MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Education and Review (ISSN: 2350-2282) Vol. 3(5) pp. 200-207, May, 2015
Available online http://www.meritresearchjournals.org/er/index.htm

Original Research Article

Learning conditions and students' characteristics that enhance Effective Teaching and Learning of Biology in Secondary Schools in Migori District, Kenya

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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. Learning environment and students' characteristics are important focus of national and local policy. Reforms and actions aim to promote quality teaching, learning and achievement both at school level and nationally. In order to tailor policies and interventions to the needs of different stakeholders and to improve the learning conditions of students, it is important to understand comprehensively what is happening in the classroom and school environments 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 District Education Officer and observation checklists for theory and practical lessons. The theoretical framework of the study was based on the knowledge that conducive learning environments lead 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 congested and crowded classrooms to be one of the major factors contributing to poor achievement in Biology in Migori district. Therefore, the following recommendation was made; school administration to provide for the resources and facilities 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 consistency in the use of resources.

Keywords: Achievement, enhance, entry behavior, environment, instruction, learning conditions, peer influence

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 environments for teaching and learning Biology are those that ensure the participation of both the teachers and the students. In these environments individual students experience learning personally and discover personal meaning in every idea in schools (SMASSE, 2000).

The types of classroom interaction determine not only the effectiveness of the learning situation, but also the attitudes, interests and in part, even the personality of the child. According to Gammage (1971):

In the context of personality, as it is, affects learning. The child's reaction to success, failure, praise and blame (which is in interaction with the teacher) become crucial since they relate not only to the pupil's social and emotional behavior in the classroom but also to motivation. (P.56)

The learning environment or atmosphere found inside the classroom is of extreme importance in molding the character of the pupils and determining the efficiency with which learning takes place. The motivation of the learner to achieve may be enhanced or damaged by the teacher's attitude towards the students and how he or she interacts with them (Anderson et al, 1989 and Flanders, 1970). The teacher can make the students to be eager to learn or inhibits their interests and attitudes.

A conducive classroom environment refers to the mood and atmosphere inside of a class that motivates students to participate actively in learning and to be engaged in classroom activities. Creating a conducive environment can be a combination of good teaching skills, rapport between the teacher and students, appropriate behavior among students and strategic use of incentives and disincentives for good and poor behavior. Maintaining the proper environment is the challenge because classrooms are dynamic – from moment to moment the atmosphere changes. Teachers must recognize when learning is not optimal and employ strategies to regain the conducive environment. For instance;

1. Employ classroom management strategies consistently. Most education training programs teach classroom management techniques such as discipline and rewards, but implementation of those ideas is not always easy. Strive to achieve a balance where students are familiar with the behavior expected and where you are firm and consistent in enforcing those expectations.
2. Encourage students to participate by publicly acknowledging their efforts through incentives and other rewards. Students will aid you in keeping a conducive classroom when they know that their efforts will be rewarded in some way. Incentives can include free time at the end of the day, stickers or small gifts such as pencils and erasers.
3. Maintain a neat and orderly classroom. Messy, cluttered desks and poorly maintained classrooms are the enemy of a conducive atmosphere. Assign a time when students must rearrange their desks and clean the areas around them; show a good example by keeping your own desk, the classroom walls and windows clutter-free.
4. Maintain good lighting conditions. The lighting and layout of the classroom also affects the mood and performance of students. Experiment with low lights and partial lighting to see how they influence the students.
5. Remove toxic influences. There are times when a teacher must acknowledge that a certain combination of students or a particular strategy is harmful to the classroom environment. Remove the toxic element by either changing where a child is sitting, sending the child to the principal for a few minutes or, in the case of an unworkable strategy, finding a new way to approach the issue (Robinson, 2013)

We have an endemic problem in our society - in that a love of learning for its own sake, and the self-motivation needed for effective learning are educated out of us at school. Yet all of us are natural learners. From birth, we've been absorbing as much as we can take. Given the right conditions - of encouragement, challenge, modeling, behavior and access to expertise - we develop and grow intellectually, emotionally and physically.

Then "society" determines that there are certain things that need to take priority over others, and we go to school to be taught by the experts, and tested to make sure the experts are doing their jobs right. However much those experts want to develop and nurture the children in their care, they are constrained by society at large (Robinson, 2013).The huge majority of people are highly able biology learners. The students can do it but they fail dismally at biology learning. But all it takes is the right environment and a bit of external motivation. In other countries, where the motivation is higher and the environment more conducive students pass in biology. It's actually very little to do with the teaching techniques - it's much more about the conditions.

There's probably little we can do to change schools and education - given the weight of public opinion that is stuck with the British ideas about learning. But let's not accept those ideas in the workplace. In workplace learning, we tend to focus a lot on the learning intervention itself (whether it's a workshop, an eLearning package, a mobile app etc), but spend very little time on fostering the conditions that will encourage learning & development. Our interventions would be so much more effective if they took place in the right conditions.

Just like a plant need light, warmth and water. What conditions are best for effective learning and development? It would be argued that the following are essential:

- a culture where a mistake is treated as a learning point not a failure.
- a management culture built on coaching and challenging to improve
- access to expertise that people can understand when they need it
- immersion in the practices, behaviors or knowledge that we are trying to teach

There will be times when the conditions are not quite right, just like a gardener starting out with an uncultivated patch of land. A lot of effort will be needed to get the other conditions right first. Classroom teacher-student interaction is important since it either enhances or inhibits effective learning that translates into higher or lower achievement. Turiel (1969) stated that it is necessary to consider what the child responds to in the environment as well as the nature of interaction with the environment that leads to change. The goal of education in a democratic society like Kenya should be to provide the conditions to produce more abstract conceptual structure.

The classroom interaction that governs verbal communication between the teacher and the learner are learned in the course of children's learning experiences. Many signals pass between the teacher and the learner, which convey feelings about a topic and give information, which helps to organize conversation. Flanders (1970) and Franyo (2007) argue that if these signals are responded to appropriately, it is possible for effective communication to take place. Among the teachers, there are those who choose to ignore or do not notice these cues, so they influence the communication to become one-sided. Such are autocratic teachers and therefore make the students to withdraw and become uninterested in learning. In this situation, the listener(s) can show disapproval in various ways- making explicit remarks about the subject which forces them to have a negative attitude resulting in low achievement.

In the traditional classroom, wisdom and knowledge is supposed to flow from the teacher to the student. The teacher is the final authority as far as the possession of knowledge is concerned and the learner is considered an 'empty vessel' who is supposed to imbibe the presented knowledge (Tsuma, 1998). Unfortunately, this is what most of the teachers believe in. The interaction of the teacher and the student, which is one of the most important aspects of the environment of education process, still may be one of the most neglected aspects of the teaching learning process implying the need for constant investigations (Amidon and Hough, 1967).

According to SMASSE report findings of 2000, heads of secondary schools must take a more responsible role in both administrative and academic activities in the schools they head. Hellinger and Heck (1995) noted that in many ways, the school head is the most important and influential individual in any school. It is his/her managerial skills that set the benchmark, the direction, the tone and the learning environment. His/her management are pivotal for the moral of the teachers and set the degree of concern for what students may or may not become.

One basic role of schools is to provide a suitable environment conducive for learning. Therefore, the heads should ensure that all available resources are directed towards this end. Starting projects for the sake of it without due consideration of high academic achievement including biology is a failure on the heads part. Teachers work within hierarchical institutions that place highly visible constraints upon their professional discretion (Hawthorne, 1992). Teachers' effort to make a difference in the students' achievement is influenced by the school administration.

The heads of schools cannot escape the blame for the falling standards of biology achievement in Kenyan schools. This is because a school's performance is a reflection of the head's management style (SMASSE, 2000). Kamotho in Kombo (1998) states that the basic reasons why some schools perform better than others in examinations is that while some school heads organize the learning process for their students, others leave it to chance. Head teachers who are committed to their work are responsible and have a sound moral conduct and usually provide favorable learning environment to students.

The purpose and programs of the educational system must be designed to meet the needs of each individual child (Wilson, 1986). The characteristics include; entry behavior, time spent studying, peer group influence and aspiration. They vary from one individual student to the next. According to Hunt (1971), individual differences are given much lip service and even more drawer space in the form of filed test results, yet educational planners and decision makers continue to work from models for the student-in-general. Ignoring the importance of differential student characteristics leads to questions about the general effectiveness of educational procedures, for example, whether a discovery approach is more effective than a structured approach (Kumar, 2005). No account is taken of the differential effectiveness of such approaches on different kinds of students.

Peer relationships exert their influence through the attitudes, expectations and understanding of roles that they leave with the individual (Erwin, 1993). Human relationship is the most powerful psychological behavior modifier known to man. The students misperceive how their peers evaluate their social and academic competence and do not recognize the contribution, which their own social skills have on peer reactions so that this influences their general academic achievement (Erwin, 1993). Entry behavior of a student fosters his/her language, cognitive and social development with frequent and varied verbal interactions. It also improves students' interaction with their peers, intellectual development as well as school and social adaptations. Provision of education curriculum that permits the student to initiate

and pace their own learning activities also influences the entry behavior. (Wilson,1986).

The characteristics of the student and the educational objectives must both be employed as guides in the design of maximally effective environments for learning for better achievement. According to Driver (1989) the role of education in our society is to train children to be creative and self-reliant. This is basically through achieving biology education objectives. Africa lags so much behind the rest of the world in science and technology development: an indication of the relative failure of science education in Africa (Unesco, 1986). For Kenya to develop industrially improvements are necessary in the provisions for science education and in particular biology education at all levels in the country.

The 1982 conference of African Ministers of Education in its Harare Declaration, resolved to draw up and implement during the coming two decades, educational policies designed in particular to:

Develop and renovate science and technology teaching at all levels and activities designed to popularize Science among general public, in order to promote full utilization of modern scientific and technological knowledge in development, to stimulate an interest in scientific career and to increase the number of pupils and students opting for work in scientific fields…Unesco (1982:2)

This can be better realized if Kenya learns from reassessment of the past and present conditions of teaching and learning biology in the country (Ajelayemi, 1990). When motivational factors such as interest, attitude, and aspiration are inculcated in the learners, they tend to spend more time studying the particular subject. This translates into higher achievement in sciences. Students understand better when they spend more time studying biology and will therefore achieve to the expected standard. If the major educational goal is to encourage the development of higher conceptual level with its associated adaptive capacity and flexibility, then this study would provide a specific guide for working toward this long-term goal as reflected in assessment methods, inappropriate classroom interaction styles, inadequate teacher's qualification, lack of experience and inadequate time spent studying the subject.

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 question was; what learning conditions enhance students' achievement in biology?

RESULTS AND DISCUSSION

According to Gagne (1985), factors that influence learning are determined chiefly by environmental events. Members of the school society are responsible for the care of developing a person and have a tremendous degree of control over events that affect learning. The events that the developing child lives through at home, in the geographical environment, in school and in various other social events will determine what is learned and therefore to a large extent the achievement of a learner. The enormous dependence of learning on environmental circumstances implies a great responsibility for all members of school society. The conditions, in which learners are placed, whether deliberately or otherwise, have effects on them. Learning Environment related variables that this study investigated included;

Positive relationship between the teachers and the students in biology

This item was intended to reveal the number of the students who felt that their biology teachers related well with them. Researchers have argued that effective biology teachers must be human, responsive, rational, caring and have feelings for the individuals (Flander, 1970). Such teachers therefore must show positive relationship and support interaction between them and their students to ensure positive classroom interaction.

Table 1 shows that majority of the students (86 %) indicated that their biology teachers related well with them by assisting them in problematic areas in biology even outside classroom, (11%) of the students felt that their teachers were harsh and the remaining (03%) of the students were undecided. The biology teachers (75%) agreed that students went to them with problems though students went to the remaining (25%) of the teachers only when they asked them to. This is an indication that biology teachers in Migori district were effective in teaching biology for they are friendly with their students

Table 1. Relationship between students and teachers

Statement	%		
Our biology teacher is very friendly and assists us with our assignments	86	3	11
Our biology teacher is harsh and does not care whether we understand the concepts or not	11	3	86

Table 2. Congestion in classes

Statement	Percentage (%)	
There are 50-70 students in my Biology class	75	25
My biology students are less than 50 in class	25	75

Table 3. Supportive school administrations

Statement	Percentage (%)		
Our school administration is supportive in terms of availing the necessary resources	83	2	15

and assist them in problematic areas in biology. Perhaps this is because of the SMASSE project in-service program which may have had a positive impact on the teachers themselves. (Table 2)

Congestion/class size

There is a common belief that teachers teach more effectively when they handle smaller classes since they give individual attention to the students and that students learn more effectively when they are fewer in class. Small classes are more manageable and allow for easy detection of individual differences. A teacher who teaches a small class is able to reach and assist each student individually. This item was intended to reveal the size of each class each teacher taught. Most teachers (75%) agreed that there are more than 50 students per class while (25%) had less than 50 students in their classes. Teaching a class with more than 50 students is considered to be large especially during practical lessons.

Congestion could be due to the fact that since these are mostly district schools, every parent whose child cannot make it to National or Provincial schools due to financial limitations and those who scored below the pass mark in KCPE would want to secure a chance in these nearby schools. This may explain the inability of the policy makers, school administration and teachers to cater for the growing number of poor performing schools. Similarly, (87%) of the student confirmed that they were more than 50 students in class, 10% indicated they were less than 50 while 3% were undecided. Observation data also confirmed that 76% of the classes had more than fifty students. In fact, three schools had 69, and 78 each. Eight schools had between 50-58 students per class and another school had 29 students in form three classes. Although this was the case, this factor also affects the good performing schools in the district, so it should not be a major contributing factor to poor achievement in biology.

Support from the School administration

This item investigated the teachers' opinions concerning the support they receive from the heads of various schools they teach in as far as availing of the required instructional resources and facilities is concerned. This is because teachers' effort to make a difference in students' achievement may be influenced by the school administrative style.

From table 3 majority of the teachers (83%) believe that their school administration was supportive while (15%) of the teachers felt that this was not the case and 2% were undecided. Perhaps the 17% negative response explains the fact that these schools still have inadequate instructional resources and facilities. On the same note, majority of the students (74%) felt that their school administrators were concerned about their learning, (13%) of them did not feel the same and another remaining (13%) were undecided. Good relationship between the head teachers, teachers and the students encourage teamwork among the parties concerned and this boosts achievement in school subjects biology included.

Table 4. Students' entry behavior

Statement		%	
I score 70% and above in every biology test I do.	16	-	84
I score just between 50 to 40% in every biology test I do	50	-	50
I always score 40% and below whenever I do any test	34	-	66

Students' related variables

Students are the receivers of all the knowledge, skills, principles and practices that are passed to them by the teachers and have an important role to play in the process of their learning. As they go through the process of learning, there are many factors such as lack of adequate time, negative peer influence and low entry behavior which may affect their learning. Students are essential since without them, the teaching profession would be meaningless. Thus the students and the teachers make the teaching/learning process complete. The following section analyses student-related factors that affect their achievement in biology.

Time spent by students studying biology

This item was aimed at establishing whether students spent adequate time outside the school timetable studying biology. When motivational factors such as interest, attitude and aspiration are inculcated in the learners, they tend to spend more time studying that particular subject. Thus this translates in higher achievement in the subject. Majority of the students (79%) indicated that they spent time outside the school timetable studying biology. Some however, (21%) indicated that they did not spend time studying biology outside the normal school timetable. Majority of the teachers (83%) confirmed that students who spent enough time studying biology were likely to be high achievers in the subject while (17%) did not agree with that view. These findings reveal that learning of biology was taking place as was expected though the students may be lacking proper guidance from their biology teachers. The teachers rarely give tests and examinations therefore the students may be just studying for the sake of it.

Students' wish to be in future careers that require biology

This item was intended to show the number of students who were intending to be in future careers that required biology as a subject. This is important because it indicates the interest and attitude of the students towards the subject. Most of the students (86%) intended to be in careers that require biology while (11%) did not intend to be in future careers that require biology and 3% were undecided. This means that most students are interested in biology a fact which was confirmed by 86% of the students when they declared their like for biology as a subject though 11% did not like biology and 3% were undecided. Although students may be interested in biology, the teachers need to reinforce this through extensive assignments, tests and examinations with feedback on their progress.

Entry behavior of the students

Entry behavior of a student fosters language, cognitive and social development of a student with frequent and varied verbal interaction as well as provision of education curriculum that permits a student to initiate and pace their own learning activities. It also improves students' interaction with their peers, intellectual development as well as school and social adaptations, Erwin (1993). This item aimed at gauging the entry behavior of the students.

Results from table 4 indicate that (50%) of the students are just average students while (34%) are below average and (16%) are above average. The teachers (58%) also confirmed that they had just average students though (25%) had below average and (17%) had above average students. Content analysis of the past KCSE result revealed that (62%) of the students were just average, (25%) were below average and (13%) were above average students. Teaching and learning process is made effective when there is improvement in a student's interaction with his/her peers, intellectual development as well as school and social adaptations. Perhaps this explains why the students display low achievement.

Peer influence

Peer relations exert influence through attitudes, expectations and understanding of the learning activities. This item was supposed to portray the number of students who felt that their peers helped them perform well in biology. Majority of the students (61%) felt that their friends have a positive influence on them while

(32%) felt that their friends had a negative influence on them and (7%) were undecided. Through interviews with the heads of schools, the researcher realized that in mixed schools boy-girl relationships are not encouraged since the teachers consider them not healthy. Most of them spend a lot of time on their relationships at the expense of their studies. Erwin (1993) supports this when he says that peer relationships exert their influence through attitudes, expectations and behavior. The students misperceive how their peers evaluate their academic and social competence. They therefore do not recognize the contribution which their own social skills have on peer reactions so that this influences their general academic achievement but mostly negatively.

CONCLUSIONS

The learning conditions, in which learners are placed, whether deliberately or otherwise, have a great effect on them. The factors that influence learning are determined chiefly by environmental events. The following are the findings as regard the learning conditions.

a). the head teachers, teachers and the students all confirmed that their interrelationship was good. About 86% of the students indicated further that their biology teachers were friendly to them and therefore approachable. It should be not that the heads of schools should be firm in their decisions and not to favor teachers and students in the name of good relationship.

b). the students, head teachers and biology teachers all reported that there were large classes of more than 50 students per class. However, the problem of large classes applies to good performing schools also and therefore should not be a reason to cling to by teachers in low performing schools.

c). teachers (83% and students (74%) said that they received support from their school administration in the teaching and learning process. The reason this is not reflected in achievement in biology could be that both teachers and students take the heads of schools commitment for granted and therefore do less to improve the performance.

d). Students lack attention from teachers since teachers are not committed and complain of inadequate time to cater for each and every student. Comber and Keeves (1973), teaching experience does not necessarily cause higher achievement in science, but committed teachers are less likely to pass on to pass on misconceptions, are more confident in imparting information, use less time for preparation and are able to present a wider range of examples and analogies which help the students to learn and understand a certain topic more easily.

e). Students waste valuable study time in group discussions that are not guided by teachers and therefore digress from study purpose to personal stories that have no connection to achievement in biology.

ACKNOWLEDGEMENTS

I owe a special debt of gratitude to my supervisors Dr. David Khatete and Dr. Samson Ondigi of Educational Communication and Technology (Comtech) department, Kenyatta University who devoted their energy, time and patience while guiding me through the study. Similarly, I am indebted to Prof. Kithinji, Dr. Karen Oyiengo and many other academic staff members for their constant encouragement. To the entire ComTech non-teaching staff, I say a big thank you. To my husband, Jared Okach, thank you so much. May God continue giving you that loving, caring and supporting heart.

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