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Challenges Facing the Performance in Biology in Public Secondary Schools in Kilungu Sub-County, Makueni County, Kenya

By

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Abstract

Performance in Biology in the Kenya Certificate of Secondary Examinations (KCSE) has been below expectations and has continued to cause concern to educators and the general public. This performance has been attributed to many factors among which are the uses of predominantly teacher-centered approaches in teaching. Biology was recorded among the worst-performed subjects nationally in the KCSE 2019. The purpose of this study was to investigate the challenges facing the performance of Biology in Secondary Schools in Kilungu Sub - County in Makueni County. This study was guided by the following objectives; to find out the relationship between students' attitudes towards Biology and performance in Biology, to investigate the relationship between teachers' attitude, motivation and performance in biology, to determine the relationship between the role of the principal and learning of Biology and lastly, to find out the relationship between career preference of student and performance in Biology. The study was significant since the performance in K.C.S.E Biology has been below average over the years, hence need to find out challenges affecting performance in Biology. The study was guided by the transactional leadership theory (1978), developed by Bass and the theory of educational productivity (1981), developed by Walberg. The research was conducted by use of descriptive survey design by quantitative and qualitative approach. The target population for the study was comprised of 406 form four biology students and 24 principals drawn from 24 secondary schools in Kilungu sub-county. The study respondents comprised form four students. Stratified random sampling was used to categorize schools into extra county, county and Sub – county schools. Simple random sampling was then used to select 15 schools from the 24 secondary schools in the sub – county. Purposive sampling was used for selecting form four students and Principals. Data was collected using questionnaires for students, teachers and interview schedules for principals. The data collected was analyzed by use of descriptive statistics with the aid of SPSS computer programme. The data collected was coded, tabulated and represented using frequencies, tables and percentages. The study concluded that there were a number of challenges that contribute to poor performance in Biology by students. The factors are related to four key study objectives. The study showed that students' negative attitude had a positive relationship with performance in Biology ($p < 0.05$, $\rho=0.011$). Secondly, Biology teachers' attitudes and motivation had a positive relationship with performance in Biology ($p<0.05$, $\rho=0.015$). Thirdly, the role of a principal in promoting academic excellence had a positive relationship effect on performance in Biology ($p<0.05$, $\rho=0.026$). Lastly, students' career choices had a positive effect on performance in Biology ($p<0.05$, $\rho=0.019$). This study recommended that students should be sensitized and advised on the value of Science subjects in order to make them develop interest and positive attitude towards Biology. In addition, it recommended the need for the school to build up a good relationship between Biology teachers' and students. The teachers need to be motivated in order to be proactive in offering support to students to contribute to their performance improvement in Biology.

Keywords: Kenya, Makueni, Kiliungu, Performance, Biology, Secondary School

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Background of the Study

Poor performance in Biology is a global problem as indicated by studies done by many scholars such as Valverde and Schmidt (2017) in USA, Landry (2018) in Canada, Fonseca and Conboy (2016) in Portugal. According to Majo (2016), the performance of Biology has been dwindling in the recent times among secondary school students in East Africa and Africa and globally. The poor performance in Biology has been a major concern to the educationists and the stakeholders in education sector. Kiyagi (2013) maintains that Biology remains a big burden to the education sector globally and in Africa.

Biology is one of the core subjects in secondary school curricula of many nations as it is mandatory for admission to quality courses in tertiary institutions. Students' performance in secondary school Biology in Kenya has generally been unsatisfactory as it ranges from average to poor (Arokoyu & Chimuanya, 2017). Blair-Walters and Soyibo (2004) examined the correlations among five variables and Jamaican high school students' performance in Biology. The students obtained a mean score of 64% which was rated as fairly good.

Biology has many divisions that include; Zoology, Botany, Ecology, Genetics, Morphology, Anatomy, Physiology, Histology, Microbiology, Biochemistry and Evolution among others (Ahmed, 2008). Osuafor and Okonkwo (2013) linked academic performance in Biology to availability of facilities, teaching methods and school characteristics such as class size and teacher-student ratio according to a study conducted in Anambra State, Nigeria. Empirical Studies have shown that instructional leadership contributes significantly to students' achievement (Musungu & Nasongo, 2008). Consequently, many factors have also been associated with secondary school students' academic performance in Biology. According to Espania (2012), schools require good leaders to organize and supervise the teaching and learning process in order to ensure that learning outcomes are realized.

A study conducted in Kenya in selected secondary schools in Nyakach by Owino, Osman and Yungungu (2014) established that there was positive and significant relationship between teacher characteristics and performance, teaching/learning resources and performance, motivation and performance in KCSE Biology. Mwangi (2014) demonstrated that learner centred strategies such as Activity, Student, Experimentation and Improvisation (ASEI) and Plan, Do, See, improve (PDSI) influenced students' Biology performance in KCSE. The achievement of the student in Biology as a subject has also been associated with students' characteristics. Wabuke (2013) defines students' characteristics as personal attributes of the learner and/or circumstances in school, at home or his/her environment.

According to Kithela (2016), students' characteristics include; gender, peers, school environment, physical, social and economic background. Students' characteristics have been associated with academic performance by several scholars. Ebele and Olofu (2017) established

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that there was significant relationship between students' study habits and their academic performance in Biology. A study by Oigara (2011) revealed that school location affected students' achievement. The study showed that schools located in urban areas tend to perform better than those in rural settings. The type of school has also been linked with academic performance. Owino, Osman and Yungungu (2014) noted that students in national and extra county schools in Kenya always perform better than their counterparts in county and sub county schools. Other students' characteristics that have been associated with academic performance include their attitudes, career preference, parental socio-economic status, and gender (Juma, 2016; Kashu, 2014; Nasr, 2011).

Performance in secondary school Biology is also generally low in Kenya. Mwirigi (2011) noted that performance in biology is low despite the key role the subject plays in industrialization and other sectors of the economy. Siringi (2010) observed that performance in KCSE Biology has been consistently low over the years. Siringi argues that the low achievement in Biology and other science subjects is a pointer that the country is not providing its citizens with quality education. Siringi further argues that unless this trend is reversed, Kenya may not attain her Vision 2030 goals which are driven by science and technology. However, despite its importance, academic performance in secondary school Biology in Kenya and in sub counties such as Kilungu has generally been unsatisfactory. For example, the Kenya Certificate of Secondary Education (KCSE) national mean scores for the years 2013 and 2014 were 32.20% and 33.60% respectively (Kenya National Examinations Council, (KNEC, 2015). Table 1.1 gives a summary of national Examination (KCSE); National, Makueni County and Kilungu sub county percentage mean scores for the years 2014 to 2018.

Table 1.1: National, Makueni County and Kilungu Sub County Biology Performance mean scores in percentage from 2014-2018

Percentage Mean Scores			
Year	National	County	Sub- County
2014	33.60	31.02	21.72
2015	34.76	33.34	21.63
2016	29.19	27.20	20.67
2017	18.93	16.22	14.30
2018	19.23	18.37	13.15

Source: KNEC, KCSE Annual Reports 2014, 2015, 2016, 2017 and 2018.

Data on Table 1.1 shows that the National mean scores were in the range of 18.93 to 34.76 percent, those of Makueni County ranged from 16.22 to 33.34 percent, while those of Kilungu Sub County were between 13.15 to 21.72 percent. It is evident that students' performance in Biology as measured by the KCSE means scores was relatively low in the whole country. It is also evident that students' performance in the subject in Makueni county and Kilungu Sub County was very low. The Kenyan society has laid a lot of emphasis on performance tests because the immediate goal of learning is to pass tests that open doors to higher education pursuit. Success in school is determined by high passing scores in examinations.

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There has been a public outcry and debate in the country over massive failure that has led to poor grades in performance of science subjects at KCSE and especially in Biology (Michira, 2017). According to Michira, one of the possible causes of this poor performance has been attributed to the change in the setting of questions which sharply shifted from discriminating the ability to a more analytic approach. Despite the shift in examining the students, the preparation among the candidates had not changed; students are expected to apply the acquired knowledge, not just memorizing what they had been taught in class. He further reports that, feedbacks from teachers suggest a deliberate shift, which could be undermining the country's education process through unfair grading of candidates. Other possible causes for the poor outcome of performance could be due to teaching skills in preparation for examinations, disconnect between student abilities and the questions set, strict marking and inconsiderable grading.

According to Nadenge (2015), socio-economic status includes features like education, occupation, income, religion, gender, environment in which the child is brought up among others. Okemwa (2014) asserts that parents who are privileged educationally, socially and economically, promote a higher level of achievement in their offspring.

Many previous researchers have cited different factors that affect academic performance in the foregoing observations. In this regard, the poor performance in biology in Kilungu Sub County has been caused by many interconnected variables. The study investigated the challenges contributing to poor performance in Biology in Kilungu Sub-County in Makueni County

Statement of the Problem

Poor performance in sciences especially Biology has continued to be a major concern for the Government of Kenya and other education stakeholders. This trend has been more pronounced in rural areas such as Makueni County. The poor performance in effect jeopardizes learners' chances for upward academic mobility. At the national level poor performance has led to low transition into careers in science and technology. According to Espania (2012), schools require good leaders to organize and supervise the teaching and learning process in order to ensure that learning outcomes are realized. A study conducted in Kenya in selected secondary schools in Nyakach by Owino, Osman and Yungungu (2014) established that there was positive and significant relationship between teacher characteristics and performance, teaching/learning resources and performance, motivation and performance in Biology. Mwangi (2014) examined the influence of learner-centered strategies on students' Biology performance in Kenya Certificate of Secondary Education in Kinangop Sub-County, Nyandarua County, Kenya. He noted that although learner-centered instructional strategies enhanced achievement, performance in Biology in most schools was still low.

The continued poor performance in Biology has been attributed to a number of challenges including students' attitude towards Biology, teachers' attitude towards students' abilities and poor teaching methodologies among others, (Michira, 2017). However, it was not clear which of the challenges was most responsible for the poor performance of Biology in Kilungu Sub-County Makueni County, Kenya

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Objectives of the Study

This study was guided by one specific objective to investigate the relationship between students' attitude and performance in Biology in public secondary schools in Kilungu Sub- County, Makueni County.

Methodology

Methodology adapted was literature review using scientific method that tried to explain how to apply thinking in Education. In this scientific method a problem was defined, data determined through critical literature review, patterns established and conclusions drawn.

Theoretical Framework

The study was guided by two theories; Transformational Leadership Theory (1978) and the theory of educational productivity developed by Walberg in 1981.

The Transitional leadership theory (1978) was developed by Bass and it advocates for the leader to work with team members in identifying the needed change, thereby creating a vision to guide the change through inspiration and executing the required change in momentum with the needs of the committed group members. The theory thus serves to enhance the motivation required, morale and ultimately the requisite performance of the group members. The leader must identify the group members' vision as well as objective so as to guide and direct them toward their destinations. The leader is required to understand the strengths as well as weaknesses of each of the followers. The leader is required to align the followers with the tasks that befit each one of them and the one that enhances their performance. According to Bass and Riggio (2006), transformational leadership ties the leader to the group member and thus has a potential of affecting positively the students' achievement. Studies have shown that transformational leadership has a positive impact on students' achievements and attainment of their objectives (Allen, Grisby & Peters, 2005)

The theory of educational productivity (1981) by Walberg advocates that in education, productivity is often taken to mean inputs and processes of schooling in ways that increase desired outcomes. The most common measures of outcomes have been students' academic achievement which is often measured by scores on standardized tests while they are in school. Walberg's (1981) theory of educational productivity includes nine factors hypothesized to the learner's cognitive outcomes. These nine factors include ability or prior achievement, age, motivation or self-concept, quantity of instruction, quality of the instructional experience, the home environment, the classroom or school environment the peer group environment, and the mass media (DiPerna, Volpe & Elliot, 2002).

This study is concerned with educational productivity and how this affects students' academic performance in school. Walberg's theory expounds this clearly by showing how learners' characteristics are linked to academic performance. It is due to the differences in learners' backgrounds characteristics that make various students from varied backgrounds to vary greatly in academic achievement while in school. In this regard, the theories fit well into this study.

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Review of Related Literature

Students' Attitudes and Academic Performance

Biology is a natural science that deals with how living things came into existence and how they react to one another and with their environment (Umar, 2011). Biology is an important science subject because it is the bedrock upon which many science courses that are of great economic importance to nations like Medicine, Biochemistry, Genetics and Agriculture are based on (Aniaku, 2012). It is a prerequisite subject for many careers such as Medicine, Pharmacy, Nursing, Agriculture, Forestry and Biotechnology among others (Ahmed & Abimbola, 2011). Biology is one of the subjects offered in secondary schools and tertiary institutions.

Students' academic performance in secondary school Biology has been associated with many factors. Onan (2012) established that teaching methods affect achievement in Biology and that the inquiry teaching method enhances performance as it promotes students' interest in the subject. Gambari, Yaki, Gana and Ughovwa (2014) demonstrated that students taught using video based multimedia instruction performed better than their colleagues in the conventional teaching methods. Owino *et al* (2014) established that there was a positive and significant relationship between teacher characteristics, teaching/learning resources, students' motivation and academic performance in Biology. Attitudes have also been cited as a determinant of academic performance in Biology (Nasr & Ashgar, 2011).

Attitudes are defined as psychological orientations developed as a result of one's experiences (Mensah, Okyere & Kuranchie, 2013). They are beliefs, feelings and behavioural tendencies towards a person, an object or a process and are either positive or negative (Sanchal & Sharma, 2017). They influence one's views of situations, objects, people and how an individual respond to them. Attitude toward Biology can therefore be considered as a disposition towards the subject, that has been acquired by a student through his or her beliefs and experiences but which can be changed (Eshun, 2004). Some authorities regard attitude towards Biology as just a like or dislike for the subject, while others extend the meaning to embrace beliefs, ability, and its usefulness (Owoeye & Agbaje, 2016). Students' attitudes towards a subject are influenced by factors such as perceptions and beliefs, learning abilities and competence, and also previous performance and ranking of the subject in schools (Lang'at, 2015).

Several studies have associated students' attitudes towards Biology with performance in the subject. Attitudes have been associated with performance because they affect students' level of engagement, interest, personal effort without which one can hardly perform (Garden & Smith, 2001). Ramírez, (2005) investigated the students' attitudes towards mathematics and academic performance in Chile. The results indicated that students' attitudes were significant predictors of achievement in mathematics. Lindell and Davidson (2004) examined the relationship between final year medical students' attitudes to consultation skills and their academic results. They noted that the students' attitudes correlated significantly with academic performance. Omwirhiren and Anderson (2016) investigated the effects of class size and student's attitudes on academic performance in Chemistry of secondary students in Zaria State, Nigeria.

The t-test results revealed that attitudes significantly affect students' achievement in the subject. Ballah and Okoronka (2015) examined the influence of attitudes on secondary school students' achievement in Physics in Nigeria. They established that the relationship between the

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two constructs was positive and significant. Manoah, Indoshi and Othuon (2011) examined the performance on attitudes on students' achievement in Mathematics in Kisumu East District in Kenya. The results of the regression analysis revealed that attitudes explained a significant variation in mean scores in mathematics.

Wabuke's (2013) study found that majority (89.5%) of student and (92%) teacher respondents were of the opinion that attitude affects students' performance in Biology. According to Owiti (2001), attitudes affect achievement because it influences learners' thoughts, feelings and how they react. The study habit as those behaviours that one manifest when studying such as listening to music, chewing kol anut, smoking, drinking coffee, taking memory pills and ant sleeping drugs, lying down while studying and so on (Obe, 2016). He further said that not all behaviours manifest during study are positive rather those that are positive are called study habits. He concluded that study skills are the ability to acquire information, do mental processing of information for logical organization and understanding, re-reading and memorizing for a long time meaningful retention and recalling of information on important occasions such as during test or during examination situations.

According to Ball in Ajayi, *et al.* (2016), the following study habits usually contribute to unsatisfactory grade of students in tests or examinations: procrastination and overloading, lack of study time plan, not making notes while reading, truancy by skipping classes or refusal to take notes during lectures, laziness and ignorance, memorization and orphaning. He concluded that many committed students experience frustration and despair in schools not because they lack the potential, but because they do not have the appropriate study skills to learn. This argument was supported by Rana and Kausar (2011) who said that many students fail not because they lack ability but because they do not have adequate study skills.

There are many factors that influence attitudes and achievement among adolescents. Some of the factors are associated with parental background and family environment. Other factors relate to individual characteristics such as study attitude, self-concept, locus of control, and achievement motivation. Still other variables are associated with school's influences such as class climate, teachers, and administrative styles (Talton and Simpson in Soltani, 2011). Studies have incorporated a range of components in their measures of attitudes to science including: the perception of the science teacher; anxiety toward science; the value of science; self-esteem at science; motivation towards science; enjoyment of science; attitudes of peers and friends towards science; attitudes of parents towards science; the nature of the classroom environment; achievement in science; and fear of failure on course (Osborne *et al.* in Soltani, 2011). The foregoing review has shown that attitudes affect students' academic achievement in Biology and other subjects. Positive attitude leads to greater achievement because it creates interest in the student. Although the literature review was on attitudes and academic achievement, most of them were not on biology neither were they conducted in Kilungu Sub County. The poor performance in Biology in the sub county was to some extent due to students' attitudes, filling this gap was the motivations behind this study.

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Data Analysis And Discussion Of Findings

Introduction

This chapter presents the results of the study on the challenges facing the performance in Biology in public secondary schools in Kilungu Sub-County, Makueni County, Kenya. The study collected quantitative data from students and teachers. The findings are presented using descriptive and inferential statistics based on the objectives of the study.

4.2 Response Rate

Table 4.4 shows the response rate based on the respondents sampled.

Table 4.2: Instruments Return Rate

Category	DISTRIBUTION		
	Number Issued.	Response Rate	Percentage
Students	406	285	70.20%
Total	406	285	70.20%

Survey Data (2022)

Table 4.4 shows that out of the 406 questionnaires issued, 285 were returned signifying a 70.20% response rate. On average, the study attained 70.20% response rate from respondents which is considered to be acceptable because it is above 70.0% response rate (.....)

4.3 Demographic Data

The study sought to determine the demographic information of the respondents who participated in the study. The study presents the age of the respondents, type of the school, school category and form, and their understanding on the challenges facing the performance in Biology in public secondary schools in Kilungu Sub-County, Makueni County, Kenya.

Table 4.3: Age of Respondents

		Frequency	Percent	Cumulative Percent
How old are you?	Between 13-15 years	3	1.1	1.1
	Between 16-17 years	130	45.6	46.1
	18 years and above	152	53.3	100.0
	Total	285	98.9	

Source: Field Data 2022

Findings in table 4.5 indicate that the majority of the respondents, 53.3% were aged 18 years and above followed by 45.6% of respondents who were aged between 16-17 years old. Lastly, 1.1% of the respondents were aged between 13-15 years.

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Table 4.4: Type of the School

Statements	Responses	Frequency	Percent	Cumulative Percent
What is your school type?	Boarders (Boys)	148	51.9	52.9
	Boarders (Girls)	24	8.4	61.4
	Mixed Day School	107	37.5	99.6
	Mixed Day and Boarding	6	2.2	100.0
	Total	285	98.2	

Source: Data Field 2022

Results of the study in table 4.6 shows that with regards to the type of the schools chosen for the study, 51.9% were Boys Boarding Schools followed by 37.5% which were a mixed Day School. In addition, 8.4% and 2.2% were Girls Boarding Schools, and Mixed Day and Boarding Schools respectively.

Table 4.5: School Category

Statements	Responses	Frequency	Percent	Cumulative Percent
School category	Extra County	5	1.8	1.8
	County	130	45.6	47.4
	Sub County	150	52.6	100.0
	Total	285	100.0	

Source: Field Data 2022

Regarding school categories, study results indicate that 52.6%, 45.6% and 1.8% schools were in Sub County, County and Extra County categories respectively. This is because more than 50% of the Boarding Schools were considered for the study.

Table 4.6: Type of Students

Statements	Responses	Frequency	Percent	Cumulative Percent
Are you a border or day scholar?	Boarder	217	76.1	76.1
	Day Scholar	68	23.9	100.0
	Total	285	100.0	

Source: Data Field 2022

Findings in table 4.8 gives the presentation of the type of students as either boarders or day scholars. The result shows that most of the respondents, 76.1% were boarders whereas 23.9% were day scholars.

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Table 4.7: Current Class

Statements	Responses	Frequency	Percent	Cumulative Percent
Which class are you?	Form 2	45	15.79	15.79
	Form 3	98	34.39	50.18
	Form 4	142	49.82	100.0
	Total	285	100.0	

Source: Data Field 2022

Table 4.9 shows the current classes of various respondents, of which majority, 49.82% were in form 4, 34.39% were in form 3 while a minority of those who responded, 15.79% were in form 2.

Relationship between Students' Attitude and Performance in Biology

The first study objective aimed at finding out the relationship between students' attitude and performance in Biology. In order to get the information from the students on their attitude towards Biology, the researcher issued out research questionnaires bearing information on students' attitude towards Biology. The collected data is analysed as both descriptive and inferential statistics as shown in table 4.10 below.

Table 4.8: Relationship Between Students Attitude and Performance in Biology

Statements	Responses	Frequency	Percent	Cumulative Percent
Performance in Biology in 2020 KCSE	Very Good	6	2.1	2.1
	Good	22	7.7	9.8
	Very Bad	12	4.2	14.0
	Bad	60	21.1	35.1
	Average	185	64.9	100.0
	Total	285	100.0	
Science subjects taken by students	Physics	18	6.3	6.3
	Biology	88	30.9	36.2
	Chemistry	179	62.8	100.0
	Total	278	100.0	

Source: Field Data 2022

The table above shows findings on students' performance in Biology in 2020 KCSE. According to the findings, majority of the students, 64.9% had an average performance followed by 21.1% who badly performed in Biology. Contrary, only 2.1% of the students posted a good performance. This poor performance in Biology by students could have been caused by their negative attitude towards Biology as a subject. The poor performance in Biology by students is in line with the study conducted by Onan (2012) who established that teaching methods affect achievement in Biology. Basically, poor teaching methods on natural Sciences can make students develop negative attitude towards the Science Subjects.

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Regarding subject choice by the student, study results in table 4.10 indicate that majority of the students chose Chemistry as their preferred Science subject followed by 30.9% students who chose Biology and lastly 6.3% respondents who chose Physics as their preferred subject. Basically, the variations in the number of students taking different science subjects is as a result of their attitude towards the sciences. Most of the students tended to have negative attitude towards Physics followed by Biology. They cited these subjects to be more practical and kinder of compel one to continuously memorize their contents.

From the qualitative data, the study established that principals have a role to play to better students' performance.

There is a growing body of evidence underscores a significant and positive relationship between effective role of principals and student learning and achievement. Our skills in school management influences the behavior of the school in terms of how students perceive the learning methodologies and benefits of specific subjects. This makes them to either develop positive or negative attitude towards the same (Principal 2).

Summary, Conclusion and Recommendations

The first study objective aimed at finding out the relationship between students' attitude and performance in Biology. The study established that most students had average performance in Biology subject. This poor performance in Biology by students was found to have been caused by their negative attitude towards Biology as a subject. Most the students prefer Chemistry as opposed to Biology and Physics. Basically, the variation in the number of students taking different science subjects is as a result of their attitude towards the sciences. Most of the students tend to have negative attitude towards physics followed by Biology. They cite these subjects to be more practical and calls for one to continuously memorize their contents.

Conclusion

The study established that most students' performance ranged from average to poor. This poor performance in Biology was found to have been caused by their negative attitude towards Biology as a subject. The study showed that students' negative attitude had a positive relationship with performance in Biology ($p < 0.05$, $\rho=0.011$).

Recommendations

This study recommends that students should be sensitized and advised on the value of Science subjects in order to make them develop interest and positive attitude towards Biology.

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