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Research article

Pedagogical Practices that Hamper Effective Teaching and Learning of Biology in Secondary Schools in Migori District, Kenya

Eunice O. A., Dr. Khatete, D. W. and Dr. Ondigi, S. R.

Educational Communication and Technology department,

Kenyatta University

P.O. Box 43844-00100

Nairobi

+254720823481

E-mail of corresponding author: owitieunice@yahoo.com

Abstract

Biology is a very potent tool for social and economic changes in the contemporary world. However, students constantly display low achievement in the subject at KCSE level countrywide and majorly in Migori district. Teaching techniques are an important focus of national and local policy. Reforms and actions aim to promote high-quality teaching in classrooms and team work both at school level and nationally. In order to tailor policies and interventions to the needs of different stakeholders and to improve teaching and learning of students, it is important to understand comprehensively what is happening in the classroom and schools in general. This study aimed at contributing to this knowledge base. The study employed a descriptive survey design and a sample size of 28% and three hundred and eighty five (385) respondents. The research instruments used included questionnaires for Biology teachers and students, interview schedules for principals and Disrict Education Officer and observation checklists for theory and practical lessons. The theoretical framework of the study was based on the knowledge that modified

human behavior leads to prediction and control over performance and learning. The data was analyzed using descriptive statistics; frequencies and percentages were used to describe the findings according to the various variables under study. The findings of the study established use of inappropriate teaching techniques to be one of the major factors contributing to poor achievement in Biology in Migori district. Therefore, the following recommendations were made: more practical activities be carried out in the teaching of the subject in the schools, school administration to provide for the resources in the school budgets, seminars, workshops, and other in-service courses should be intensified by the Ministry of Education to encourage Biology teachers' creativity and innovation in teaching and that teachers to be consistent in the use of resources.

Keywords: Techniques, hamper, effective teaching, learning, education, achievement, instruction

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1.1 Introduction

The knowledge of biology is the major potent source for social and economic changes in the contemporary history of mankind. It has contributed so much and still continues to contribute to make life comfortable for people both in developed and developing countries. It has helped to promote health and control many diseases, increase in food production through genetic engineering and other modern practices over famine, affluence over poverty, reason over superstition and education over ignorance (Tsuma, 1998). However, students constantly display low achievement in the subject at KCSE level countrywide and majorly in Migori district. The most effective methods of teaching Biology are those that ensure the participation of both the teachers and the students. In these methods individual students experience learning personally and discover personal meaning in every idea taught (SMASSE, 2000)

Teachers need to understand that the learner is the most important person in the classroom and the learner's attitude in the subject has to be nurtured so that this can lead to improved achievement (Khatete, 1995). What children learn in schools influences their attitudes and beliefs of future generations. Some principles on effective teaching are rooted in logic of instructional design, for example, instructional methods (Corno and Snow, 1986). No single teaching method such as direct instruction, social construction of meaning, can be the method of choice for all occasions. Instructional needs change as the students' expertise develops and consequently, what constitutes an optimal mixture of instructional methods and learning activities will evolve as student's school years, instructional units and even individual lessons progress (Harris and Taylor, 1983). Effective instruction needs to focus on the range of knowledge, concepts and skills that students are not yet ready to acquire on their own but can acquire with the help from their teachers and the knowledge of the relationship between classroom processes.

Teaching involves creating, enriching, maintaining and adapting instruction to achieve the objectives of the subject, capture and sustain interest and engage students in building biological understanding. Teachers have a wide variety of instructional strategies at their discretion, which differs in terms of the amount of teachers' preparation and the number and type of students being taught at any given time (Gastel, 1991). Constructivism brings about the desired

outcome of conceptual change by creating a conflict between the student's naïve ideas and the accepted biological ideas (Driver, 1989).The student should be exposed to situations where his/her ideas are matched against the biological concepts, which are backed up by evidence through experimentation, and therefore the student has to justify her/his ideas against the conflicting scientific observations (Beck and Earl, 2003). This leads to better understanding of the scientific concepts and hence greater achievement in Biology.

Dunkin (1989) states that children do not come to class 'empty headed', so when planning for teaching, teachers are supposed to develop strategies that make the process of learning more meaningful, the kind of teaching and learning process that will make the students change their unscientific conceptions. Effective teaching practices allow for increased opportunity to learn. This is because students tend to learn more when most of the time allocated to curriculum activities and the classroom management system emphasizes maintaining their engagement in those activities.

Establishing a learning orientation is through beginning lessons and activities by communicating the purpose of the activity, connecting it to prior knowledge and cueing the kinds of students' responses that the activity requires (Baez, 1967). It is practical and attractive to teachers. The lower ability students perform better and higher achievers also benefit (Lord, 2001). May be these pedagogical practices have not gained easy access in most schools in Migori district. Several reasons may account for reservations and reluctance on the part of many teachers to adopt these strategies. These may include a general lack of adequate resources and facilities.

1.2 Materials and Methods

The study employed a descriptive survey design and a sample size of 28% which was three hundred and eighty five respondents. The research instruments used included questionnaires for Biology teachers and students, interview schedules for Principals and District Education Officer and observation checklists for Theory and Practical lessons and resource checklists. The study employed stratified, simple random and purposive sampling techniques. Descriptive survey provided the important leads in identifying the needed emphasis and changes aimed at enhancing appropriate teaching techniques. It also enabled the researcher to obtain information on the opinions of Biology teachers, head teachers, District Education Officers and students concerning the same. Both quantitative and qualitative techniques were used in data analysis. Quantitative data provided leads to the indicators of the problem of use of ineffective teaching techniques whereas Qualitative data sought to establish the options to problem solving and chat the way forward. The research questions included;

i) What pedagogical practices constrain effective teaching and learning in Biology?

ii) What teaching and learning characteristics hamper appropriate choice of techniques in Biology?

1.3 Results and Discussion

Item 1: Students' responses on Pedagogical practices that constrain effective teaching and learning in Biology

Table 1: Results from students

Statement	Response by Percentages (%)				
	SA	A	UD	D	SD
1.We have class practical lessons regularly in biology	7	10	3	28	52
2. Our Biology teacher gives us assignments, marks them frequently and insists that we do corrections	13	25	-	42	20
3. Our Biology teacher uses resources during lessons	18	22	-	25	35
4. I score 70% and above in every Biology test I do.	8	8	-	44	40
5. We do regular Biology tests in class	7	11	4	58	20
6. Our class completes the Biology syllabus on time	-	16	5	40	39
7. We lag behind in syllabus coverage	39	40	5	16	-
8. Our school has adequate and up-to date Biology teaching/learning resources	11	10	-	50	29
9. We are 50-70 students in our Biology class	57	30	3	-	10
10. We have a separate laboratory for Biology	28	30	-	12	30
11. I score just between 50 to 40% in every Biology test I do	20	30	-	30	20
12. We utilize our Biology laboratory adequately	12	30	-	30	28
13. We use teaching/learning aids frequently during Biology lessons	11	10	-	59	20
14. Our Biology teacher does not use resources during our Biology lessons	10	11	-	20	59
15. We do not adequately utilize the Biology laboratory	12	30	-	30	28
16. Our school administration and management is not supportive in the teaching and learning of Biology.	5	8	13	40	34
17. Our school administration is very considerate and supportive in	34	40	13	8	5

academic matters					
18. We are less than 50 students in our Biology class	-	10	3	37	50
19. I like biology since it deals with everyday life	36	50	3	4	7
20. I spend time studying Biology outside the school timetable	50	29	-	11	10
21. I always score 40% and below in Biology tests I do	14	20	-	32	34
22. My future career will not require Biology	-	11	3	36	50
23.My fellow students help me improve in Biology	40	21	7	12	20
24. My fellow students are never concerned about our learning in Biology	12	20	7	21	40
25.Our Biology teacher is very friendly and assists us with our assignments	26	60	3	7	4
26. Our Biology teacher is harsh and does not care whether we understand the concepts or not	7	4	3	26	60

Practical lessons

Practicals play an important role in achievement of a student since it's also done as a separate paper at KCSE level. This item was intended to find out whether students had practical lessons regularly. The results show that 17% of the students indicated they did practical regularly, 80% indicated they did not while 3% were undecided.

Giving and marking of assignments, tests and exams by Biology teachers

Assessment in classroom setting makes important contribution to the teaching and learning process. This item was aimed at establishing whether the Biology teachers gave frequent assignments and tests to the students. The findings indicated that 38% of the students agreed that their teachers gave frequent assignments and marked them, 62% disagreed. Similarly, 18% of the students indicated that they did regular tests, 78% indicated they did not and 4% were undecided.

Completion of Biology syllabus

This item was intended to find out whether the students covered the Biology syllabus within the time given. The results reveal that 16% agreed they covered the syllabus on time while 79% indicated they lagged behind in syllabus coverage and 5% were undecided.

Item 2: Teachers' responses on pedagogical practices that constrain effective teaching and learning in Biology

Table 2: Results from teachers

Statement	**Responses by Percentages (%)**				
	SA	A	UD	D	SD
1. Our school has adequate resources required in Biology	12	30	-	28	30
2. I use resources to ensure mastery of biological concepts, skills and ideas frequently	25	25	-	25	25
3. Most students in my Biology class are average ability students	30	28	-	22	20
4. Most students score 70 marks and above in Biology tests	15	2	-	59	24
5. Most students in my Biology class are below average	13	12	-	35	40
6. There are 50-70 students in my Biology class	50	25	-	5	20
7. My Biology students are less than 50 in class	5	20	-	25	50
8. Students who spend more hours studying Biology achieve better than those who do not spend more hours	53	30	-	11	6
9. I give regular assessments with feedback to students	13	20	2	40	25
10. I do not give regular tests since marking involved is tedious	19	14	4	40	23
11. We work as a team with other Biology teachers to ensure our students are learning effectively	45	40	-	8	7
12. We have a separate Biology laboratory in our school	22	20	-	23	35
13. The current Biology syllabus has very little content to be covered in the four years	-	-	9	51	40
14. A committed teacher can still improve students' achievement in biology	34	46	11	9	-

with limited resources and facilities					
15. The current Biology curriculum has a lot of content that is too much for the four-year course.	20	47	4	6	23
16. I mostly use lecture and demonstration methods since my Biology class has more than 50 students	50	25	-	11	14
17. My Biology class do practicals and projects frequently and I mark the practical record books	22	33	5	10	30
18. We do practicals very infrequently and my students have no practical record books	10	35	-	31	24
19. The current Biology curriculum has just enough content to be covered within the time given at each level and so has nothing to do with the students' poor achievement in Biology	13	20	7	20	40
20. Our school administration is supportive in terms of availing the necessary resources	33	50	2	10	5
21. My students like coming to me with Biology problems	35	40	5	10	10
22. My students rarely come to me unless I tell them to	11	14	5	45	25
23. I have taught Biology for more than five years	50	25	-	13	12
24. I have taught Biology for less than five years	15	10	-	50	25
25. I have adequate time to plan for the Biology lessons and mark the assignments	17	23	-	30	30
26. There is inadequate time to plan for the Biology lessons and mark the assignments	27	13	2	10	48

Teaching techniques

The findings established that 75% of the Biology teachers mostly used lecture and demonstration techniques while 57% used practical and projects during lessons.

Giving of regular tests and examinations to students

The results established that 33% of the teachers gave regular tests and examinations with feedback to student whereas 67% did not.

Teamwork

Findings from the study show that 85% of the teachers worked together with other teachers to ensure that effective learning takes place while 15% did not.

Teachers' commitment

The results revealed 80% of the teachers accepted that commitment on the part of the teacher can improve student's' achievement while 9% did not agree and another 11% were not sure.

Biology syllabus

Biology teachers look at the syllabus with mixed feelings about its broadness, scope and the time allowed for its completion. This item was intended to find out whether some of them felt that Biology syllabus content was broad, little or just enough to be covered within the time given at each level. The results reveal that 67% of the teachers indicated it was too wide while 33% indicated that the content was just enough.

Item 3: Teaching techniques used by Biology teachers

Teaching techniques are essential in that they influence the degree of learning of knowledge, concepts and skills. They illustrate processes and skills and stimulate interest along new lines of thought. This item was intended to reveal the teaching techniques that were used by Biology teachers in Migori district.

Table 3: Teaching techniques used by Biology teachers

Teaching techniques	Percentage (%)
Demonstrations	75
Lecture	75
Practical	50
Projects	25
Problem solving	25

From table 3, it is important to note that most teachers used more than one teaching technique. The results show that majority of the teachers (75%) used demonstrations and lecture methods respectively. Other techniques included practical (50%) while projects and problem solving tied at 25%. Teachers do not often use these techniques since they complain of lack of adequate resources and large classes though in some schools the resources were available and adequate but the teachers never used them. The students (77%) also confirmed that they never had practical lessons regularly while (23%) agreed that they had practical lessons regularly. From observation data, the researcher found out that most teachers (75%) used lecture and demonstrations. This explains why student display low achievement in biology since these two techniques may not be appropriate for all the topics in biology. Projects and problem solving are high thinking skills which stimulate high level of learning in students and given that the teachers rarely use them; this perhaps explains low achievement in Biology.

Item 4: Factors influencing teachers' choice of teaching methods

This item was intended to depict the factors that influenced the teachers' choice of teaching methods. This is important since the teaching technique chosen in turn influences the learning process.

Table 4: Factors that influenced teachers' choice of teaching methods

Factors	%
Biology syllabus-content and scope	83
Adequacy of time to plan biology lessons	75
Class size	75
Students' entry behavior	50
Resources and facilities	42

From Table 4 there are several factors that influence a teacher's choice of any teaching technique in Biology. Majority of the teachers (83%) felt that the content and scope of the biology syllabus was the major factor that influenced their choice of teaching techniques while (75%) of the teachers felt that class size and adequacy of time for planning the lesson respectively influenced their choice of the teaching techniques. Through observations, the researcher realized that many teachers (58%) taught very large classes which were impossible to manage during practical lessons with the meager resources available. As a result many teachers opted to teach through demonstrations and lecture methods. The results also indicate that teachers in sample schools consider the students' entry behavior in their choice of teaching methods. Planning for a lesson is an important part in the teaching and learning process. The findings show that most teachers made no attempt to plan lessons and this may result in

haphazard teaching which leads to jumbling up of facts that end up confusing the learners. This explains students' low achievement in Biology.

Conclusion

Teaching techniques are important since they determine how well a lesson is learnt. The following were the findings in this area:

a. Teachers used a variety of teaching techniques which they found more applicable depending on the prevailing conditions. The most common technique was demonstrations with (75%) of the teachers and lecture method (75%). The other popular methods included practical which had 50% of the teachers. This could be due to the fact that teachers themselves lack the confidence in handling resources efficiently given the nature of their training that does not monitor closely use of resources so they tend to avoid techniques that require use of resources.

b. Teachers (67%) felt that the current Biology curriculum is too wide while 33% said it had just enough content to be covered within the four year period.

c. Teachers (60%) suggested that inadequate time to plan Biology lessons; large class size, low students' entry behavior, wide Biology syllabus and inadequate instructional resources were the major factors contributing to students' low achievement in Biology.

d. Teachers (83%) rated teaching techniques and students' characteristics as the number one factors contributing to students' achievement in Biology while instructional resources was rated last.

e. Teachers suggestions on how Biology achievement can be improved included the following;

i). Schools to have adequate teaching and learning resources. It should be noted that even in the high achieving schools, the resources are not adequate in most cases and therefore teachers should not blame low achievement in biology to inadequacy of resources. Teachers should make use of the available resources first.

ii). Allow more time for biology practical lessons. Teachers have not proved that they use the stipulated time frame wisely and therefore they cannot ask for more time

iii). Biology teachers to embrace improvisation and scaling down of reagents in terms of quantities. Improvisation can not apply to all cases for some resources cannot be improvised such as thermometers. Teachers in low performing schools should not blame inadequacy of resources in their schools for the low achievement since their counterparts in good performing schools also are also affected by the same.

iv). Biology teachers be given fewer periods in other areas. Nonetheless, this would prove very expensive to the TSC since they will have to employ teachers with one teaching subject only to secondary schools.

v). Biology syllabus be narrowed accordingly though this had been done and reviewers thought what is in the syllabus is enough content.

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References

[1] Baez, Albert V. Improving the teaching of science with particular reference to developing countries. New York, United Nations Economic and social council advisory committee on the application of science and technology to development. (Doc. STD/8/1A & Corr.1, 10 October 1967)

[2] Beck, J. & Earl, M**.** (2002). Key issues in secondary education. Continuum: New York: MPG Book Ltd, Cornwall.

[3] Corno, L. & Snow, R. E. (1986)**.** Adapting teaching to individual differences among learners. In Wittrock M. C. (1986). Handbook of Resource on teaching, 3rd edition. . New York: Macmillan.

[4] Driver, R. (1989). The construction of scientific images in school classrooms. In Miller, R. (1989). Boring science images in science education. Lewes: Falmer press.

[5] Dunkin, M.J. (1989). Teacher sex and instruction. In T. Hussein & T.Neville- Postlewaite: International Encyclopedia of Education, vol 1.

[6] Gastel, Barbara (1991). Teaching science. Arizona: The Oryx press

[7] Harris, D. and Taylor, M. (1983). Discovery teaching in school science. The myth, the reality. J.Curric.St 15(3)

[8] Khatete, D. W. (1995). Children's understanding of decomposition and its importance in nature among some Kenyan children. Doctoral Thesis, University of Leeds.

[9] Kumar, A.(2005). Teaching Systems Biology: an Active-learning Approach. Biology and Life Sciences Institute, University of Michigan, Ann Arbor, M1 48109-2216. Retrieved on 13th February, 2009 from http://www.lifescied.org/cgi/content/abstract/4/4/323.

[10] Lord, T. R. (2001). 101 Reasons for Using Cooperative Learning. Retrieved on 13th February, 2009 from http. //www.nap.educ/catalog/10497.html.

[11] Strengthening of Mathematics and Sciences in Secondary Education (SMASSE). 2000 report.

[12] Tsuma, O. (1998). Science education in African context. Nairobi: Jomo Kenyatta Foundations.