The Availability of Live Specimen in the Teaching and Learning of Biology in Secondary Schools in Nandi South Sub County in Kenya

Ng'etich K. Peter*[1], Waswa Peter[1] and Kabesa Stella[2]
[1]Department of Centre for Teacher Education, School of Education,
University of Eldoret P.O. Box 1125, Eldoret

[2]Department of Curriculum and Instruction, School of Education,
University of Eldoret, P.O. Box 1125, Eldoret

***Corresponding authors email address:** petersngetich10@gmail.com

Abstract

Effective teaching of Biology entails the use of live specimen in order to facilitate the learning and application of science process skills in and outside the classroom. In Kenya, teaching of Biology has been found effective if the students are exposed to live specimens. The purpose of the study was to establish availability of live specimen in the teaching and learning of Biology in secondary schools in Nandi South sub county in Kenya. The research was based on the Gagne Theory of Instruction (1963). Descriptive survey design was utilized. The unit of analysis consisted of 45 public secondary schools in Nandi South Sub County comprising 45 school principals, 135 teachers of Biology and 2267 Biology students. Purposive and simple random sampling method were utilized to pick 14 public secondary schools, 14 school principals, 14 Biology teachers and 227 Form 3 Biology students were selected totaling to a sample size of 255. Data was collected using questionnaires and interviews. Validity was determined through consultation in form of discussions with the supervisors. Reliability of the instruments was established by means of the split half technique. A Cronbach alpha coefficient of 0.8 was obtained in the study. The research used descriptive statistics (frequency and percentage) and inferential statistics (Pearson's Product Moment Correlation) to evaluate the results. Findings showed that availability of live specimen significantly influence Biology instruction in secondary schools in Nandi South sub-County ($\beta 1 = -.174$, $P < 0.05$). The study concluded that, schools have inadequate live specimen which is an effective teaching method which Biology teachers should be encourage to use to enhance students' achievements in the subject. The study recommended that school principals should make basic resources available. Biology teachers should build up small aquariums, vivariums, and botanical gardens in their classrooms.

Keywords: Live Specimen, Availability, Teaching, Biology, Learning, Secondary Schools and Kenya

INTRODUCTION

The teaching and learning methodologies used in classrooms are critical as they influence effectiveness of student learning and performance in the subjects they undertake (Wong & Wong, 2011). On the contrary, concerns have been raised as to whether teaching and learning of Biology in secondary schools is promoting quality education and whether students are achieving the required level of performance and are prepared adequately to attain the skills, attitudes and knowledge to develop as holistic individuals.

According to World Bank (2017) learning in the low and middle-income countries has focused on schooling without focusing on students learning. The findings of the Africa-America Institute (2015) stated that despite the fact that there are a lot of learners gaining access to education in secondary schools, they are not gaining basic skills in sciences such as Biology. In addition, Africa faces severe shortage of highly skilled African talent in sciences. The skills that will confront today's world challenges will depend on the improvement of students' Performance with the teacher being part of the process or the pathway to learning.

Given the education stakeholders concerns on the declining students' performance in Biology questions have started to be raised on the appropriateness of teaching that includes use of live specimens in Biology. The persistent negative attitude of students toward biology instruction is a severe problem in the Kenyan educational system, particularly at the secondary school level. Biology should be taught and learned in a way that is simple, comprehensive, and concrete. Biology is made more fascinating, exciting, and understandable for students through extensive use of laboratory facilities. Biology students' success in secondary school is highly dependent on the availability and effective use of human and material resources. There is poor students' achievement in KCSE. Several studies have been done to address the problem. Several interventions have been put in place to address the identified challenges. They include in-servicing of Biology teachers through SMASSE, provision of teaching resources through KESSP, campaigns on the importance of Physics (Nderitu, 2009). However, the students continue to perform porrly in the subject of Biology.

As proposed by Kwek (2011) majority of the teachers apply teaching techniques that reflect on students as passive learners and listeners teaching approaches and methods used in Biology in schools is still inadequate is the arguments This is against a backdrop that Biology is a practical subject which requires use of live specimens in teaching and learning Biology. Live specimens are critical if teachers have to improve students' learning based on their needs. Live specimens entail wide range of means by which students are able to learn independently from those that are mediated by teachers. Lomibao (2016) documented that teacher often lack teaching materials needed for preparing and delivery of quality lessons. The live specimens approach reflects on teaching resources, physical and material property and expertise resources as subsidiary research objectives for the research study. Aguisibo (1998) indicate that the availability of live specimens enhances the effectiveness of the schools as they can bring about good academic performance in the students.

It is a known fact that biology is a core subject required not only for placement into tertiary institution, but also form the foundation on which future programme of studies in science and technology is based unfortunately, for some years now, the performance of students in this subject (Biology) has been poor throughout the state beyond (KNEC, 2017). Live specimens are often used to ease understanding, fosters academic achievement of learners at all ability levels. Thus, the teaching of biological concepts like fruits, frogs, millipedes among others should emphasize the use of live specimens because it stimulates students desire to learn, equally assist the student learning processes by making assimilation and memorization. It makes materials easy and help to hold attention as well as longer retention of information (Zumyil, 2019). But the problem in many secondary schools is that some instructors continue to teach with traditional methods of instructions such as lecture and note taking without making use of appropriate instructional materials that can stimulate students desire to learn due to unavailability of laboratories or laboratory resources. It is in line with this background

that this study attempts to examine the rationale for teaching using live specimen in secondary school in Biology in Nandi South Sub County. The purpose of the study was to find out the availability of live specimens in teaching and learning of Biology among selected secondary schools in Nandi South Sub-County in Kenya. The study results will also be of great magnitude to teachers training institutions to change or tailor their training approaches towards the utilization of live specimens in teaching and learning of Biology. Finally, the findings may assist the Biology Quality Assurance Officers in the Sub-County to enlighten the teachers in the field about the influence of Biology practical on performance in Biology.

Theoretical Framework

In this study Gagne's theory of instruction was adopted. Robert Gagne a psychologist theorist put forward the theory of instruction also known as instructional design theory (Gagne & Dick, 1983). The theory of instruction describes the deliberate arrangement of conditions of learning for attainment of specific performance goals or outcomes (Driscoll, 2000). Gagne's theory of instruction stipulates that there are quite a lot of and dissimilar variety of learning and each requires diverse categories of instruction. Gagne acknowledged five learning classes that include; verbal information, intellectual talents, cognitive strategies, motor skills and attitudes.

He later added enterprise as the sixth domain of learning and posited that in each category or type of learning, diverse interior and exterior circumstances are obligatory or required (Cannedy, 2009 and Thories, 2008). Gagne exemplifies intellectual skills by noting that learning tasks can be hierarchically arranged according to complexity that is involved; stimulus recognition, response generation, procedure following, making use of vocabularies, discrimination, concept formation, rule application and problem solving. The chain of command assists in identifying prerequisites for facilitating learning at every rank; and learning offers basis for sequencing instruction (Thories, 2008). Driscoll (2000) explained that instructional theory offers guidance on the way to facilitate people to learn and develop. Lawrick and Novak (2009) and (Cannedy, 2009), outline Gagne, nine instructional events with correspondingly nine cognitive processes. These include; increase on attention, enlightening the students about the objectives, stimulate recollect of previous learning, present content, provide "learning guidance", brings out performance (practice), grants feedback, review performance and improve retention and shifting to the employment.

METHODOLOGY

The research employed a descriptive survey research design. Nandi South Sub-County was the study area. The Sub County has two divisions namely Kaptumo and Aldai Divisions. The sub county is bounded to the North by Nandi Central, Nandi East Sub County to the East, and Vihiga County to the West. The study was done here because of the continued poor performance in Biology in this Sub County. In addition, little research has been done on challenges of using curriculum recommended live specimens in teaching Biology among selected secondary schools. The target population for this study entailed 45 public secondary schools in Nandi South Sub County compromising 135 teachers of Biology, 45 principals and 2267 Form 3 Biology students. This study therefore targeted 2447 respondents (Nandi South Sub County Education Office, 2018). The study adopted simple random sampling technique to sample the learning institutions that will participate in the research. Creswell and Plano (2011) recognize 30% of the target population as an adequate representation in the descriptive survey design which ensures reliability of the data collected. Using simple random sampling 14 head teachers were selected in Nandi South Sub County. This

represents 30/100 *(3 x 45) =14 of the study target population which is higher than 10%, least sample suggested for social science research (Sekaran, 2006; Orodho, 2005). Simple random sampling was used because it enables each subject to have an equal opportunity to be sampled. The 10% of the target population which is the minimum sample suggested for social science study was used to sample teachers and Form 3 Biology students due to their large numbers. This led to selection of 14 teachers of Biology 10% (1 x 135) = 14 and 227 students 10% (1 x 2267) = 227. This result is as summarized in Table 1.

Table 1: Sample framework

Respondents	Target population	Sampling Procedure	Sample Size
School Principals	45	30%	14
Biology Teachers	135	10%	14
Form 3 Biology Students	2267	10%	227
Total	2447		255

Source: Nandi South Sub County Education Office, 2020

The questionnaires were given to Biology teachers and form 3 Students and the interview schedule were given to the principals of the selected schools. Both structured and unstructured items were included. Likert-scale closed ended and open-ended type of questions were developed to collect data regarding the availability and use of live. Unstructured questionnaires were developed to collect qualitative data. The interviews were administered to the head teachers so as to give their insights into the acquisition and availability of live specimens in schools among selected secondary schools. Pilot study was used to determine the questionnaires' internal consistency and to detect any difficulties that the respondents were likely to face when responding to the items. Content validity of the questionnaire items was also conducted by the researcher consulting with the supervisors for guidance and advice on the validity of the instruments. Reliability was determined by utilizing the Cronbach alpha. The R value of 0.8 showed that the objects were precise. A letter of introduction from the University of Eldoret was obtained to aid in getting a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) to conduct the research.

The data collected through validated questionnaires; it was then edited and coded. Interview data consisting of qualitative data in the form of terms and phrases was transcribed and then set according to the rising topics. Quantitative data was subjected to descriptive statistics that produced frequencies and percentages. To find out the correlation and prediction among the dependent and independent variables correlation analysis and simple linear regression was employed in the analysis which provided a rise to the regression model; $Y=a+b_1X_1+b_2X_2$. Where Y represents teaching and learning of Biology, X_1 is teacher of Biology skills and X_2 is relevance of live specimens. The analysis is illustrated in the Table 2 below.

Table 2: Analysis of variables

Objective	Hypothesis	Statistical Test
To establish availability of live specimen in the teaching and learning of Biology	Ho_1: There is no statistically significant relationship between availability of live specimens and their use in teaching and learning of Biology.	Computation of frequencies, percentages Correlation, simple linear regression analysis

RESULTS AND DISCUSSION

Respondents Demographic Distribution

The distribution was categorized to the respondent's gender, age, highest education level and working experience as presented in table 3 below.

Table 3: Demographic distribution of the respondents

	Teachers		Students	
Gender	**Frequency**	**Percent**	**Frequency**	**Percent**
Male	11	91.7	82	46.9
Female	1	8.3	93	53.1
Total	12	100	175	100.0
	Teachers		**Students**	
Age	**Frequency**	**Percent**	**Frequency**	**Percent**
Below 15 years	0	0	0	0
16 – 20 years	0	0	162	92.6
Above 20 years	0	0	13	7.4
Below 30 years	7	58.3	0	0
31 - 35 years	4	33.3	0	0
36 – 40 years	0	0	0	0
41 - 45 years	0	0	0	0
Above 46 years	1	8.3	0	0
Total	12	100	175	100
	Teachers			
Level of education	**Frequency**	**Percent**		
Degree	11	91.7		
PGDE	1	8.3		
Total	12	100.0		
	Frequency	**Percent**		
1-5 years	8	66.7		
6-10 years	3	25.0		
Above 10 years	1	8.3		
Total	12	100.0		

Source: Researcher 2021

The gender variable as indicated in Table 3 shows that 11 (91.7%) teachers and 82 (46.9%) students were male. On the other hand, 1 (8.3%) teacher and 93 (53.1%) were female. The finding indicates that, female respondents were the majority in relation to students and male respondents were majority in relation to teachers of Biology. This is accounted for by the fact that, many initiatives have been put in place to ensure that girls proceed to the secondary education so as to achieve gender parity. Also, majority 7 (58.3%) of the teachers were below 30 years while only one teacher (8.3%) was above 46 years. It can therefore be observed that, as far as age is concerned teachers were in the active part of their careers thus, they may not have difficulties in using live specimens in the teaching of Biology. On the other side majority of the students 162 (92.6%) were aged 16- 20 years while a few 13 (7.4%) were aged above 20 years. This shows that schools were admitting students who had the appropriate age of schooling. The outcome shows that the majority of teachers 11 (91.7 %) attained a degree from the university, while one teacher 1 (8.3%) had a PGDE. From the results it can be stated that the sampled respondents had at most a first degree in Bachelors of Science and some of them had also a PGDE course in education and are capable of managing

activities that are related to use of live specimens. Table 3 indicates that, 8 (66.7%) of the teachers had a familiarity with teaching profession of 1-5 years, 3 (25%) of the teachers had taught for 6-10 years while 1 (8.3%) of the teachers had working experience of more than 10 years. These findings show that majority of the teachers had the experience of using live specimens in teaching Biology. This agrees with sentiments of Zhang (2008) in his study that regarding the consequence of level of education of the teacher education and teaching experience influence the achievement science education. The issue was whether teaching behaviors and teaching experience contributed to student improvement in science performance. The results showed that science teachers who are more educated and with advanced levels in Biology influenced students' success in Biology.

Availability of live specimens in teaching biology

Descriptive statistics for availability of live specimens in teaching biology

Availability of live specimen biology observation checklist

The study sought to establish availability of live specimen in Biology instruction in secondary learning establishments in Nandi South Sub County in Kenya. The teachers' responses are indicated in Table 4.

Table 4: Availability of Live Specimen Biology Observation Checklist

	Available	Not available
Plant roots	10	4
Plant flowers	13	1
Arthropods e.g. Millipedes	6	8
Insects e.g. grasshopper	5	9
Teeth	8	6
Frogs	5	9
Bones	7	7
Fruit of plants	11	3
Fish	2	9
Eggs	10	4
Mushrooms	9	5
Onions	12	2
Parasitic worms	7	7
Seedlings	12	2
Bread Moulds	3	11

Results from observation checklist Table 4 reveals that parasitic worms, arthropods e.g. millipedes and insects e.g. grasshoppers and locusts were scarce in the County. Egg, mushrooms, onions, seedlings, bread moulds, plant flowers, plant roots were sufficient with in the schools having a ratio at 2:1. The table also shows that teeth, bones and fish were available in reasonable numbers that could be satisfactorily used to instruct learners. Other live specimen like plant roots and plant flowers on each topic for a class of forty-five was considered sufficient.

On the question of the availability of live specimen biology instruction in their schools, majority of the principals said they had inadequate live specimen while others said they had adequate resources in their schools. It is instructive to note that the few principals who indicated they had adequate resources were from schools that are deemed to have sufficient resources according to list of schools from the DEO office. Enough or scarce, the availability aspect of using live specimen in Biology instruction is what determines

whether learning objectives can be realized, taking into account what we want our students to know (Brown & Wragg, 2003). The principals were asked whether they thought availability of live specimen in Biology instruction. Quoting from one principal who is also a SMASSE biology trainer in the district, "Availability of resources provides students with more hands-on activity and enhances their understanding of taught precepts. The principal's sentiments are in line with Sepulveda (2003) who reveals that use of instructional resources influences learning and determine achievements.

Teachers Responses Regarding Availability of Live Specimen Teaching Biology

Also, the study sought to establish availability of live specimen in Biology instruction in secondary learning establishments in Nandi South Sub County in Kenya. The teachers' responses are indicated in Table 5.

Table 5: Availability of Live Specimens in Teaching Biology

		SA	A	UD	D	SD
Live specimens are always available for Biology lessons in our school	F	2	3	1	4	2
	%	16.7	25.0	8.3	33.3	16.7
There is sufficient Live specimens is sufficient available for teaching and learning Biology	F	0	1	0	9	2
	%	0	8.3	0	75.0	16.7
Student to teacher ratio enables use of live specimen during Biology lesson	F	4	4	0	1	3
	%	33.3	33.3	0	8.3	25.0
The school adequately maintains the live specimen used in Biology lessons	F	2	2	2	4	2
	%	16.7	16.7	16.7	33.3	16.7
Students participate in acquisition of live specimens used in Biology lessons	F	2	7	0	3	0
	%	16.7	58.3	0	25.0	0
Live specimen are preserved in the Lab for future use	F	1	6	0	4	1
	%	8.3	50.0	0	33.3	8.3

Source: Researcher 2021

Results in Table 5 indicate that 50.0% (6) of the respondents disagreed that live specimen is always available for Biology lessons in our school, 41.7% (5) agreed while 8.3% (1) were undecided. Results in Table 4 indicate that a greater part of the sampled respondents 75% (9) disagreed that it's easier to acquire live specimens to be used in Biology, 16.7% (2) strongly disagreed while 8.3% (1) agreed that it's easier to acquire live specimens to be used in Biology. Results in Table 4.6 also show that 66.7% (8) agreed that student to teacher ratio enables use of live specimen during Biology lesson while 33.3% (4) disagreed to that. Finding on whether the school adequately maintains the live specimen used in Biology lessons with 50.0% (6) disagreeing with the statement, 33.4% (4) agreed while 16.7% (2) were not sure. Results also shows that majority of the sampled of the teachers 75% (9) agreed that students participate in acquisition of live specimens used in Biology lessons while 25.0% (3) disagreed that students participate in acquisition of live specimens used in Biology lessons. Live specimens are preserved in the Lab for future use as indicated by most of teachers 58.3% (7) while 41.3% (5) disagreed to that.

Students' responses regarding availability of live specimen teaching biology

The results on the availability of live specimen in Biology instruction in secondary schools in Nandi South Sub County in Kenya are presented in table 6 below.

Table 6: Availability of live specimen in teaching biology

		SA	A	UD	D	SD
Live specimens are always available for Biology lessons in our school	F	18	16	30	42	69
	%	10.3	9.1	17.1	24	39.4
It's easier to acquire live specimens to be used in Biology	F	46	45	22	37	25
	%	26.3	5.7	12.6	21.1	14.3
There is sufficient time to collect live specimens from their environment	F	35	56	29	41	14
	%	20	32	16.6	23.4	8
Student to teacher ratio is a barrier to using live specimens during Biology lesson	F	43	46	21	37	28
	%	24.6	26.3	12	21.1	16.0
There is stipulated time to collect live specimens during Biology lesson	F	44	57	16	37	21
	%	25.1	32.6	9.1	21.1	12
The school adequately maintains the live specimens used in Biology lessons	F	12	39	10	51	63
	%	6.9	22.3	5.7	29.1	36
Students are expected to contribute on acquisition of live specimens used in Biology lessons	F	55	66	9	17	28
	%	31.4	37.7	5.1	9.7	16
Live specimens are preserved in the lab for future use	F	20	21	12	24	98
	%	11.4	12	6.9	13.7	56

Source: Researcher 2021

Table 6 show that 4 (26.3%) of the students strongly agreed that it's easier to acquire live specimens to be used in Biology, 45 (25.7%) agreed, 37 (21.2%) disagreed while 25 (14.3%) strongly disagreed. Results show that a greater part of the students stated that it's easier to acquire live specimens to be used in Biology. This implies that students are likely to benefit from the teaching that is based on live teaching.

Further findings indicated that 35 (20%) of the students strongly agreed that there is sufficient time to collect live specimens from their environment, 56 (32%) agreed, 41 (23.4%) disagreed while 14 (8%) disagreed. This implies that teachers can easily source for these specimens from the environment cheaply so as to use them in teaching of Biology.

Results further indicated that 43 (24.6%) of the students strongly agreed that the student to teacher ratio is a barrier to using live specimens during Biology lesson, 46 (26.3%) agreed, 37 (21.1%) disagreed while 28 (16%) strongly disagreed. Results also signify that majority of the students perceived the student to teacher ratio was a barrier. These findings imply that utilization of the live specimen may be a challenge in the teaching and learning of Biology owing to the large number of students.

Further findings indicate that 44 (25.1%) of the students strongly agreed that there is stipulated time to collect live specimens during Biology lesson, 57 (32.6%) agreed 37 (21.1%) disagreed while 21 (12 %) strongly disagreed. This implies that teaching of Biology may not be hindered by time as feared by majority of the teachers and other players. Furthermore, cases that have been cited by teachers regarding the issue of inadequate time may not arise. Therefore, teachers not using live specimen may be using this time to teach theoretical concepts.

Further information in Table 6 indicated that 18 (10.3%) of the students strongly agreed that live specimens are always available for Biology lessons in school, 16 (9.1%) agreed, 42 (24%) disagreed while 69 (39.4%) strongly disagreed. These findings indicate that majority of the students felt that specimens were not readily available. This implies that teaching using the live specimen may not take place thus may impact on the teaching and learning of Biology. Lomibao (2016) documented that

teacher often lack teaching materials needed for preparing and delivery of quality lessons. Teaching resources, physical and material resources and knowledge resources were considered by the resource-based instruction approach as associated variables of the research study. Resource-based instruction is also known as resource-based learning. Yaniawati et al (2020) explains resource-based learning as a teaching instruction involving use of multiple resources available in print, non-print form including the key educators that include the teachers and media personnel.

Further findings indicated that 12 (6.9%) of the students strongly agreed that the school adequately maintains the live specimens used in Biology lessons, 39 (22.3%) agreed, 51 (29.1%) disagreed while 63 (36%) strongly disagreed. Outcome shows that majority of the students felt that the school didn't maintain live specimens. It is important to mention that live specimens are supposed to be adequately maintained so as to be continuously used. Various researchers such as Dessauer et al., (1996); Longmire et al., (1997 and Kilpatrick, (2002) provided proof to various methods for gathering, hoarding and archiving tissue samples. The following analysis highlights elements that are most beneficial for bat researchers working in the field of tissue processing, storage, and transportation. Since DNA is difficult to extract from formalin-fixed specimens, it is necessary to save biological samples even though whole organisms are to be retained as fluid-preserved subsidies.

Results showed that 55 (31.4%) of the students strongly agreed that students are expected to contribute on acquisition of live specimens used in Biology lessons, 66 (37.7%) agreed, 17 (9.7%) disagreed while 28 (16%) strongly disagreed. This means that most of the learners believe that students play a key responsibility in the acquisition of the live specimens. This implies that the students who have tasked themselves to the acquisition of live specimen will likely benefit more in terms of teaching and learning of Biology.

Lastly, Table 6 indicates that 20 (11.4%) of the students strongly agreed that live specimens are preserved in the lab for future use, 21 (12%) agreed, 24 (13.7%) disagreed while 98 (56%) strongly disagreed. These findings indicate that majority of the students felt that live specimens were not maintained in the lab. This compliment earlier statement that these live specimens were not maintained well. There are variety of ways in which tissues samples could be preserved with the alternative characteristically defendant on ground surroundings and the use projected for the samples. In molecular studies of vertebrates, impressive findings are typically obtained from fresh samples frozen with both dry ice and liquid nitrogen shortly after collection (Prendini et al., 2002).

Correlation Analysis for Availability of live specimen in teaching biology

The study employed Pearson's product correlation coefficient to confirm that there is linear connection among the variables. Table 7 below shows the correlation in the present bivariate correlations between the study variables (availability of live specimens and Biology instruction).

Table 7: Correlations analysis between the dependent and independent variables

		Correlations	
		Biology instruction	**Availability of Live specimens**
Pearson Correlation	Biology instruction	1.000	-.174
	Availability of live specimens	-.174	1.000
Sig. (1-tailed)	Biology instruction	.	.011
	Availability of live specimens	.011	.
N	Biology instruction	175	175
	Availability of live specimens	175	175

** Correlation is significant at 0.001 level (2 - tailed)

Wong & Hiew (2005), they indicated that it is well thought-out to be a weaker association when the value of correlation coefficient (r) range between 0.10-0.29, 0.30-0.49, medium, 0.5-1.0 is calculated as high. Likewise, Field (2009) concluded that to eliminate multicollinearity, the correlation coefficient should not surpass 0.9.

The availability of live specimens therefore is negatively correlated to Biology instruction and is highly significant ($r = - .174$, $p < 0.001$). This implies that there may be few live specimens that are being used in the teaching and learning of Biology thereby impacting negatively.

A Simple Linear Regression Analysis Model Summary of Availability of Live Specimen and Biology Instruction
A simple linear regression model was run to show the regression between availability of live specimen and Biology instruction. The results as summed up in Table 8.

Table 8: Simple Linear Regression Model for H_1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change
1	.174[a]	.030	.025	6.61647	.021

a. Predictors: (Constant), Availability of Live specimen

Result reveals R2 x 100 = .030 x 100 percent = 3 percent, as shown in Table 8, which indicates that 3 percent of the difference in the predictor variables is explicated by that of the current study independent variables. The R-square value shows that up to 3 percent of the biology education component in secondary schools in Nandi South Sub County in Kenya can be predicted by this model. The availability of live specimens accounts for up to 3 percent of the variability seen in the region under study.

Table 9: Anova Analysis for H_1

ANOVA[a]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	235.891	1	235.891	5.388	.021[b]
	Residual	7573.537	173	43.778		
	Total	7809.429	174			

a. Dependent Variable: Biology Instruction
b. Predictors: (Constant), Availability of live specimen

Source: Researcher 2021

The ANOVA analysis is highly significant (0.021), suggesting that the relationship is very good between the independent variable and the dependent variable. The overall significance of the model is evaluated by Anova and, since $p<0.05$, the simple linear regression model adopted in this study is applicable to the research. The ANOVA findings of the simple linear regression analysis indicate that it is statistically acceptable for the regression equation to analyze the relationship ($F = 5.388$; $df = 1$; $p = 0.05$) at the significance level of 0.05. The ANOVA findings of the simple linear regression analysis indicate that it is statistically acceptable for the regression equation to analyze the relationship ($F = 5.388$; $df = 1$; $p = 0.05$) at the significance level of 0.05. The model summary showed that the model could explain the 3 percent difference in the teaching of Biology caused by any changes in the availability of live specimens.

Table 10: Coefficient for H_1

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**T**	**Sig.**
1(Constant)	20.878	1.079		19.341	.000
Availability of Live specimen	-.169	.073	-.174	-2.321	.021

a. Dependent Variable: Biology Instruction

Source: Researcher 2021

The coefficient resulting from the analysis is further defined in Table 10. In order to establish the relationship between live specimen availability and Biology instruction, a simple linear regression analysis was carried out.

The equation $Y = \alpha + \beta 1X_1$ generated from this model therefore become:
$Y = 20.878 + -.169\ X_1$

Where Y is the dependent variable (Biology instruction), X_1 availability of live specimen. Taking all extra factors constant at zero the regression equation established, Biology instruction was 20.878. Taking all other factors as zero the results clearly states that, a unit raise in availability of live specimens will lead to a -.169 decrease in Biology instruction.

Hypothesis testing

H_{01}. There is no statistically significant association between availability of live specimens and their use in Biology Instruction in secondary schools in Nandi South Sub County in Kenya. The results clearly indicate that the significance level of $p > 0.05$ using the regression analysis was achieved and the null hypothesis was to be rejected as argued in the subsequent sections. The researcher's first hypothesis (H_{o1}) affirmed that there is no statistically significant relationship between availability of live specimens and their utilization in Biology Instruction in secondary schools in Nandi South Sub County in Kenya. However, findings in Table 8 showed that availability of live specimen has a negative and significant influence on Biology instruction in secondary schools in Nandi South sub-County ($\beta 1 = -.174$, $P < 0.05$). As a result, the researchers' hypothesis (Ho1) was rejected and this can be further explained by testing the significance degree of the t-test, which reported that 19 times as opposed to the impact of the standard error correlated with the predictable coefficient ($t = 19.341$), the biology instruction will be accredited to the regression model. This implies therefore

that availability of live specimen has a statistically significant effect on Biology instruction of in secondary schools in Nandi South Sub County in Kenya.

The findings indicate that majority of the teachers felt that it is not easy to acquire live specimen. This implies that live specimen is not easily available in the schools. Teachers also stated that there is sufficient time to collect live specimens from the environment. This implies that teachers can easily source for these specimens from the environment cheaply so as to use them in teaching of Biology. Different opinions were found regarding the student teacher ratio in terms of using live specimens during Biology lessons. Teachers cited that the ratio was not a hindrance to the utilization of live specimen. On the other hand, students as indicated by the majority felt that the student to teacher ratio was a barrier. These findings imply that utilization of the live specimen may be a dispute in the teaching and learning of Biology owing to the large number of students. Both teachers and students were in agreement that there is stipulated time to collect live specimen from their environments. This implies that teaching of Biology may not be hindered by time as feared by majority of the teachers and other players. Furthermore, cases that have been cited by teachers regarding the issue of inadequate time may not arise. Therefore, teachers not using live specimen may be using this time to teach theoretical concepts.

Results clearly show that majority of teachers and students agreed stated that live specimens were not always available for Biology lessons in our school. This implies that teaching using the live specimen may not take place thus may impact on the teaching and learning of Biology. This finding is in agreement with Lomibao (2016) studies which documented that teacher often lack teaching materials needed for preparing and delivery of quality lessons. Teaching resources, physical and material resources were considered as sub-variables of the study by the resource-based instruction strategy. Resource-based instruction is also known as resource-based learning. Campbell et al (2014) explains resource-based learning as a teaching instruction involving use of multiple resources available in print, non-print form including the key educators that include the teachers and media personnel. Majority of the teachers and students were in agreement that schools didn't maintain live specimens. It is important to mention that live specimens are supposed to be maintained so as to be continuously used. Failure to do this may imply that the school will be required to buy more thus incurring more expenditure. Since many publications already include detailed explanations of methods for tissue sample selection, storage, and archiving (e.g., Dessauer et al., 1996; Longmire et al., 1997; Kilpatrick, 2002;), The following analysis highlights elements that are most beneficial for bat researchers working in the field of tissue processing, storage, and transportation. As indicated by teachers and students live specimens are preserved in the lab for future use as indicated by most of teachers and students who felt that students play a key role in the acquisition of the live specimens.

Lastly, findings indicated that majority of the students and teachers felt that live specimens were not maintained in the lab. Tissue sample preservation can be done in one of many ways, with the option usually depending on the conditions of the field and the use planned for the samples. Prendini, Hanner & desalle, (2002) asserted that for the most excellent outcome for vertebrate molecular study are regularly acquired from fresh samples frozen using either dry ice or liquid nitrogen shortly subsequent to gathering

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, the study concludes that live specimens are equally as effective in improving the teaching Biology. Teachers should therefore be encouraged to embrace the use of live specimens as instructional materials to instruct Biology especially for topics for live specimens are difficult to obtain. The availability of live specimen in the laboratory will facilitate teachers conducting adequate practical activities in parallel with theoretical classes. On availability of live specimen in Biology instruction the study concluded that they have inadequate live specimen. Enough or scarce, the availability aspect of using live specimen in Biology instruction is what determines whether learning objectives can be realized, taking into account what we want our students to know.

Based on this research, the study recommends that the school principals should make basic resources available. Biology teachers should build up small aquariums, vivariums, and botanical gardens in their classrooms. Through specific subsidies, the government should also provide basic resources to schools.

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