluation feedback is crucial for promoting learning (Brown 2007).

Gibbs and Simpson (2004) assert that the purpose of feedback is to foster knowledge through clarification, error correction, support for additional learning by providing additional study material, encouragement of critical thinking, and a push for students to do more tasks independently. In FA, feedback is crucial in assisting students in critically evaluating their learning so they may take charge of their education. As a result, FA becomes a valuable tool for enabling students to take charge of and manage their own learning (Nichol, 2007). Feedback in FA should be created to promote students' learning, according to Gibbs and Simpson (2005). The emphasis of comments provided in writing or verbally should therefore inspire students. Students may find it unpleasant when teachers make comments like "your work is poor." Instead, positive words such as "your argument is fair, but you can strengthen it" can be presented to learners as a way to push them to do better in their work (Gibbs and Simpson, 2005). Comment sheets may also be used in the process of recognizing students for their achievements (Taylor, 2008). Students may put a high value on feedback when it is provided in this manner, particularly if it is given to them immediately while they are still thinking about the task while they are working on it. This will be a significant boost to both their reinforcement and motivation for learning (Gibbs and Simpson, 2005). Njiru (2015), who conducted research to ascertain the impact of formative assessment on students' mathematical performance, provides additional evidence in support of this hypothesis.

Additionally, Gibbs and Simpson (2005) stress the importance of frequent evaluation feedback that is tailored to the work at hand in order to enhance students' learning. Teachers should also explain to pupils why they are receiving feedback and how acting on it would advance their learning (Scott, 2008).

The researcher was able to bridge a gap in the body of knowledge regarding the use of feedback from formative assessment by performing this study because it was unknown how feedback from Physics assessments were used, particularly in Elgeyo Marakwet County.

Wambugu (2009) discovered that the majority of instructors (54%) took two weeks to provide feedback to learners in a study to determine how long teachers take to provide assessment feedback in mathematics. The study also showed that most teachers (53%) provided broad criticism to the entire class, while just a small percentage (27%) did so for specific students. A small percentage of teachers (20%) provided feedback to students in groups based on their performance. Another similar survey was carried out by Gichuru (2014), and the results showed that teachers without FA training hardly ever use the data from students' tasks to grade students (mean 1.35), identify students' learning challenges (mean=1.17), inform parents (mean=1.09), assign students to other tracks (mean=1.13), and plan for future lessons (mean=1.39).

Similar research by Kemboi (2015) revealed that 37% of math teachers evaluate students using assessment feedback, while 31% utilize it to provide feedback to students. Additionally, although 18% of teachers utilize student assessment data to plan for upcoming lessons, 27% of teachers use FA data to determine their students' learning needs. 6% of teachers said they report to parents using information gleaned from students' FA tools.

Only the opinions of the teachers were extracted from the reviewed material. There were no learner opinions on how professors handle FA in their classes. Information regarding how teachers assess whether course objectives have been accomplished, assist students in evaluating their own learning, and assess students' proficiency with practical skills is also included improve student attitudes toward physics and assess teachers' efficacy were lacking in the subject of physics. Last but not least, there was no discussion of how using the results from the FA tool for learners affects their performance in physics in the literature we evaluated. This study's execution assisted in filling in the gaps in the body of current material.

2.8 Summary of Literature Review

Factors including adhering to syllabus rules, testing students after each session, explaining the purpose of an experimental assessment to students before the experiment, giving students assessment materials, and scheduling FA in the lesson plan were not looked at when it came to preparing FA. Furthermore, it was unclear how FA planning affected students' performance on the KCSE in Physics. For the purpose of clear analysis and reporting, cognitive domains were also not divided into lower order thinking, middle order thinking, and higher order thinking. Additionally, one of the surveys did not look at how often analysis, synthesis, and assessment were assessed. It is also unknown to what extent the use of Bloom's taxonomy in FA tools affects students' physics performance. More holes that were found in the extent to which classroom assessment, self-assessment, peer assessment, and performance-based assessment use affect students' performance in physics was not well understood by the literature at the time.

Last but not least, the evaluated literature does not include students' opinions about how professors implement FA in their classes. In addition, nothing was known about how educators utilize student feedback via FA tools to gauge mastery of course goals, facilitate self-reflection, evaluate application of physics concepts, improve students' perceptions of the subject, and evaluate their own performance as educators. Last but not least, it was left unresolved how the results from the FA tool affected students' performance in physics. Therefore, carrying out this study assisted in filling up the gaps in the body of knowledge.

2.9 Theoretical Framework

This study was based on the Framework of Formative Assessment by William and Thomson (2007), which was supported by the Heritage (2010) Model of Formative Assessment and Vygotsky's (1978) socioconstructivist theory of learning. The three different types of drumes, which teachers and students use to compare real learning levels to predetermined targets (Heritage, 2010), were founded on behaviorism or social constructivism, according to Roble (2015). Social constructivism is the guiding principle behind the formative assessment paradigm developed by Black, P., Harrison, & Lee (2004). The second factor is teacher expertise because it is up to them to choose the lesson's learning objectives and success standards that the students must satisfy. How the instructors place themselves along the continuum from social constructivism to behaviorism will significantly affect the methods and questions utilized in the classroom. The Heritage (2010) concept is based on teacher knowledge and learning progressions. These progressions use a pathway that is motivated by learning objectives and success criteria to define the big picture of students' learning. In order to test students' understanding in respect to the specified goals, formative assessment is then employed in

conjunction with the goals and criteria. By outlining what needs to be learnt, how students will be measured against the objectives, and what they must do to satisfy the objectives and success criteria, the progression also aids teachers in assessing the students' present levels of learning. This demonstrated why the three had to support the study.

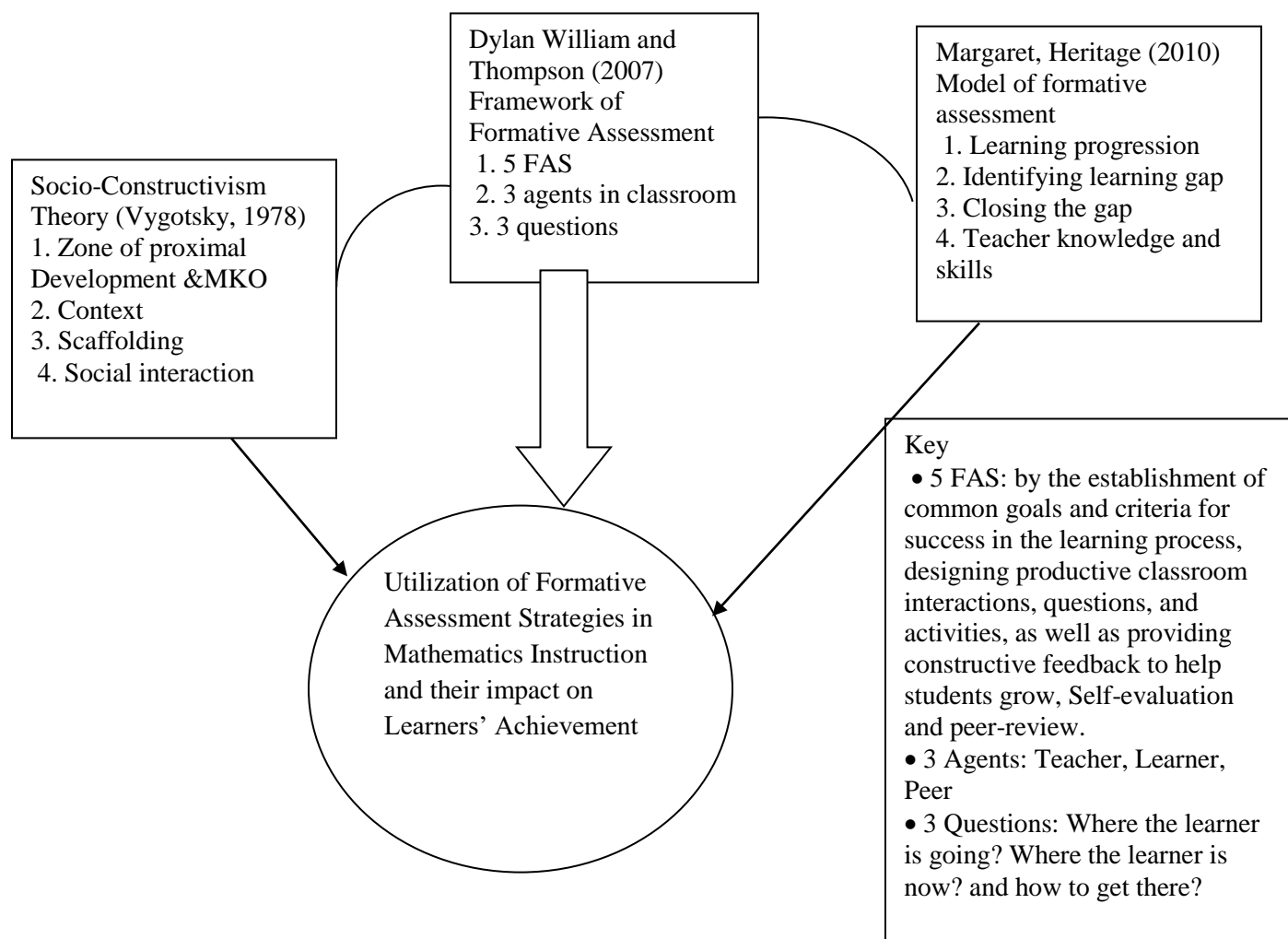


Figure 2.1: An overall theoretical framework on the impact of the five key formative assessment strategies

An overarching theoretical framework is depicted in Figure 1, along with the components from each of the aforementioned frameworks that contributed to the formation of the investigation. The researcher picked some aspects of an example theory and model to bolster the formative assessment framework for Dylan William and Thompson, and they are presented here. The Zone of Proximal Development (ZPD), context, scaffolding, social interaction, and collaborative learning were all selected based on Vygotsky's theory. The following components of the Heritage (2010) approach to formative assessment were selected by the researcher from among

those offered: learning progression, gap identification, teacher knowledge and skills, and gap closing. In Dylan Wiliam's (2007) framework for formative assessment, the five primary strategies for formative assessment are laid out. These strategies are as follows: defining and disseminating learning aims and success criteria; designing effective classroom dialogues; observing students' responses to formative assessments; and analyzing students' responses to formative assessments. Questions and activities geared toward learning, feedback that is meant to be constructive and helps students improve, as well as opportunities for students to assess both themselves and their peers. The teacher, the student, and the peer are the three agents in the classroom. During instruction, three questions must be addressed: Where is the learner going? Where is the student right now? how do I go there?

2.10 Conceptual Framework

In this study, it was presupposed that formative assessment procedures and student perception, as controlled by tactics like attitude, experience, and teaching methods, would affect students' chemistry test scores. Below is a conceptual illustration of this supposition.

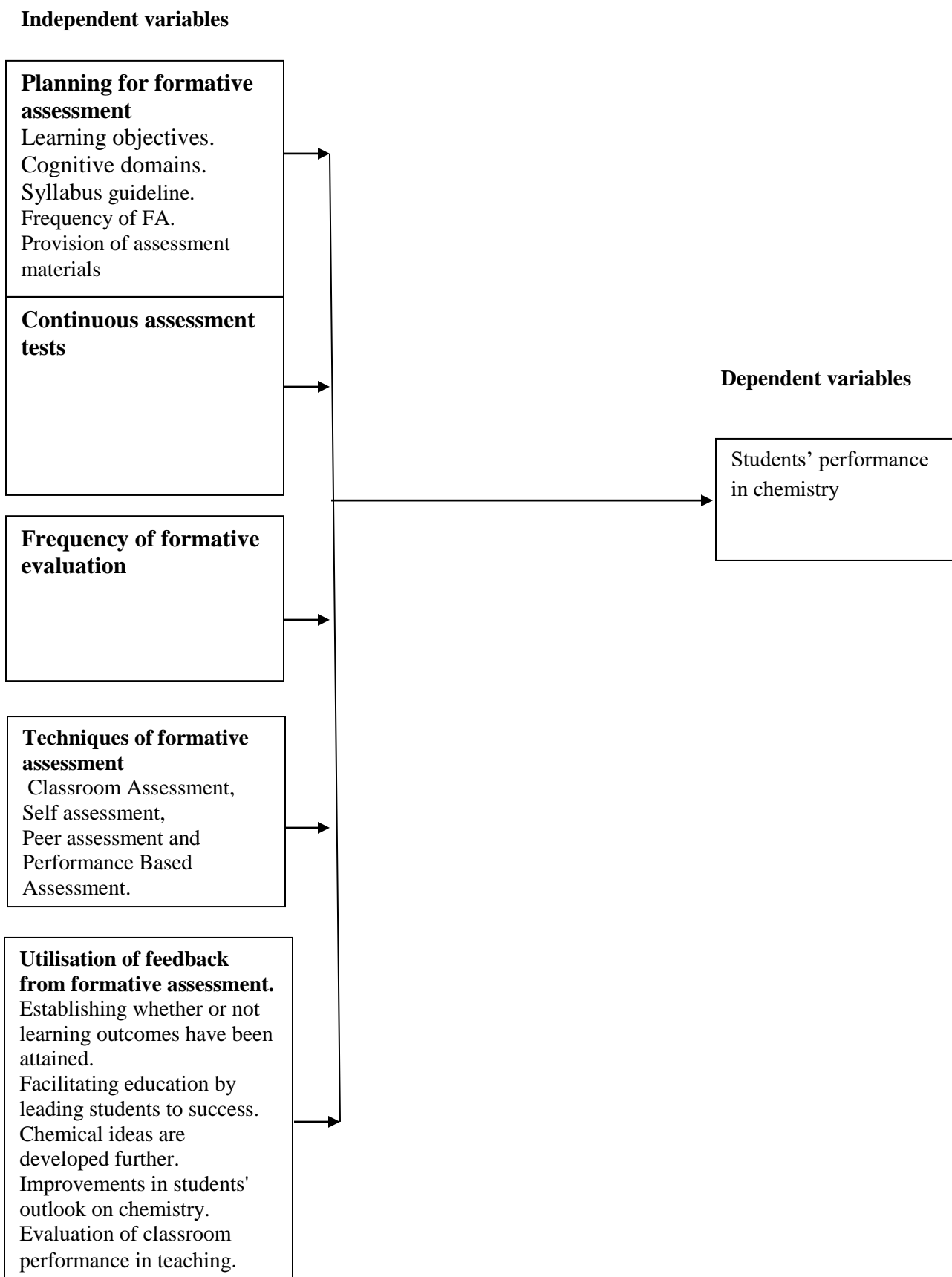


Figure 2.2: Conceptual framework

CHAPTER THREE

METHODOLOGY

3.0 Introduction

A brief summary of the approach used to address the research topic is provided in this chapter. The chapter is divided into sections that cover the following topics: research design, target population, sampling technique, sample size, data collection technique, validity and reliability, research procedure, and data analysis.

3.1 Research Design

The study used explanatory sequential mixed method design. The design was used because both the quantitative and qualitative data was collected and analyzed in two phases for purpose of gaining a general understanding of the research problem (Tashakkori and Teddlie 2003). In the first phase, learners performance in end of term chemistry, quantitative data in chemistry was analyzed in Arya Girls. In the second phase, qualitative data was collected to help in explaining the witnessed trend of performance by investigating the practice of FA by chemistry teachers.

3.2 Location of the Study

The study was conducted at Parklands Arya Girls High School. Parklands Arya Girls Secondary School is a Public Girls boarding high school located in Parklands area of Westlands constituency in Nairobi County. It is an extra county public girls school. The school is located around 50 metres from Aga khan Hospital just before Highridge shopping center. It offers a wholistic education that develops the academic, physical, spiritual and moral aspects of students.

3.3 Target Population

The target population will be 250 form three chemistry students form five streams, six chemistry teachers at Parklands Arya Girls High School.

3.4 Sample and Sampling Procedures

Sampling design refers to the subfield of statistics concerned with selecting a representative sample from a larger data set for the purposes of analysis and inference. The study used a census sample strategy that included the entire population. Since the area is small, the census sampling method was crucial because it gave comprehensive information about all the units.

3.5 Data Collection Instruments

Questionnaires and continuing assessment examinations were the primary methods of data collection. During the time when their pupils were taking tests, principals, assistant principals, and chemistry teachers filled out questionnaires to collect data. Each of the five goals of the research might have been attained using the data collection technique used. Sampling design refers to the subfield of statistics concerned with selecting a representative sample from a larger data set for the purposes of analysis and inference. The study used a census sample strategy that included the entire population. Since the area is small, the census sampling method was crucial because it gave comprehensive information about all the units. when split in half into two halves. The first component of the survey asked for demographic data, while the next four sections addressed the five research questions: how often formative assessments are used, what they include, how they are planned, and how the findings are put to use. With the use of structured

questions, we can get to the heart of the matter faster, for less money, and with more readily accessible information for easier analysis.

The poll included both free-form and multiple-choice questions. After that, we dropped off and picked up the surveys. The quantitative component of the tool employed both nominal and Likert-type scales to establish the range of values for each variable. Responses to statements-like questions were collected using a 5-point Likert scale with a range of 1 to 5. The Likert-type format was chosen because it produces equal-interval data, enabling the application of more potent statistical techniques (Kiess & Bloomquist, 2018).

3.6 Data Collection Procedure

The National Commissions for Science, Technology, and Innovation were consulted for approval to conduct the study. After that, the researcher traveled to the school to meet with the principal. The questionnaire included a request for the principal to invite the teachers for an introduction and a training on the confidentiality of the data. The questionnaires were distributed using the drop and pick later approach. After one week, completed surveys were gathered.

3.7 Data Analysis Techniques

Statistical Package for Social Science was used to clean, code, enter, and analyze the data (SPSS, Version 21.0). Because SPSS is quick, adaptable, and offers more reliable analysis with more correct data, it will be used. Editing, categorization, coding, and tabulation of acquired data are all examples of data processing that make data suitable for analysis. Metric calculations and the identification of patterns in the interplay of dependent and independent variables are essential to

the analytical process. The information was examined in light of the study's aims and parameters. Descriptive statistics were used for data analysis, presentation, and interpretation. Relationships between dependent and independent variables were calculated using descriptive methods like cross tabulation and frequency distribution tables. Analyses were performed on the free-text responses to the questionnaire's open questions.

3.8 Validity of the Instruments

The research instrument was piloted in form two class which was not be part of the study. By reviewing the questionnaire with the respondents, we made sure that all of the questions were worded in the clearest possible way. Validity of the instruments' concept is being tested in a pilot study. The difficulties that respondents could have in understanding or answering the questions were highlighted in the pilot research. After piloting the surveys, changes were made to clarify any questions that were left open. A primary goal of the pilot research is to determine the survey's reliability and validity. The researchers checked the surveys for their veracity using a mix of techniques, including visual appeal and substantive analysis. The test's content validity was established by extrapolating its results to a vast pool of items with similar structures and contents. Issues of representativeness of the sample population are central to the concept of content validity.

In a form two class that wasn't involved in the study, the research instrument was tested. This was made sure by going over the questionnaire with the responders to make sure each item was phrased in the clearest possible terms. A pilot research was conducted to determine the instruments' construct validity. The difficulties that respondents could have in answering the

questions were identified in the pilot research. In the pilot studies, we modified the questions that generated the most doubt. Finding out if the questionnaire is valid is a key objective of the pilot study. Several methods were used to determine the validity and reliability of the questionnaires, including face validity and content validity. Content validity ratings for a wide variety of things were inferred from test results because they were thought to be similar to test items. For content validity, it's crucial that the sample population be a good reflection of the whole.

3.9 Reliability of the Instruments

The dependability of a research instrument is measured by the consistency with which it produces findings or data over several testing instances. The trustworthiness of a study increases if its results can be repeated by other researchers. In this study, we only considered constructs with a Cronbach alpha of 0.6 or above for their composite reliability. It is acceptable to have a reliability coefficient of 0.6 or greater. Cronbach's alpha was used to determine the instrument's reliability.

3.10 Ethical Consideration

It's nice to see that the researcher took into account the norms of the groups they were studying. The investigator approached the school administration to obtain approval for the study. Researchers assured those who participated in private surveys that their information would be kept secret and used only for scholarly study. At all times, the researcher maintained anonymity.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This section emphasizes the study results on the effectiveness of formative assessment in improving student performance in chemistry. The statistics were examined and translated in line with the research goals in frequency tables and themes.

4.2 Response Rate

The reaction rate of the survey directed to the form three chemistry students and 6 chemistry teachers at Parklands Arya Girls High School was as shown up in the table below.

Table 4.1: Respondents' response rate

Sample size	Students		Teachers	
	Frequency	Percentage	Frequency	Percentage
Correctly filled and returned	250	100	6	100
Not returned	0	0	0	0
Total	250	100	6	100

The results were gathered from the questionnaires, which were correctly completed and returned. There were 250 form three chemistry students in the study, of whom 100% responded, and 6 chemistry professors, of whom 100% responded. The response rate is quite high in light of the plan; a 50% response rate is enough for analysis and reporting. A response rate of 70% is outstanding, but anything above 60% is regarded acceptable (Lomulen, 2016). This confirmation suggests that the research's response rate was satisfactory.

4.3 Demographic Information

4.3.1 Gender of the Teachers

As demonstrated in the table below, the respondents were requested to affirm their gender.

Table 4.2: Gender of the Teachers

	Frequency	Percent
Male	2	33.33
Female	4	66.67
Total	6	100.00

The research found that 66.67% of the teachers were female while 33.33% of the teachers were male. This indicates that most teachers at Parklands Arya Girls High School were female.

4.3.2 Highest Education Qualifications of the Teachers

As demonstrated in the table below, the respondents were requested to indicate their education qualifications.

Table 4.3: Highest Education Qualifications of the Teachers

	Frequency	Percent
Degree	4	66.67
Masters	2	33.33
Total	6	100.00

The research found that 66.67% of the teachers had attained a degree while 33.33% of the teachers had a Masters degree.

4.3.3 Period the Teachers had Taught Chemistry

The teachers were asked to indicate the period the teachers had taught chemistry.

Table 4.4: Period the Teachers had Taught Chemistry

	Frequency	Percent
1 to 5 years	1	16.67
6 to 10year	3	50.00
11 to 15	2	33.33
Total	6	100.00

From the findings, 50% of the teachers had taught for 6 to 10 years, 33.33% had taught for 11 to 15 years and 16.67% had taught chemistry for 1 to 5 years. This indicates that the teachers had enough experience to teach chemistry and moreover to use formative assessment.

4.4 Formative Assessment

Formative assessment encompasses all of the activities that teachers and students engage in during self-evaluation and that yield data that can be used as feedback to modify pedagogical practices.

Table 4.5: Whether the teachers employed formative assessment in teaching chemistry

The study sought to find out if the teachers employed formative assessment in teaching chemistry.

	Frequency	Percent
Yes	6	100.00
Total	6	100.00

According to the findings, all (100%) teachers indicated that they employed formative assessment in teaching chemistry.

Table 4.6: Learners' improvement in chemistry performance Through formative assessment

The study sought to find out if through formative assessment they had realized learners' improvement in chemistry performance.

	Frequency	Percent
Yes	6	100.00
Total	6	100.00

According to the findings, all (100%) teachers indicated that through formative assessment they had realized learners' improvement in chemistry performance.

4.4.1 Planning of Formative Assessment

This is setting out of procedures and standards under which the assessment will be conducted and preparation of students for the assessment.

Table 4.7: Views about how teachers plan for formative assessment in chemistry in the school

The study sought to find out the views about how the teachers plan for formative assessment in chemistry in their school.

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	std ev
	F	%	F	%	F	%	F	%	F	%		
	I schedule formative assessment in the schemes of work	0	-	0	-	1	16.67	2	33.33	3		
I schedule formative assessment in the lesson plan.	0	-	2	33.33	1	16.67	2	33.33	1	16.67	3.33	0.3
I consider learning objectives when designing formative assessment tools.	0	-	0	-	1	16.67	3	50.00	2	33.33	4.17	0.2
I strictly adhere to syllabus guidelines	0	-	0	-	2	33.33	4	66.67	0	-	3.67	0.7

when planning for formative assessment.				3						
I assess my chemistry students after every lesson based on lesson plan.	0 -	2 33.33	3 0	50.0	1 16.67	0 -	2.83	0.1		
I inform students the objective of an experimental assessment before they conduct it.	0 -	0 -	0 -		4 66.67	2 33.33	4.33	0.3		
I give to students written procedures a day before an experiment	0 -	3 50.00	2 3	33.3	1 16.67	0 -	2.67	0.3		
I ensure that all apparatuses are available before conducting experimental assessment.	0 -	0 -	0 -		2 33.33	4 66.67	4.67	0.2		
I provide each student with all the needed apparatus to complete assessment tasks during experiments.	0 -	0 -	0 -		1 16.67	5 83.33	4.83	0.4		
I provide assessment's objectives to students in advance.	0 -	0 -	1 7	16.6	2 33.33	3 50.00	4.33	0.1		
I provide assessment procedures to students in advance.	0 -	1 16.67	2 3	33.3	2 33.33	1 16.67	3.50	0.5		

From the findings, 50% of the teachers strongly agreed that they scheduled formative assessment in the schemes of work. This was supported by an average of 4.33 and a S.D 0.5. In addition, 33.33% of the teachers agreed that they scheduled formative assessment in the lesson plan. This was supported by an average of 3.33 and a S.D 0.3. More over, 50.00% of the teachers agreed that they considered learning objectives when designing formative assessment tools. This was supported by an average of 4.17 and a S.D 0.2. to add to this 66.67% of the teachers agreed that they strictly adhered to syllabus guidelines when planning for formative assessment. This was supported by an average of 3.67 and a S.D 0.7.

In addition, 50.00% of the teachers were neutral that they assessed their chemistry students after every lesson based on lesson plan. This was supported by an average of 2.83 and a S.D 0.1. Also, 66.67% of the teachers agreed that they informed students the objective of an experimental assessment before they conducted it. This was supported by an average of 4.33 and a S.D 0.3. More over, 50.00% of the teachers disagreed that they gave to students written procedures a day before an experiment. This was supported by an average of 2.67 and a S.D 0.3. Again, 66.67% of the teachers strongly agreed that they ensured that all apparatuses were available before conducting experimental assessment. This was supported by an average of 4.67 and a S.D 0.2.

On top of that, 83.33% of the teachers strongly agreed that they provided each student with all the needed apparatus to complete assessment tasks during experiments. This was supported by an average of 4.83 and a S.D 0.4. As well, 50.00% of the teachers strongly agreed that they provided assessment's objectives to students in advance. This was supported by an average of 4.33 and a S.D 0.1. Besides, 33.33% of the teachers agreed that they provided assessment procedures to students in advance. This was supported by an average of 3.50 and a S.D of 0.5.

4.4.2 Continuous Assessment Tests

This is the process that provides evidence concerning students' performance.

Table 4.8: Views on how continuous assessment tests of formative assessment in chemistry in the school affect performance of students

The study sought to find out how the views of teachers on continuous assessment tests of formative assessment in chemistry in the school affect performance of students.

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	stdev
	F	%	F	%	F	%	F	%	F	%		
I use the assignments exam as a formative assessment strategy to determine how well students are progressing in their chemistry performance, which is an essential component of the educational system.	0	0	0	0	1	16.67	3	50.00	2	33.33	4.17	0.2
Students' ability to acquire and retain new information may be improved via the use of diagnostic assignments coupled with remediation.	0	0	0	0	0	0	2	33.33	4	66.67	4.67	0.1
Tests of continuous evaluation give evidence about the accomplishments of pupils, which, when understood, assists the evaluators in taking actions for future improvements.	0	0	0	0	0	0	1	16.67	5	83.33	4.83	0.4
Teaching and learning may be improved with the use of formative and continuous assessment exams since they provide a more targeted application for students.	0	0	0	0	1	16.67	2	33.33	3	50.00	4.33	0.1

According to the data, fifty percent of the educators polled acknowledged that they used assignments tests as a formative assessment technique to means of monitoring student improvement in chemistry performance that is an essential component of the education system. An average of 4.17 and a S.D of 0.2 provided support for this assertion. In addition, 66.67 percent of the educators strongly felt that the employment of diagnostic assignments together with remediation boosted the acquisition and retention of learning tasks among the pupils. An average of 4.67 and a S.D of 0.1 provided support for this assertion.

In addition to this, 83.33 percent of the educators highly felt that continuous assessment exams gave evidence about the accomplishments of pupils, which, when understood, encouraged the assessors to take actions for future improvements. The mean was 4.83, and the S.D was 0.4, which lent credence to this assertion. In addition, fifty percent of the educators surveyed strongly believed that formative continuous assessment assessments had the potential to improve teaching and learning by delivering a more targeted application for students. An average of 4.33 and a S.D of 0.1 provided support for this assertion.

4.4.3 Frequency of Formative Evaluation

This is the number of times an assessment is used to consequently assess the learning objectives.

Table 4.9: Views on how frequency of formative assessment in chemistry in the school affects performance of students

The study sought to find out the views on how frequency of formative assessment in chemistry in the school affects performance of students.

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	stdev
	F	%	F	%	F	%	F	%	F	%		
Frequent assessment of students performance has demonstrated to improve student outcomes	0	-	0	-	1	16.67	4	66.67	1	16.67	4.00	0.2
We use assessments frequently which are modified to improve learning outcomes of the students	0	-	0	-	1	16.67	3	50.00	2	33.33	4.17	0.1
We conduct frequent formative evaluation in every week to access the progress of children achievement	0	-	1	16.67	3	50.00	2	33.33	0	-	3.17	0.1
It has been shown that frequent formative evaluation and progress monitoring have a favorable influence on the results for students.	0	-	0	-	2	33.33	1	16.67	3	50.00	4.17	0.4
The effects of giving reading, chemistry, and spelling tests once or twice a month, as well as seeing graphs created by a computer to show how well students are doing, along with tips for how they might improve their performance,	1	16.67	1	16.67	2	33.33	2	33.33	0	-	2.83	0.1

According to the findings, 66.67% of the teachers agreed that frequent assessment of students performance had demonstrated to improve student outcomes as shown by an average of 4.0 and a S.D of 0.2. In addition, 50.00% of the teachers agreed that they use assessments frequently which were modified to improve learning outcomes of the students as shown by an average of 4.17 and a S.D of 0.1.

More over, 50.00% of the teachers were neutral that they conduct frequent formative evaluation in every week to access the progress of children achievement as shown by an average of 3.17 and a S.D of 0.1. Besides, 50.00% of the teachers strongly agreed that frequency formative assessment of progress monitoring had proved to have positive impact on student outcomes as shown by an average of 4.17 and a S.D of 0.4.

To add to that, 33.33% of the teachers agreed that impacts of giving spelling, reading, and chemistry tests weekly or biweekly, seeing computer-generated graphs of students' progress, and obtaining instructional advice, as evidenced by an average of 2.83 and a S.D of 0.1.

4.4.4 Techniques of Formative Assessment

These are the methods used in teaching and learning process in formative assessment.

Table 4.10: Different techniques of formative assessment during teaching and learning of Chemistry

The study sought to find out how the teachers applied different techniques of formative assessment during teaching and learning of chemistry

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	stdev
	F	%	F	%	F	%	F	%	F	%		
I utilize assessment in the classroom to determine whether or not the students have comprehended the goals of the session.	0	-	0	-	1	16.67	3	50.00	2	33.33	4.17	0.2
Assessment in the classroom is one of the ways I motivate pupils to learn.	0	-	1	16.67	2	33.33	2	33.33	1	16.67	3.50	0.3
Assessment in the classroom is how I determine whether or not students have the skills necessary to solve numerical problems in chemistry.	0	-	0	-	1	16.67	2	33.33	3	50.00	4.33	0.1
I use classroom assessment to enhance students' understanding of the lessons' objectives.	0	-	1	16.67	2	33.33	2	33.33	1	16.67	3.50	0.1
I use self-assessment to promote learner freedom in solving problems in chemistry	0	-	0	-	1	16.67	3	50.00	2	33.33	4.17	0.3
I use self-assessment to promote learner confidence in chemistry.	0	-	0	-	1	16.67	1	16.67	4	66.67	4.50	0.2
I use self-assessment to know the individual needs of a learner	0	-	0	-	2	33.33	3	50.00	1	16.67	3.83	0.1
I use self-assessment to encourage individual	0	-	0	-	1	16.67	3	50.00	2	33.33	4.17	0.3

students to take ownership of the learning process.				67		00						
I use peer assessment to enhance learning among the students.	0	-	1	16.67	2	33.33	2	33.33	1	16.67	3.50	0.4
I use peer assessment to provide students with additional feedback through their peers.	0	-	0	-	1	16.67	2	33.33	3	50.00	4.33	0.2
I use peer assessment to help students to internalize learning concepts better.	0	-	0	-	2	33.33	3	50.00	1	16.67	3.83	0.1
I use experiments to enhance learner's application skills in chemistry.	0	-	0	-	2	33.33	3	50.00	1	16.67	3.83	0.7
I use experiments to gauge learner's evaluation skills in chemistry.	0	-	1	16.67	2	33.33	1	16.67	2	33.33	3.67	0.2
I use experiments to enhance learners' skills in report writing in chemistry.	0	-	0	-	1	16.67	1	16.67	4	66.67	4.50	0.2

From the findings, 50.00% of the teachers agreed that they used classroom assessment to find out if the students had understood lesson's objectives. This was supported by an average of 4.17 and a S.D of 0.2. In addition, 33.33% of the teachers agreed that they used classroom assessment to encourage students to learn. This was supported by an average of 3.50 and a S.D of 0.3.

More over, 33.33% of the teachers agreed that they used classroom assessment to identify students' abilities in solving numerical problems in chemistry. This was supported by an average of 4.33 and a S.D of 0.1. Besides, 33.33% of the teachers agreed that they used classroom assessment to enhance students' understanding of the lessons' objectives. This was supported by an average of 3.50 and a S.D of 0.1.

To add to that, 50.00% of the teachers agreed that they used self-assessment to promote learner freedom in solving problems in chemistry. This was supported by an average of 4.17 and a S.D of 0.3. Also, 66.67% of the teachers agreed that they used self-assessment to promote learner confidence in chemistry. This was supported by an average of 4.50 and a S.D of 0.2.

In addition, 50.00% of the teachers agreed that they used self-assessment to know the individual needs of a learner. This was supported by an average of 3.83 and a S.D of 0.1. Again, 50.00% of the teachers agreed that they used self-assessment to encourage individual students to take ownership of the learning process. This was supported by an average of 4.17 and a S.D of 0.3.

More over, 33.33% of the teachers agreed that they used peer assessment to enhance learning among the students. This was supported by an average of 3.50 and a S.D of 0.4. Additionally, 50.00% of the teachers agreed that they used peer assessment to provide students with additional feedback through their peers. This was supported by an average of 4.33 and a S.D of 0.2.

To add to that, 50.00% of the teachers agreed that they used peer assessment to help students to internalize learning concepts better. This was supported by an average of 3.83 and a S.D of 0.1.

On top of that, 50.00% of the teachers agreed that they used experiments to enhance learner's application skills in chemistry. This was supported by an average of 3.83 and a S.D of 0.7.

As well, 33.33% of the teachers agreed that they used experiments to gauge learner's evaluation skills in chemistry. This was supported by an average of 3.67 and a S.D of 0.2. Also, 66.67% of the teachers agreed that they used experiments to enhance learners' skills in report writing in chemistry. This was supported by an average of 4.50 and a S.D of 0.2.

4.4.5 Utilisation of feedback from Formative Assessment

This is the use of assessment feedback to drive and improve learning.

Table 4.11: Utilization of learners' results from formative assessment in chemistry

The study sought to find out the views on how the teachers utilized learners' results from formative assessment in chemistry.

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Standard deviation
	F	%	F	%	F	%	F	%	F	%		
When determining whether or not the goals of the lesson have been met, I look at the outcomes of formative assessment.	0	-	1	16.67	1	16.67	3	50.00	1	16.67	3.67	0.2
I utilize the outcomes of formative assessment as a guide to help students evaluate and reflect on their own learning.	0	-	1	16.67	2	33.33	2	33.33	1	16.67	3.50	0.1
When determining whether or not a student has mastered the practical skills required for chemistry, I look at the outcomes of formative assessments.	0	-	0	-	1	16.67	2	33.33	3	50.00	4.33	0.1
I make use of the findings of formative assessment in order to expound on chemical ideas that are not fully comprehended by the pupils.	0	-	0	-	2	33.33	3	50.00	1	16.67	3.83	0.3
To help students develop a more positive attitude about chemistry, I utilize the outcomes of formative assessments.	0	-	0	-	3	50.00	1	16.67	2	33.33	3.83	0.3
In order to evaluate how successful I am as a teacher, I look at the outcomes of formative assessments.	0	-	0	-	1	16.67	2	33.33	3	50.00	4.33	0.7
For the purpose of determining which children need particular attention, I utilize the outcomes of formative assessments.	0	-	1	16.67	1	16.67	2	33.33	2	33.33	3.83	0.2
I try to improve my teaching by using the feedback I get through formative assessments.	0	-	0	-	2	33.33	1	16.67	3	50.00	4.17	0.6
I motivate my pupils to actively	0	-	1	16.67	2	33.33	2	33.33	1	16.67	3.67	0.2

participate in their own education by using the feedback they get through formative assessments.	-	16.67	33.3	33.	16.67	3.50	.
The findings of the students' formative assessments are what I use to judge whether or not they are ready for the following subject.	0	0	16.6	50.	33.33	4.17	0
I use results from formative assessment to inform parents on the learning progress of their children.	0	0	16.6	33.	50.00	4.33	0
I use results from formative assessment to encourage students to be in control of their learning.	0	1	16.67	33.3	33.	16.67	3.50

According to the findings, 50.00% of the teachers agreed that they used results from formative assessment to determine if lesson objectives had been attained. An average of 3.67 and a S.D of 0.2 provided support for this assertion. In addition, 33.33 percent of the educators indicated that they guided students in the process of self-evaluation of their own learning by using the findings of formative assessments. An average of 3.50 and a S.D of 0.1 provided support for this assertion.

In addition, fifty percent of the instructors strongly agreed that they utilized the findings of formative assessment to determine whether or not their students had mastered the practical abilities involved in chemistry. An average of 4.33 and a S.D of 0.1 provided support for this assertion. In addition to that, fifty percent of the instructors polled acknowledged that they utilized the findings of formative assessment to explain to pupils on ideas in chemistry that were not well grasped. An average of 3.83 and a S.D of 0.3 provided support for this assertion.

More over,50.00% of the teachers were neutral that they used results from formative assessment to improve students' attitude towards chemistry. This was supported by an average of 3.83 and a S.D of 0.3. Also, 50.00% of the teachers strongly agreed that they used results from formative

assessment to judge my effectiveness in teaching. This was supported by an average of 4.33 and a S.D of 0.7.

To add to that, 33.33% of the teachers strongly agreed that they used results from formative assessment to determine students in need of individual attention. This was supported by an average of 3.83 and a S.D of 0.2. Besides, 50.00% of the teachers strongly agreed that they used results from formative assessment to enhance teaching. This was supported by an average of 4.17 and a S.D of 0.6.

Additionally, 33.33% of the teachers strongly agreed that they used results from formative assessment to encourage students to take part in their learning process. This was supported by an average of 3.50 and a S.D of 0.1. Moreover, 50.00% of the teachers agreed that they used results from formative assessment to determine student's readiness for the next topic. This was supported by an average of 4.17 and a S.D of 0.4.

In addition, 50.00% of the teachers agreed that they used results from formative assessment to inform parents on the learning progress of their children. This was supported by an average of 4.33 and a S.D of 0.5. As well, 33.33% of the teachers agreed that they used results from formative assessment to encourage students to be in control of their learning. This was supported by an average of 3.50 and a S.D of 0.1.

4.5 Students' Performance for Form three Chemistry mean score

This was used to measure the student performance in chemistry to know if formative assessment had made the performance improve.

Table 4. 12: Mean score of chemistry in your school as per the indicated term

The study sought to find out the views about how the teachers plan for formative assessment in chemistry in their school.

Year	Form three Chemistry mean score
Term one 2021	32.44
Term two 2021	33.74
Term three 2021	38.8
Term one 2022	39.86
Term two 2022	46.93

According to the findings, the form three had attained an average score of 46.93 in Term two 2022. This was an improvement from the previous terms.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter aims at providing a discussion of the effectiveness of formative assessment in improving student performance in chemistry.

5.2 Summary of Findings

The study was aimed at determining the effectiveness of formative assessment in improving student performance in chemistry. All teachers indicated that they employed formative assessment in teaching chemistry which realized learners' improvement in chemistry performance.

The study's findings showed that teachers planned formative evaluation into their lesson plans. When creating the formative assessment tools, learning objectives were taken into account. They ensured that all apparatuses were available before conducting experimental assessment. They provided each student with all the needed apparatus to complete assessment tasks during experiments. The teachers strongly agreed that they provided assessment's objectives to students in advance.

According to the study, using diagnostic assignments in conjunction with remediation improved students' ability to learn and retain information. Tests used in continuous evaluation provide proof of students' accomplishments, which, when understood, assisted the assessors in taking action for further improvement.

The teachers concurred that they commonly employed exams that were altered to enhance students' learning results. It has been demonstrated that frequent formative evaluation and progress monitoring have a positive effect on student results. Frequent assessment of students' performance had demonstrated to improve student outcomes.

Classroom assessment was used to identify students' abilities in solving numerical problems in chemistry. Classroom assessment was used to find out if the students had understood lesson's objectives. Self-assessment was used to promote learner freedom in solving problems in chemistry. Self-assessment was used to encourage individual students to take ownership of the learning process.

Results from formative assessment were used to gauge student's mastery of practical skills in chemistry. They used results from formative assessment to judge my effectiveness in teaching. Results from formative assessment to inform parents on the learning progress of their children. They also used results from formative assessment to determine student's readiness for the next topic and enhance teaching.

5.3 Conclusions

The study concluded that formative assessment was effective in improving student performance in chemistry at Parklands Arya Girls High School.

The study came to the conclusion that teachers include formative evaluation in their lesson plans. Designing formative assessment tools takes into account learning objectives. Students are informed of the objective of an experimental assessment before they conduct it. Each student is provided with all the needed apparatus to complete assessment tasks during experiments. Assessment's objectives are provided to the students in advance.

Assignments and tests are used as a formative evaluation strategy to track students' performance in chemistry, which is a crucial component of the educational system. The use of diagnostic assignments in conjunction with remediation improves students' ability to learn and remember new information. Tests used in continuous assessment give proof of students' accomplishments, which, when analyzed, aids assessors in developing action plans for future improvements. Tests of formative continuous assessment improved instruction and learning by giving students a more targeted application.

Regular evaluation of students' progress has been shown to enhance learning results. Assessments were used frequently to improve learning outcomes of the students. Frequency formative assessment of progress monitoring had proved to have positive impact on student outcomes.

Classroom assessment was used to find out if the students had understood lesson's objectives and also to identify students' abilities in solving numerical problems in chemistry. Self-assessment was used to promote learner freedom in solving problems and learner confidence in chemistry.

Self-assessment was also used to encourage individual students to take ownership of the learning process and to provide students with additional feedback through their peers.

Results are used from formative assessment to gauge student's mastery of practical skills in chemistry and to judge effectiveness in teaching. Results from formative assessment were also to enhance teaching and to determine student's readiness for the next topic. The results are also used to inform parents on the learning progress of their children.

5.4 Recommendations

Teachers need to be encouraged to employ formative assessment in teaching chemistry so as to improve performance. Teachers need to schedule formative assessment in the schemes of work and lesson plan. They should consider learning objectives when designing formative assessment tools. Teachers should adhere to syllabus guidelines when planning for formative assessment. Teachers should inform students the objective of an experimental assessment before they conduct it and also provide them with written procedures a day before an experiment. All apparatuses should be availed to students before conducting experimental assessment.

Teachers must use assignments and tests as a formative evaluation strategy to monitor students' performance in chemistry, which is a crucial component of the educational system. Diagnostic assignments should be utilized. Continuous assessment tests should be adopted. Frequent assessment of students' performance should be put in place. The assessments should be done after every sub topic.

The teachers need to put in place classroom assessment and experiments. Self-assessment and peer assessment should be encouraged among students. Teachers need to use the findings of the formative assessment to assess whether the learning objectives have been met.

5.5 Areas for further research

To determine whether formative evaluation enhances student performance in chemistry, it is suggested that comparable research be conducted in other schools in Nairobi County. This study has improved prior formative assessment studies.

There is a need for further research on many fronts, including the impact of formative assessment on chemistry education in Kenyan boarding schools, the role of feedback in improving student performance, and the weight students give to instructors' judgments of the importance of formative assessment.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

Victoria Owiti

P.O Box

Nairobi

Tel:

Dear Sir/Madam,

REF: REQUEST TO CONDUCT DATA COLLECTION

As part of my studies for my Master's degree in education measurement and evaluation at the University of Nairobi, I am conducting a study titled "**ASSESSING THE EFFICACY OF FORMATIVE ASSESSMENT IN KENYA SECONDARY SCHOOLS: A CASE STUDY OF FORM 3 CHEMISTRY STUDENTS AT PARKLANDS ARYA GIRLS HIGH SCHOOL.**" Because of your ability to offer trustworthy information that will help the study accomplish its goals, you have been selected. I want to use questionnaires to conduct research on the aforementioned subject. Any assistance provided will be very appreciated since it will only be used to further the objectives for which it was provided, and the identity of the replies will be treated in confidence. Any cooperation provided would be greatly appreciated and utilized only for the purpose of the research; the respondents' identities will be kept in strict confidentiality. Upon request, you may obtain a final copy of the document. We sincerely appreciate your cooperation and assistance. In advance, I appreciate it.

Yours Faithfully,

Thank you in anticipation

Yours Faithfully,

Victoria Owiti

APPENDIX II: QUESTIONNAIRE FOR THE CHEMISTRY TEACHERS

Please tick the appropriate box or write your answer for the questions below on the spaces provided.

Part One: General Information

1. Indicate your gender

Male Female

2. What is your highest education qualifications?

Diploma Degree

Masters

3. For how long have you taught chemistry?

1 to 5 years 6 to 10year

11 to 15 16 years and above

Part Two: Formative Assessment

4. Do you employ formative assessment in teaching chemistry?

Yes No

5. Through formative assessment have you realized learners' improvement in chemistry performance?

Yes No

Part A: Planning of Formative Assessment

6. Your opinions on how your school plans for formative chemistry assessment are sought for in this area of the study. Carefully read each statement, then check the relevant box. 5 = Strongly Agree, 4 = Agree, 3= Neutral, 2 = Disagree, 1 = Strongly Disagree

No.	Statement	5	4	3	2	1
1	I include formative evaluation in the work plans.					
2	I schedule formative assessment in the lesson plan.					
3	When creating formative assessment tools, I take learning objectives into account.					
4	When preparing for formative assessment, I scrupulously stick to the syllabus's instructions.					
5	After each lesson, I evaluate my chemistry students using the lesson plan.					
6	I inform students the objective of an experimental assessment before they conduct it.					
7	I give to students written procedures a day before an experiment					
8	I ensure that all apparatuses are available before conducting experimental assessment.					
9	I provide each student with all the needed apparatus to complete assessment tasks during experiments.					
10	I provide assessment's objectives to students in advance.					
11	I provide assessment procedures to students in advance.					

Part B: Continuous Assessment Tests

6. The study is curious about your opinions in this part regarding how continuous assessment tests of formative assessment in chemistry in your school affect performance of students. Carefully read each statement, then check the relevant box. 5 = Strongly Agree, 4 = Agree, 3= Neutral, 2 = Disagree, 1 = Strongly Disagree

No.	Statement	5	4	3	2	1
1	I use tests and assignments as a formative evaluation strategy to gauge students' performance in chemistry, which is a crucial component of the educational system.					
2	The use of diagnostic tests combined with remediation improves students' learning task acquisition and retention.					
3	Tests used in continuous evaluation give proof of students' accomplishments, which, when analyzed, enables the assessors to make further improvements.					
4	Tests that provide formative continuous evaluation can improve teaching and learning by giving students a more targeted application.					

Part C: Frequency of Formative Evaluation

6. Your opinions on how the frequency of formative assessments in chemistry at your school affects student performance are sought for in this area of the study. Carefully read each statement, then check the relevant box. 5 = Strongly Agree, 4 = Agree, 3= Neutral, 2 = Disagree, 1 = Strongly Disagree

No.	Statement	5	4	3	2	1
1	Frequent assessment of students performance has demonstrated to improve student outcomes					
2	We use assessments frequently which are modified to improve learning outcomes of the students					
3	We conduct frequent formative evaluation in every week to access the progress of children achievement					
4	Regular formative evaluation of progress monitoring has been shown to have a favorable effect on student achievements.					
5	Effects of giving weekly or bimonthly reading, chemistry, and spelling tests, as well as getting computer-generated graphs of students' progress and advice on how to improve instruction					

Part D: Techniques of Formative Assessment

The purpose of this area of the study is to learn how various formative assessment strategies are used when teaching and studying chemistry. Carefully read each statement, then check the relevant box.

5 = Strongly Agree, 4 = Agree, 3= Neutral, 2 = Disagree, 1 = Strongly Disagree

No.	Statement	5	4	3	2	1
1	I use classroom assessment to find out if the students have understood lesson's objectives					
2	I examine my students in class to motivate them to learn.					
3	I use classroom assessment to identify students' abilities in solving numerical problems in chemistry.					
4	I use classroom assessment to enhance students' understanding of the lessons' objectives.					
5	I use self-assessment to promote learner freedom in solving problems in chemistry					
6	I use self-assessment to promote learner confidence in chemistry.					
7	I use self-assessment to encourage individual students to take ownership of the learning process.					
8	I use self-assessment to know the individual needs of a learner					
9	I use peer assessment to enhance learning among the students.					
10	I use peer assessment to provide students with additional feedback through their peers.					
11	I use peer assessment to help students to internalize learning concepts better.					
12	I use experiments to enhance learner's application skills in chemistry.					
13	I use experiments to gauge learner's evaluation skills in chemistry.					
14	I use experiments to enhance learners' skills in report writing in chemistry.					

Part E: Application of Results from Formative Assessment

The study wants to know how you use students' formative assessment data in chemistry in this area. Carefully read each statement, then check the relevant box.

5 = Strongly Agree, 4 = Agree, 3= Neutral, 2 = Disagree, 1 = Strongly Disagree.

No.	Statement	5	4	3	2	1
1	I evaluate if instructional objectives have been met using the findings from formative assessments.					
2	I use the findings from formative evaluation to help students reflect on their own learning.					
3	I evaluate students' mastery of chemistry practical skills using the findings from formative assessments.					
4	I use the findings from formative evaluation to further explain any chemistry ideas that students may not fully grasp.					
5	I use the findings from formative evaluation to change students' perspectives about chemistry.					
6	I evaluate my teaching efficacy using the findings from formative assessment.					
7	To identify pupils who require individualized attention, I use the findings from formative assessments.					
8	I use results from formative assessment to enhance teaching.					
9	I use results from formative assessment to encourage students to take part in their learning process.					
10	I use results from formative assessment to determine student's readiness for the next topic.					
11	I tell parents about their children's learning development using the findings from formative assessment.					

12	I use results from formative assessment to encourage students to be in control of their learning.					
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Part F: Students' Performance for Form three Chemistry mean score

In this section, the study seeks information about form three chemistry results in your school from the year 2021 to 2022. Please, indicate the mean score of chemistry in your school as per the indicated term.

Year	Form three Chemistry mean score
Term one 2021	
Term two 2021	
Term three 2021	
Term one 2022	
Term two 2022	

APPENDIX III: QUESTIONNAIRE FOR STUDENTS

1. How often are you given class assignments in chemistry?

After every lesson. [] After finishing a subtopic []

After finishing a topic [] We are not given class assignment at all []

2. How are you provided with apparatuses during practical tests in chemistry?

All the needed apparatuses are provided [] Some apparatus provided are improvised []

Sometimes, not all apparatus are provided []

Some apparatus provided are old and do not work []

3. How often are you given individual assignments in chemistry?

During every lesson. [] After every subtopic []

After every topic [] We are not given individual assignment at all []

4. How often does your chemistry teacher give you group assignments?

During every lesson. [] After every subtopic []

After every topic [] We are not given group assignment at all []

5. How are the questions set in end of term examination in chemistry related to what you were taught in class?

All the set questions are related to what we are taught in class. []

Some questions are not related to what we are taught in class. []

6. How does your teacher mark assignments given to you in chemistry?

Marks them by himself [] Reads answers for us to mark []

Writes answers to us on the board []

Tells us to exchange exercise books to be marked by our desk mate. []

APPENDIX IV: RESEARCH PERMIT


REPUBLIC OF KENYA
 National Commission for Science, Technology and Innovation
 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **347080**
Date of Issue: **16/December/2022**

RESEARCH LICENSE



This is to Certify that Ms. VICTORIA ATIENO OWITI of University of Nairobi, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: ASSESSING THE EFFECTIVENESS OF FORMATIVE ASSESSMENT IN KENYA SECONDARY SCHOOLS: A CASE STUDY OF FORM 3 CHEMISTRY STUDENTS AT PARKLANDS ARYA GIRLS HIGH SCHOOL for the period ending : 16/December/2023.

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