Advanced Level Student Competences in Doing Biology Practical: The Case of Dissection of Frog in Kinondoni and Bagamoyo Districts, Tanzania

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Abstract: **This study examined students' learning competences of biology practical skills during dissection of animal specimen-Frog/Toad in A'level secondary schools in Kinondoni and Bagamoyo district. Mixed method approach and case study design were employed. Biology practical sessions were examined in 10 secondary schools, five from each district. Participants involved 10 form six biology students and 2 teachers from each school. Data were collected through interview with teachers, focus group discussion with students and participatory observation. Sampling was purposively to teachers and randomly to students. Qualitative and quantitative data were analyzed thematically and descriptively respectively. Findings includes: A'level students were not competent in dissecting frog. Students lack practical technical skills in dissection, lack clear knowledge on the internal features of frog, lack knowledge on the ethics of dissection processes, lack familiarity of some dissecting materials and skills in using dissecting tools. There was limited practical guides and facilities needed for dissection. The study concludes that teachers need to be trained on how to teach practical lessons. The study recommend the government to supply guides and dissecting kits to all schools and make a follow on what and how students are learning practical lessons.**

Key Words: **Students, Competences, Specimen, Practical, Dissection**

I. INTRODUCTION

In academic arena, the study of Biology is compulsory to secondary school students at junior or senior secondary levels in various countries. The subject is studied into some science combinations such as PCB, CBG and CBA to advanced secondary school level. Biology subject is a key study to everyone as it deals with life of every living organism. Practical biology is taught and learnt in the laboratory by doing experiments and practical activities. Practical biology involves various organisms and non-living organism as part of environment from which organisms' residences. In secondary schools the content of biology is learnt both theoretically and practically. However, despite its importance studies have shown that the performances of Biology to advanced level students in Tanzania are not satisfactory. This study therefore prompted to examine on students' learning competences in doing biology practical in particular dissection processes of frog/toads.

1.1 Background of the Study

Biology practical on one side involve animal specimens both preserved and live ones. The learning of internal features of organisms are done through dissection processes and direct observations are done by students based on practical instructional guide provided by teachers. Learning which involve dissection processes is done by cutting organisms to expose and observe particular parts of their body features as instructed. Commonly used organisms in biological education for A'level students in Tanzania includes cockroaches, frogs/toad and rats or mice. Real specimens are dissected by scissors and other dissection tools to display the required features. Dissection and surgery in medical courses are biological activity which align together. The basics of surgery results from dissection processes done in science courses in advanced secondary education to higher institutions.

Dissection teaching and learning technique has been done since many years ago in Western countries. During medieval times the anatomical teaching from India spread throughout the known world about the practice of dissection (Wiebers, 2016). The emphasis on teaching biology courses through dissection was stunted by religious such as Islamic and Christian. Up to 1900s the University lecturers had to continually push against the social taboos of dissection, until around 1950s when the universities decided to train doctors in India, England and Britain on dissection processes. (Tony, 2013 in Wikipedia (e.d); Wiebers, 2016; Hartie Science Tools, 2020). Training of medical doctors on dissection and surgery increased effort in the teaching of biology practical by dissection processes in junior and senior secondary schools and in higher institutions (Tony, 2013).

Furthermore, studies revealed that the biology supply company in western countries during those days started to deal with many species of both vertebrates and invertebrates and preserve them as biological learning specimen (Tony, 2013). In America for example, there increased special specific areas where dead animal specimens were sold for educational purposes. The supply houses provided that services to variety of educational institutions from lower to higher for biological education purposes. About 75% of American high school students participated in animal dissections around 1960s (Tony, 2013). Wiebaer (2015) noticed that close to six million vertebrate animals were

dissected in U.S. in high schools alone each year, and about three million of dissected specimens were frogs. These were found to have internal working body systems closer to that of human. Furthermore, a survey by National Anti-Vivisection Society in U.S. revealed that a research to adults who learnt biology in their studies about 78% agreed that animal dissection was part of their education since then and increased their understanding of biology content (Tony, 2013). Dissection skills obtained by students exposed them to a method that has played an important historical role in the acquisition of biological knowledge, and it provided a concrete, non-abstract personal experience (Cossa & Uamusse, 2015).

Similarly, in Africa, around 1970s biology practical to Advanced level increased to the extent of adding time in school timetable to allow much dissection of animals such as frogs and mice (UNESCO, 2016). The aim was to prepare youths for becoming doctor of medicines or veterinary. Muleta & Seid (2016) established that from 1980s the doing of biology practical in African secondary schools of all levels increased following the need of medical doctors who could work in the hospitals. However, around 20^{th} to 21^{st} in various countries of Africa biology practical started deteriorating especially to junior secondary schools mainly due to lack of facilities and experienced teachers. For instance, Muleta & Seid (2016) noticed that in Ethiopia many senior secondary schools lacked equipped laboratories and qualified teachers hence the learning through practical were minimized. Similarly, Mwangu & Sibanda (2017) pointed on the same problem of biology practical in Zimbabwe that resulted from deficit of teachers, laboratory technicians and laboratory attendances. Teachers were observed lacking of biological skills in preparing specimen and conducting biology experiments. Lack of laboratory space and textbooks was the other problem that said to lead to student's poor performances in biology subject.

Muleta and Seid (2016) reported that West African countries perform poorly in science subjects in particular practical lessons. They pointed on the reason that because candidates often have wild guesses of what they are learning and they are not adequately involved in doing practical instead learn by watching teacher's demonstrations in classrooms. Also, equipment deficit becomes the obstacle for students doing dissections activities. Students lose the appetite of learning biology and teachers demonstrated limited skills on dissection processes. As it was quoted from (Mwangu & Sibanda, 2017)

> *Problems associated with the teaching of biology practical in schools in Nigeria include lack of good laboratory, lack of qualified teachers, poor attitude of students towards biology practical, no excursions or field trips and inadequate instructional materials, some students have lost interest in learning biology through practical. Various schools were found doing practical partially or totally…but most of these problems serve as barriers in the teaching of biology practical.*

Tanzania like other countries had similar problems associated with teaching and learning of biology practical. The A'level schools in Tanzania use much specimens like cockroaches, rats/mice and frog/toads for educational purposes however, there is no specific place where these specimens are found or sold. Getting these specimen for all secondary schools to date is a challenge. The increased enrolment of students in ordinally level secondary schools and the emphasize of the government to students on the need of learning more science subjects lead to decreased laboratory equipment such as , space, apparatus, chemicals and books. Kibga, (2013) pointed that from the years of 2000 Tanzania forced by situation in schools and therefore introduced alternative to practical for O'level students. This approach involved the learning where practical lessons learnt theoretically by observing diagrams and follow given instructions. This type of teaching influenced students who join biology courses at A'level when they meet real practical learning. Practical lessons changed to theoretical lessons and laboratory technicians were no longer employed in schools (UNESCO, 2017). Science teachers for biology subject were to do roles of teaching and laboratory services because of lacking laboratory technicians. Crash program introduced where untrained teachers were brushed in methodology and allowed to teach in secondary schools. This was the time when science in terms of practical started to deteriorate substantially and students taking biology in A'level classes increased poor performances mainly with grade 'D, E and S' pass. Students demonstrated poor practical abilities in every category of science subjects (Kibani, 2014). To date students at advanced level their performances are not promising and as majority attain passes from D to S grade, hardly get A to C grades. It is from such performances the current study prompted to engage in investigating the dissection processes done by students if are proper and students are competent.

1.2 Problem Statement

The academic performance in A'level Biology subject was found to be poor in various secondary schools in different countries (Mwangu & Sibanda, 2017). Studies conducted in Tanzania secondary schools about student's performances revealed unsatisfactorily performance to A'level Biology students in most schools (Kibga, 2013). The purpose of this study was to examine the area of practical learning in the processes of dissection so as to find out the causes of poor performances to advanced level biology students. Although biology practical to advanced level has been taught for a very long time in Tanzania, relatively little has till now known about how students learn through dissection processes, what they learn, how competent they are in doing biology practical processes, what do they understand concerning dissection processes in relation to theoretical biology content? Available studies concerning students learning of biology subject at advanced level many dealt with theoretical part and those that

researched on practical area were mainly on teaching facilities. There is limited literature on the students learning and studying of biology content through dissection processes and its importance to future academic arena as in this study. Therefore, the current study aimed at investigating students' competences in dissection processes of frog/toad as a technique of learning advanced level biology content to realize the associated problems that cause them to perform below expectations.

II. METHODOLOGY

The research was focused on three areas namely (i) Morphological identification knowledge, (ii) Anatomical dissection techniques and procedures and (iii) Identification of anatomical features of the specimen. The study employed both quantitative and qualitative approaches in collecting and analyzing data. Data collection methods involved participatory observation to A'level students, focus group discussion, questionnaires and a Practical Instructional Guide with task-based activities to A'level biology students. The study adopted a case study design where five A'level secondary schools in Kinondoni and five from Bagamoyo district were purposively sampled based on performances in final examinations in previous year. First five performers were selected from each district. Ten students were sampled randomly from each school through picking fifty mixed papers with only ten written numbers. All participants thus forming a population of 100 sample size. Collected data were analyzed thematically to qualitative and descriptively to quantitative using excel program.

The study was guided by the Constructivist Learning Theory. Constructivist claim is that knowledge is constructed from prior learning experiences thus, in school students should construct meaning themselves from prior knowledge during learning. The constructed knowledge expected in this study included: Prior theoretical knowledge about frog anatomy and physiology, Prior knowledge on dissecting instruments, Prior knowledge and skills on the dissecting processes and Clear understanding of frogs external and internal features. These aspects acts as independent variable. Students' competence in doing dissection constitute the dependent variable. The constructivist theory recognizes the essence of acquisition of learning skills through practice and ultimately affecting performances and student competences which rationalize the study.

III. FINDINGS AND DISCUSSION

Learning biology content through animal dissection is incredibly valuable for students to understand reality and get skills and knowledge. Real hands-on dissection add something into student brain through touching and feeling texture, observe and see, visualize and recognize, understand and construct meaning from observed features. By doing animal dissection students get opportunity to explore the internal anatomy of a particular organism, observe its morphology, structure, relate and assimilate with other experienced structures in human and other organisms.

In general, this study found that there was averagely difference between teacher's theoretical and practical lesson taught when explored on what students experienced and what they demonstrated. What teachers prepared to teach during practical lesson was not revealed by students in this study. Findings in this study revealed various problems to students including: Lack of particular dissection skills, limited logical flow of ideas, unsystematic procedural steps and incompetent in dissecting organisms. In general students participated in this study demonstrated limited technical skills of dissecting animal specimens, limited vocabulary of biology terminologies in the language associated with dissection, lack of clear understanding of organism's dissected features and limited understanding on dissecting tools. Findings further revealed that, experienced teachers teaching of dissection processes were not well planned to pinpoint expected skills and competences to be attained by students at the end of the course as they were prescribed in the syllabi. Additionally, A'level biology students were not competent in the area of holding tools and preparing specimen on the tray. These problems were identified through various methods as follows:

Through a test-based instructional (practical) guide, obtained students' were asked questions and obtained responses expose the existing problems in their learning of biology practical lessons. In the first question students were asked to write down morphological features observed directly from their specimen, the habitat and reproductive characteristics. Obtained responses from 100 A'level biology students were as in Table 1 below.

Table 1: Students Understanding of the Morphological Structures of Frog/toad- (External features)

External features of frog	Well Identified (%)	Good Identified (%)	Moderate Identified (%)	Poorly Identified (%)
Stout body	1	2	5	92
Protruding eyes	3	24	70	3
Underneath folded limbs	00	5	7	88
No tail	00	00	00	100
Glandular skin	00	00	00	100
Live in fresh water and on land	04	90	06	00
Live in moist places, fresh water and on land	79	06	10	05
Lay eggs in water, which hatch into tadpoles	41	17	42	00
Have shorter fore limbs than hind limb	08	25	14	53
Webbed hind foot	60	37	03	00

Has head and trunk	79	20	01	00
Skin has mucus, moist, smooth and slippery	58	40	02	08

Source: Field study, 2019

The results in Table 1 revealed that students lack understanding of some external parts of the experienced specimen (Frog). Most of areas asked on frog external features were those indicated in the books and laboratory guides of advanced biology content and were clearly observable but students failed to name them all. It seemed students in their daily learning were not curious to study the asked areas. This finding implies that students were learning specific parts may be those asked in examinations. For instance, in Table 1 all students failed to mention that the specimen had glandular skin and had no tail. Moreover, majority 88% didn't mention the part of underneath folded limbs and 92% on stout body. Majority 79% were well mentioning characteristic of the specimen that live in moist places, fresh water and on land, 79% on had head and trunk and 60 webbed hind limb but non-pointed that specimen had no tail.

In order to confirm Table 1 responses students were asked verbally during the focus group discussion on almost the same features of the specimen. These were possession of moist skin, big eyes and characteristics like that of laying eggs in water, living in water and on land, and webbed feet for swimming. Many student 90% all knew that the specimen live in water. When questioned during the focus group discussion students established that the parts experienced are those areas that normally asked in mock and national examinations but not other parts. The implication for such students' responses is that learning proceeding in our schools are not for other benefit instead for passing examinations. Students were observing the reality but they failed to state on what they were observing. Learning syndrome of this type kills the meaning and aim of the subject matter content and weakens ability of students thinking.

The second question was on the classification of the specimen. This was because according to dissection ethics, before the processes students are required to understand well the characteristics of the specimen they are going to deal with. In any learning arena of biology practical, before dissection you should classify your specimen. Findings in Table 2 revealed that all students 100% were familiar with the kingdom and phylum of the specimen but as you move down the phylogenetic tree the understanding decreased. Responses were as can be seen below.

Table 2: Classification of Specimen

Classification	Correct (%)	Incorrect (%)
Kingdom	100	00
Phylum	100	00
Class	73	27
Order	12	88
Difference between frog and toad	16	84
All members of the order you have mentioned are:	02	98
All members of the family you have mentioned are:	0	100

Source: Field data, 2019

Students' responses in Table 2 revealed that majority 84% do not understand the difference between toad and frog. At A'level biology student who had learnt a theory under the topic of 'Homeostasis or Regulation' should be able to describe both two organisms. This is because the two organisms have unique characteristics of regulating their body temperature according to environmental changes. Responses obtained in Table 2 implies that students either are learning partially or they have problems in transferring knowledge from theory to practice. Not only that but also the problem in limited content of the subject matter because majority 98% and 100% had no extra knowledge about the 'Anura and Bonavidae' which is the knowledge associated with the specimen's classification. Students either not studying deeply or the experienced teaching culture by teachers do not direct them in what to learn and on how to take deep learning. That habit if not rectified can kill student culture of self-learning and therefore develop incompetent learner and graduates.

The third question in Table 3 aimed at identifying students understanding of the vocabulary normally used as a language of communication in the preparation of dissection processes. In biology before dissection you are required to lay your specimen in either of the asked sides and display on asked features. The obtained responses in Table 3 revealed that students' were not understanding clearly the terms associated with dissection activities. Majority 84% and 92% provided the incorrect meaning of 'Ventral side and Median side' as can be seen below.

Table 3: Students' Knowledge on Dissection Vocabulary

Biological terms	Correct meaning (%)	Incorrect meaning (%)
Dorsal side	43	57
Ventral side	16	84
Lateral side	23	77
Median side	8	92
Anterior end	67	33
Posterior end	79	21
Source: Field data, 2019		

Findings in Table 3 revealed that students were not familiar with the terms asked as majority 77%, 84% and 92% provided the incorrect responses on the terms lateral side, ventral and median sides of the specimen respectively. This implies that

students have been using these terms either by imitating on teachers demonstrations or by copying from textbooks without understanding their meaning. Students responded much on the two correct terms 67% and 79% on anterior and posterior end of the specimen. The reason behind these responses was that the terms were experienced through past papers that asked in national examinations. Moreover, the terms Lateral 23% and Dorsal 43% were also used much in examinations though responses were poor. It seems students memorized or read biological terms from books without getting clear understanding. Given responses in Table 3 reveals the reality that they don't know. In general among 100 students majority can't give meaning of the asked vocabularies. These findings meant that dissection processes in A'level classes have been done superficially.

When asked orally through focus group discussion, students had the same answers. Really they didn't know which lateral or ventral side was. Even through direct observation students were not sure of correct sides among asked terms.

The followed question aimed at identifying students' understanding of tools used in dissection processes. Obtained findings revealed that students averagely understand the materials or tools used in dissection processes.

Table 4: Students Familiarity on the Tools used in Dissection Processes

Tools used in dissection processes	Correct expressions on the meaning and uses of tools (%)	Average expression on the meaning and uses of tools (%)	Incorrect expression on the meaning and uses of tools (%)
Dissecting kit	10	76	14
Dissecting scissors	67	30	03
Dissecting tray	69	21	10
Gloves	89	10	01
Hand lens	67	26	07
Scalpel	09	86	05
Specimen	43	46	11
Cotton wool or paper towel	97	03	00
Thread	78	09	13
Lazor blade	39	20	41
Apron or white coat	32	21	47
Gaggles	40	07	53

Source: Field data, 2019

Responses in Table 4 showed that majority were familiar with some tools such as 89% gloves, 97% cotton wool or paper towel and 78% thread. Obtained responses through the focus group discussion about experienced dissection practices revealed that in many schools practical lesson were conducted traditionally where dissecting tools were not sufficient. Direct observation in visited schools revealed that some students had no complete dissecting kit, they had no laboratory coat, goggles and gloves. Missing these tools indicated lack of safety since through dissection one can for example get blood on his/her clothes and so on. Some students were using razor blade instead of scissors and some tools such as forceps and pin were rarely found.

One student was quoted saying that:

> *The issue of practical largely depends on the teacher. For example, madam in this class when you come with a specimen to ask for self-practicing dissection, madam does not want to see anybody doing anything more out of what she instructs you. Even when you finish your work early she don't allow you to proceed doing other observations as you wish, up to the end she force us to throw the specimen in the dustbin instead of allowing us to self-learn more animal features.*

More observation found that students' competences and skills in dissection process can hardly develop if they don't get opportunity to try doing practice themselves in advance. Teachers who limit students self-learning betray the competence-based curriculum of Tanzania as it emphasizes development of student competences and learner-centred approach in classrooms (Tanzania Institute of Education, 2009). The overall findings showed that students lacked free time to practice dissection and therefore were not conversant with the dissection processes of frogs as can be seen in Table 5. These findings agrees with what Mwangu & Sibanda, (2017) noted in Zimbabwe that science teachers' practical work is pitiable as a result they do it to fulfil the minimum requirements of the syllabus. In other words practical work were minimized to students.

Table 5: Students Procedural Skills on Real Dissection Processes

S/N stepwise	Dissecting Procedures	Correct (%)	Average (%)	Incorrect (%)
1.	Place your frog on its back on the dissecting tray.	100	00	00
2.	Pin your frog to the tray	100	00	00
3.	Lift the skin at the middle or stomach by a forceps.	16	56	28
4.	Make a small cut with a scissor, then use a scalpel to continue lifting the skin while using scissor to keep on cutting, Do not cut inside skin.	21	38	41
5.	Use scissor, cut up to the neck then stop. Make sideway incision above the legs and the arms.	12	59	29
6.	Use the forceps to pick up the flap of skin and separate it from the muscle and pin them to the dissecting tray.	21	33	46
7.	Use a forceps, lift the middle part where you see a blood vessel, make a small cut on both side of the vessel, take a thread tie on two side of the vessel to avoid bleeding. Then cut the vessel to separate it.	18	53	29

8.	Use a scissor, cut the muscle vertically and keep on incision downward both below the front legs and above hind legs.	07	56	37
9.	Turn the scissor sideways to cut the chest bones. Don't cut too deeply to avoid damaging the heart and other organs.	19	32	49
10.	Carefully, make the horizontal incisions; use a scapular separate the muscle flap with internal organs without disturbing anything inside. Pin the muscle on the dissecting tray.	34	60	06
11.	Display the digestive system to the right of the specimen.	09	23	68

Source: Field data, 2019

The obtained findings in Table 5 revealed that A'level biology students do not understand dissection processes. It seems majority 100% were familiar with the procedure of placing a frog on its back on the dissecting tray and that of pinning the specimen on the tray. The rest of dissecting procedures were averagely performed with majority failed to display the digestive system on right of the specimen. Very few students (07%) were successful in following the dissection processes of 'cut the muscle vertically and keep on incision downward both below the front legs and above hind legs. Nearly half of total students (46%) failed to use the forceps to pick up the flap of skin of the specimen and separate it from the muscle and pin them to the dissecting tray.

Through direct observation this study founded that an effective guided instructions in the form of questions as it was in this study increased students' mastery of procedural dissecting skills and enabled them to think critically and get understanding of what they were observing. It was in this study students' identified that there were specific steps in doing dissection. This was based to the fact that, during the focus group discussion one student was quoted saying:

> *Today's test was difficult and challenging but I realised that it was a good way of learning practical. As you move step by step you understand and get the answer why some features are arranged in that ways. Oh if our teacher could have teaching us in that manner everyone could be able to do dissection even in the absence of teacher and you can score the all marks.*

The study further revealed that the current teaching of dissection processes was not proper because students memorized textbook content but when come to reality they don't understand those content available in books. Kinzie et al. (2006) established that dissection procedures should be done systematically if one have to follow logical ideas of scientific process. In this study dissection processes were found to be the critical problem to students in all visited schools. Dissection ethics were totally not followed as it was required. This finding affirms the fact that A'level biology teachers have to change the strategies experienced in teaching dissection processes during practical classes. Current students' skills of holding dissection instruments, the way they cut the specimen and the way they move stepwise are not proper biology practical skills. The study found that there were no systematic sequencing of steps in initial procedures of exposing internal organs of the frog. The initial steps were supposed to be uniform in all schools since the question was the same to all students, then procedures may differ somewhere ahead because of different aims of dissection purposes but observed practices were of not case. Steps and procedures were different among students of the same school and from school to school. Such findings implies that teachers may be were not using official practical guide, syllabi and textbooks to the extent of everyone teaching as he/she wish. This implies that in Tanzanian schools A'level biology students in dissection processes were not doing the same. In other words, in Tanzanian A'level secondary schools either there were no practical guides for supporting teachers, or available practical guides were not used properly or practical guides available were not uniform.

Results obtained from the question which guided students systematically on what to do in dissecting frog and what was really observed can give the evidence of existing problems to advanced level students in Tanzania. Responses in Table 6 where students were tested if really they understand the specimen internal organs, confirmed that they didn't understand the reality instead they used to memorize answers from textbooks. The obtained responses were as follows in Table 6.

Table 6: Students' Exploration of Internal Anatomy of Frog

Dissecting procedures	Correct procedure (%)	Wrong procedure (%)	The correct organs to be observed were (%)	Observed correct organs (%)	Observed averagely correct Organs (%)	Observed incorrect organ (%)
1. First organs observed as you pull back cut muscles.	67	33	Liver and heart	14	68	18
2. Using forceps to pull the liver and heart up, the second organs below the liver and heart are…	35	65	Gall bladder, Stomach, and Small intestine.	31	37	32
3. Use a scissor and scalpel, cut and remove a river, gall bladder and a heart. Use the forceps, lift the stomach and intestine, the observed organ is:	29	71	Lungs	16	48	36

4. Use a scissor and a forceps cut and remove the lung on the left side of the frog. The observed organ is:	17	83	Pancre ase	12	19	69
5. Display the lifted stomach and intestine on the right side of the frog. The third organs observed is:	65	35		-	-	-
6. If your frog is the female, remove the ovaries and oviduct.	24	76		-	-	-
7. Remove the stomach, small and large intestine. The observed organ is:	47	53	Spleen	04	07	89
8. On the lower part of the frog's abdomen, the observed organs are:	47	53	Kidney s and (tests for those who had male frog)		69	12
9. Draw the diagram of your specimen	30	70	-	-	-	-

Findings in Table 6 revealed that students have been doing dissection and displaying specimen's organs without understanding the actual organs and their relationship. It seemed that students have been learning and studying on various tissues and organs of frog but in reality they don't know them. By exploring the internal organ after dissecting frog in this study, it seemed that many students 68% were familiar with the heart and liver, whereas 69% were familiar with kidneys. But majority failed to get the correct organs because they didn't know exactly which was the asked organ and where it was located in the body. For instance, majority 89% failed to identify the spleen, 69% the pancreas and 69% were unsure if the organs were kidney or tests as they noted that all were kidneys. Majority 83% failed in attempting dissection procedures as they were hardly use a scissor and a forceps to cut and remove the lung on the left side of the frog to expose the pancreas. Many students 70% failed to draw the diagram of the specimen they had in hand but they drew well the diagram from one practical manure book by Patel 2012 which exposed the alimentary canal of the specimen to the right of themselves instead of rights of the frog as the question asked. This response implied that students were not learning by understanding instead they were learning by memorizing answers they experienced in past paper examinations. What students did on this part gives the clear picture. Students drew what they memorized from books without even thinking of what the question required them to do. It is imperative for teachers to be aware of such problems and make effort to change their students' mindset on the meaning of learning by understanding.

Moreover, this study realized that there was a problem in students' observation while doing dissection. The problem was due to students forcing to write and answer on what they memorized from text books rather than what they actually observe. Majority 76% failed to remove ovaries in the specimen; it seemed students believed much on what were written in the textbooks than what they were actually observing and seeing. Students lacked skills of integrating theoretical knowledge they had in the actual practical they experienced. Majority (89%) failed to apply their understanding of underlying theory to the practical situation. Teaching of dissection of frog according to what the current study observed in visited schools was still wanting. To a large extent if really the aim of secondary education is to build students' competences in learning of biology subject, teachers have to modify their teaching strategies of dissection processes to their A'level students.

This study found teachers task of teaching biology practical to A'level students were challenged by lack of proper facilities. Among visited secondary schools, none had photographic dissecting guides that align the specimens authorized to A'level biology content. Not only that, but also none had dissecting guides to support students' step by step procedures needed as per syllabi. The available dissecting kit and tools were insufficient to the extent that students were sharing in groups and sometimes used razor blade to dissect frogs, the skill which was not perfect. However, frequencies of doing dissection practical in schools were limited. Probably, this contributed to the weaknesses observed in students' competences in dissection processes. The internal features of specimen and organisms' studied seemed almost the same in all schools but practices were not done frequently. Obtained responses in Table 7 give the evidence.

Table 7: Students Responses on the Frequency of Doing Frog/Toad Dissection

School	Frequency of dissecting frog/toad	Organism involved	Parts studied
1	4	Frog, Cockroach	Digestive system
2	3	Frog and Cockroach	Digestive system Reproduction
3	2	Frog, Cockroach	Digestive system
4	3	For, Rat and Cockroach	Reproduction system
5	3	Rat and frog	Digestive system
6	5	Cockroach, Frog and mice	Digestive system, Nervous system and Reproduction
7	2	Frog, Cockroach and mice	Alimentary canal Reproductive part Excretory organ

8	7	Frog and Cockroach	Excretory organ Digestive organ
9	6	Frog, Mice and cockroach	Digestion Reproduction
10	3	Frog and Cockroach	Reproduction Digestion Excretion

Source: Field data, 2019

Findings in Table 7 reveals that in all participated schools, students were already engaged in dissection processes of frog for more than two times. It was therefore right for students to demonstrate competences in the dissection of frog however, things were different. Students had limited knowledge and skills in dissecting frogs. Findings in Table 7 shows that the frequency of doing biology practical in particular dissection differs where some do more and others less. For instance school 8 had 7, School 9 had 6 and school 6 had 5 frequencies. More frequencies imply more practices to students and more skills and understanding to students. Moreover, findings also shows that in all schools visited specimen used for A'level biology classes were mostly frog, cockroach and mice. Areas which were learned in these organisms seem to be mainly digestive and reproductive parts. When asked verbally students pointed that the areas were asked much in national examinations.

In general findings from this study found that students demonstrated low level skills in dissecting animals and they were not uniform in the same and in different schools. Some student failed even to pin up the animal specimen on the tray. Techniques of opening the stomach of frog was a complex task to some students as they were trying to cut starting from the head some started from the fore limb while others started by entering a pin to the cloaca and pull it up to easy cutting. Some students did not understand which part represent digestive system as they were exposing more than that part.

IV. CONCLUSION AND RECOMMENDATIONS

This study conclude that, in order to make A'level biology students' competent, there is a need to improve assessment of students' learning of practical skills in a range of diverse contexts. Students have to be encouraged to think critically and engage in actual practices carefully especially on the procedures of doing dissection processes. Students need to be directed on the observed features on how they relate to the content of the specification they had leant in theory. Also on believing of what they actually observe than what they memorized from textbooks.

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