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Teacher-Learner-Resources Instructional Interaction Pattern and Secondary School Learners' Attainment in Biology in Kakamega County-Kenya

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Abstract

Purpose: The performance of learners' in Science subjects has been below average over the years in many countries; hence causing concern among the education stakeholders. Poor performance in Biology and the intervention mechanisms on methodology within Kakamega Central Sub County has not been documented. This study endeavored to fill this gap by assessing how an improvement on instructional interaction patterns can positively influence the learners' attainment in Biology. The aim of this study was to assess the effect of teacher-learner-resources instructional interaction pattern on secondary school learners' attainment in Biology.

Methodology: The study adopted the constructivism theory as advanced by Jerome Bruner, alongside a conceptual framework based on the objective of the study. A Quasi-experimental Solomon four-group design was used. The target population was one Quality Assurance and Standards Officer, thirty-two secondary school Principals, one hundred and twenty-eight teachers of Biology and, one thousand, four hundred and forty form three students of Biology from thirty-two secondary schools in Kakamega Central Sub County. Stratified sampling, simple random sampling and purposive sampling procedures were employed in the study. Data was collected through use of Learners' Achievement Tests, questionnaires, interview schedule and direct classroom observation. Data collected was analyzed using descriptive and inferential statistics.

Results: The findings showed a significant improvement in the post-test scores as compared to the pre-test scores. This indicated that the teacher-learner-resources instructional interaction pattern influenced better attainment of Biology among secondary school learners.

Unique Contribution to Theory, Policy and Practices: The study therefore recommends teachers of Biology to be encouraged to use relevant learning resources while teaching. The teachers of Biology are to be encouraged to use relevant teaching-learning resources while teaching. Similarly, learners to be allowed to learn through a multi-sensory approach because it caters for the different learning styles that enhances their attainment in Biology.

Key words*: Instructional, Interaction, Pattern, Attainment*

INTRODUCTION

The performance of learners in science subjects has been persistently low in many countries in the world, causing concern among the education stakeholders. Fensham (2008) in Ajaja (2013) indicates that the list of countries with declining performance of students in science subjects is on an upward trend especially among the developed countries. Several factors have been attributed to this low interest by learners as witnessed in various scholarly works. Biology is the worst hit, despite the importance of Biology as a science of life. It is a very critical subject in the secondary school curriculum. It acts as a bridge between social sciences and pure sciences. Knowledge received from Biology is to aid in improving and maintaining personal, family and the community's health. Biological knowledge is useful in understanding both social and economic situations in rural and urban settings. Besides the popularity of Biology as witnessed by the increasing yearly enrolment of students in secondary schools, several research studies conducted continue to show a decline in performance.

From the World Bank report (2020) it was established that the results of resources spent on education were disappointing in terms of learning outcomes. Many students were now finishing school and entering the world of work without having acquired the relevant knowledge, skills and competencies required in a competitive and increasingly globalized world economy. This observation is supported by Anderman et al. (2010) who revealed that the state of science education for high school students was below average, causing a concern that many learners may end up with enormous scientific challenges in their work places. Further, it was discovered from the National Center of Education Statistics (2007) that high school learners in the United States performed poorly in science as compared to those from European and Asian countries. In Turkey, for instance, statistics from the University Entrance Examination showed the following results in Science subjects: 42.6% for Physics, 46.4% for Chemistry and 38.1% for Biology, making Biology the lowest percentage subject for those students.

The report from the Dakar Framework for Action, during the world education forum (UNESCO, 2000) reaffirmed the vision of the World Declaration on 'Education for All'. The report supported quality education of learning to know, to do, to live together and to be. This is in line with Trowbridge et al (2004) as cited by Wamukota and Masibo (2017) who noted that because Biology entails an active process, it would be ideal for the learners to learn through relevant hands on activities. In so doing, individual's talents and potential would be tapped. Learners' self-esteem develops better when allowed to actively participate in the learning process. Active learning improves their lives and attainment, enabling them to transform their societies socially, economically and technologically.

Bell (2007) observes that the future success of the African continent lies to a large degree in its ability to tap the skills and talents of its ever-growing youth population. Use of proper classroom interaction methods should be adapted. The traditional methods in teaching fail to prepare children to fit in the scientific world. Audu (2018) reports an outcry from science educators and

the general public concerning the persistent low achievement in Biology. Further, various reports have brought to the limelight the fluctuating under achievement of students in Biology in the West African Examination Council (WAEC) examinations conducted in Nigeria. The period between the years 2010-2015, most students had never recorded an average of 50% credit pass in their national examinations. Naimah (2018) noted that facts relating to learning outcomes of science subjects in many African countries are quite depressing and heartbreaking. There is dire need for classroom interaction patterns to be improved in order for quality results to be realized in examinations.

In a study conducted by Glewwe et al. (2009) poor performance of students in science subjects in the Kenyan secondary schools has been a persistent problem. Biology is the gateway to professions in health, agriculture, environment and education. The Kenya National Examination Council (KNEC) report of (2019) shows a dismal performance in Biology since the year 2014; as shown in table 1.

Table 1: Enrolment and Performance of Biology Nationally and Kakamega County

	Nationally			**Kakamega County**		
Year	Candidature	Mean mark	Grade	Candidature	Mean mark	Grade
2014	432,977	31.32	D	22,567	29.10	D-
2015	465,584	34.79	D	23,209	37.99	D+
2016	509,982	29.18	D-	26,454	28.18	D-
2017	545,663	18.92	E	28,553	20.35	D-
2018	589,900	25.69	D-	31,117	25.87	D-
2019	618,730	25.69	D-	33,287	26.78	D-
2020	651,236	26.52	D-	36,095	22.57	D-

Source: KNEC Report (2017, 2018, 2019, 2020) and MOE Kakamega KCSE Analysis (2019, 2020)

In agreement, the Basic Education Framework (BEF) (KICD, 2019) proposes active learning through inquiry, problem solving, project work and discovery learning. It is through such that learners can be helped to meet the challenges of the 21st century learning. Several researchers such as Wamukota and Masibo (2017) Kiria (2003) Okoli (2014) and Ogutu et al. (2017) have

carried out studies on general causes of poor performance in Biology in secondary schools. Kakamega Central Sub-county has not received intervention mechanisms especially, in accordance to the classroom instructional interaction patterns. The Sub County has persistently recorded below average performance in Biology compared to the neighboring Sub Counties; as illustrated in table 2.

Table 2: Performance of Biology in Kakamega Central Sub-County, Butere and Mumias West Sub-Counties (2016-2020)

	Kakamega Central		Mumias West		Butere Sub County	
Year	Candidature	Mean mark	Candidature	Mean mark	Candidature	Mean mark
2016	1,937	27.02	1,987	28.917	1,846	28.941
2017	2,113	20.283	2,136	29.50	1,956	25.341
2018	2,188	25.85	2,219	31.216	2,243	29.85
2019	2,297	28.50	2,395	31.325	2,417	31.542
2020	2,681	26.317	2,412	29.724	2,742	32.456

Source: MOEST Kakamega County (2019, 2020)

It is on this backdrop that this study endeavored to fill this gap by investigating how an improvement on the instructional interaction patterns can positively influence learners' attainment in Biology.

STATEMENT OF THE PROBLEM

Poor performance in Biology in the Kenya Certificate of Secondary Education (KCSE) examinations and test scores has been persistent. Despite the popularity of Biology as witnessed by the increasing yearly enrolment of learners in secondary schools, the KNEC yearly reports continue to show a dismal performance (KNEC Report, 2018).

Kakamega Central Sub County has persistently posted below average performance in Biology over the years as compared to the neighboring Sub-Counties of Mumias West and Butere. For instance, out of the 2,188 candidates in 2018, 1,087 scored 'D' and below. In 2019, 1,707 candidates out of 2,297 candidates scored 'D' and below. Consequently, in the year 2020, from a total candidature of 2,681, 1,968 candidates scored grade 'D' and below (MOEST, Kakamega County, 2018, 2019, 2020). The preceding scenario made it necessary for this study to assess the

effect of the teacher-learner-resources instructional interaction pattern on secondary school learners' attainment in Biology in Kakamega Central Sub-County, within Kakamega County.

The World Bank report (2020) explicitly posits the importance of good performance in science subjects for the development of important knowledge and skills necessary for global economic growth. Knowledge received from Biology aids in improving and maintaining personal, family and community's health (KICD syllabus, 2017). Low attainment in Biology causes many learners to be locked out of lucrative Biology based professions like health, agriculture, environment and education at higher levels of learning (Wamukota and Masibo, 2017). The 21st century pedagogy, according to Mynbayeva et al. (2017) presents a shift from teacher centered to learner centered then learning to learn. In agreement; the KNEC report (2017) and KICD-BECF (2017) propose active learning that is pedagogically sound to help learners tackle the challenges of the 21st century. The change in curriculum from 8-4-4 to the Competency Based Curriculum (CBC) has a science pathway which emphasizes on the acquisition of the 21st century skills. The skills require learners to acquire knowledge through hands-on and minds–on activities. This presents an interactive way of learning that can be realized by an improvement in instructional interaction patterns, hence the need for this study.

PURPOSE OF THE STUDY

The purpose of this study was to assess how an improvement on instructional interaction patterns can influence learners' attainment in Biology in Kakamega Central Sub-County, Kakamega County-Kenya.

OBJECTIVE OF THE STUDY

The objective of this study was to assess the effect of the teacher-learner-resources instructional interaction pattern on secondary school learners' attainment in Biology in Kakamega Central Sub-County-Kakamega County, with a view coming up with recommendations that can minimize the low attainment and improve on the performance.

RESEARCH HYPOTHESIS

Ho: There is no statistically significant effect of teacher-learner-resources instructional interaction pattern on secondary school learners' attainment in Biology in Kakamega Central Sub-County.

RESEARCH DESIGN AND METHODOLOGY

This study adopted the quasi-experimental Solomon four-group design plan. According to Campbell & Stanley (1963) this design compares intact groups when random assignment is not possible. It is an appropriate research design since the classes that were used in the study remained intact as per the schools' routine with their regular teachers of Biology. The design allowed the study to be conducted in a natural setting of the schools with intact and already existing form three streams. Campell and Stanley (1963), Mcmillan and Schumacher (2010)

explain that the quasi-experimental Solomon four-group design is appropriate when determining the cause and effect with no random assignment of the subjects. However, in as much as random assignment strengthens internal validity, it would have been unethical in this study since the research was conducted in schools where classes and other programmes were already established.

The treatment classes were exposed to the instructional interaction pattern with the use of resources as per the study. This allowed the independent variable to be manipulated and the effect observed through the dependent variable. The teachers were asked to prepare and make use of their professional documents. They were also requested to use relevant teaching-learning resources and allow learners learn through minds on and hands on activities. The learners were exposed to a pre-test and a post-test examination. The pre-test was used to measure the learners' level of attainment in Biology before participating in the study. The post-test was used to determine the influence of the independent variable on the dependent variable and ascertain any form of value addition that took place after the study.

Similar studies (Wamukota and Masibo (2017) and Ogutu et al.(2014) employed the descriptive survey research to find out the instructional practices in Biology and their influence on student performance in secondary schools. This study used a different design to find out whether it could add any new knowledge. There were intervening variables but this was not considered as a rival hypothesis. Likewise, it was assumed that the learners' differences like socio-economic status and their entry behavior, did not account for the results (Mcmillan and Schumacher, 2010).

Study Area

This study was carried out in Kakamega Central Sub County, within Kakamega County. It is located in the central part of Kakamega County and houses the County headquarters. The sub-county borders Mumias to the east, Kakamega north to the south, Kakamega east to the west and Butere to the north. It lies on latitude 0.2842^0N and longitude 34.7523^0 E. The sub county has a population of 188,212, (KPHC, 2019) with an approximate area of 161.8 square kilo meters. It has relatively diverse economy with significant contributions from Agriculture, small commercial businesses and 'bodaboda' transport business. This makes it possible for the parents and guardians to sustain their children in school. It is a metropolitan sub-county as a result of the discovery of gold in 1931, which brought in an influx of settlers from different places. It has a total of 32 secondary schools: both urban and rural. The sub-county has persistently posted below average performance in Biology over the years as compared to the neighboring Sub-Counties of Mumias and Butere. Intervention measures have been put in place by the National government and the World Bank through SMASSE, improvement of schools' infrastructure and adequate supply of text books but the performance is still below average (MOE, 2019) and Waititu and Orado(2009).

Target Population

Kakamega Central Sub-County has two divisions namely: Lurambi and Municipality, with a total of 32 secondary schools. The target population for this study was 32 Principals, 128 teachers of Biology, 1440 form three learners and one Quality and Assurance Standards Officer (QASO) in charge of the Sub County.

Sampling Procedure and Sample size

Sampling Procedure

Stratified sampling was done to group schools into national, extra-county, county and sub-county levels, then urban and rural schools as per the zones. Kakamega central sub county does not have an extra county school. Purposive sampling was used to select the national school since it is only one within the Sub-County. According to Creswell (2014) this means that specific characteristics of schools were represented in the sample and that the sample reflected the true proportion of schools with certain characteristics of the population. Eight Principals of the sampled schools were purposively sampled because each school has only one Principal. The QASO was purposively sampled since every Sub-County is assigned to only one. Simple random sampling was used to sample schools, form three streams and the form three teachers of Biology. An approximate of 45 learners per stream, as per the Ministry of Education requirements, participated in the study.

Table 3: **Stratification of schools and learners**

School type	Total number of schools	Number of schools sampled	Number of learners
National (boys)	1	1	45
Extra-County	0	0	0
County	6	2	90
Sub-County mixed	20	4	180
Private schools	5	1	45
Total	**32**	**8**	**360**

Sample Size

The sample size was based on Mugenda and Mugenda (2003) who illustrated that a study population of less than 10,000 could have a representative sample size of between 10% and 30% of the target population. This study used 25% of the target population of Principals, teachers of Biology and forms three students of Biology.100% was used for the Quality Assurance and Standards Officer (QASO). The study's sample size was 8 Principals, 32 teachers of Biology, 360 students of Biology and one QASO.

Data collection instruments

The data collection instruments used were: questionnaires for Principals, form three teachers of Biology and form three learners, interview schedule for the QASO, Learners' Achievement Tests (LATs): Pre-test and a Post-test. The direct classroom observation schedule, in form of lesson observations was done. It helped the researcher to determine the classroom interaction patterns that were being used in the teaching-learning of Biology.

Data Analysis

The data collected was analyzed using descriptive statistics generated in terms of mean, tables and frequencies. The collected data was then presented in terms of tables, bar graphs, pie charts and narrative. The inferential statistics was done through t-test.

RESULTS AND DISCUSSION

Return Rate of the Research Questionnaires

The sample population that were given questionnaires was eight (8) Principals, thirty-two (32) Teachers of Biology and three hundred and sixty (360) form three learners of Biology. 100% of the respondents in the sampled schools were given the questionnaires. 83.333% of learners, 100% of the teachers and 100% of Principals returned their questionnaires. The total return rate was 94.444%. According to Gay et al.(2012) a return rate of 70% and above is considered an adequate representative of the target population.

Classification of the Schools

Schools that participated in the study were classified as national, extra-county, county, sub-county and private. However, there was no extra-county school in Kakamega Central Sub-County.

12.968% of learners were from national schools, 25.96% from county schools, and 51.873% from sub-county schools while 9.22% were from private school. The level of school dictates to some extent, the instructional interaction patterns used by teachers. Different schools have varied facilities, learning environment and resources; right from technological, equipped laboratories and spacious classrooms.

Further results indicate that by gender, 48% were boys while 52% were girls. A finding on sex of learners therefore, indicates that Biology is done by both male and female learners alike on near equal ratio. The performance in Biology per gender in Kakamega Central Sub County yields similar results.

Professional Qualification of Teachers

The researcher sought to establish the level of professional qualification of the teachers of Biology in Kakamega central sub-county. The findings were presented in table 4 and figure 1.

Table 4: Professional Qualification of Teachers

Education level	Number of teachers	Percentage
Master of education	2	6.25%
Bachelor of education	24	75%
Diploma in education	6	18.75%
Others	0	0%
Total	**32**	**100%**

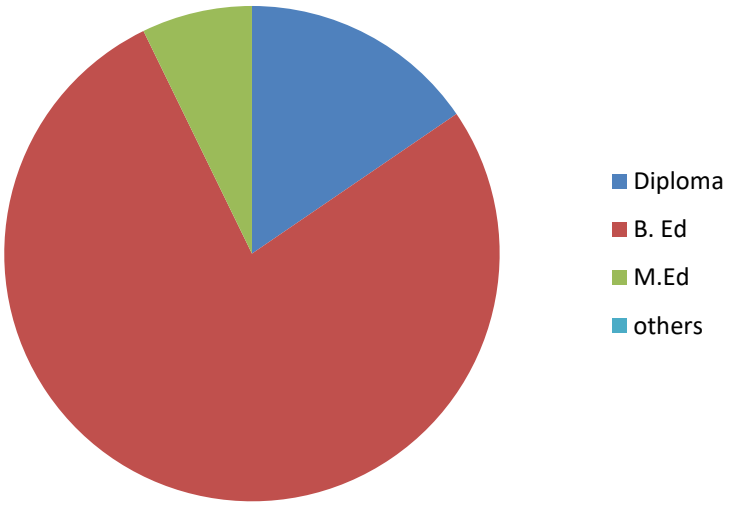

Figure 1: **Professional qualification of teachers**

The findings indicate that 18.75% biology teachers had Diploma in Education, 75% had Bachelor of Education degree, and 6.25% had Master of Education degree. None of the sampled teachers had other qualifications. This data indicates that all the teachers were trained and they all qualified to teach Biology.

Teaching Experience

The researcher sought to establish the teaching experience of the form three teachers of Biology from the schools under study. The following findings were obtained from the Teacher's questionnaire and presented in table 5.

Table 5: Teaching Experience

Teachers' demographic data(years of teaching)	Frequency(N=32)	Percentage
Below 5 years	5	15.625%
5-10 years	11	34.375%
11-15 years	8	25%
16-19 years	5	15.625%
Above 19 years	3	9.375%
Total	**32**	**100%**

The researcher established that 15.625% teachers had been teaching for below 5 years, 34.375% ranged between 5-10 years, 25% ranged between 11-15 years, 15.625% ranged between 16-19 years and 9.375% had taught for over 20 years. This indicates that most the teachers have taught long enough to have the requisite mastery of content to teach biology effectively.

Principals' length of stay in the current school

The study sought to establish the length of stay of school Principals in their current schools. This would inform their responses regarding the teaching of Biology in the schools under their charge.

Table 6: Principal's length of stay

Length of stay	Number of principals	Percentage
Below 5 years	3	37.5%
5-9 years	3	37.5%
10-14 years	2	25%
Over 14 years	0	0

The findings indicate that 37.5%; three (3) Principals had served for less than 3 years, 37.5%; three (3) ranged between 3-5 years, 25%; two (2) had served between 6-8 years. No principal from the sampled schools had served for over eight (8) years in their current stations. However, the Principals had stayed long enough in the teaching profession, which enabled them to be familiar with the required teaching-learning resources. Subsequently, they were in a position to guide their teachers on instructional interaction patterns ideal for enhancement of results in Biology.

The researcher also sought to find out how often Principals supervise curriculum.

From the responses 60% said they rarely supervise curriculum implementation because of other administrative duties. Instead, they had delegated this to the deputy principals, the director of studies and the heads of departments who were in charge of academic standards in school. 40% often supervised curriculum implementation in person because they felt that it was a way of identifying gaps and offering support to their teachers.

Responses from the Principals' questionnaire on performance of Biology in their schools gave the following data: four (4); 50% said the performance was below average, two (2); 25% said it was satisfactory and the remaining two (2); said their learners' performance was average. All the principals reported their dissatisfaction with the Biology results. This is in agreement with Torres and Vasconcelos (2017) who noted that with the global scientific and technological advancement occurring rapidly, declining learners' achievement in science courses was a concern, hence the need for this study.

Findings from the Study Instruments

During the direct classroom observation, the teachers came to class with real specimen together with their lesson plans and lesson notes. After stating the objectives of the lesson content to the learners, a few learners assisted the teacher in preparing the projector and other ICT gadgets. Demonstration was done by the teachers before learners could be allowed to observe and manipulate the resources. The lesson content was then projected and learners were asked to identify the specimen that the teacher had come along with. The learners observed the specimen in groups of threes as they discussed their answers. A few of the learners were asked by the teacher to describe the specimen to the rest of the class. The teacher assisted them by giving further clarification. They were told to draw and write the characteristics. At the end of the lesson, the teacher referred to his cell phone and read to the learners an assignment. They were expected to go to the computer laboratory and in groups of threes, search online and discuss further on the lesson content as they answer the questions given in their text books. Their findings were to be submitted during the next Biology lesson.

Further lesson observations revealed the use of other resources like: charts and pictures of organisms. In some cases, there was an indication that learners came to class with prior knowledge of what was to be learned. The learners assisted the teachers with mounting the

charts. The diagrams were clearly drawn. The content was explained as learners participated in asking and answering questions. They were then given the pictures of organisms and asked to observe, identify them then write their characteristics. The teachers supplemented the learners' notes with what they had written in the notebooks. An assignment of looking for specific real specimen was given for the learners to carry them to class during the next lesson.

The notes from the interview schedule revealed that, in most schools, learners barely had adequate time to interact with the learning resources. The available resources were inadequate compared to the over-crowded classes. Likewise, in some sub county schools, learners were not trusted with ICT gadgets without the presence of the teacher. It was noted that teachers of Biology were ICT compliant. Hence, they were able to get more information online and come up with new ideas and resources for teaching Biology.

The national and the county level schools were reported to have adequate teaching-learning resources, ranging from spacious and well-equipped laboratories. Other resources include charts, realia, skeletons and a rich school environment. This was the opposite of the sub county schools which accommodate 51.873% population of the learners.

The researcher sought to establish the most common method used by teachers in encouraging learners to share ideas during the Biology lesson. The response was captured in table 7.

Table 7: Methods used in teaching-learning Biology

Method	Number of learners	Percentage
Question/answer	198	66%
Specimen manipulation	36	12%
Group work	36	12%
Peer teaching	30	10%

The learners' response in table 7, 66% learners responded that teachers used question and answer method,12% responded that specimen manipulation was used,12% responded that teachers used group work and 10% responded that teachers used peer teaching to encourage them to share ideas during the Biology lesson. The findings are also illustrated in figure 2.

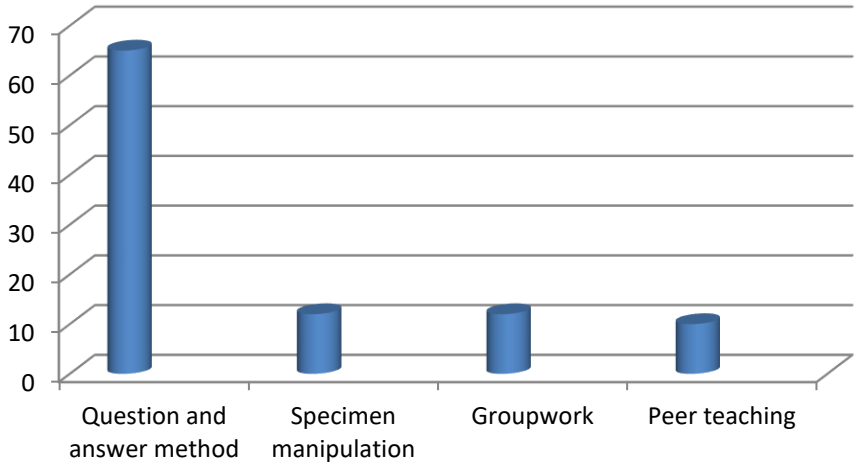

Figure 2: How learners are encouraged to share knowledge

Learners were asked about the best mode of revision they preferred using when revising past papers in Biology. The responses were presented in table 8 and figure 3.

Table 8: Preferred Revision Method

Preferred method	Number of learners	Percentage
Teacher-learner	30	10%
Learner-learner	45	15%
Teacher-learner-resource	150	50%
Learner-learner-resource	75	25%

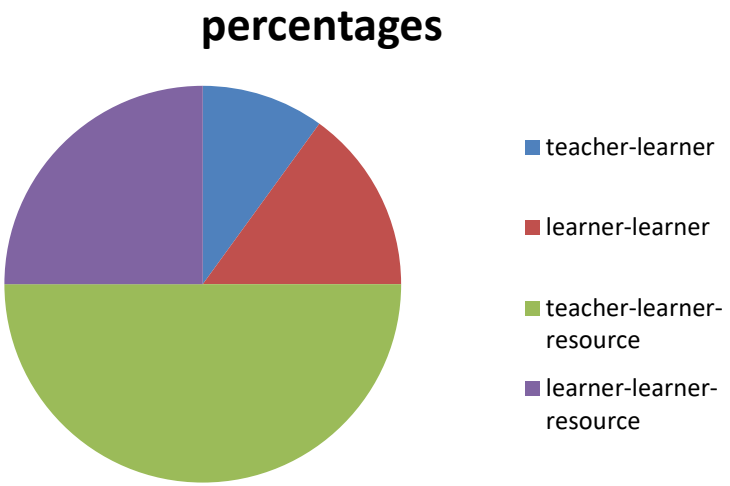

Figure 3: the most preferred revision method

50% learners prefer teacher-learner-resource revision method, 25% prefer learner-learner-resource, and 15% prefer learner-learner. 10% of the learners said that they prefer teacher-learner revision method. A pre-test was administered before the treatment, then, the learners were exposed to the teacher-learner-resource interaction pattern for a period of three weeks. A post-test was administered after the treatment. The results were collected, tabulated, analyzed and presented in table 9.

Table 9: Results of Pre-test and Post-test

Item	**Pre-test**		**Post-test**	
School	**A_1**	**A_2**	**A_1**	**A_2**
Entry	45	45	45	45
Total marks	1920	1012	2674	1330
Mean marks	34.28	31.63	47.76	41.59
Standard deviation	11.40	12.24	9.62	10.37

From the analysis, A_1 had a mean mark of 34.28 in the pre-test with a standard deviation of 11.40. The post-test mean mark was 47.76 with a standard deviation of 9.62 for learners in A_1. Learners in school A_2 had a mean mark of 31.63 in the pre-test with a standard deviation of 12.24. The mean mark for the post-test was 41.59 with a standard deviation of 10.37. In both schools, the standard deviation was low, implying that the spread of the learner scores had a small range.

Likert Rating Scale for Teachers

A likert rating scale of five points was used to determine the teachers' views on instructional interaction patterns in teaching Biology. The responses were coded as: SA-Strongly agree =5, A-agree =4, UD-undecided 3, D-disagree =2, SD-strongly disagree =1. N=32. The responses are as shown in table 10.

Table 10: Descriptive statistics for teachers' responses

Observation	SA	A	UD	D	SD	Total	Mean	% Mean
Work with learners to improvise	1	22	9	0	0	32	3.78	75.63%
Laboratory well equipped with materials	2	2	0	2	2	32	2.25	45.00%
Learners enjoy doing experiments with the teacher	3	2	0	0	0	32	4.93	98.75%
Planning makes learning interactive	3	1	0	0	0	32	4.96	99.38%
Learners enjoy when teacher uses resources	0	3	29	0	0	32	3.09	61.88%
Use of resources improves attainment in biology	8	24	0	0	0	32	4.25	85.00%
Overall Score							**3.88**	**77.6%**

The teachers' responses on the likert rating scale showed 75.63% reporting that they worked with their learners in improvising learning resources. 45% said that laboratories were well equipped and 98.75% responded that learners enjoyed doing experiments with their teachers. 99.38% of the teachers agreed that planning for lessons makes learning interactive. 61.88% said that learners enjoy when teachers use resources while 85% reported that use of resources improves learners' attainment in Biology. The findings are in line with Olaleye (2017) who carried out a study on the 'effect of teaching charts, real specimens and videos on secondary school student's achievement'. He observed that use of instructional materials in teaching significantly enhanced learners' attainment.

A t-test was carried out at 0.05 level of significance and 44 degrees of freedom to test the null hypothesis.

Table 11: T-test for learners in school $A_1$and A_2

School	t-value	Degree of freedom	p-value
A_1	6.763	44	0.0000
A_2	3.512	44	0.0008

From the results, the **H_O** that there is no statistically significant effect of teacher-learner-resources instructional interaction pattern on secondary school learners' attainment in Biology in Kakamega Central Sub-County was rejected because the p-values obtained were less than the 0.05 level of significance.

CONCLUSION

This study assessed the effect of instructional interaction patterns on secondary school learners' attainment in Biology in Kakamega Central Sub County. According to the statement of the problem, Kakamega Central Sub County has been recording below average performance in Biology over the years, as compared to the neighboring Sub Counties of Butere and Mumias West. The research found that an improvement on the instructional interaction patterns through an interactive way of use of resources enhances learners' attainment in Biology.

It was found out that the teacher-learner-resources instructional interaction pattern was the most preferred by the learners. The pattern enabled the learners to learn with the teacher and the peers through a multi-sensory approach. As a result, the learners' content retention was improved. This was evidenced through the computed t-test of the pre-test and the post-test scores that showed a significant improvement in the post-test scores. The treatment given to the learners was the use of the teaching-learning resources; charts, pictures of organisms, real specimen, ICT gadgets and learning from outside class environment. Learners were actively involved in observing, identifying and classifying organisms under the guidance of the teacher. Teaching was done through demonstration and thereafter learners were allowed to interact with the resources as they asked and answered questions. Likewise, they also got excited interacting with resources within the school environment.

Computation of the pre-test and the post-test mean marks done revealed that the standard deviation was low, implying that the spread of the learner scores had a small range. A t-test was carried out at 0.05 level of significance and 44 degrees of freedom to test the null hypothesis. From the findings, the **H_O** that there is no statistically significant effect of teacher-learner-resources instructional interaction pattern on secondary school learners' attainment in Biology in Kakamega Central Sub-County was rejected because the p-values obtained were less than the 0.05 level of significance.

RECOMMENDATIONS

The following recommendations are made based on the findings and the conclusions of the study for various institutions and education policy makers for an improvement in instructional interaction patterns and secondary school learners' attainment in Biology in Kakamega Central Sub-County and other sub counties as well:

i. Teachers of Biology to be encouraged to use relevant learning resources while teaching. Similarly, learners to be allowed to learn through a multi-sensory approach because it caters for the different learning styles that enhances their attainment in Biology.
ii. There is need for the Ministry of Education to be organizing in-service courses for teachers regularly so that they can be sensitized on the importance of using teaching-learning resources in Biology. During the workshops, the teachers can be reenergized in creativity, innovation and ICT integration in teaching Biology.
iii. The KICD to review the syllabus for Biology in order to make it more practical so that the teachers avoid rushing to cover the wide syllabus. Rather, adequate time should be allocated to enable teachers embrace a multisensory approach to teaching Biology.
iv. Regular visits to schools by the Ministry staff at both the County and Sub County level in order to access utilization of teaching-learning resources and to offer continuous curriculum implementation support to the teachers.

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