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An Assessment of How Students' Mastery of Drawing Skills in Secondary Schools Affects Performance in Biology in Bungoma West District, Kenya

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Abstract

Performance in Biology in the Kenya Certificate of Secondary Examinations (KCSE) has been poor in the recent years. This has been attributed to many factors, among which is the poor mastery of drawing skills by the students. The purpose of this paper is to assess the drawing skills mastered by Biology secondary school students and to determine the impact of mastery of biological drawing skills on performance in Biology. The paper is based on a study conducted in Bungoma West District in Kenya. A descriptive survey research design was used in the study, in which 15% of the schools in the District were selected using stratified random sampling to ensure equal representation of girls and boys. Thirty-three percent of the target population, Form Three students, was selected using simple random sampling technique. In mixed schools, the subjects were obtained using stratified sampling technique to ensure gender equality. The teachers for the study were obtained using purposive sampling technique. Three instruments were used to collect data: the teacher's questionnaire (TQ), Student's questionnaire (SQ) and students' test (ST). The data obtained from the study was analyzed using both descriptive and inferential statistics using the computer software, Statistical Package for Social Science (SPSS). The results indicated that on average, over 68% of the respondents lacked biological drawing skills and that. It was further revealed that mastery of drawing skills had a significant effect on performance in Biology in secondary schools. The findings would be useful to curriculum developers in developing instructional materials to assist teachers and students on how best to present biological drawings and interpretation of biological photographs and drawings. They would also form a basis for further research not only in practical biology but also in other disciplines with an aim of improving the quality of teaching.

Keywords: assessment, student's mastery, drawing skills, secondary schools performance, biology, Bungoma West District, Kenya

INTRODUCTION

The role of drawing skills in the teaching and learning of Biology has often been underestimated. Schonborn and Anderson (as cited in Lerner, 2007) argue that the pedagogical importance of visual literacy and visualization in Biology and especially in the education of biochemistry has been ignored for a long time. Mei-Ying (1992) notes that very little research has been done on understanding the function of drawing in children's writing and learning processes. The use of visual representations to learn can be traced to Louis Agassiz, Harvard Professor of Zoology. In his approach, students were to study nature through carefully observing, drawing and making inferences (Lerner, 2007). In Biology, the study of life requires careful observation and description. One excellent way to describe an object is to draw it. The goal of the observer is normally to move beyond simple mental images of what he/she believes a particular plant or animal looks like, and instead concentrate on the unique identity of that specimen (Dempsey *et al*., 2001). Such approaches to learning in Biology will help students relate structure to function to a great extend.

Aggarwal (2001) says that the making of drawings in botany and zoology is an accepted technique. He notes that drawing in Biology has the following functions:

a) Ensure that the pupil looks at and examines the details of the specimen with proper attention. This ensures meaningful learning which will be translated into good performance in Biology.
b) To provide avenues for learning through visual and kinaesthetic experience in addition to the auditory experience of listening to the teacher. This breaks monotony during the learning process resulting in increased attention span.
c) To provide a record of the work done by the pupil
d) To provide the pupil with material useful for revision. As it will be noted later, drawings can be used to summarize a large content of information. This makes it an excellent tool in preparing for examinations.
e) To act as a medium for analysis and synthesis, that is to be a stimulus to think.

> Analysis and synthesis are among the high domains of Bloom's taxonomy of objectives. This suggests that making of drawings encourages deep learning.

One of the national goals of education in Kenya is to enable the learners play a more effective role in the economic, technological and industrial development of the nation (Kenya Institute of Education, 2002). Among the many skills required to achieve this goal is observation skill, a skill which is developed by making drawings and diagrams. Allan *et al.* (1994) say that drawing has an important place in biological teaching because of its role in developing observation skills. Making of drawings of specimens is very fundamental in developing observational skills. Alkaslassy and O'Day (2002) note that observing is a fundamental science process skill. We observe objects and events using all our five senses and this is how we learn about the world around us. According to Hayward (2000), observing is not simply a question looking, but it involves the use of all the senses, that is, sight, sound, touch, smell and even taste. One has to look at a specimen very carefully to be able to draw it accurately, and labelling of a drawing forces one to think about the component structures and their positions (Allan *et al*., 1994).

This means that making and labelling of drawings in Biology sharpens a student's observation and thinking skills making him able to relate structure to function. This will help in solving the problem of candidates being unable to relate structure to function as indicated in the KNEC report of 2005. Ogunniyi (1996) defines science as an organized body of knowledge and processes by which that knowledge is gathered, analyzed, synthesized and disseminated. One way the scientific knowledge is disseminated is by use of drawings and diagrams. Drawing enhances communication skills especially where students are required to make elaborate descriptions of phenomena which are changing in shape and appearance (Yockey, 2001). A good example could be expressing the process of plasmolysis in plant cells where diagrams can be used to express the physiological changes that are taking place.

Drawing is a powerful tool used to communicate, transfer of information and to solve problems by virtue of its effect on the senses. This is so because approximately eighty percent of our sensory input comes from our visual system. Visual language is very helpful to the learning process, and there is a lot of information that can be transferred in a visual way especially in the sciences (Ostrogona & Mulyandi, 1999). According to Dempsey *et al*. (2001), line drawings, diagrams and photographs can elaborate and make memorable the text that they accompany. The essential concepts are presented in a quickly read format. For example, diagrams can be a powerful tool for summarizing the relationships between photosynthesis and respiration. These two related concepts contain numerous difficult-to-learn biochemical cycles and information that students must disentangle, segregate, group and compare. Research and classroom experience suggest that students who learn such cycles from diagrams rather than from prose do better.

The act of creating pencil drawings helps students to explain scientific concepts. Creating pencil drawings in the teaching of biology calls into play a different kind of thinking process that forces the students to break down larger concepts into their constitutive pieces (Kara *et al*., 2008). This helps in clarification of the otherwise abstract concepts, for example the concept of cell division. This means that visually explaining concepts by using drawings is not only a powerful communication tool but also an appropriate teaching and learning tool. If students can master the drawing skills and use them well we shall experience effective teaching and learning and an improvement in performance in examinations.

Sandy (2004) argues that gaining confidence in making of biological drawings assist students in teaching one another and that the learning process seems very effective and enjoyable when it involves making of drawings. Drawing breaks the monotony, especially in teacher-centred approaches to allow in-class learning, while keeping the class content intensive. This break in monotony is essential since students have varying learning styles. Making of drawings of specimens is essential in teaching certain concepts in Biology. Matern and Feliciano (2000) note that some Biology instructors ask students to draw and label specimens as an aid to learning morphology. They add that this technique is both effective and well received by students. According to Brauckman *et al.* (2007), making of drawings helps in understanding and accepting new theories. They add that hand drawings may be used in developing of new theories and this is why students should learn the skill of drawing. It can lead to understanding of present theories in the subject as well as formation of new theories.

Michael and Judith (2005), in a research, have found out that active visual approach to teaching which exploits visual senses of students increases students' interest and learning. They say it also increases the number of students, especially women opting for the subject. If these findings can be applied in our Kenyan schools it may lead to a rise in students who opt for sciences. According to Donna (1990), when an abstract or an unfamiliar concept is illustrated pictorially, it becomes more concrete and memorable to the learner; especially those with a visual learning preference. Paivio (as cited in Craig, 1995) says that one of the basic ways that illustrations aid retention

relates to the dual-coding theory of memory. This theory proposes that information is stored in long-term memory both as verbal proposition and as mental images. This theory of dual-coding suggests that when information is represented verbally and visually it has a better chance of being remembered.
Janice and Clement (2008), in their research on the beneficial effects of student-generated diagrams versus student generated summaries on understanding of concepts, have found out that the group which generated diagrams after a brief exposition on a given concept out-performed the one which generated summaries in a test. This may be attributed to the effect of dual-coding of the memory suggested by Paivo. There is strong evidence that when learners draw diagrams or pictures to represent the facts they have learned makes them stick in their mind better than pages and pages of notes. Gert *et al.* (2007) argue that comprehending instructional texts often requires the integration of verbal and visual information. They say visual information, especially diagrams, can be helpful for relating and integrating pieces of information and therefore contribute to mental model building.

Students join school with a wealth of science knowledge based on uncontrolled observations made as part of their daily experiences. According to Bruning *et al*. (1995), teachers not only should expect to find these naive beliefs but also must find ways of seeking them out before systematic instruction in science can begin. Unless these misconceptions are confronted and cleared, no meaningful learning can take place. Could this be one of the reasons Biology is performed dismally in national examinations in Kenya? This could be true to a large extent, as Hoese and Casem (2007) put it that even professional biologists may not even realize students' misconceptions. They add that image-based assessments are powerful instructional tools to provide insight into students' misconceptions.

Frankel (2008) says that drawings are very essential in enabling the teacher immediately identify students' misconceptions and hence be able to correct them for meaningful instruction to take place. Drawings are now considered as a simple research instrument that enables easy comparisons at the international level in finding out misconceptions held by people. Drawing method in conjunction with interviews have been successfully used to diagnose student's conceptual understandings and misconceptions about abstract concepts, for example 'photosynthesis and respiration' (Sacit, 2008). Sadoway (as cited in Rogers, 2008) says that because drawings show student's misconceptions very clearly, teachers can anticipate which concepts are likely to confuse the learners and hence take necessary precautions as they prepare for instruction. He adds that students seem to perform better in topics taught using drawings on the final examination.

The skill of recording in science is one of the fundamental science process skills. Biologists, from early days have been recording data from specimens mostly in form of drawings. The biologist must include as part of his work the accurate and careful study of living organisms. His or her observations are made on the structure and behaviour of animals and plants, and these may include dissections or sections in order to display the internal parts. These observations are normally recorded in form of drawings as a permanent record of what has been seen (Soper & Smith, 1986). This helps to visualize the data and to support one's own analysis (Brauckman *et al*., 2007). Drawing helps record data from specimens, highlighting the main features of a specimen (Billiet, 2004). Drawing is a novel skill which should be instilled in young biologists at all cost in order to improve performance in this subject.
Drawing assignments require students to keenly observe and draw specimens. This causes students to examine specimens closely thus enabling them to have a deeper appreciation of the similarities and differences between organisms (Alkaslassy & O'Day, 2002). Such drawings of assignments during biology practical sessions make the teaching process a participatory experience. All the domains of the student, that is, cognitive, affective and psychomotor are engaged in the learning. These make students to be creative and learn at a deeper level as compared to surface learning (Rogers, 2008). Fiona (2006) notes that a reduction on the emphasis on formal examinations (practicals included) and an increase on the value of ongoing practical assessment (dissections, drawings and scientific reports) can help achieve better outcomes for the students in terms of what they have learned in school.

As Sheridan (2001) notes, drawing helps the learner train the brain to pay attention and to sustain attention; to practice and organize the shapes and patterns of thought. These are very essential for development of what she calls, visual, verbal, artistic, scientific, and mathematical amongst other forms of literacy. The findings of Sheridan's research suggest that children who engage in drawing disseminate information better than those who do not. She says the learner who engages in drawing also practices thinking. This helps the learner to develop thinking skills, skills which are very crucial in learning scientific concepts. Basing on her findings, drawing skills is a precursor to development of thinking skills.
Peggy *et al*. (2006), in their research on learner generated drawings as a strategy for learning, have found out that making of drawings made learners improve their problem solving skills apart from improving in examination performance. They say making of biological drawings helps in summing up a

lot of information quickly and in a small space. This is important for candidates who are preparing for the biology examinations especially at national level. This is economical in terms of time required for revision. From the foregoing, it is evident that making of drawings during Biology lessons is aimed at intentionally engaging students meaningfully and in appropriate learning tasks. This participatory learning approach fosters deep learning and high retention rate.

Drawing forms an integral part in both Biology practical and theory work. Practical work in biology like in other science subjects is very essential in making concrete the otherwise abstract subject matter. In KSCE Biology, the score in practical examination heavily bears on the overall grade obtained by a candidate. The Kenya National Examinations Council reports indicate that, performance in Biology has been below average for many years in Kenya. For a candidate to get a grade of B- (minus) and above, he/she must obtain a minimum grade of D+ (plus) in the practical paper (KNEC, 2006).

Several initiatives have been put in place to improve the situation. These include in-servicing of Biology teachers through the Strengthening of Mathematics and Science Subjects in Secondary Education (SMASSE) programme and provision of guidelines from the Ministry of Education through KIE and the quality assurance and standards division. In spite of these elaborate initiatives for teachers on how to implement the Biology curriculum, performance in this subject has continued to be below average both in theory and practical papers. One of the reasons for this dismal performance in Biology, especially in Biology practical is thought to be due to lack of drawing skills in the candidates. Analysis of KNEC reports from 1999 to 2008 indicate that virtually all questions on diagrams and drawings are poorly performed both in theory and practical papers (KNEC, 1999-2008). This calls for a decisive intervention to reverse the trend.

Given that drawing skills in Biology underlie the ability to communicate results in terms of observations and inferences, it is therefore necessary to investigate the extent to which secondary school students use the drawing skills to communicate scientific results in Biology.

STATEMENT OF THE PROBLEM

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LIMITATIONS OF THE STUDY

In mixed schools, the composition of respondents was to be in equal proportion in terms of gender. However, in some schools the number of girls or boys in Form Three was less than 23. This was in schools which were in the process of facing out either girls or boys. To make up a sample of 46 per school as intended, either more boys or girls were selected as per the need. Despite these challenges, the study successfully managed to capture and document valuable data on the level of students' competence in drawing and the impact of this mastery on performance in Biology as a science subject offered in Kenya's secondary schools system.

MATERIALS AND METHODS

The study was conducted in Bungoma West District, Western Province, Kenya. It was conducted using a descriptive survey design. The research population comprised the Form Three Biology students in the District. The Form Three students were selected because they have covered substantial Biology syllabus thus assumed to have been taught drawing skills in biology. On the other hand, Form Fours were left out because they were busy preparing for their Kenya National Examination Council examinations.

The sample schools were obtained using simple random sampling technique. The six sampled schools had a population of 460 Form Three students. Where necessary, balloting was used to select the required number of students from each sampled school. Balloting was used because the characteristics of the students to sample were assumed to be homogenous since they are at the same cognitive level. Therefore, 273 respondents out of the 950 Form Three students were to be selected. However, for purposes of having equal number of respondents in each school category 276 respondents were selected. Forty-six students and one biology teacher were sampled in each school.

To collect data, the study employed a students' questionnaire (SQ) and teachers' questionnaire (TQ) as well as a students' test (ST). The test focused on the dependent variables, performance in Biology. The students' test was used to obtain first-hand information on drawing skills mastered by students in Biology, the difficulties they encountered when making drawings of specimens and to find out if they can relate structure to function of the parts of the specimen. Both qualitative and quantitative data were generated from the field. The data were coded and analyzed using descriptive and inferential data analysis techniques. The analyses were presented in tabular form. For quantitative data, one-way ANNOVA was used to test hypotheses, because in each there was a comparison of more than two categories. The Statistical Package for Social Science (SPSS) computer program was used in data analysis.

RESULTS AND DISCUSSION

The study investigated the drawing skills mastered in Biology in Bungoma West District secondary schools using students' tests. Each skill tested carried one score. Scoring meant possession of the skill and failing to score meant lack of the skill.

When studying the structure of organisms, one of the best ways to record information is in the form of a drawing. The drawing should be realistic and simple (Geoff, 2000). From the results, it is evident that majority of the respondents lacked all the seven biological drawing skills tested. This indicates that they could not record and present their observations during experiments accurately in form of drawings and diagrams. This casts doubt on the students' understanding of biological concepts and hence their overall performance in the subject. The percentage of respondents indicating lack or presence of each skill and examples of actual drawings made are indicated separately below.

Making of Proportional Drawings

In a morphological diagram, where the objective is to make a life-like representation, it is very important to keep the different parts in proportion to each other. This is achieved by using construction lines and frames. The results depicting mastery of making proportional drawings were as summarized in Table 1. The results show that none of the respondents was able to make a proportional drawing. This indicates that the drawings made were not accurate as required in all biological drawings. In one drawing, the author noted that the size of the gill filaments was shown to be same as that of the gill bar. In another instant, the gill filaments and the gill rakers were very short compared to the same size and the gill bar.

Table 1: Percentages on Mastery in making Proportional Drawings

School Category	Had Skill	Without Skill
Provincial Boys	00%	100%
Provincial Girls	00%	100%
Provincial Mixed	00%	100%
District Boys	00%	100%
District Girls	00%	100%
District Mixed	00%	100%
TOTAL	**00%**	**100%**

This is not the case in the real specimen. The size of the structures in drawings, compared to one another was not a true representation of the real specimen as it should be in morphological drawings. This amounts to an incorrect record and presentation of what was observed since a biological drawing should be a detailed and accurate representation of a specimen. It should depict the real specimen for future reference. Lack of the ability to draw proportional drawings could be attributed to:

a) Lack of observation skills. The learners are not keen enough to take into consideration the size of a given structures in relation to other structures.
b) Lack of practice in making of biological drawings
c) Theoretical approach to teaching and learning of biology. The learners are not exposed to practicals which require them to make drawings.
d) In the case where drawing is done, the teachers do not assess the students' work with a view of correcting the drawing mistakes committed.

Accuracy in Observation

As noted by Allan *et al*. (1994), a biological drawing is an accurate representation of the specimen. To produce such a drawing, the learner should be a keen observer. This skill will enable the learner to include all the key structures of interest in the biological drawing made, in their correct position, size and length.

To test this skill, the author tested the students by asking for drawings of a fish gill and a cross section of a berry fruit (tomato). It emerged that most of the learners were not accurate in their observation of specimens. In one drawing, the gill rakers were not originating from the gill bar as they ought to. The

respondent was not keen to note that gill rakers originated from the gill bar and not from around the gill bar. In this drawing, also the gill bar and the gill filaments are shown to be one structure yet they are different.

Table 2: Percentages on the Mastery in Accuracy in Observation

School Category	Had Skill	Without Skill
Provincial Boys	09%	91%
Provincial Girls	04%	96%
Provincial Mixed	07%	93%
District Boys	04%	96%
District Girls	07%	93%
District Mixed	02%	98%
TOTAL	**5.43%**	**94.57%**

In another drawing, the respondent drew the filaments as if they are rectangular in shape and too many gill rakers. In another instant, the shape of the filaments was wrongly drawn. The filaments are very few and continuous with the gill bar. For the case of the fruit drawings, the respondent did not indicate the three layers that form the pericarp, that is, the epicarp, mesocarp and endocarp. From Table 2, it is evident that more than 94% of the respondents were unable to make accurate observations of the specimens. This indicates that they did not draw the structures the way they appear on the specimens. Majority of the respondents did not include key structures in the drawings they drew. This amounts to an incorrect representation of the specimen.

This lack of observation skills can be attributed to:

a) Lack of practice in making biological drawings. Lerner (2007) notes that a pencil is one of the best eyes to the biologist. Drawing in Biology makes learners active participants in creation of meaningful knowledge, rather than passive repositories of information. A careful examination of specimen is secured best by careful sketching. Drawing is not only an excellent device for securing close observation, but a rapid method of making valuable notes. The results imply that teachers preferred a theoretical approach to the teaching of Biology.
b) Lack of guidance during practicals. Just like any other skill, the skill of observation should be learned. This requires guidance by the teachers, especially during practical sessions.

Lack of observational skills makes the data recorded and presented in form of drawings inadequate due to omission of key information. If this occurs in an examination it leads to dismal performance.

Cutting of Correct Sections

Cutting of sections is not directly related to the making of biological drawings; however, cutting of wrong sections automatically affects the kind of drawings made. The respondents were therefore asked to cut transverse-sections of the berry fruit (specimen Q). From the results, more than 81% of the respondents were unable to cut correct sections; 63% of the learners in provincial schools apart from provincial mixed with 96% could not cut the correct section of specimen asked

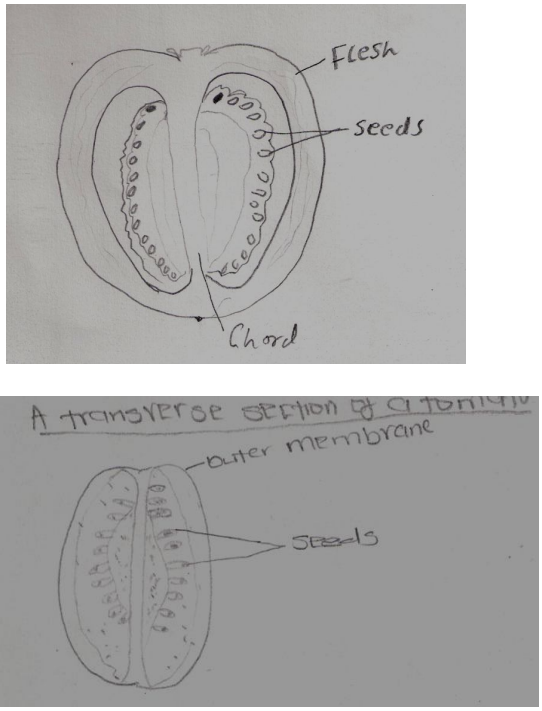

Figure 1: Students' Drawings of Transverse Section of a Berry Fruit (Tomato)

In the district category, over 83% could not cut correct section. As it is seen in Figure 1 (i) and (ii), the respondents termed the longitudinal section cross section. This may be an indication that teachers do not consider the practical approach in the teaching of Biology and that learners are not exposed to cutting of sections of specimens. This has a negative impact on performance. A candidate cannot be awarded marks of a drawing whose section was not asked by the examiner.

Drawing Continuous Outline of Specimen

Biological drawings must be drawn with a thin, clear, visible and continuous outline. The respondents were asked to draw a gill of a fish (specimen S) and a fruit (Specimen Q), to test for practice of this skill. The results showed that 84% of the respondents were unable to make drawings with continuous outline. The drawings had scratchy outlines with junctions between structures improperly drawn. The woolly and scratchy outlines make the drawings incorrect record and presentation of information about the specimen apart from making the drawing untidy. The inability of the students to draw continuous outlines may be an indicator of:-

a) Lack of supervision and monitoring of students' practical work by biology teachers
b) Negative influence of wrongly drawn diagrams in charts and other sources
c) Carelessness and low aptitude on the part of the learners

Use of Pencil in Drawing

It is highly recommended that all biological drawings be drawn in pencil to allow corrections to be made (Kilgour, 1989). The main outlines should be drawn faintly with 2HB pencil. When satisfied, a sharp HB or 2B pencil should be used to go over the lines firmly. The study results indicated that majority of the respondents (over 72%) had the idea that biological drawings are drawn in pencil. However, 26% of the respondents used ball pens. Use of ball pen in making drawings of specimens lowers performance in examinations testing on drawing (Jepson, as cited in Allan *et al*., 1994). This could indicate lack of guidance from teachers and poor provision of learning resources like pencils by parents and guardians. It also indicates lack of knowledge about the correct pencils required to make biological drawings. Use of ball pens makes correction of mistakes in the drawings difficult and often leads to untidy drawings.

Shading Drawings of Specimen

Biological drawings should not be shaded. If there is a need to distinguish between different regions, hatching or stippling should be used (Allan *et al*., 1994). The shading obscures some of the structures hence leads to congestion of structure in the drawing. Slightly above 56% of the respondents lacked the skill of shading biological drawings. This indicates lack of guidance by the Biology teachers or negligence on the side of the students. Figure 2 is a scanned drawing of one of the respondents. It makes the drawing untidy

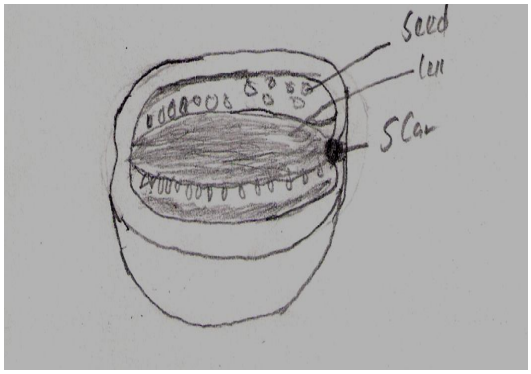

Figure 2: A Student's Drawing of a Transverse Section of a Berry Fruit (Tomato)

Calculation of Magnification

It is recommended that all biological drawings be accompanied with magnification or a scale factor. This enables other biologists to approximate the size of the real organism with greater accuracy. If a drawing is made, especially with the help of a hand lens, the magnification of the drawing must be calculated. It involves measuring the linear dimension of the drawing then dividing it with the linear dimension of the specimen. Over 85% of the respondents were unable to calculate magnification of the drawings they had drawn as shown in Table 3. This indicates:

a) Lack of teaching how magnification is calculated
b) Lack of practice in drawing specimens and calculating their magnification

Table 3: Percentages on the Mastery in Calculating Magnification

School Category	Had Skill	Without Skill
Provincial Boys	26%	74%
Provincial Girls	26%	74%
Provincial Mixed	17%	83%
District Boys	07%	93%
District Girls	13%	87%
District Mixed	07%	93%
TOTAL	**14.49%**	**85.51%**

Of the 85% who were unable to calculate magnification, majority were from district schools. The inability to calculate magnification of drawings makes the learners unable to correctly represent biological data. In general, majority of the respondents lacked the biological drawing skills tested. However, on average respondents from provincial schools possessed more biological drawing skills (31%) compared to those from district schools (20%). This could be attributed to the mode of selection of those who join secondary schools from primary. The provincial schools are given priority to select students of high cognitive level. Most of the provincial schools are better equipped in terms of resource compared to district schools.

CONCLUSIONS AND RECOMMENDATIONS

The results of the study indicate the majority of the students in schools lack drawing skills. The results from the study indicated that most students could not draw the specimen well, almost all of them could not make accurate observations of the specimens, and all the students could not make proportional drawing of the specimens. Mastery of drawing skills significantly affects performance in biology. Drawing of specimens enables learners to develop observational skills. This enables them to relate structure to function a problem experienced in Biology by most candidates in biology at national examinations level.

The author deduces that the recommended practical approach in teaching of Biology is overlooked in syllabus coverage. This is the reason why majority of the respondents could not cut correct sections. The recommendations by KNEC and KIE that biology

teachers should keenly supervise and guide individual learners and groups during biology instruction especially during practical sessions, so as to develop in them scientific skills was not actually being practiced in the sampled schools. Teachers should instil in learners the skills which will enable them to relate structure to their function of the specimens. One way of doing this is by involving them in drawing and labelling of specimens.

The drawing of specimens during practical sessions was clearly overlooked. Most of the respondents did not know; hence consider the biological way of making drawings. Since mastery of drawing skills significantly affects performance in Biology, the learners should actually be involved in the learning process, especially drawing, labeling and relating structure to function of the specimens. This will help in solving the problem of relating structure to function, a problem experienced in by most candidates in biology at national examinations level. Moreover, the learners should be assessed and helped to develop the drawing skills intended. There should also be increased learner-to-learner and teacher-to-learner interactions to aid students in gaining confidence in their drawing skills in Biology.

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