

INFLUENCE OF TEACHER AND STUDENT RELATED DETERMINANTS ON ACADEMIC PERFORMANCE IN BIOLOGY IN PUBLIC SECONDARY SCHOOLS IN KISII COUNTY

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ABSTRACT

Biology performance in our public secondary schools has not been good in the year 2015-2019. This therefore gave the need to conduct a research study on various factors that might be influencing biology performance in public secondary schools. The study was guided by the following objectives: first, to establish the extent to which teachers' qualifications influence academic performance in students in biology in public secondary schools; secondly, to determine the extent to which methods of teaching influence academic performance in biology in public secondary schools; thirdly to find out the effect of students' entry behaviour on their performance in biology in public secondary schools and finally, to determine the effect of students' perception on academic performance in biology in secondary schools in Kisii County, Kenya. The study was guided by Education productivity theory by Walsberg, (2008) which posits that there are different characteristics of individual learners in the classroom influenced by teachers' ways of teaching leading to educational outputs. The study adopted descriptive survey research design. The target population for the study was 10,232 from three (3) students, 306 school principals, 637 class teachers, 813 biology subject teachers, and 306 head of departments. Stratified and random sampling was used to select key informants starting from the principal, deputy principal, the class teachers, heads of Departments, subject teachers and students. Questionnaires and document analysis guides were employed in data collection. The research instruments were piloted in one school but the results were

not included to give credibility to methodology. The validity of research instruments was established before data collection by research expert judgment in the School of Education of the Kenyatta University. Suggestions and clarifications by the experts were used to improve content validity of the instruments. Reliability was established using the split half procedure. The reliability coefficient established was 0.85 which was satisfactory. Data from the closed ended items was quantitatively analysed using SSP statistical package while data from open ended items was analysed thematically. Descriptive statistics including mode, mean and standard deviations were used to analyse data. The results were presented by use tables, graphs and pie-charts. From the study it was established that: A majority of the respondents indicated that teachers qualified with degree enhanced academic performance in the students in biology; Audio-visual, academic visit, lecture method, discussion and question and answer methods were the most preferred methods of the teaching and learning of biology while the least preferred methods of teaching and learning of biology by the students were symposiums and virtual chat rooms. Also, perceptions of the learners and teachers had a very positive effect on the academic performance in students in biology. The study concluded that Qualification of teachers with degree is preferable to teachers with other qualification; learner centred teaching methods which enhances engagement among learners promote academic performance; there is a significant positive

relationship between the entry behaviour of students and academic performance in biology; a positive perception towards the biology subject enhances academic performance.

Keywords: teachers' qualifications, academic performance, methods of teaching, students' entry behaviour, students' perception, biology subject.

INTRODUCTION

Background to Study

Biology is a branch of natural science concerned with the study of living organisms and how they interact with their surroundings. The word biology is drawn from the Greek terms *bios*, which means life, and *logos*, which refers to study or understanding (KLB, 2013). This subject is important in everyday life because it helps individuals make sense of living processes and the environment they live in. It also provides a pathway to various professions such as farming, healthcare, scientific research, home science and environment conservation (KLB, 2013; Wafubwa, 2015). As learners study biology, they are able to relate what they learn in class to real-life situations, which helps them see its practical value.

In addition to its career related value, biology benefits people understand how natural resources can be used in a more effective and sustainable manner across different industries (KIE 2015). For instance, biological knowledge is applied in fields such as food processing, constructions. It also assists in addressing environmental challenges that affect human life and in explaining changes that occur within human populations. Furthermore, an understanding of biology prepares individuals with practical skills for preventing and managing diseases, preparing food safely, and taking care of families. It also supports the enhancement of agricultural production through research and innovation. In general, biology plays an imperative role in promoting socioeconomic growth, which is a crucial objective for many nations worldwide.

Given the vital role of Biology, it's important that students succeed in learning and understanding biology which is typically measured through assessments like examinations. Students' academic performance is the key element for both learners and teachers in examining educational objectives.

Inspite the need for a good performance in Biology, poor academic performance is a global issue (Lutz, 2019). For instance in Canada (Lutz, 2019) in Ontario students have been found to score below average in examination results in biology subject. Faraday, (2012) reports

that in the United Kingdom a review of performance in biology by level of candidates indicated that most students do not attain basic mastery by the time they leave secondary schools. A study conducted in Australia by Nystrand (2017) found that students' performance in biology did not meet expectations, largely due to the absence of effective related determinants to both teachers and learners.

Across many African countries, performance in biology at the secondary school level has remained relatively low (Kangethe, 2015). The same pattern is evident in Kenya, where results in Biology in the Kenya Certificate of Secondary Education (KCSE) have continued to fall below the expected standards, causing concern among educators and the public. For instance, the average score in Biology in the 2019 KCSE was recorded at 18% (KNEC, 2019). This situation creates a need for further inquiry to identify the factors affecting students' performance in biology and to recommend suitable strategies for improvement.

Academic achievement in biology is determined by a range of interacting factors linked to both teachers and learners (Fahiminez, 2012). These include the teacher's level of training, the approaches used during instruction, the background knowledge students bring into the classroom, and how learners view the subject. Such factors continue to play a major role in explaining differences in performance among secondary school students. Teachers are particularly important in guiding learners to grasp biological concepts, and effective teaching can strengthen understanding and improve results (Cloney, Hattie, Cleveland, and Tayler, 2015). In addition to supporting academic success, proper instruction in biology helps build valuable knowledge and skills that contribute to human capital development. As a result, teaching methods, student entry behaviour, and learner perceptions remain key influences on performance in biology.

Students' success in biology is closely linked to the qualifications and competence of their teachers, which directly influence academic outcomes (Megan, Browyn, Stacy, & Hannah, 2016). Teachers who are well trained are better able to organize content, use appropriate teaching approaches, and support learners in achieving improved results. In contrast, teachers who lack adequate training may struggle to keep up with changes in curriculum and instructional practices, which can negatively affect student performance (Achombo, 2016). Continued low performance in biology has therefore drawn attention to the need for ongoing professional development among teachers. Such development equips educators with updated skills and knowledge, making it an important factor in enhancing teaching effectiveness and improving students' academic achievement.

The teachers' methodologies are failing to adopt to the rapid changing needs such as technology (Murunga, 2015). The decline in biology academic performance suffers severely from a lack of effective methods of teaching biology in recent years. Teaching biology subjects requires scientific creativity in explanation given without imaginations or following innovations. In the light of teaching biology affects both scientists and science literacy to the study of nature. The concern of teaching biology in secondary schools provide the

opportunity to understand how life changes by accommodating student differences and help them struggle to perform better in examination (UNESCO, 2014). Additionally, teaching methods adopted in laboratory and class presentations has alarmed in schools to motivate teachers and students related determinants in achieving academic performance. Motivating students and teachers can influence academic performance by better results in biology examinations (Odumbe 2012).

At the centre of student factors is that teaching is a transmission of knowledge and skills. Student related determinants have been known as the common cause of low academic performance due to student's perceptions towards the concepts taught, the teachers and students blame each other and the teachers blame the government for their poor motivation. Students pursuing biology continue to experience difficulty in understanding biology concepts and thus failing to perform in their examinations.

The student entry marks from Primary education is no doubt a determinant influencing academic performance since some perform better in primary than in secondary. Academic performance in students is measured by use of an exam test while attending all entry marks. The entry marks of students are thought to be a determinant in performance. The analysis of entry marks of students informs teachers to prepare students well achieving good performance in which case students with a lower entry point may score higher than a student with a higher entry point. Entry level of students is therefore be put to consideration to help the students perform better. The study of learning models in teaching biology can place learners in categories of academic performance. By grouping learners accordingly as per their entry level, teachers may help learners develop different learning skills in terms of academic achievement. However, inconsideration of students' entry level can influence the student's ability hindering better performance in examinations due to challenges unnoticed (Alexander, 2013).

Positive perception toward biology subject registers better academic performance in examinations while negative perception registers low performance in most schools (Samikw, 2013). The student goal-oriented behaviours and participation influences performance, although it does not result in academic performance. Many educators agree to the point that logical entry for academic performance is a scientific thinking (Sogon and Musasia 2016).

However, this not only applies to biology but to general performance as the teacher can learn students' common-sensory perspectives. There is an extensive poor academic performance in most countries where secondary school students have created negative perceptions towards biology. Students' views about how qualified their teacher is can also affect how well they perform academically. When learners believe their teacher is skilled and knowledgeable, they tend to trust the instruction, participate more actively, and stay motivated in their studies. However, if they question the teacher's ability, their interest and effort may reduce, which can lead to lower performance in biology.

The perception of students has been influencing academic performance by the results obtained in biological sciences than physical one. This is evidenced by continuous decrease in number of students performing biology in examinations lower grades than teachers and parent expectations in the biology subject. The poor academic performance in biology is becoming a gloaming end in secondary schools and persistently over the years. Issues linked to both teachers and students still present major obstacles in the teaching of biology, especially when efforts are made to enhance performance in examinations (Okello, 2017).

Qualification of teachers and students' perceptions towards biology are the major requirement for improving student performance. It deals with important determinants to place individual learners to achieve academic performance, the teacher's determinants are the good measurement where students get information and apply knowledge to change their preferences which mostly encourage biological thinking.

In Kenya, biology is given in most schools as a compulsory subject in science curriculum. The Biology performance has repeatedly been below average (KNEC, 2019) as presented in table 1.1

Table 1.1: Biology Performance in Kenya.

Biology Performance in Kenya Since 2015-2019												
Years	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
2019	117	145	186	192	233	306	467	451	753	134	187	197
2018	67	105	102	141	113	403	313	458	871	21	298	202
2017	0	10	10	50	100	200	250	305	421	635	660	212
2016	3	15	50	65	185	524	452	325	345	325	324	124
2015	12	45	56	125	252	356	345	459	652	128	112	98

Source: Kenya National Examination Council (KNEC), 2019

The poor academic performance among secondary school students has been attributed to many different determinants. These are categorized into individual, family, social incentives, socio- economic conditions, teacher qualifications, teaching methods, entry behaviour, and student perceptions towards education. This study seeks to establish the influence of selected determinants on academic performance in biology in secondary schools in Kenya. The selected determinants of focus relate to both teachers and students. But the extent to which these determinants influence academic performance has not been established in the context of Kisii County, to the best of researcher's knowledge.

Kenya Certificate of Secondary Education (KCSE) national mean scores for the years 2012 to 2019 in mean percentage were presented. Table 1.2 shows the summary of National and Kisii County in percentage mean scores for the years 2012 to 2019:

The result of National and Kisii County Biology Performance mean scores in percentage from 2012-2019 as per KNEC Report 2019.

Table 1.2: National and Kisii County Percentage Mean Scores.

Percentage Mean Score		
Year	National	Kisii County
2012	26.22	26.75
2013	33.31	30.14
2014	33.60	31.02
2015	34.76	33.34
2016	29.19	27.20
2017	18.93	16.22
2018	19.23	18.37
2019	19.11	18.97

Source: KNEC (2019)

The results showed that the mean grade scored was 34.76% in 2015 and was the highest, while 18.93 % was the lowest grade performed in Kisii County. The percentage of the grades performance was 33.34 % in the year 2017, followed by 16.22%. The biology results were indeed poor as it was shown by examination reports. Despite, the government providing free secondary day education and other access to student fees funding, biology results in the last 10 years was evidenced to be far below average.

Lack of understanding of determinants that are related between teachers and students during classroom may be case for the failure in examinations. There is increasing evidence that biology subject is performed poorly in secondary schools and thus, there is a need to carry out this study to examine the influence of student and teacher related determinants on academic performance by focusing on public secondary schools in Kisii County.

Statement of the problem

Biology has a lot of pertinence in everyday life. Biology is a life science vital in the health sector as well as in socio- economic development. The Kenya vision 2030 which embraces health and socio economic development of the country has drawn attention to the emphasis of science including biology teaching so as to achieve this goal. Students need to succeed in learning and understanding of biology if the goal of health and socioeconomic development is to be achieved. Students' academic performance which is typically measured through assessments like examinations is the key element for both learners and teachers in evaluation of the intended objectives. In spite the need for a good performance in Biology, poor academic performance has been consistently recorded as seen in the examination reports (KNEC-2015-2019). For instance in 2019 the average score in Biology

in KCSE was only 18% (KNEC, 2019). Kisii County, one of the Kenyan Counties continuously posted a mean average lower than that of the national average mean score which was below average itself (KNEC-2015-2019). This is the case despite, the government providing free secondary day education and other access to resources and student funding. Academic performance in biology is influenced by a complex interplay of factors stemming from student and teacher determinants including teacher qualifications; teaching methodologies students' entry behavior; and students' perceptions towards Biology. Lack of understanding of determinants that are related between teachers and students in the classroom discourse may be case for the failure in examinations. This calls for an investigation to tease out the determinants which influence academic performance in biology and suggest possible remedies to the situation.

Purpose of the Study

The study aims to examine the influence of teacher and student related determinants on academic performance in biology in public secondary schools in Kisii County, Kenya.

Objectives of the study

The study was guided by the following objectives:

- i. To establish the extent to which teachers' qualifications influence academic performance of students in biology in public secondary schools in Kisii County, Kenya.
- ii. To determine the extent to which methods of teaching influence academic performance of students in biology in public secondary schools in Kisii County, Kenya.
- iii. To find out the effect of students' entry behaviour on their performance in biology in public secondary schools in Kisii County, Kenya.
- iv. To determine the effect of students' perceptions towards biology on academic performance in biology in secondary schools in Kisii County, Kenya.

Research Questions

The study sought to answer the following research questions:

- i. To what extent do teacher's qualifications influence students' academic performance in biology in public Secondary schools in Kisii County, Kenya?
- ii. To what extent do methods of teaching biology influence the students' academic performance in biology in Public secondary schools in Kisii County, Kenya?
- iii. To what extent does Student entry behaviour influence students' academic performance in biology in Public secondary schools in Kisii County, Kenya?
- iv. To what extent do Student perceptions influence students' performance in biology in Public secondary schools in Kisii County, Kenya?

Significance of the Study

The study findings may be used to contribute to the advancement of knowledge of teaching and learning biology in secondary schools. It is hoped that teachers will use the findings to

address the different gaps in their teaching and help students to attain knowledge, skills and attitudes to enable them post a good performance in biology.

The study findings may be useful to the Educational policy makers, in formulating education policies aimed at enhancing teaching and learning of biology and consequently enhancing students' performance. The findings may also be applicable to Teachers Training Colleges and Universities in the improvement of course content and training so as to produce more competent teachers.

Study Assumptions

This research made the following assumptions:

- i. Biology teachers in public secondary schools in Kisii County teach students according to the curriculum guidelines.
- ii. The respondents interpreted the questions in the research tools as intended by the researcher
- iii. Respondents provided true information.

Theoretical Framework

Education productivity theory by Walberg, (2008) guided this study.

The theory is applicable in education to mean that there is an increased process of learning for desired outcomes. According to (Jameson, 2016) academic performance is a distinguishable learning outcome. The theory posits that there are different characteristics of individual learners in the classroom influenced by teachers' ways of teaching leading to educational outputs of cognitive, attitudinal and behaviour (Ravkin 2015).

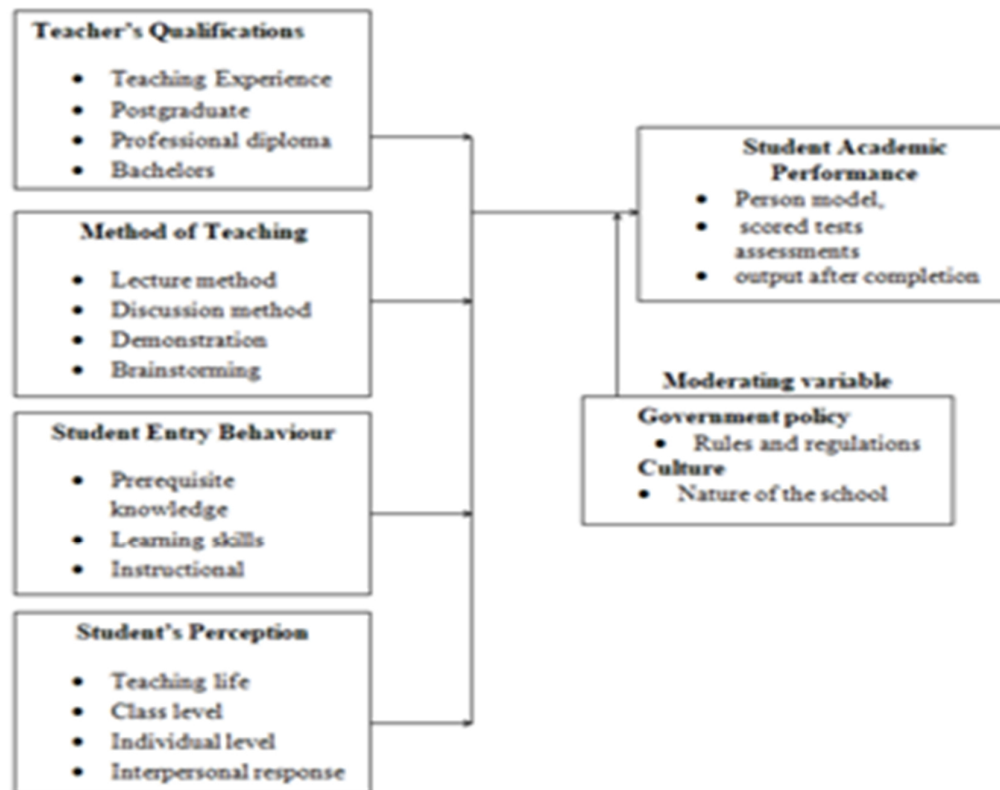
Walberg educational productivity assumes that there are nine determinants that affect academic performance. Productivity can be explained by the entry behaviour in the school, grades concerning completion, motivation, perception, age, home involvement and support from peers. This study emphasized on how students' entry behaviours, students' attitudes, teachers' qualifications and teachers' teaching methods influenced academic performance. The theory helps teachers to understand student learning attitudes towards biology subject and thus strive to improve the students' attitudes. This is because attitude determines student performance in biology subjects (Almasri, 2021). This theory explains the relationships between education productivity in terms of academic performance and teacher and students determinants thus qualifying as an appropriate theory for the study.

Conceptual Framework

The conceptualization of this study is as illustrated in figure 1.1

Figure 1.1 Conceptual framework

Teacher and Students Determinants



Drawing from figure 1.1, the independent variable is the students and teacher related determinants. The indicators of the students and teacher related determinants entail teacher qualifications, teaching methods, students' entry behaviour and students' perceptions towards biology. The dependent variable is the students' academic performance in biology. Academic performance entails scored tests. the intervening variable is government policies entailing rules and regulations and the nature of the school. The effective interaction of the named independent and dependent variables determines the level of academic performance of students in biology.

REVIEW OF RELATED LITERATURE

Introduction

This chapter presents critical review of teacher and student related determinants namely teacher qualifications, methods of teaching, student's entry behaviour, and students' perceptions towards the teaching of biology. The influence of the teacher and student related determinants and their influence on student performance are reviewed to show what other researchers found out and isolate the gaps that this study may address.

Teacher level of Qualifications on Academic Performance

The minimum level of marks is the first condition for one to become a teacher other than other qualification such as Master Degree in the areas of specialization (Adeyemi (2010). A study by Musau and Abere (2015) in Nigeria found out that teacher qualification has not been statistically significant on academic performance even though teacher qualification influenced student academic performance. This means that teacher qualification though important may not influence students' academic performance by itself.

Another study by Matzer (2014) analysed the effects of teacher's qualifications on academic performance in Munich school. The study aimed to analyse the relationship between teacher qualification and knowledge and student performance. The researcher adopted a self-administered questionnaire method. The study, which also used correlation, revealed that there was a weak, but positive relationship, between teacher qualification and knowledge and student performance. This resulted from the fact that qualification of teachers in learning institutions was not taken seriously on supervision.

This opened an avenue for unqualified teachers to contribute to low academic performance. This study did not analyse teacher qualification in secondary schools against performance in students in Biology.

Ganyaupfu (2013) investigated teacher qualification and knowledge and student performance in South Africa. The target of population comprised of 109 respondents from different departments especially in economics. The study used inferential statistics to establish the relationship between variables, Z-score and factor analysis. Data collected was analysed by use of the linear model of ANOVA. The study showed that teacher qualification and knowledge was the most effective contributor to student performance. In a like manner, the current study will investigate qualification of teachers against student performance but differs in that it addresses secondary school rather than college.

Simpson Nancy, Froyd (2017) analysed the influence of teacher qualification and knowledge on student performance in Texas A&M University. The study targeted 74 students at the faculty in the language department. The results indicated that a variety of teacher qualifications is critical to student performance. This qualification also places the learner at the centre of being aware of their performance.

Sharan (2010) analysed teacher qualification on academic performance with social gains, valued pedagogy, and problematic practice in Ghana. The study employed descriptive statistics to analyse data collected from students. The findings were that the teacher qualification improved academic performance. Teacher qualification improves understanding in learning of biology and what is assessed. Additionally, learners take many cues and insights from learners around them.

As such, teacher qualification and knowledge facilitate purposeful interaction among learners that promotes and sustains learning.

The qualification of teachers through level of education such as diploma level, undergraduate, postgraduate and Phd may determine academic performance. Mwanahamisi (2014) conducted a study of teacher qualifications on academic performance in Tanzanian institutions. The study identified various teacher qualifications such as degree and diploma, as affecting teaching. This means that a part from teachers attaining minimum qualifications, level of qualification may further different level of qualifications may affect academic performance differently.

Another study, (Bartsch, 2015) investigated the effect of teacher qualification on student performance. The study established that teacher qualifications make it difficult to effectively relate performance to each individual learner. Without proper teacher qualifications, performance has been observed to be low in some schools. Schul, (2011) in his study compared effectiveness of teacher qualifications on performance. However, it did not find any significant difference between qualifications and performance. This current study will be conducted in secondary schools on a particular subject unlike the two reviewed studies which are general on teacher qualifications.

Teaching Methods on Academic Performance

Teaching methods is that technique of following pedagogical process to deliver an idea to learners taking a study or students to learn. The methods of teaching are the various strategies determined by teachers to teach the main subject under study. Methods of teaching therefore comprise all those principles used to give instructions. Naisianoi's, (2020) study found out that teaching and learning materials influence academic performance in pupils in primary schools in Karunga zone Gilgi Sub-county in Kenya.

There are many teaching methods commonly used including demonstration method, participation or interactive and group discussions, content focused method, and lecture methods. The selection of proper teaching methods is the responsibility of a teacher as methods of teaching are related to student learning and consequently students' academic performance in evaluations (Abdi 2014).

Abdi (2014) examined the effect of using teaching methods on academic performance with Tehran School in Iran. The study indicated that teaching methods was effective with student centred approach such as brainstorming, demonstration, discussion, participation and group approach. The choice of teaching method therefore determines academic performance of students. McKeachie (2016) examined the effect of methods of teaching biology which included: concepts discussions, teaching tips, lecture approach and participation approach.

The study sought to determine how methods of teaching influenced academic performance. The methodology of the study involved mixed approach to collect data for easy

interpretations. The results showed that teaching biology required type of method applied for both primary schools and secondary schools. The poor methods of teaching may impact academic performance negatively as it leads to acquisition of insufficient knowledge among students. Pals, (2012) examined the effect of teaching methods on performance in students in the study of biology experimentations at the University of Buffalo. The study showed that use of centred teaching methods influences academic performance in many students studying biology and their syllabus coverage. Student centred teaching approach can also improve academic performance in biology subjects. In addition, learner centred methods motivate teachers helping them improve on their teaching career.

The study recommended that student should be provided with textbooks of biology and learning materials necessary.

However cost implications on these materials often may hinder provision of learning materials. Learning materials are necessary in enhancing teachers' methods but lack of the teaching and learning materials due to their high cost influence academic performance in students negatively.

Sajjad, (2011)' study analysed the factors influencing teaching methods on higher level of education in Pakistan. The research was done in Karach University and interview schedule was used on six teachers. Findings showed that student participatory methods and use of classroom demonstrations improved grades scored. in the same study, students were interrogated using biology questionnaire and found that brainstorming was the best way to be used in teaching biology than group discussion. Classroom presentation and lecture method was also used to enhance student capability in answering biological questions that non-participations methods. Learner centred method therefore has more statistical influence on academic performance. Muray (2011) recommended that science subjects should be improved by use of essay writing and case study of different concepts in biology. The teaching methods enabled students to improve their grades in examinations by understanding of concepts of different topics in biology.

A study conducted by Makewa (2011) noted that student centred methods was the best in teaching biology and it improved academic performance in students. Student centered approach is preferable when introducing basic concept in a subject than evaluating general performance in students. The study found that proper teaching method is good for weak students to help them get encouraged even those with low performance results. The study analysed by Makewa (2013) found that teachers teaching biology like use of student centred methods preferably on concepts however, it is difficult to assess performance in every student results. The study showed that teachers cannot avoid to use appropriate teaching methods to improve performance in students.

Another study by Faraday (2012) examined the effect of teaching methods and its effects on academic performance. The study objectives were to examine the effects of teaching

methods on performance in secondary schools in Kenya. Findings indicated that student centred learning methods was the best way of helping learners improve on their academic performance. Traditional methods such as lecture method can be used to teach students in high school and but it was found out that there was no statistical significant effects on academic performance in students.

Umar (2014) examined the relationships between participatory teaching methods on academic performance in students. Cooperative teaching methods was also examined and found that participatory methods were the most preferable way to enhance academic performance in students in high schools. Demonstrations methods influenced academic performance was seen by many students answering questions asked by teachers. Teachers used brainstorming method to test their students through group discussions and thus academic performance improvement. Learner centred teaching methods in biology subjects therefore enhanced better academic performance compared to traditional passive methods.

Murray, (2011) indicates that some subjects cannot be performed easily, unless students use case studies and discuss in different groups so as to enable instructors to understand their level of knowledge about the subject topics. This study therefore advocates case studies and group discussion in teaching biology to enhance academic performance. In spite of these studies, the learner centred method is not effectively analysed in regard to student performance. This study seeks to fill in this gap.

Student Entry Behaviour

The student entry behavior refers to that prerequisite knowledge and skills which the student already possessed in biology. It also refers to KCPE entry mark in science. Haas, (2002) conducted a study on the influence of student entry behaviour on student achievement in Virginia, USA. The focus on student entry behaviour was on each secondary school subject. The findings showed that entry behaviour influences achievement. Bategeka (2010) showed that if student entry behaviour is below average then improvement of student's knowledge is difficult. However, student entry behaviour remains a challenge in the determining the success of academic performance as Njoroge and Kiweu, (2023) in their study however noted that there is no statistical significant relationship between entry behavior and academic achievement.

The student centred methods enables interactions between themselves affect performance. Morge (2013) examined the entry behaviour and academic performance. Social constructions in biology knowledge are categorized by teacher behaviours and student entry behaviour in each subject chosen. The findings showed that Student entry behaviours determine improvement the mastery of biology content and understanding of basic concepts in schools.

Ondiek, (2016) focused on student entry behavior on academic performance in mathematics, the results showed that entry behaviour may point out to the best approach to help students to achieve good grades in evaluation of tests. Wamukota, (2017) studied the effect of entry

behaviours on academic performance in Moi University. The study entry behaviours involve pre-requisite information, student attitudes and skills possessed by use of relevant learning strategies, the biology subjects requires the student to show its experience in answering questions. This indicated that learning barriers are influenced by student entry behaviours and type of teaching method in biology.

These learning barriers included age of students, entry marks and perceptions toward biology knowledge of teacher's experience, social economic factors, student language formations and attitudes for completion of biology examinations, lack of interest in teaching biology can also influence academic performance in learners. Thus, it is very important for students to assess their entry mark during admissions in order to manage their performance outcomes through effective student to teacher interaction.

Yalcinkaye & Baker (2012) showed that entry behaviours determine student's knowledge and skills that enhance academic performance. Then entry behaviour enable student to understand and know teaching instructions by achieving biology knowledge and ability to learn human life. Entry behaviours enhance academic performance through references from students to students. Classroom presentations promote interactions between student behaviours resulting to good academic performance in the subject assessed. The interactions may motivate teachers teaching methods on enhancing academic performance in students, this is through teaching methods compared from one subject to another in the selected course. Therefore, student entry behaviours is enhanced by different ecological factors on performance in students from peers, home, neighbourhood of students, school factors, climatic conditions and social economic determinants. Student entry behaviours can trigger learning environment which later affects academic performance. Thus, student entry can be recommended by teachers and find the best way to enhance student academic performance.

Pals and Rylaarsdam (2012) noted student entry behaviours affects academic performance; this is because it influences learning ability and knowledge of understanding biology. The entry behaviour improves teaching molecular biology.

The study observed that using case study in student entry behaviour helps science student interactions to achieve good performance, University of Buffalo. The study indicates that there is no communication without student entry behaviour. This implied that guidance in teaching is indispensable in many classroom situations.

Students Perceptions

Student's Perception refers to that information relating teaching life, class level, individual level and interpersonal response to student academic performance. Rainmond (2012) studied the effect of student's perception on academic performance in Indonesian School. The researcher used an experimental group.

The student behaviours can give the direction of learning outcomes which included knowledge measurable to biology concepts. Learning experience is influenced by student perceptions and test evaluations. The study findings showed that student perceptions affect academic performance through specific knowledge, concrete and affective understanding of basic concepts. Student perceptions influence academic performance by group discussions.

The use of ANOVA analysis showed that teacher and student perceptions had a positive significant effect on performance in students in schools. The division of small group discussions are also influenced by student perceptions. Perception of students involves interpretations of personal information in which perspective of learning is based. School factors influences students' perception on academic performance. Perception of a student is very significant on performance in learning activities related from student relationships and teachers' level of education.

Student perception is influenced by learning beliefs and ability to perform better in the examination situations.

The parents need to cooperate with teachers in classroom; perceptions toward academic perceptions had significant effect in examination results. However, student perception can be influence academic performance. Perception of students can be facilitated by classroom presentations in order to improve performance. The study usually adopted by online teaching methods perceived by improving interaction of students face to face communications. This is due to probability of maintaining social interactions among students and teacher satisfaction improves academic performance in biology. The study found that perception of learning in education is not easy to identify its nature. The facts can be considered by teacher and student related determinants on academic performance.

Ganyaupfu (2013) examined the influence of perception of students on academic performance in schools. The study determined the effects of student perception on academic performance by the level of education systems. The study used biology experiments awareness of student performance in grades and other results events in terms of organization, stimulation, evaluation, interpretation and mastery recalls. The group discussion influences academic performance in students and project learning process. The findings indicated that formulation, investigation and appropriate learning strategies enable in solving problem.

The perception can be realized by student's tasks performance relatively to the basic concepts promoting student participation and reasoning ability to perform better. The study however, it assists the student to promote biology understanding concepts effectively in learning the subject and examinations. Their perceptions result to the use of appropriate teaching methods that are directly to improve academic performance, but it is important to understand relate perceptions and ability to perform in examinations.

Student perception provides an important insight to understand the ability of a teacher to possess good attention in classroom teaching and interaction relevant to academic performance.

Tababal and Kahssay (2011) examined the study on the effects of student perceptions on academic performance. The study noted that perception makes student to perform better by understanding teacher's concepts and classroom situation to biology subject by improving of the best grades, performance in bad grades provides the student an idea to think about that grade and identify weaknesses. The study noted that student perception affects academic performance and the present study can enhance the understanding of teaching methods.

Andafu and Simatwa (2014) evaluated the effects of student perception on academic performance. These findings indicated that relating student perceptions academic performance may help to interactions through individual thoughts, behaviours and action. Thus, perception helped students to relate one social factor on individual situations and performance. The study note that the time spent on learning determine performance, through perceptions, psychological thoughts and cultural aspects of performing. Student perception influences academic performance in students in sciences where think it is hard to understand as compared to other subjects. This indicated that student perception influences performance through intervention and demonstrative test in classrooms. The perception of students is good in creating teaching experience of which the teachers deal with examinations environment. Perception of every student can be very significant on understanding the level of teaching methods and human behaviours.

The assessment of student perception is expected to improve academic performance in biology subjects. The perception of research in students demonstrates qualitative method of teaching on academic performance.

The perception of student acknowledgement in teaching biology relates to the performance in schools. The student perceptions are provided by the feedback derived by academic results obtained.

Yee (2015) analysed the influence of student perception on academic performance in Chemistry. The study analysed the effect of student perception on academic performance. The case study was used by the national centre for science of Buffalo University. The study analysed through factor analysis, it was established that students simply achieve more information on teaching methods affect academic performance. The teachers use student perception to assess the academic performance.

The approach is theoretical and relies on memorization by the students. It does not use activity-based learning to encourage students to learn real life problems based on applied knowledge. The study did not address students' perception on teaching bonding in

chemistry. This will be addressed by the current study although it will be the student's perception and student relations in biology.

Sharan (2010) examined the effect of student perception on academic performance in biology subjects. The study showed that social gains, valued pedagogy, problematic practice are interrelated. The relationship between students' perception and their performance is important, particularly when it comes to application in class context. This suggests that perception opens the gate to achieving performance.

The study also found out that successful learning depends on other determinants that are not related to the students' perception. On the other hand, the method the teacher uses continues to form an important role in student's perception in academic Accomplishment.

However, challenges that student's perception face in academic achievement is more critical. This needs to be addressed so as to help the student achieve their goals.

The study examined by Ediger (2011) found that student perception is very important in improving academic performance. The study also noted that student perception enables the teachers to identify performance in assessment tests given that the students is able to make good grades depending on the nature of perceptions. The perception of student can be determined by individual behaviours which may be intentional to positive learning of a subject taught by teachers on the nature of knowledge perceived. Student perception enabled flexibility and openness in learning any subjects in the schools.

Coskun (2011) further adds that student's perception is not taken into account in science subjects' activities. This should be investigated so as to get insight resulting to positive performance in schools. Mugan and Simga (2010) did a study on the influence of student perceptions and academic performance in biology. The findings indicated that student perceptions affect performance in students in schools. The study noted that student perception is positive when there are good grades performed; learning strategies on biology is influenced by teachers teaching method applied in sciences. The study indicated group based perceptions should find the best way to improve performance, and group discussion also affect academic performance.

The group based perception is also affect academic performance through size of the group, centeredness, classroom sessions and brainstorming approaches. The study stated that perception towards affect academic performance.

DDjudin (2018) determined the effect of student perceptions on academic performance in students in Virginia. The study examined perception of students towards academic performance.

The study indicated that perception of students affects classroom presentations. The study indicated that perception of students includes the concern of teaching methods on learning relationships in schools. The teachers teaching biology is the main concern on academic performance in students. The study noted that the common process of understanding student perception is through performance, results in response to the teacher evaluations.

The teacher teaching biology need to be motivated by different motivational tools on performance. The reinforcement of student perceptions influences performance through teaching and learning strategies, perception can be used to evaluate the level of teaching methods. The study included community relations between student and teachers on problem-based methods, determination of the type of knowledge affect performance.

Kauffman (2012) noted the effect of student perceptions affect performance in students. The study sought to determine the effect of student perception on academic performance. The study indicated that the perception of the student influences performance. The perception factors influencing student impressions in form of personal characteristics in the situation context of an individuals. The personal traits and other past student experiences can impress academic performance for good grades obtained.

Student perception is that process of learning positively on academic performance. Perception of student is awareness in understanding ideas given by teacher teaching techniques. This is expressed by organization and interpretation on academic performance. Though, the perception towards biology experiment needs personal relations to know whether the act is going to be positive or not. It encompasses all learning strategies employed by the students and teachers that includes think about certain aspects, thus student perceives sciences as a difficult in solving problems. The perception of student can be recognized as one method of interpreting conscience of future and past experience in human beings. This includes processing of bottom up and top down ideas in thinking of different concepts psychologically.

Teacher use teacher centred method in teaching their lessons, but some time they do not consider student perceptions towards academic performance. The low performance in student indicates negative perception toward the subject. Said (2011) noted that level of grades performed by the student during examinations affect general performance in academic setting, especially in sciences and mathematics sets. The results showed that student perception enhances problem solving in examinations such as identification the answers by use of figures and numbers are acknowledged by if student is positively perceived. The perception towards knowledge had impacted teaching methods on academic performance in examination results.

The student perception involves many psychological ideas towards knowing what is good or bad, teachers are required to find their way of teaching biology to encourage good performance. This included flexibility of understanding and interpreting biology curriculum

and its goals. The central nature of understanding perceptions is through grades achieved in classroom and how the students are expressing their challenges in answering questions.

Pals (2012) did classic experiments in the study of molecular biology in the National Centre in the University of Buffalo. He observed that students' perception enabled access to covering the curriculum framework for learning.

Soon and Musasia (2016) studied the effect of student's perception in secondary schools in Kinematics in Kenya. Findings indicate that student's perception led to better performance.

The study revealed that cooperative learning improved student's achievement in physics kinematics. The study only focused on achievement, cooperative learning and conventional learning in physics. It left out a student's perception which is a gap to be focused on in this study. Patekur and Panggabean (2022) added that teacher perceptions and attitude on changes in curriculum influence academic performance.

Summary of Key Research Gaps

The main focus of the studies that have been reviewed in this chapter is on: teacher qualifications, the type of teaching methods employed by teachers, students' entry behaviour, and the perception of students towards school subjects. The most common research methods used in these studies were survey and quasi experimental designs. The common methods of data collection in these studies were observation techniques, focused and in-depth interviews, use of questionnaires, and document analysis. Data analysis in these studies was mainly means, standard deviations and inferential statistics. Results from these studies have shown discrepancies in Biology performance as influenced by teacher qualifications, the type of teaching methods employed by teachers, students' entry behaviour, and the perception of students towards Biology. The main gaps identified in the studies reviewed are insufficient investigation on students' and teachers' determinants on academic performance in Biology. Methods, findings and suggestions made in the reviewed studies shall inform this study. In addition, this study will use description to explain the findings from the survey.

RESEARCH METHODOLOGY

The study adopted the descriptive survey research design to investigate the influence of selected student and teacher determinants on academic performance in biology in secondary schools in Kisii County. This allowed collection of data from selected individuals at a single point in time (Gay, Geoffrey and Peter, 2009). This study adopted the descriptive survey design as it enables the collection of primary data and description of the nature of the study to make conclusions.

Open ended questionnaire allowed for explanations of closed ended questions giving a rich description of the status of determinants and academic performance being investigated. Creswell, (2014) states that use of questionnaires is suitable in collecting

large information within a short period of time and allowing for analysis of results by studying a sample of the population. Data from the closed ended items was quantitatively analysed while data from open ended was analysed thematically. Both qualitative and quantitative data was analysed according to the objectives of the study.

The target population was 12,294 comprising 10,232 form three (3) students, 306 principals, and 813 biology subject teachers, class teachers 637 and 306 heads of departments in Kisii County. Principals were involved in this study since they are in charge of management and administration of the implementation of curriculum in secondary school. Class teachers have information about student academic performance from students' performance records. Therefore, they were better placed in providing general information about their schools' academic performance.

These are the ones who keep the records of students and are able to provide immediate and relevant information regarding performance. Form 3 students were selected because they have chosen biology as a subject of choice and therefore provided information on student related determinants. The stratification was done based on school category (mixed boarding, boys boarding, girls boarding and mixed day schools).

The researcher used stratified sampling procedure and random sampling to get the sample of 1229 respondents. Stratified sampling was used to stratify the schools into categories of national schools, extra county schools, county schools, and sub county schools. The researcher also stratified the gender factor in order to differentiate the schools by either boy's schools, mixed schools and also girls schools and their Biology academic performance. The researcher selected a sample from each stratum principal, class teachers, and head of department, subject teachers, and form three students. Each school was given an equal chance of being selected under the study.

According to Gall (2003) and Bryman (2016) sample size is the number of observations or items, people to be used in the study. The number selected represents the entire population under the study. Sample size can have a significant influence on data analysis with estimated precisions in order to make final conclusion.

Ogula (200) describes a sample as a subset number selected from the entire population in order to analyse data. The sample size cannot be more than the target population.

The appropriate sample size represents the entire target population of which the findings can be generalised. The sample size comprised of 1, 229 respondents as shown in Table 3.1

Table 3.1: Target Population and sample size

Category of the respondent	Target population	Sample (n)
Principals	306	31
Class teachers	637	63
Head of department	306	31
Biology Subject teachers	813	81
Form 3 students	10232	1023
Total	12294	1229

Data Collection Instruments

The study used questionnaires as the data collection instruments. The questionnaires had both open-ended and closed questions that was used to collect the data for the study and were served to all the 1229 respondents.

FINDINGS, INTERPRETATION AND DISCUSSION

Introduction

This chapter presents the findings of the study, the interpretation and discussion of the findings. The study investigated on how teacher and student related determinants influence academic performance in biology in public secondary schools in Kisii County. The data was analysed interpreted and results discussed according to the specific objectives stated below:

- i. To establish the extent to which teachers' qualifications influence academic performance of students in biology in public secondary schools in Kisii County, Kenya.
- ii. To determine the extent to which methods of teaching influence academic performance of students in biology in public secondary schools in Kisii County, Kenya.
- iii. To find out the effect of students' entry behaviour on their performance in biology in public secondary schools in Kisii County, Kenya.
- iv. To determine the effect of students' perceptions towards biology on academic performance in biology in secondary schools in Kisii County, Kenya.

General and Demographic Information

Return rate

The study targeted a population of 306 principals, 637 class teachers, 306 heads of departments, 813 biology teachers and 10232 form three students. Of these, a sample size of 31 principals, 63 class teachers, 31 and heads of departments, 81 biology teachers, and 1023 form 3 students from 306 secondary schools was selected.

The researcher distributed the questionnaires to respondents and managed to collect a total of 774 questionnaires returned and filled. Table 4.1 shows the return rate for each respondent category.

Table 4.1 Return Rate

Category of the respondent	Target population	Sample (n)	Response	Percentage
Principals	306	31	18	58
Class teachers	637	63	39	61.9
Head of department	306	31	19	61.2
Biology Subject teachers	813	81	51	62.9
Form 3 students	10232	1023	647	62,2
Total	12294	1229	774	100

Source: Researcher

The findings on the return rate were as follows: $18/31 \times 100$ (58%) of principals; $19/31 \times 100$ (61.2%) head of department; $39/63 \times 100$ (61.9%) class teachers; $51/81 \times 100$ (62.9%) biology subject teachers and $647/1023 \times 100$ (62.2%) students from form three responded to the questionnaire. Overall, the response rate of 62.97% which considered adequate for data analysis. According to Kothari (2014) who asserted that a response rate of above 60% is adequate and response rate of above 70 % is very good under the study.

Demographic data

The demographic data of the principals who participated in the survey included gender, academic qualification, Category of school, Headship experience and for how long one had been a Principal in his current school.

Demographic data regarding the Heads of departments were analysed by gender, academic qualification, Category of school, Headship experience and based on the period that one had served as the head of department in the current school.

While data for Biology subject teachers included gender, Subject of specialization, Subject combination, Teaching experience, highest academic qualification and their employer. And lastly, data regarding the form 3 students were analysed by their gender and the form they join this school.

Gender Distribution

Table 4.2 shows the gender distribution of the respondents who participated in the study..

Table 4.2 Gender Distribution

Gender	Principals		HODs		Biology		Students	
	n=31	%	n=31	%	n=81	%	n=1023	%
Male			1				3	
Female	19	61.1	17	54.8	42	51.9	458	44.8
Total	12	38.9	14	45.2	39	48.1	565	55.2
	31	100	31	100	81	100	1023	100

Source: Researcher (2023)

The results showed that $19/31 \times 100$ (61.1%) of the principals who participated in the study were male while $12/31 \times 100$ (38.9%) were female. This implied that there were more male

principals than females in secondary schools. The male Head of Department persons who participated in the study were $17/31 \times 100$ (54.8) while the female were $14/31 \times 100$ (45.2%) which indicated that the majority of the respondents were male head of departments. This finding shows that the gender stereotype that headship positions are the preserve for men (Matete, 2022) may be persisting. Even though gender disparities among the representations of the principals and head of departments agreed with the constitutional gender rule of at least representations of 30% in employment of both genders, the participation of female teachers in headship could still be a subject of concern.

Biology subject teachers respondents showed that $42/81 \times 100$ (51.9%) were females and $39/81 \times 100$ (48.1%) male. This implied that there were more female teachers teaching biology subjects in secondary schools than male. The form 3 biology students who participated in the study were $565/1023 \times 100$ (55.2%) female while $458/1023 \times 100$ (44.8%) were male. This was an indication that majority of the students in Kisii county studying biology were girls. Wangu, (2014) observed that students tend to copy the choices of their role models. It could therefore be that since many female teachers taught biology than male teachers female students tended to choose Biology as compared to the boys. Eseine, A, & Christabel, E (2021) also notes that, biology is a subject that allows learners to understand about their bodies and is important to be studied by all gender. Therefore, there is need to address this gender parity by encouraging more male students to take the biology subject.

Academic Qualifications of Principals, HODs and Biology Teacher by Gender

The principals, HODs and Biology subjects were asked to state their levels of education. Teacher level of qualifications is as shown in table 4.3.

Table 4.3 Level of Education

Level of Education	Principals		HODs		Biology	
	n=31	%	n=31	%	n=81	%
Masters	4	12.90	2	6.45	8	9.88
Bachelor	19	61.29	24	77.42	64	79.01
Diploma	8	25.81	5	16.13	9	11.11
Total	31	100	31	100	81	100

Source: Researcher (2023)

The results showed that $19/31 \times 100$ (61.1%) of the principals who participated in the study had a Bachelors degree while $4/31 \times 100$ (12.9%) had a Masters degree. This implied that the majority of the principals of secondary schools had degree.

The results of the Head of Department persons who participated in the study revealed that $24/31 \times 100$ (77.42) had Bachelor's degree while $5/31 \times 100$ (16.13%) had Diploma, while $2/31 \times 100$ (6.45%) of the Head of department persons had a Masters degree. The majority of the head of departments had bachelor's degree.

The study showed that $64/81 \times 100$ (79.01%) of the biology teachers who participated in the study had a Bachelors degree; $9/31 \times 100$ (11.11%) had a Diploma and $8/31 \times 100$ (9.88%) had a Masters degree.

Teacher's level of qualification is essential in teaching and transmission of secondary school knowledge, values, skills, creativity and studying student attitudes towards performance. from Table 4.3 the results indicated that all the teachers sampled had the required training in education. The findings confirm that teachers who participated in this study had the requisite education and knowledge to teach biology in the secondary school. The Teacher's Service Commission (TSC) requires that for a teacher to qualify to teach at the high school, he or she should have a minimum of a diploma in education. Additionally, with adequate professional qualification, sufficient knowledge, understanding of the curriculum and teaching practice in both classroom and practical approaches helps the students improve in biology subject.

This finding is consistence with the findings of Waseka, et al. (2016), Darling – Hammond (2000), and Sparks (2000) who observed that, teachers with bachelor's degree and have served for some time had strong influence on the academic performance in students in examinations.

School Category

The study sought to determine the category of the schools. Consequently, the school principals and HODs were asked to state the category of the school they were serving in. The results were presented in table 4.4.

Table 4.4 School Category

Category	Principals		HODs	
	n=31	%	n=31	%
National	2	6.45	2	6.45
County	11	35.49	17	54.84
Sub-county	18	58.06	12	38.71
Total	31		31	100

Source: Researcher (2023)

From the data collected, it can be noted that very few principals interviewed were from national schools $2/31 \times 100$ (6.45%), many $11/31 \times 100$ (35.49%) were from county schools while the majority were $18/31 \times 100$ (58.06%) from sub county schools. Overall, the study reveals that majority of the respondents were from county schools, a small number of national schools and just below a quarter of sub-county schools. This was a good representation of categories of schools in Kisii county as most are County schools, many Sub County schools and few national schools

Experience of Principals, HODs and Biology Subject Teachers

The study required the principals, HODs and Subject teachers to state their experience in the present roles. The results obtained are presented in table 4.5 below.

Table 4.5 Years of Teaching Experience in Current Roles

Experience in years	Principals		HODs		Biology	
	n=31	%	n=31	%	n=81	%
1 Year	4	12.90	4	12.90	6	7.40
1 to 3	2	6.45	15	48.39	13	16.05
4 to 9 years	20	64.52	4	12.90	41	50.62
10 and more	5	16.13	8	25.81	21	25.93
Total	31	100	31	100	81	100

Source: Researcher (2023)

Findings from the data obtained indicate that $20/31 \times 100$ (64.52%) of the principals had an experience of between 4 to 9 years, $5/31 \times 100$ (16.13%) indicated that they had served as principal for a period of more than 10 years whereas $2/31$ (6.45%) said that they had served as principals for a period of 1 and 3 and $4/31 \times 100$ (12.90%) indicated that they had an experience of 1 year. This implied that a good percentage of principals had more than 4 years of experience as principals which is considered a good experience to understand student and teacher related determinants affecting performance.

For the Head of departments, almost half $15/31$ (48.39%) said that they had an experience of 1 to 3 years as HODs, a quarter $8/31$ (25.81%) indicated an experience of 10 years and more, $4/31$ (12.90%) said that they had served 1 year and $4/31$ (12.90%) said had worked for 4 to 9 years. Overall, most of the head of department persons had sufficient experience to understand student and teacher related determinants affecting performance

On experience of teachers teaching biology subject teachers, $41/81$ (50.62%) of the respondent teachers said that they had worked for a period of 4 to 9 years, $21/81$ (25.93%) said that they had thought for more than 10 years, $13/81$ (16.05%) indicated an experience of 1 to 3 years and lastly few $6/81$ (7.40%) of the teachers indicated an experience of 1 year.

This implied the majority of the biology subject teachers had the pre-requisite experience in teaching and assessment of performance.

This finding is supported by the work of Francis Abusei, (2007) and Bilesanmi (1999) who found that the teacher's experience had an effect on the student's achievements, since it significantly affected the study habits. In their findings, older teachers were found to have had an opportunity in life to handle different types of learners. This made them to have better people skills that helped them to adopt appropriate teaching methods which enable learners to perform better in their examinations.

Students' Entry Point

The students were asked to indicate when they joined the school and the result was shown in figure

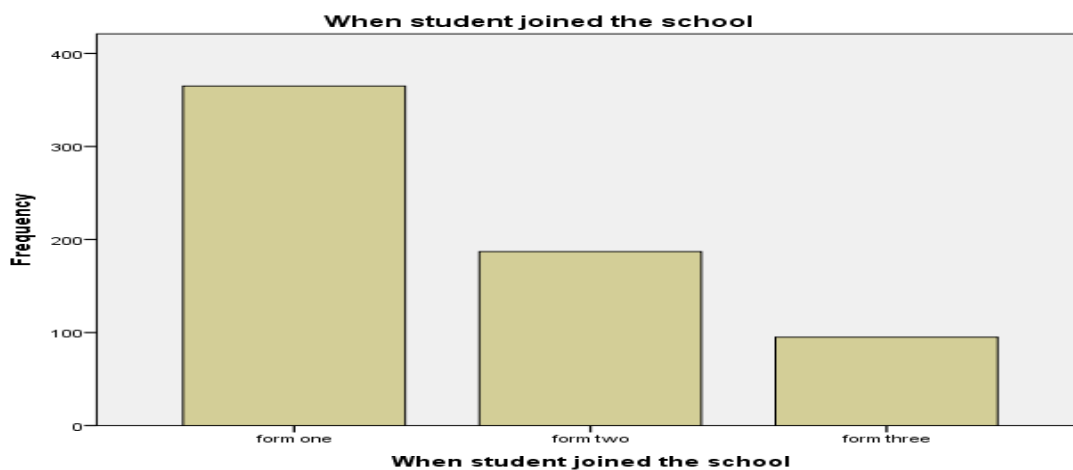


Figure 4.1: Frequency Histogram on How the Students Joined School

The results showed that the majority 365/648 (56.4%) joined the school from form one, followed by 187(28.9%) joined when form two and 95/648 (14.7%) joined the school in form three. This implies that the majority of the students joined the schools in form one with some joining from form two and form three. Therefore the student's entry point varied and can affect his/her subject performance. This is because, when instruction quality and delivery styles get subjected to changes abruptly due to change of school, then the student naturally must adjust so as to cope with the new styles. Consequently, this adjustment can affect the student's subject performance.

Teacher Qualification

The first objective was to establish the extent to which teachers' qualifications influence academic performance of students in biology in public secondary schools in Kisii County, Kenya.

The Principals and HODs were asked to state how often they assessed the adequacy and level of teacher's qualification to teach biology. The collected data was analysed and findings were presented in table 4.6.

Table 4.6 Adequacy of Teacher Qualification

	Principals		HODs	
	n=18	%	n=19	%
Rarely	4	22.2	3	15.8
Frequency	12	66.7	15	78.9
Never	2	11.1	1	5.3
Total	18	100	19	100

Source: Researcher (2023)

Information from Table 4.6 revealed that a high percentage 12/18 (66.7%) of principals and 15/19 (78.9%) HODs frequently assessed the adequacy and level of the teachers' qualification to teach biology in their schools. 4/18 (22.2%) and 3/19 (15.8%) of the responding principals and HODs respectively indicated that they rarely assessed the teachers while very few 2/18 (11.1%) and 1/19 of principals and HODs respectively indicated that they have never done the assessment.

The study further sought to establish the extent to which teacher qualification affected the academic performance in biology subject. Therefore, principals and HODs were asked to state the extent to which the teacher's qualification influenced academic performance and the results obtained were presented in table 4.7 below.

Table 4.7 Teacher Qualification

Extent of qualification	Principals		HODs		Mean	Std dev.
	n=18	%	n=19	%		
Qualification of Degree has a high influence on academic performance	10	55.5	11	57.9	4.51	.6901
Qualification of Diploma improves academic performance.	5	27.8	6	31.6	3.02	.7011
Teacher's qualification of master's influence student academic performance	3	16.7	2	10.5	2.01	1.087

Source: Researcher (2023)

From the data analysed and presented in table 4.8, it can be revealed that, slightly more than half of the principals and head of departments said that teachers with degree qualifications had high impact on academic performance. With an average mean value 4.51 and standard deviations of 0.6901, it can be deduced that most of the teacher's qualification preferred was that of degree.

In addition, 5/18 (27.8%) of the principals and 6/19 (31.6%) of HODs indicated that, teachers qualified with diploma improved academic performance. The average mean value was 3.02 and standard deviation 0.7011 which implied that some teachers whose qualification was diploma improved academic performance.

Further, 3/18 (16.7%) of principals and 2/19 (10.5%) of the head of departments indicated that, master's degree qualifications affected the academic performance. With a mean of 2.01 and standard deviation of 1.087, it implies that the master's degree might not be preferable in improving academic performance.

This finding is consistence with the findings of Waseka, et al. who noted that, the teachers who were qualified with a bachelor's degree had strong influence on the academic performance in students in examinations. These results therefore show that the teachers who

teach Biology in Kisii County are well qualified in instilling good performance among learners.

The principals and HODs were required to indicate how often they assessed the teachers involve learners in teaching biology and how it influences its performance. The data obtained was analysed and data obtained presented in table 4.8.

Table 4.8 Assessment of Teachers Teaching Biology

Extent of qualification	Principals		HODs		Mean	Std dev.
	n=18	%	n=19	%		
I assess by use of the Head of department	12	66.7	9	47.4	4.32	.2902
By use of specific learners	5	27.7	8	42.1	4.02	.4013
Other specified	1	5.6	2	10.5	2.51	1.210

Source: Researcher (2023)

As indicated in Table 4.9, almost three quarters 12/18 (66.7%) of the principals and about half 9/19 (47.4) of the HODS said that they assessed the teachers teaching biology by using the head of the department.

Also, about a quarter 5/18 (27.7%) of the responding principals and about 8/19 (40%) of the HODs said that they assessed the teacher's qualification by using specific learners.

Lastly, 1/18 (5.6%) of the responding principals and about 2/19 (10%) of the HODs said that they used other specific methods other than head of departments and learners to assess how the teachers involved learners in the teaching and learning of biology.

The research study also sought to understand whether the principles and HODs organised and sent the teachers of biology to seminars and trainings. Consequently, the teachers were asked to indicate whether they ever attended trainings or seminars of teaching biology. The findings were shown by Table 4.9.

Table 4.9 Attended Seminars and Training

Attended	Principal		HOD	
	N=18	%	N=19	%
Yes	2	11.11	7	36.84
This term	3	16.67	2	10.53
Last term	4	22.22	3	15.79
Last year	5	27.78	5	26.31
No	4	22.22	2	10.53

Source: Researcher (2023)

As indicated in the table 4.10, some of the principals and Head of departments (2/18, 11.11% and 7/19, 36.84% respectively) said that their biology teachers attended to seminars and workshops. For those saying this term, 3/18 (16.7 %) of the principals and 2/19 (10.53%) of the HODs said that their biology teachers had attended to them in the same term, 4/18 (22.2%) of the principals and 3/19 (15.7%) of the HODs said that they had attended in the

month preceding the current term while 5/18 (27.8%) of the principals and 5/19 (26.31%) of the HODs said that they had attended to them in the previous year.

On the other hand, 4/18 (22.22%) and 2/19 (10.53%) of the principals and HODs respondents said that their biology teachers had never attended to seminars and workshops.

This analysis implies that the majority of principals and head of departments had attended trainings and seminars and hence had the requisite knowledge to assess teaching of biology. However, on average, the majority indicated that their biology teachers had attended seminars and workshops last term as compared to this term and last year.

Further, the principals were asked to indicate how often they organize for seminars or workshops in their school in teaching biology. On how often does your school organize workshops/seminars in teaching of biology. The results were presented in table 4.10.

Table 4.10 How often the school organize workshops/seminars in teaching of biology

How often	No	%
Rarely	6	33.33
Frequently	11	61.11
Never	1	5.56
Total	18	100%

Source: Researcher (2023)

The principal showed that the majority of the respondents were 11(61.11%) said that frequently organized seminars, 6(33.33%) said rarely and 1(5.56%) said never organized for seminars/workshop.

The above information was also represented by figure 4.1 as shown



Figure 4.2: Distribution Curve showing how Principals Organized Seminars or Training

The results showed that the majority of principals stated that they frequently organized seminars or workshop in teaching biology. These findings agree with (Bartsch, 2015) who established that teacher professional development help improve performance to each individual learner. This means that the principals were keen in supporting Biology teachers' professional skills in an effort to better learner' academic performance.

The study also asked head of department to indicate whether teacher qualifications influence coverage of syllabus of teaching biology. The figure 4.2 presented results shows the teacher qualification distribution.

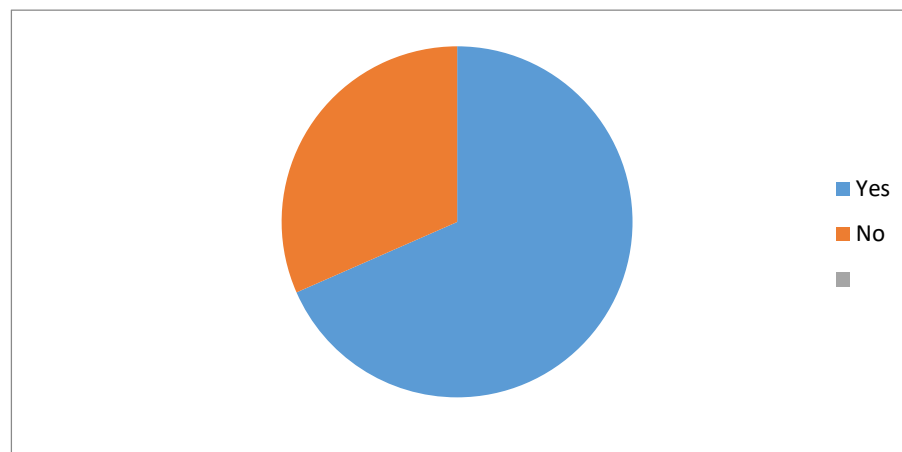


Figure 4.3: Teacher Qualification Distribution on Syllabus Coverage

The results in figure 4.2 indicated that head of department about syllabus coverage by teacher qualification 6/19 (31.6%) said No and 13/19 (68.4%) said Yes. The majority of the head of department agreed that teacher qualification influences syllabus coverage and therefore affect academic performance in teaching biology. These findings however differ with Schul, (2011) who found no significant difference between teacher qualifications and performance. Therefore this study appreciates that teacher qualification should be accompanied with teacher continuous professional development to boost student's performance.

Method of Teaching

The second objective was to determine the extent to which methods of teaching influence academic performance of students in biology in public secondary schools in Kisii County, Kenya.

The research required the principals and heads of the departments to list the frequently methods of teaching biology adopted in their schools. Data collected and analysed is as presented in Table 4.11 below:

Table 4.11: Method of Teaching

	Not at all	Rarely	Moderate	Frequent	Very frequent	Mean	Std. Dev
Practical approach	10.8%	10.8%	10.8%	29.7%	37.8%	4.0270	1.27990
Discussion	2.7%	10.8%	5.4%	29.7%	51.4%	4.4595	.86905
Simulations	18.9%	8.1%	13.5%	29.7%	29.7%	3.8108	1.43058

The results in Table 4.11 show that, slightly above average of the respondents indicated that the most frequently adopted method of teaching biology in the schools under investigation was discussions with a mean of 4.0270 and standard deviation of 0.86905. This is slightly followed by practical approach with a standard deviation of 4.0270 and standard deviation of 1.2799. As per this study, simulation approach was the least frequently adopted method of teaching and learning of biology with slightly above half of the respondents indicating they used it. Simulation was indicated as used with a mean of 3.8108 and standard deviation of 1.4038. Overall, it can be stated that, the majority of teachers adopted discussion method of teaching biology. These findings concur with Muray (2011) who recommended that the teaching methods which emphasized on discussion enabled students to improve their grades in examinations by understanding of concepts of different topics in biology. This study therefore concluded that with many teachers adopting discussion methods the academic performance could start getting better than the previous years.

The researcher asked the respondents to indicate how appropriate they recommended the following methods of teaching biology in schools; lecture method, discussion, practical approach, resource person, question and answer method, academic visit and audio-visual. The data obtained and analyzed is as presented as in the table 4.12 below:

Table 4.12: Recommending the Method of Teaching Biology

		Frequency	Percent	Mean	Std. Dev
Lecture method	Very appropriate	15	40.5		
	Appropriate	5	13.5		
	Not appropriate	17	45.9		
	Total	37	100.0	2.0541	.94122
Discussions	Very appropriate	13	35.1		
	Appropriate	6	16.2		
	Not appropriate	18	48.6		
	Total	37	100.0	2.1351	.91779
Practical	Very appropriate	11	29.7		
	Appropriate	7	18.9		
	Not appropriate	19	51.4		
	Total	37	100.0	2.2162	.88616

Resource person	Very appropriate	12	32.4		
	Appropriate	6	16.2		
	Not appropriate	19	51.4		
	Total	37	100.0	2.1892	.90792
Question and answer	Very appropriate	10	27.0		
	Appropriate	9	24.3		
	Not appropriate	18	48.6		
	Total	37	100.0	2.2162	.85424
Academic visit	Very appropriate	15	39.5		
	Appropriate	6	18.9		
	Not appropriate	16	40.5		
	Total	37	100.0	2.0000	.91287
Audio – visual aids	Very appropriate	15	40.5		
	Appropriate	8	21.6		
	Not appropriate	14	37.8		
	Total	37	100.0	1.9730	.89711

The findings in table 4.12 show that majority 17/37 (45.9%) of the respondents indicated that, lecture method is not the appropriate method for teaching biology. About 15/37 (40 %) of the respondents said that the method is very appropriate with few 5/37 (13.5) saying that it is appropriate. With the mean of 2.0541 and standard deviation of 0.9412, the method was not preferred by most teachers in secondary schools. These findings are in agreement with Umar (2014) who found that on using lecture method there was no statistical significant effects on academic performance in students. These results indicate that that many teachers were aware that lecture method alone is not sufficient in promoting academic performance.

On student centered methods the study showed the following: on discussion method; slightly below average 18/37 (48.6%) of the respondents said that the method was not appropriate in the teaching and learning of biology, slightly above a quarter 13/37 (35.1%) of the respondents said that it was very appropriate and lastly about one eighth 6/37 (16.2%) of the respondents said that it was appropriate. Most principals and head of department recommend discussion method of teaching biology in schools.

Slightly more than half 19/37 (51.4%) of the respondents said that practical was not appropriate method for teaching and learning biology, slightly more than a quarter 11/37 (29.7%) indicates very appropriate and just above one of eighth 7/37 (18.9%) indicating that it was appropriate. On resource person, slightly more than half 19/37 (51.4%) of the respondents indicated not appropriate, slightly above a quarter 12/37 (32.4%) indicated very appropriate and a few 6/37 (16.2%) said that it was appropriate. On question and answers method, slightly below half 18/37 (48.6%) of the respondents indicated was not appropriate methods of teaching biology, slightly above a quarter 10/37 (27.0%) indicated very

appropriate and just below a quarter 9/37 (24.3%) said it was the appropriate method of teaching biology.

On academic visit, just below average 16/37 (40.5%) of the respondents indicated appropriate which is almost at par 15/37 (39.5%) with very appropriate. Just above a quarter 6/37 (18.9%) of the respondents indicated that it was the appropriate method of teaching biology.

Audio visual aid was also very appropriate in teaching biology with almost half 15/37 (40.5%) of the respondents indicating so, 14/37 (37.8%) said that it was not the appropriate method of teaching biology and just above a quarter 8/37 (21.6%) of the respondents indicating that it was the appropriate method of teaching biology in secondary schools.

These findings are in concurrent with Faraday, (2012) who indicated that student centred learning methods were the best way of helping learners improve on their academic performance. This study therefore equally calls for learner centred teaching methods which enhances engagement and learning among learners and consequently promotes academic performance.

The researcher also asked the students to state how often they have discussion with their teacher in biology class.

Table 4.13: Student Discussion with Teachers in Biology

		Frequency	Percent
How often	Once a week	189	29.2
	Twice a week	321	49.6
	Not specific	137	21.2
	Total	647	100.0

The study findings showed that the majority 321/647 (49.6%) indicated that discussions with biology teachers was twice a week, 189/647 (29.2%) was discussing with biology teacher once a week and 137/647 (21.2%) said that discussions with biology teachers was not specific. These findings differ with Makewa (2011) who state that teachers often used passive methods in teaching biology despite their knowledge that student centred methods such as discussion methods were better. These findings therefore indicate that many teachers were making an effort to help improve students' academic performance.

The researcher also asked students to state whether their biology teacher encouraged them to participate in discussion during classroom.

Table 4.14 shows the responses:

Table 4.14: How Teacher Encouraged Student to Participate in Classroom Discussions

	Frequency	Percent
Yes	510	78.8
No	137	21.2
Total	647	100.0

The study findings from table 4.14 indicated that 510/647 (78.8%) agreed that teachers of biology encouraged them to participate in classroom discussions while 137/647 (21.2) did not agree that teacher encourage them to participate in classroom discussions.

This is supported by Tersia M. K. et al, (2016) who says that many teachers help students to have positive attitude towards biology by explaining to them the career opportunities related to performing it better. This means that many teachers made an effort to change the attitudes of students towards better academic performance.

The responded who indicated yes were also asked to state the activity that they got involved in and the methods they enjoyed using. The data collected was organised and results presented in table 4.15 below.

Table 4.15: The Teaching Method Involved and Enjoyed in Classroom

		Frequency	Percent
Methods	Group discussion	210	32.5
	Practical	137	21.2
	symposium	100	15.5
	Virtual chat roots	47	7.3
	Demonstrations	153	23.5

The results showed that 210/647 (32.5%) of student were involved and enjoyed with group discussions, slightly below a quarter 153/647 (23.5%) were encouraged to involve and enjoy demonstrations, 137/647 (21.2%) were encouraged to join in practical, 100/647 (15.5%) were encouraged to enjoy in symposium and lastly 47/647 (7.3%) enjoyed with virtual chat roots. these results agree with Abdi ,(2014) who indicate that many students enjoyed teaching methods in which they were involved.

These results therefore mean that methods such as discussions, symposiums which not only involve students but also consider the learners' interest is what students enjoyed and would consequently promote academic performances

Students' Entry Behaviour

The third objective was to find out the effect of students' entry behaviour on their performance in biology in public secondary schools in Kisii County, Kenya.

The student entry behaviour was assessed by whether there was enough material in the school like biology charts and apparatuses during entry time. The results showed that 401/647 (61.9%) said Yes while 246/647 (38.1) said No. This implied that there was material for the teaching and learning of biology at the point the students joined. The respondents indicated that the parents or guardian mostly provided resources materials as

compared to school during entry of the students. These results are in tandem with Yalcinkaye & Baker (2012) who showed that entry behaviours matter in determining student's knowledge and skills that enhance academic performance. Thus, student entry behaviour of a student is a starting point for teachers to find the best way to enhance student academic performance.

Students' Perceptions towards Biology

The fourth objective was to determine the effect of students' perceptions towards biology on academic performance in biology in secondary schools in Kisii County, Kenya.

To understand the perception of students towards biology students, the researcher requested the students to indicate in a scale of 1 (Strongly disagree) to 5 (Strongly agree) how they graded their perception and those of others towards the teaching and learning of biology in secondary schools in Kisii County, Kenya. The data gathered and analysed from the research is as presented in 4.16 below;

Table 4.16: The Perception of Learners Towards Teaching of Biology

	N	Minimum	Maximum	Mean	Std. Deviation
I know the importance of biology in education.	647	1.00	5.00	4.0649	1.09267
I enjoy learning biology with other students.	647	1.00	5.00	4.0696	1.07164
I can provide extended answers which will interest others in class.	647	1.00	5.00	4.0603	1.09506
I can speak in class for others to hear.	647	1.00	5.00	3.7666	1.30832
I can raise my hand up to answer questions.	647	1.00	5.00	4.0726	1.08436
I can explain my answers in class.	647	1.00	5.00	4.0819	1.05621
I enjoy going out for biology symposiums.	647	1.00	5.00	4.0804	1.06435
Biology learning and teaching is relevant to me as a student.	647	1.00	5.00	3.7481	1.32605
I learn biology to improve my understanding of biology concepts.	647	1.00	5.00	3.7604	1.30957
Valid N (list wise)	647				

The table of results reveals as follow; those who indicated that could explain their answers in class had a mean of 4.0819 with standard deviation of 1.05621, those who indicated that they enjoyed going out for biology symposiums had a mean of 4.0804 with standard deviation of 1.06435, those who indicated that they could raise their hands up to answer questions had a mean of 4.0726 with standard deviation of 1.08436, those who said that they enjoyed learning biology with other students had a mean of 4.0696 with standard deviation of 1.07164,

Those who indicated that they knew the importance of biology in education had a mean of 4.0649 with standard deviation of 1.09267, those who indicated that they could provide extended answers which will interest others in class had a mean of 4.0603 with standard deviation of 1.09506, those who indicated that they could speak in class for others to hear had a mean of 3.7666 with standard deviation of 1.30832, those who indicated that they could learn biology to improve their understanding of biology concepts had a mean of 3.7604 with standard deviation of 1.30957, and lastly those who indicate that Biology learning and teaching was relevant to them as a students had a mean of 3.7481 with standard deviation of 1.32605.

These results showed that, students' perceptions towards biology had apart to play in their academic performance in biology. These findings are in agreement with Rainmond (2012) who found out that the students' perceptions can give the direction of academic performance. This means that all students needed is for them to have positive outlook towards biology as this has been known to boost academic performance.

Teachers were requested to state their attitude and those of learners towards teaching biology. Data that was recorded and analyzed is presented in the Table 4.17.

Table 4.17: Student-Teacher Related Determinants and Academic Performance

		Attitudes of biology teacher to teaching and learning	Perception of learners towards teaching biology	Entry Behaviour on academic performance	Academic performanc e
Attitudes of biology teacher to Teaching and learning	Pearson Correlation Sig. (2-tailed) N	1 647	-.027 .500 647	-.019 .633 647	-.027 .499 647
Perception of learners towards teaching biology	Pearson Correlation Sig. (2-tailed) N	-.027 .500 647	1 647	.980** .000 647	.970** .000 647
Entry Behaviour on academic performance	Pearson Correlation Sig. (2-tailed) N	-.019 .633 647	.980** .000 647	1 647	.985** .000 647
Academic performance	Pearson Correlation Sig. (2-tailed) N	-.027 .499 647	.970** .000 647	.985** .000 647	1 647

** . Correlation is significant at the 0.01 level (2-tailed).

The study shows that there was a negative relationship between attitude of towards biology teacher to teaching and learning on academic performance with $p .499 > .05$ and $r -.027$.

On the other hand, Perception of learners towards teaching biology had a positive correlation $r .970$, $p .000 < .05$ on academic performance, while Entry Behavior on academic performance had a positive correlation $r .985$ $p .000 < .05$. These results disagreed with Njoroge and Kiweu (2023) who noted that there is no statistical significant relationship between entry behavior and academic achievement. It is therefore important to build on students' prior knowledge so as to enhance academic performance. Perception and entry behavior of students towards biology subject had significant relationship between student and teacher related determinants and academic performance.

However, attitude towards teaching and learning of biology had a negative relation between student teacher related determinants and academic performance. its therefore important to promote positive attitudes of both teachers and learners towards biology so as to enhance academic performance in biology.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The first objective establishes a significant relationship between teacher's qualification and academic performance. Qualification of teachers with degree is preferable to teachers with other qualification. Also, teachers undergoing continuous professional development through seminars and workshops boost students' academic performance. This study therefore concludes that, teachers qualified with degrees and with continuous professional development are likely to influence the academic performance in students in biology.

The second objective indicated a significant relationship between the method adopted in the teaching and learning of biology and the performance in biology. It's established from the study that students enjoy learning biology in groups as compared to other methods. It was also noted that use of practical in the teaching and learning of biology does not always positively influence academic performance in biology. This study therefore concluded that learner centred teaching methods which enhances engagement among learners promote academic performance.

The third objective revealed a significant positive relationship between the entry behaviour of students and academic performance in biology. It can be concluded that, when the materials for teaching and learning of biology are enough, teaching and learning of biology becomes easier.

The fourth objective on the perception of learners towards biology performance, it can be concluded that, when students have a positive perception towards the biology subject, their performance in the subject improves. This therefore calls for teachers to inspire positive

perception in the learners as a way of improving the subject performance. This can be done through changing the methods of teaching and adopting methods like academic visits, audio visual and virtual chat rooms.

Recommendations

Based on the findings, below are the policy recommendations and areas that require further investigations. The study suggests that the government of Kenya through the TSC ensures that it equips the public schools with enough biology teachers with degree qualification and with continuous professional development in order to encourage student enrolment in biology. The study recommends that teachers teaching in public schools be encouraged to explore other methods of teaching other than the normal practical, lecture and discussion methods. They should consider academic visits, audio visual and virtual chart room.

The study makes the following recommendations for further investigation;

- i. This study did not investigate into the background qualification of the teachers teaching biology and the affect that it may have in the performance in biology. Therefore, the study suggests that more investigation be done into teacher's background qualification to establish if they may influence the academic performance in learners in biology.
- ii. The study used visual perception as a way of assessing the general perception of learners towards the performance in biology subject. This study recommends that more investigation on touch, sound and test perceptions and their effects on performance in biology.
- iii. This study only used questionnaires as the tool for data collection. In order to get a true and fair view of these findings, the study suggests that more investigation be done focusing on the similar constructs but now by using other assessment tools.

REFERENCES

- Abdi, A. (2014). *The Effect of Inquiry-based Learning Methods on Students' Academic Achievement in Science Course*, Tehran: Horizon Research Publishing.
- Abongo, V.N. (2010). *Philosophy of Education*, Nairobi: ANU Press.
- Achobo, C.N. (2010). *Determinants affecting Performance in Pupils in Primary School in Raidha*, Dissertation submitted to Maker ere University, Uganda.
- Alexander, R.J. (2013). *Teacher centred in Teaching, Theory and Practice*, New York Teachers College Press.
- Almasri F, Hewapathirana GI, Ghaddar F, Lee N, Ibrahim B (2021) Measuring attitudes towards

biology major and non-major: Effect of students' gender, group composition, and learning environment. PLOS ONE 16(5): e0251453.
<https://doi.org/10.1371/journal.pone.0251453>

- Andafu, E.M and Simatwa, E.M.W (2014). *A Critique of Kenyan System of Education in View of the Freirean Concept of Education: A Philosophical Perspective Education Research*.
- AsikhiaBarineka (2015). Student Perception and Teacher Perception of the Causes of Poor Performance. In *European Journal of Social Sciences* 13 (1) Nigeria.
- Bartish, C. (2015) *Three Disadvantages of Using Cooperative Learning*. Global Post. International News. *International Journal of Multidisciplinary and Current research*, 5, 699
- BategekaGuloba, M. and Wokodola, J. (2010). *Do Teaching Methods and Availability of Resources Influence Pupils' Performance*, (Unpublished Research) in Uganda.
- Bennars, A.G and Njoroge, J.A. (2014). *Philosophy and Education in Africa*. Nairobi: Trans-Africa Press.
- Bereuter and Scardamalia, M. (2013). *Technology and Literacies from Print Literacy to Dialogic Literacy*. Ontario Institutes for Studies in Education, University of Toronto.
- Bilesanmi, J. B. 1999. A Causal Model of teacher Characteristics and Students' Achievement in Some Ecological Concepts. Unpublished Ph. D Thesis, University of Ibadan, Ibadan.
- Darling – Hammond, L. 2000. Teacher Quality and Student Achievement: A Review of a State Policy Evidence. *Educational Policy Analysis Archives* 8(1)
- Cooper, J.L., MacGregor, J., Smith, K.A. and Robinson, P. (2014). Implementing Small-Group Teacher centred: Insights from Successful Practitioners. *New Directions in Teaching and Learning*, 81, 64-76.
- Coskun, H. (2011). The Effect of Groups Size Memory Teacher Centred and Session Length on the Creative Performance in Electronic Brainstorming groups. *Education Sciences; Theory and Practice*, Vol. 11, 91-95.
- Djudin, T. (2018). The effect of the teaching method and lecture program on students' satisfaction rates and academic achievement. *Journal of Education, Teaching and Learning*, 3(1), 121-128.
- Ediger, M. (2011). *Collaboration versus Individual Endeavours in the Curriculum Education, Published Conference*, 217-220.
- Eseine-Aloja, Christabel E. (2021) Effects of Gender on the Academic Performance in Public- School Biology Students Participating in School Organised Extra-Mural Classes. *Sapientia Foundation Journal of Education, Sciences and Gender Studies (SFJESGS)*, Vol.3 No.1 March, 2021; pg. 337 – 349
- Fahiminezhad, A. and Mozafari A.S. (2012). Effect of Traditional and Integration Methods of Teaching Math and Student Performance, Elementary Students, Pelagia Research Library. *European Journal of Experimental Biology*, 2(5) 1646-1653),

- Faraday, S.; Overton, C. and Cooper, S. (2011). *The Effective Teaching and Learning in Vocational Education*. London.
- Fordham, McLaughlin, C., McLellan, R., M., Chandler-Grevatt, A., & Daubney, A. (2015). The role of teachers in educational reform in Kazakhstan: Teacher enquiry as a vehicle for change. *Educational reform and internationalisation: The case of school reform in Kazakhstan*, 239-262.
- Francis Abuseji (2007). Student and Teacher Related Variables as Determinants of Secondary School Students Academic Achievement in Chemistry. *Jurnal Pendidikan* 32 (2007) 3-18
- GanyaupfuMunyaradzi Elvis (2013). Teaching Methods and Student's Performance South Africa. *International Journal of Humanities and Social Invention*, 2 (9).
- Hannah K., and Ogwel, A. (2014) Enhancing Teachers capacity through In-service Education and Training: *A reflection on the projects for Strengthening Mathematics and Science Education*. Kenya: CEMASTE A.
- Hannum, E. (2012). *Do Teachers Affect Learning in Developing Countries?* University of Michigan (Unpublished Research). *Issues, International Journal of Educational Research and Technology Volume 3 Issue 1 May 2017: 15- 20, ISSN 0976 – 4089* www.soeagra.com/ijert.htm.
- Haas, M. (2012). *The Influence of Teaching Methods on Student Achievement*, Research Dissertation Submitted to the Faculty of the Virginia Polytechnic University.
- Herraid, C.F. and Schiller, N.A.; Herreid, K.F. and Wright, C. (2011). In Case you are interested; Results of a Survey of Case Study Teachers. *J. Col Sci. Teach* 40(4) 76-80.
- Jamison, Dean T.; Jamison, Eliot A.; Woessmann, Ludger Hanushek, Eric A. (Spring 2018) *Education and productivity: Education context journal* 8 (2): 62–70. Retrieved 2016-10-13.
- Kang'ethe, S. N., Wakahiu, J., Karanja, M. (2015). Assessment of the Early Childhood Development Policy Implementation in Kenya, Case Study of Ruiru District. In *Journal of Education and Social Policy* Vol. 2, (1)
- Karue, N. (2013). Analysis of Factors that Lead to Poor Performance in KCSE Examinations in Embu District, Kenya. *Journal of Social Sciences*, 13 (1): 2305 - 4557.
- Kauffman, S. (2012) Stop Lecturing Students in high school, *MacLean's*, Vol.125 Issue 6, 52-53. Kingaru, M.J. (2014). *Factors contributing to Poor Performance in Science Subjects, A Case of Secondary Schools in Kawe Division, Kinondoni Municipality*.

University of Tanzania.

Kenya Institute of Education reports (2015)

Kitti, M. (2014). *Effect of teaching Methods on Student's Performance in Tanzania*

Institutions: The Case of Secondary School in Nyamagana. Mwanza.

KLB Book one biology fifth edition (2018), Secondary Biology, Kenya Literature Bureau publishers and printers.

KNEC (2019). Results 2019 Online Portal: www.knec.ac.ke

Lutz, W. (2019). Brain Power for Sustainable Development. The Cognitive Preconditions for

a Successful Sustainability Transition.

Makewa, N., Role, E. and Biego, S. (2011). Strengthening Mathematics and Science in Secondary Education Teachers' Perception through In-service Education and Training (SMASSE-INSET) Project in Nandi Central District. *International Journal of Education and Social Sciences*. 1 (4).

Mckeachie, W. and Marilla, S. (2016). *Teaching Tips, Strategies, Research and Theory for University Teachers*. University of Texas.

Morge, L. (2013). *Teacher Pupil Interaction, Study of Hidden Beliefs in Conclusion Phrases*, Open University Press

Maranga, W. O., Otieno, S., & Mogwambo, V. (2025). The effect of financial assets as a component of corporate disclosures and the moderating role of firm size on market returns of manufacturing firms at the Nairobi Securities Exchange, Kenya. *International Academic Journal of Economics and Finance (IAJEF)* | ISSN 2518-2366, 4(4), 124-136.

Mugan, H.A and Simga, N. (2010). An Assessment of the Effective of the Effects of Teaching Methods on Academic Performance in Students in Accounting Courses, *Innovation in Education and Teaching International*, Vol. 47 (3) 251-260

Muola, J. (2010). A Study of the Relationship between Academic Motivation and Home Environment among Standard 8 pupils. *Education Research and Review*. Vol. 5 (5), 213 – 217.

Murunga, W. J. (2015). Devolving Early Childhood Development Education in Kenya: Policy Challenges and Opportunities. In *International Journal of Education and Research* Vol. 3 (2).

Musau, L. M., & Abere, M. J. (2015). Teacher Qualification and Students' Academic Performance in Science Mathematics and Technology Subjects in Kenya. *International Journal of Educational Administration and Policy Studies*, 7(3), 83-89.

Naisianoi, M. (2020). *Influence of teaching and learning materials on academic performance in pupils in upper primary schools in Karunga zone, Gilgil Sub County, Kenya* (Doctoral dissertation, St. Paul's University).

Njoroge, E., Mulwa, D. M., & Kiweu, J. M. (2023). Students'entry Behaviour And Learning

- Environment As Determinants Of Students'academic Achievement: Case Of Public Secondary Schools In Machakos County, Kenya. *European Journal of Education Studies*, 10(1).
- Nseula M. M. (2011). Incorporating Case Studies into an Undergraduate Genetics Course, *J. School Teach, Learn*. Vol. 11 Issue 3 (75-85).
- Nystrand, M. (2017). *Twenty Acres: Events that transform us*. Madison: Wisconsin Centre for Education Research.
- Odumbe, A. G., Enose, M. W. S. and Ayodo, T. M. O., (2015). Factors Influencing Performance in Day-Secondary Schools in Kenya: A Case Study of Migori Sub County. In *Greener Journal of Educational Research* Vol. 5(3)
- Okello, E., Kapiga, S., Grosskurth, H., Makata, K., Mcharo, O., Kinungh'i, S., and Dreibelbis, R. (2019) Factors perceived to facilitate or hinder handwashing among primary students: a qualitative assessment of the Mikono Safi intervention schools in NW Tanzania. *BMJ open*, 9(11),309- 347.
- Onekutu P. O., (2002). Gender Differences in Achievements in Junior Secondary School Examination in Integrated Science: Implications for National Development. *Review of Gender Studies in Nigeria*,1(3): 4 – 12.
- Ondieki, M.J. (2016). *Teacher Centred Approach to teaching Biology in Public Secondary Schools in Nyamira South, Nyamira County, Kenya*. Unpublished Thesis, Kisii University.
- Patekur, P., Wulandari, T. S. H., & Panggabean, C. I. T. (2022). The teachers' perception and attitude on curriculum changes in Indonesia toward high school biology learning in Lamongan regency. *International Journal of Education Research and Development*, 2(1), 1-10
- Rivkin Y., Steven G., [Eric A. Hanushek](#), and John F. Kain, 2015. "Teachers, Schools, and Academic Achievement," *Econometrica*, 73(2), pp. 417–458.
- Rylaarsdam, P. R. (2012). *Classic Experiments in the Molecular Biology, National Centre for Case Study Teaching in Science Case Collection*. University of Buffalo, Science Cases.
- Samikw, D.C. (2013). Determinants which Influence Academic Performance in Biology in Kenya: Perspective for Global Competitive. *International Journal of Current Research*, Vol.5, Issue, 12, pp. 4296-4300.
- Strengthening Mathematics and Science in Secondary Education (SMASSE) (2015)
- Sogoni P. K. and Musasia, A. M. (2013). Effect of Using Cooperative Learning Methods on Secondary School Students' Achievement in Kinematics in Kenya. *International Journal of Science and Research (IJSR)* ISSN (Online): 2319-7064 Index Copernicus
- Sparks, D. 2000. Issues at the Table: Teacher Quality and Student Achievement Become

- Bargaining Matters: An Interview with Julia Koppich. *Journal of Staff Development* 21(2).
- Teresia M.K. and Susan M.K. (2016). Teacher Related Factors Influencing Students' Enrollment in Biology Subject in Public Secondary Schools in Meru Central Sub County in Kenya. *Journal of Education and Practice*, Vol.7, No.2, 2016.
- Value (2013): 6.14 | Impact Factor (2015): 6.391 Volume 5 Issue 10, October 2016.
- Umar, T., Adamau, S. A. and AbdullahiSadiq (2014). The Causes of Poor Performance in Mathematics among Public Senior Secondary Schools Students in Azare Metropolis of Bauchi, Nigeria, *Journal of Research and Method in Education*, 6 (3): 2340-737.
- Wamukota, D. N., &Masibo, E. (2017). Instructional practices in biology and their influence on student performance in secondary schools in Kenya.
- Wangu M. J., (2014). The Impact of Gender Differences on Students' Academic Performance in Secondary Schools in Ndumburi Division, Kiambu County, Kenya in Science Subjects and Languages. Unpublished Student Thesis. Pp 5 – 11.
- Wanyama I. and Njeru E., (2003). The Sociology of Private Tuition. Policy Brief. 10(8): 142 – 169.
- Wanjohi, W. C. (2011). Performance Determinants of Kenya Certificate of Secondary Education (KCSE) in Mathematics of Secondary Schools in Nyamaiya Division, Kenya. In *Asian Social Science* Vol. 7, (2).
- Wafubwa N. R. and Obuba E., (2015) Influence of Strengthening Mathematics and Science in Secondary Education (SMASSE) in Service Education and Training (INSET) on the Attitude of Students towards Mathematics Performance in Public Secondary Schools of Rangwe Division, Homa-Bay Sub County-Kenya
- Waseka EL, Simatwa EMW and Okwach TO (2016). Influence of Teacher Factors on Students' Academic Performance in Secondary School Education. A Case Study of Kakamega County, Kenya. *Greener Journal of Educational Research*, 6(3): 151-169, <http://doi.org/10.15580/GJER.2016.3.060216102>