

Teaching Methods And Students' Performance Of Biology In Secondary Schools: A Case Study Of Soroti

Secondary School, Soroti District

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ABSTRACT

The extent to which Biology is failed by learners is high yet it is important in a medical and other scientific field. This level of failing has been closely associated with the teaching methods applied by the biology teachers. The main objective of this study was to assess how teaching methods affect students' performance of biology in Soroti Secondary School, Soroti district. The study specifically determined the relationship between teaching methods and students learning of Biology, identified the resources necessary for the proper teaching of Biology and ascertained the challenges faced by the students while learning biology in Soroti Secondary School. The study employed a descriptive cross-sectional study design using a quantitative approach for data collection with questionnaires and interview guides as the research tools while applying questionnaire and interviews as data collection methods to extract primary data from 81 respondents. The results indicated that (46.9%) of the respondents used explanations as their Biology teaching method, (59.3%) affirmed that their learners understood Biology well using the methods applied by them to teach, and (67.9%) observed that their learners performed highly in Biology due to the methods of teaching they used. Additionally, (52%) said that biological laboratories were adequate, (84%) asserted that Biological supplementary books were inadequate, (60%) reported that teaching guides were underutilized and (56%) said that Biology teachers were inadequate. Furthermore, (67.9%) reported that Biology as a subject was feared, (75%) said that they were not able to access all the resources for Biology, (54.3%) described the relationship between the teachers and the learners to be poor and (57%) reported that there was absenteeism of learners from school. The study therefore concluded that there was a very strong positive relationship between teaching methods and students' performance of Biology at $r = 0.708$ and at level of significance 0.05, this implied that if the proper teaching methods for Biology were used, the level at which students would pass Biology would be high and if improper teaching methods of Biology were used, the students would fail Biology.

Keywords: Teaching Methods, Students, Performance, Biology and Secondary Schools

Background of the study

Given the contribution of science and technology to today's world, one would expect a growing interest in these fields (Victoria et al., 2023), but the opposite appears to be true. Indeed, among youth, there is a decline in science enrollment and poor performance in exams, such as those taken in high school science courses (especially biology) by the brave few who enroll (Aisha et al., 2023). According to Freeman (2019), student performance is the extent to which a student, teacher or institution has achieved its short-term or long-term educational goals. Student performance is an achievement or outcome that shows which students have achieved which specific short-term or long-term goals (Micheal et al., 2023). Student performance represents outcomes that show the extent to which a person has achieved specific goals targeted by activities in the educational environment, specifically at school, college, and university (Anthony, Kazaara, Kazaara et al., 2023). Improving the quality of education has been a key feature of the reform proposals of governments in various countries. These educational reforms largely focus on basic education, which includes both primary and secondary education. At the secondary level in particular, much research has been conducted to find ways to produce higher quality biology education, as poor performance in the subject at the end of secondary school has been a long-standing problem (Godfrey et al., 2023). Some studies conducted show that there is a link between persistent poor performance in biology and the methods used in teaching it, and it is also found to be gender sensitive with more boys than girls excelling in biology (Alex & Kazaara, 2023). Globally, the good performance of students in the subject of Biology was highly emphasized; this is due to the fact that knowledge as a subject is widely used in such scientific professions as medicine, pharmacy and agriculture, which has allowed doctors to eradicate some diseases that previously posed a great threat to human existence (Joventa et al., 2023).

African schools continue to show very poor results in biology, even though biology and its applications are so important in life, it is of general public concern that fewer students/students like biology as a subject and most perform poorly (Eshwan, 2019). . Many researchers have conducted studies on the valid performance of biology in Africa and have come up with various causes that could lead to poor performance, the most prominent of which are poorly trained teachers, poor methods of teaching biology, inadequate resources and poor attitude of students towards the subject of biology (Godfrey et al., 2023).

In East Africa, many scholars in the education sector have emphasized the need to use proper teaching methods in dealing with relevant subjects. This means that each subject is unique in itself and requires an appropriate teaching method that aims to make teaching and learning successful if applied during instruction and will lead to the achievement of the set subjects and academic goals (Emmanuel et al., 2023). Although the various Ministries of Education in East Africa have overemphasized the use of correct teaching methods, the results in science subjects, especially biology, have not achieved much and have been mainly linked to incorrect teaching methods resulting mainly from the lack of required teaching resources. when implementing different teaching methods (Anthony, Kazaara, & Kazaara, 2023).

In Uganda, the government, through the Ministry of Education, emphasized the use of sound teaching methods for science subjects that should emphasize the student's problem-solving thinking process, provide students with models for "biological thinking," and create chances for students to practice this form of thinking. At the same time, these methods should include the strategic ordering of learning experiences within levels at different levels of education (Isaac et al., 2023). Although all these have been emphasized and implemented, biology remains the most feared science subject among students and holds the record for the worst science subject, as evidenced by poor test scores nationally (Moses et al., 2023).

In Soroti High School in particular, although biology is doing poorly, a few students manage to achieve averages of C5 and C6 and above at Ordinary Level and O and E grades at Advanced Level. Moreover, poor performance in biology is evident in all tests and promotional exams given to students in all grades of this school (Victor et al., 2023).

Statement of the problem

Much research has been done to determine the possible causes of failure in biology and to find ways to achieve better results, as poor performance in the subject in secondary schools is a long-standing problem. According to the available studies, they have shown that there is consistently poor performance in biology as a subject and that the way biology is taught acts as a major issue that affects poor performance in biology (Victoria et al., 2023). This has given rise to much controversy regarding the appropriate methods to be used for better student understanding (MOE, 2020).

The government has proposed many methods and provided additional training to biology teachers, but there is still no clear method that can be unequivocally identified as the most appropriate, as enrollments are falling and even those attempting Biology fail national exams, driven by average grades of 1.27 in 2018 and 1.41 in 2020, with the percentage of students receiving credits in biology being 32.5% in 2018 and 47.8% in 2020. This indicates a generally poor performance in biology (Christopher et al., 2022).

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Thus, addressing the factors influencing students' poor performance in biology required urgent investigation. Therefore, this study aimed to find out how teaching methods affected student performance in biology at Soroti Secondary School (Richard et al., 2023).

Specific objectives of the study

1. To identify the resources necessary for the proper teaching of Biology in Soroti Secondary School.
2. To ascertain the challenges faced by the students while learning biology in Soroti Secondary School.
3. To determine the relationship between teaching methods and students learning of Biology in Soroti Secondary School.

Methodology

The study adopted a descriptive cross-sectional research design which attempted to answer a research question that asks what effects one variable has on another variable. The study involved quantitative approach during data collection. This design was used since the researcher intended to collect data at one point in time (Richard et al., 2022). The study was conducted from Soroti Secondary School. Soroti Secondary School is the biggest government secondary schools located at the heart of Soroti city, Teso sub-region and in the Eastern region of Uganda. Soroti Secondary School has 120 teaching and non-teaching staff and a student population of about 3000. Soroti City is bordered by Ngora district to the East, Serere district to the South, Amuria district to the North and Kaberamaido district to the West. The population of this study was 100 respondents. This population included the school administrators, Biology department teachers and Biology students at Advanced level.

Table 1: Showing the Population of the Study

Category	Population
School administrators	05
Biology department teachers	50
'A' level Biology student	45
Total	100

Source: Krejcie and Morgan table (1970)

The sample size of this study was calculated using the Krejcie and Morgan table (1970) for determining sample size and this gave a practical ratio according to the population size.

Table 2: Showing the Sample for the Study

Category	Population	Sample	Adjusted	Technique used	Model
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			Sample		
School administrators	05	05	05	Purposive sampling	Krejcie and Morgan (1970)
Biology department teachers	50	44	40	Purposive sampling	Krejcie and Morgan (1970)
‘A’ level Biology student	45	40	36	Purposive sampling	Krejcie and Morgan (1970)
Total	100	89	81		

Source: Krejcie and Morgan table (1970)

The researcher employed a purposive sampling technique to determine the respondents in this study where respondents were selected based on the internal knowledge regarding the problem under investigation. The researcher used both questionnaire method and interviews while collecting primary data from the respondents. Questionnaire method was used on Biology teachers and ‘A’ level Biology students while interviews method was used on the school administrators who were the key informants of this study (Cand et al., 2022). The researcher pretested all study instruments to check the validity and reliability of data collection tools. The researcher ensured that all the collected data reflected the realities, using standardized instruments, data collection procedures, checking error rates during data collection for quantitative data. The researcher after organizing and ensuring the collection of accurate data, captured the data on a data base, validated and corrected the data, provided data in form that enabled analysis, storing and sharing of the data. The data was coded, categorized and analyzed using computer software packages MS Excel (2010). Quantitative data was analyzed by simple Microsoft excel which generated frequency tables, charts and graphs to present the findings. Qualitative data generated from the interviews were analyzed through careful interpretation of meanings and contents and ordering and ranking with descriptive manner. In order to determine the association between the variables under study, ANOVA was performed using SPSS V20 where P-values were used to describe the association (Nelson et al., 2022).

Results

The resources necessary for the proper teaching of Biology

Table 2: The resources necessary for the proper teaching of Biology and their conditions (n=81)

	Condition
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			Available	Not available	Adequate	Inadequate	Under utilized
	Biological laboratories	Freq	32	00	42	02	05
		% tage	40	00	52	3.0	7.0
	Biological supplementary books	Freq	11	00	00	68	02
		% tage	14	00	00	84	3.0
	Teaching guides like charts, projectors and sound output devices	Freq	19	00	03	10	49
		% tage	23	00	4.0	12	60
	Biology teachers	Freq	34	00	02	45	00
		% tage	42	00	3.0	56	00

Source: Primary data, 2023

According to table 5 above, findings indicated that biological laboratories were said to be adequate by the majority of the respondents 42 (52%) while they were perceived to be inadequate by the minority 02 (3.0%) of the respondents.

More than three quarters of the respondents 68 (84%) asserted that Biological supplementary books were inadequate while less than quarter 02 (3.0%) said that they were underutilized.

Also, most of the respondents 49 (60%) reported that teaching guides like charts, projectors and sound output devices were underutilized while the least respondents 03 (4.0%) said that they were adequate. Biology teachers were also said to be inadequate by the majority 45 (56%) of the respondents while the minority of the respondents 02 (3.0%) asserted that they were adequate (Winny et al., 2023).

According to the resources necessary for the proper teaching of Biology, findings indicated that Biological laboratories, Biological supplementary books, teaching guides like charts, projectors and sound output devices and Biology teachers are the main resources required for the proper teaching of Biology. However, in a case study school, Biological laboratories were said to be adequate by the majority of the respondents 42 (52%), Biological supplementary books were reported to be inadequate by more than three quarters of the respondents 68 (84%), also, most of the respondents 49 (60%) reported that teaching guides like charts, projectors and sound output devices were underutilized, Biology teachers were also said to be inadequate by the majority 45 (56%) of the respondents

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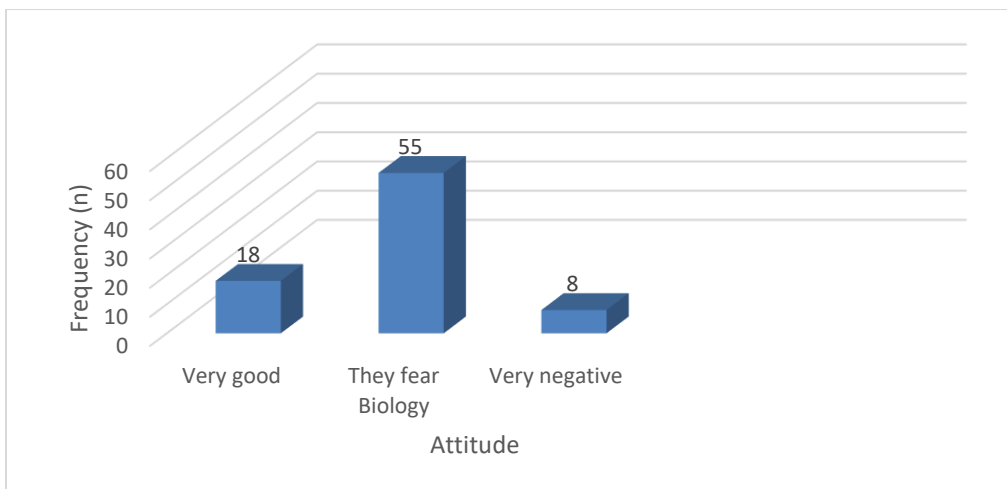
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while the minority of the respondents 02 (3.0%) asserted that they were adequate (Anthony, Kazaara, Kazaara, et al., 2023).

One of the key informants in an interview session asserted that, “*we have a challenge with inadequate Biology books, and even the specimens for conducting Biology practical are usually few compared to the number of learners we have.*”

The challenges faced by the students while learning Biology

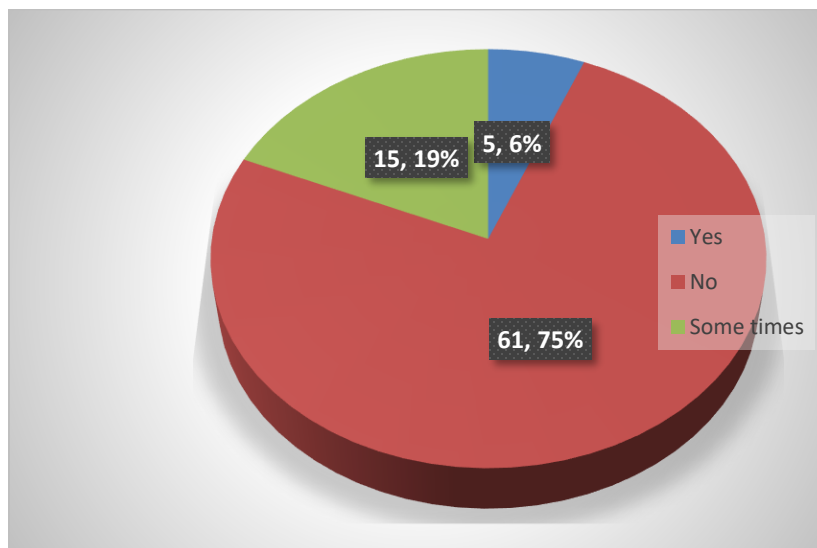
Figure 1: Attitude towards Biology (n=81)



Source: Primary data, 2023

Majority of the respondent 55 (67.9%) reported that Biology as a subject was feared while the minority 08 (9.9%) reported that was very negative attitude towards Biology.

Figure 2: Whether access to all the resources for Biology was possible (n=81)



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Source: Primary data, 2023

Three quarters of the respondents 61 (75%) said that they were not able to access all the resources for Biology while less than quarter 05 (6.0%) said that they were able to access all the resources.

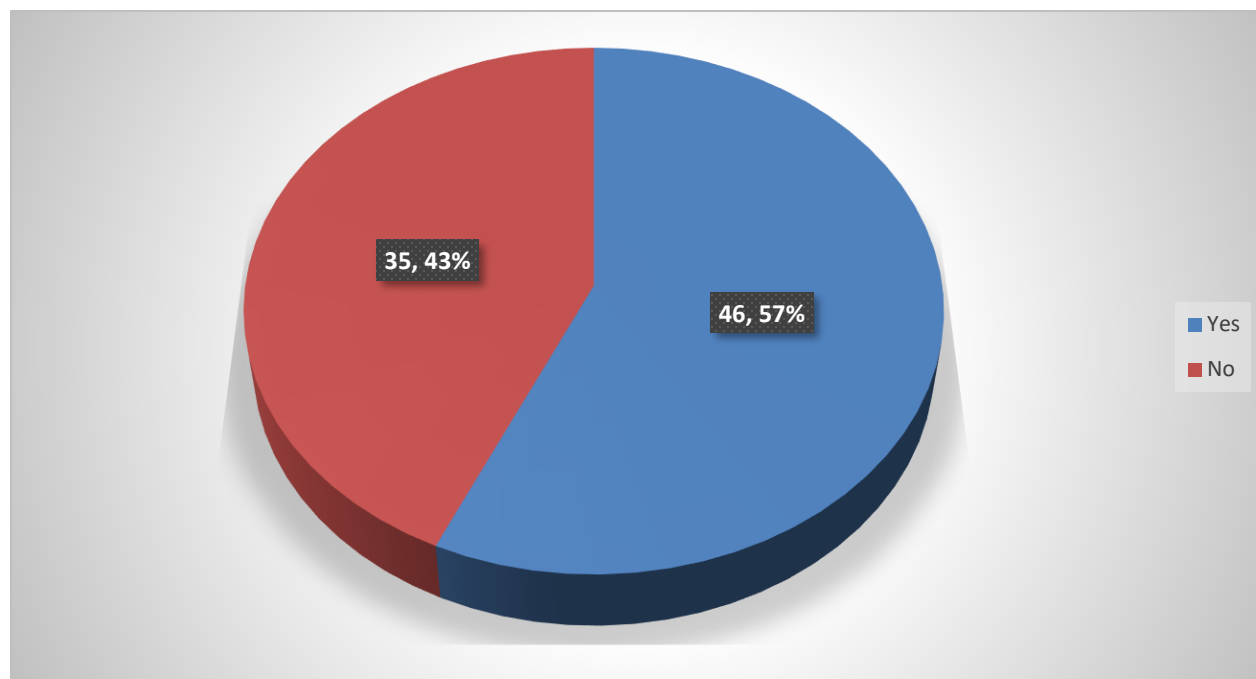
Table 3: The relationship between learners and teachers of Biology (n=81)

Relationship	Frequency (n)	Percentage (%)
Very good	13	16.0
Fair	19	23.5
Poor	44	54.3
I cannot describe	05	6.2

Source: Primary data, 2023

About half of the respondents 44 (54.3%) described the relationship between the teachers and the learners to be poor while less than quarter 05 (6.2%) could not describe it.

Figure 3: Whether there was absenteeism of learners from school (n=81)



Source: Primary data, 2023

Most of the respondents 46 (57%) reported that there was absenteeism of learners from school while the least 35 (43) reported that learners were always present at school.

Regarding the challenges faced by the students while learning Biology, majority of the respondent 55 (67.9%) reported that Biology as a subject was feared. This fear maybe associated to the way areas to be covered in Biology are large, it could as well be due to hearsays from other people who have not excelled in Biology in the past leading

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to even those hearing about how Biology is difficult developing poor attitudes and starting to fear Biology (Anthony, Kazaara, Kazaara, et al., 2023). Additionally, three quarters of the respondents 61 (75%) said that they were not able to access all the resources for Biology and it could be attributed to by poverty or lack of financial resources for buying required resources, may also be due to insufficiency of these resources from schools whereby the available few are to be shared by the many students, this inaccessibility to resources limits individuals from further revision, self-testing thereby creating a gap which leads to low understanding and consequently failing Biology (Mark et al., 2023). Also, about half of the respondents 44 (54.3%) described the relationship between the teachers and the learners to be poor which limits the students from approaching the teachers since they have fear and thereby may not be in position to express their dissatisfaction to the teachers hence leading to the reoccurrence of the problem of not understanding Biological concepts thereby leading to failure. Furthermore, most of the respondents 46 (57%) reported that there was absenteeism of learners from school. This absenteeism leads to learners missing out on some lessons which then lead them not to understand unless they seek for explanations from the teachers. These findings agree with findings of the study by (Irumba et al., 2023) which reported that poor performance and high dropout rate is attributed to the fact that learners face many problems while they pursue their education; from the finding of research it was revealed that 50% of the respondent had the following problems; Influence of peer and environment made students undisciplined, Poor relationship between the teachers and students, unstable homes, Some teachers lack commitment and lack of text books and facilities. It was further supported by (Mark et al., 2023), who found out that the factors affecting performances of Biology among many learners were; lack of interest and commitment to students in the part of the students, absenteeism and indiscipline, lack of adequate facilitation including laboratories, library books, playgrounds, lack of enough Biology trained teachers and harassment of teachers by parents.

According to one of the key informants in the interview session, he said that, “*most of our learners face challenges not only in the learning of Biology but also in other science subjects and this affects their performance in these subjects.*”

The relationship between teaching methods and students learning of Biology

Table 4: The methods of teaching Biology used by Biology teachers (n=81)

Method of teaching Biology	Frequency (n)	Percentage (%)
Explanations	38	46.9
Discussions	18	22.2
Lecturing	02	2.5
Using projectors and sound	01	1.2
Practical	22	27.2

Source: Primary data, 2023

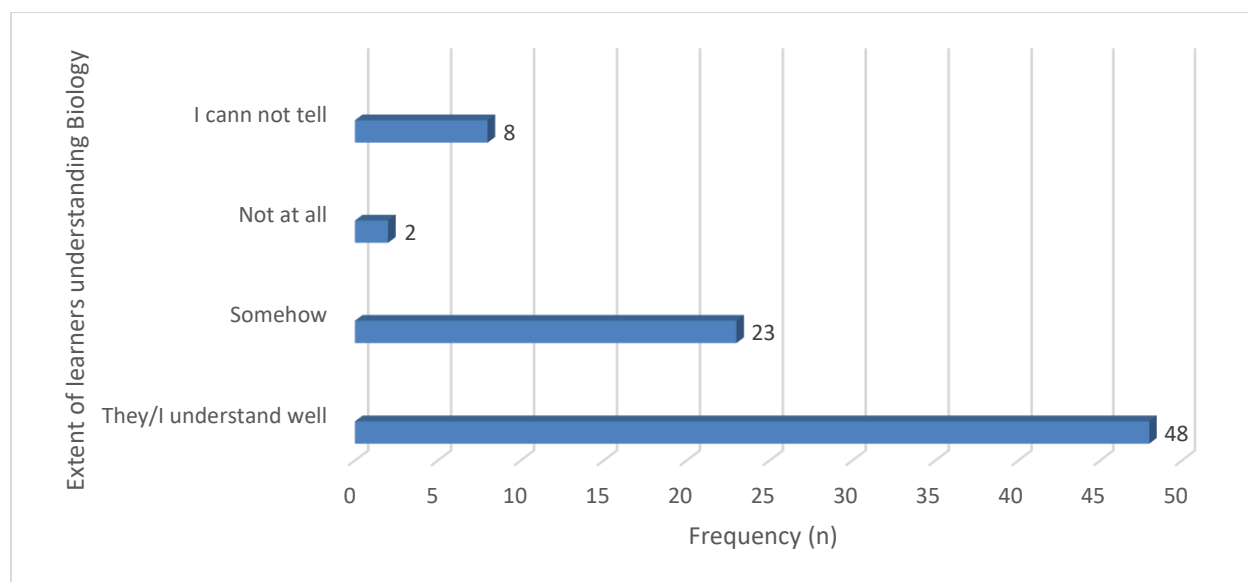
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The table above indicated that the majority 38 (46.9%) of the respondents used explanations as their Biology teaching method while a minority 01 (1.2%) used projectors and sound as their teaching method for Biology.

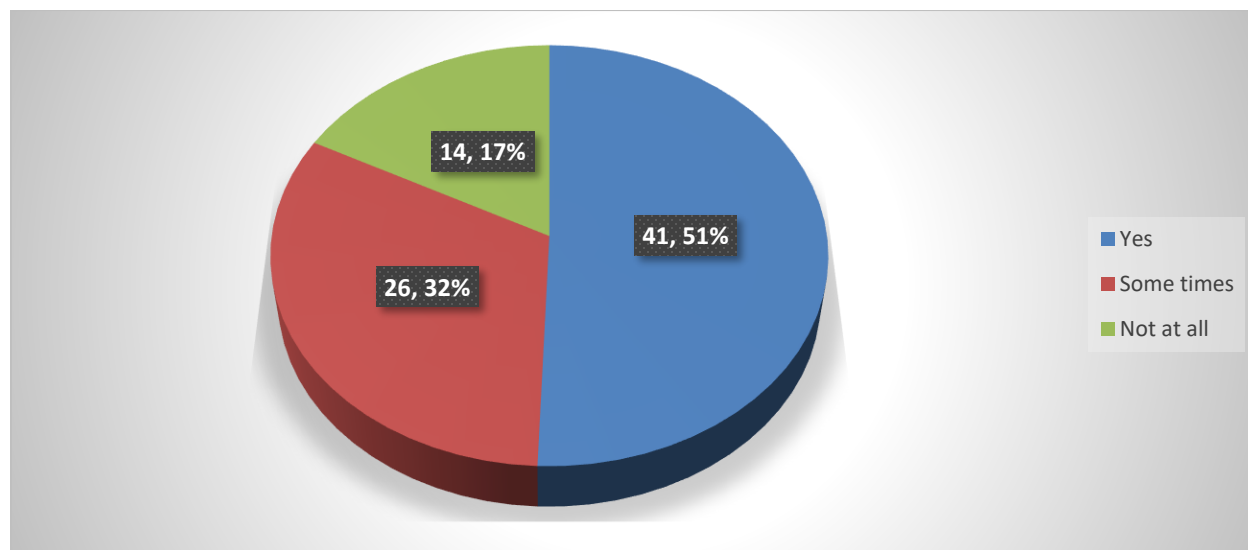
Figure 4: The extent to which learners understood Biology lesson taught using the method used in (4) above (n=81)



Source: Primary data, 2023

More than half of the respondents 48 (59.3%) affirmed that their learners understood Biology well using the methods applied by them to teach while the fewest 02 (2.5%) did not understand.

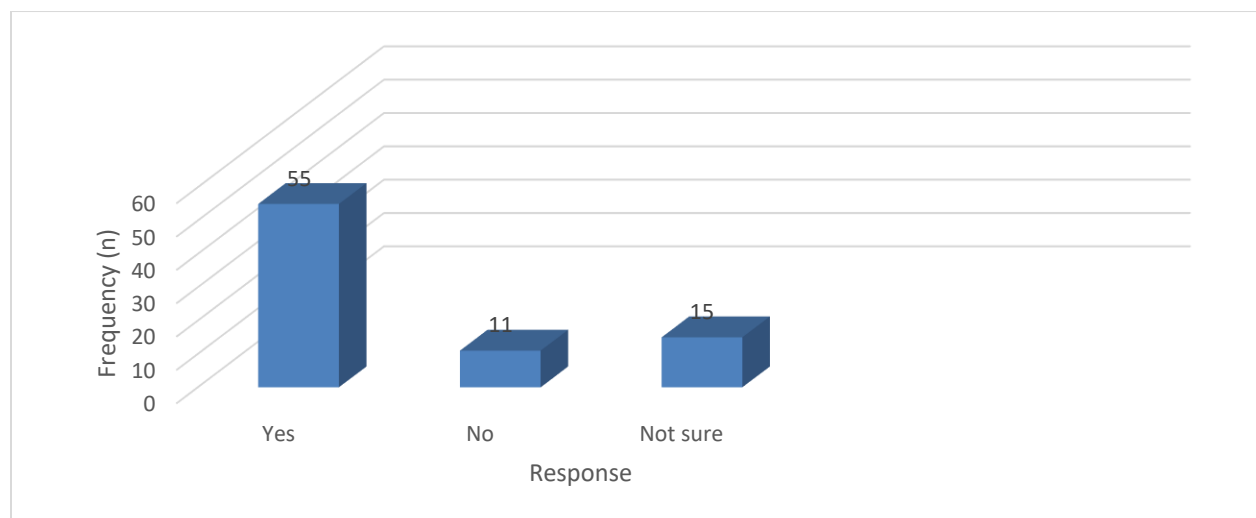
Figure 5: Whether learners passed Biology highly when assessment tests were given (n=81)



Source: Primary data, 2023

About half of the respondents 41 (51%) stressed that their learners passed Biology highly when assessment tests were given to them while the minority 14 (17%) affirmed that their learners did not pass at all.

Figure 6: Whether the performance of Biology was linked to the method Biology was taught (n=81)



Source: Primary data, 2023

More than half of the respondents 55 (67.9%) observed that their learners performed highly in Biology due to the methods of teaching they used while the fewest 11 (13.6%) observed that it was not based on their biology teaching methods.

Table 5: Showing Pearson Correlation between teaching methods and students' performance

Variable	Correlation	Teaching methods	Students' performance
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Teaching methods	Pearson Correlation	1.000	.708**
	Sig. (2-tailed)	.000	.000
	N	81	81
Students' performance	Pearson Correlation	.708**	1.000
	Sig. (2-tailed)	.000	.
	N	81	81

Table 7 indicates that there is a very strong positive relationship between teaching methods and students' performance of Biology at $r = 0.708$ and at level of significance 0.05, this implies that if the proper teaching methods for Biology are used, the level at which students will pass Biology will be high and if improper teaching methods of Biology are used, the students will fail Biology.

According to the relationship between teaching methods and students learning of Biology, it was seen that the majority 38 (46.9%) of the respondents used explanations as their Biology teaching method (Nelson et al., 2023). This is probably because they believed that by explaining the Biology related terms and concepts to the students, they would get a better understanding of the concepts than when other methods were used. This was justified by the respondents whereby more than half of them 48 (59.3%) affirmed that their learners understood Biology well using the methods applied by them to teach which hence implied that a teacher has to choose a suitable method that will suit both him/her and the learners too so as to ensure effective understanding of the concepts being taught as this will enable them to pass highly as indicated in this study whereby about half of the respondents 41 (51%) stressed that their learners passed Biology highly when assessment tests were given to them and it could be linked to the method of teaching these teachers chose which influenced good understanding and therefore, contributing to good performance as reported by more than half of the respondents 55 (67.9%) who observed that their learners performed highly in Biology due to the methods of teaching they used. These findings agree with studies elsewhere (Mosha, 2019; Harlaen, 2019 and Eshiwani, 2019).

Conclusion

In regards to the study findings, it is concluded that there was a very strong positive relationship between teaching methods and students' performance of Biology at $r = 0.708$ and at level of significance 0.05, this implied that if the proper teaching methods for Biology were used, the level at which students would pass Biology would be high and if improper teaching methods of Biology were used, the students would fail Biology.

Furthermore, the study also concluded that Biological laboratories, Biological supplementary books, teaching guides like charts, projectors and sound output devices and Biology teachers were the resources necessary for the proper teaching of Biology.

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Finally, the challenges faced by the students while learning biology were identified as fear of Biology, inability to access all the resources for Biology, poor relationship between the teachers and the learners and absenteeism of learners from school.

Recommendations

The government as a stakeholder in education should provide more funds to secondary schools to ensure they are able to include various teaching methods in their lessons.

Having identified the importance of teaching methods and the relationship played by them in ensuring students' performance. The government should ensure that various teaching methods are more applicable to schools.

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