



# The Role of Teaching Approaches in Mastering Biology Subject in Ordinary Secondary Education in Morogoro Municipality, Tanzania

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**Abstract:** The current study is mainly aimed at investigating the role of teaching approaches in mastering Biology subjects in ordinary secondary education settings in Morogoro Municipality. The study guided by two objectives, to assess the common approaches applied in teaching and learning Biology subject, and to examine whether teachers are competent and possess the skills of using more than three methods in teaching Biology. The study employed mixed methods and a case-study research design. The schools and students were selected through simple random sampling. Twenty ordinary secondary students were selected per each school, three Biology teachers per each school and one head of academic department or head of school per each school as well as one quality assurer responsible for Biology subject. The collected data were classified, analyzed through the Statistical Package for Social Sciences (SPSS) Computer Programme version 25 then interpreted using descriptive statistical techniques, and qualitative data were subjected to content analysis. The findings showed that most Biology teachers preferred to use lecture and chalk talk methods, through which these approaches lead students to fail to master well the subject. Furthermore, the findings indicated that most Biology teachers are competent and possess skills of using different teaching approaches, though in apply them become a problem due to overcrowded class and lack of enough time, teachers found themselves using lecturing or question and answers rather than other approaches recommended for the competence-based curriculum. The researcher recommended that; Biology teachers should employ hands-on and mind-on approaches and strategies such as field trips, project works, experimentation, simple research and demonstration when teaching to enable students to be creatives, hence competent and to master the subject.

**Keywords:** Teaching/Learning Approaches, Methods, Strategies, Classroom, Mastering

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## 1. Introduction

The potential of the learning sciences to inform the pedagogical knowledge of teachers helps to improve teaching approaches and pedagogical practice. Teaching approaches means various strategies that the teacher uses to deliver his or her subject matter to the students in the classroom based on the instructional objectives to bring about learning [1]. There are several teaching approaches to use in the classrooms, the power is for the teacher to use the ones most appropriate for the lesson. These approaches if properly used will enhance teaching and learning and bring about desired changes in the

students. Teaching for sure is a careful activity done in a professional manner to bring a positive change on the students [2]. Therefore, the teachers are guided by certain principles of teaching and learning which have great implication for teaching. The role of the teacher is very essential in the effective implementation of the curriculum [1]. The teacher amongst other things must be up-to-date with the fundamental principles of teaching that will enable him or her to be efficient and productive in the discharge of the duties. For a teacher to effectively adopt any teaching approach, some factors must be considered. The effective implementation of any curriculum depends to a large extent

on the availability of various teaching approaches [3]. In developed nations such as the United States (US). Most European countries, and Asian countries such as South Korea, Japan, China, and Singapore the approaches in learning science is by observing, questioning, investigating, and experimenting, so that the students can discover new knowledge about the world around them [4, 5]. That type of pedagogical approaches has not yet reached any poor nations like Tanzania, where students are learning science by memorizing science theories and figures as fixed facts of truth [6, 7].

Studies show that teaching and learning science in Tanzanian secondary mostly focuses on passing national examination so that students can join some careers that require scientific knowledge and this account for their competences to their subjects [7, 8]. Data from the National Examinations Council of Tanzania (NECTA) Examiner's reports on the performance of candidate Certificate of

Secondary Education Examination (CSEE) 2014 to 2019 indicated that there has been a consistent poor and average achievement in Biology subject for ordinary secondary schools [9]. In Tanzania, the key factor used to measure educational output is performance in examinations [10]. The academic performance of students in Certificate of Secondary Education Examinations (CSEE) in recent years has been declining. Data in CSEE 2019 indicated that total of 431,910 candidates were registered for the Biology examination. However, 423,887 sat for examination out of which 232,960 (55.26%) passed and 190,927 (45.74%) failed. This implies that, the general performance in this subject was average. This performance is lower by 5.63 percent when compared to that of 2018 where 217,531 (60.89%) candidates passed [9]. Table 1 further shows that the performance trend in Biology subject (CSEE) for six conservative years at national level (2014-2019).

*Table 1. Biology Summary Results (CSEE-2014-2019) Nationwide.*

Year	Candidates' performance in Biology subject		Comment on performance
	Passed in percent (%)	Failed in percent (%)	
2014	48.30	51.7	Poor
2015	53.74	46.26	Average
2016	55.69	44.31	Average
2017	61.37	38.63	Average
2018	60.89	39.11	Average
2019	55.26	44.74	Average

Source: NECTA 2014-2020, Examiner's Report on the Performance of Candidates.

From the Table 1 above, it rises the concern and leads the researcher to question, on how teacher teach, which approaches do they use that cannot facilitate students not pass or being excellent instead of poor and average performances, and this, indicate the student does not able to master the subject effectively.

## 2. Background

Biology subject is a basic and it is the compulsory subject in ordinary level in Tanzania secondary school education. Student are expected to appropriate use of biological knowledge, concepts, skills and principles in solving various problems in daily life. However, many students in ordinary level secondary schools were able to score below 30% in Biology that is interpreted as "F" grade as shown on Table 1 (Page 2). This tells that, student might not have adequate knowledge and skills to solve social issues concerning Biology. The subject being poorly performed limited a number of students qualified to join advanced level education and other courses in higher or tertiary education, therefore, in future the nation might have shortage of specialists on Biology related disciplines.

After completing the certificate of secondary education, a student expected to solve some of the biological problems. The fact is, societies are so confident and believe that student already acquire knowledge and skills from school, but this is contrary, because, some of form four leaver are still not

proficient enough for solving and assist society to come with couple of solutions for some of problems, in addition Biology syllabus for ordinary level provides four years courses through which a students also learn about issues related to diseases, digestive system, nutrition, environment, drugs and drug abuse, nervous coordination, genetic and others in which student expected to master and help society. Despite that, still societies suffer same consequences on issue like malaria, typhoid, cholera, malnutrition, environmental pollution and reproductive disputes, but unfortunately these form four leavers are there but fail to solve these issues. This led the researcher to question and investigate different angles specifically on the teaching approaches and their effectiveness to facilitate students to master the Biology subject.

## 3. Methodology

The study adopted a case-study research design. The target population of this study comprised of twenty (20) ordinary secondary students per each school, three (3) Biology teachers per each school, one (1) head of academic department or head of school per each school and one (1) quality assurer. Therefore, the sample size made a total number of 121 respondents. However, a total of 112 respondents participated in the study. Questionnaires were used for both teachers and students. Interview conducted to the head of school/head of

academic department (only one among them) and quality assurer, furthermore, classroom observation technique was used. The collected data classified, analyzed through the Statistical Package for Social Sciences (SPSS) Computer Programme version 25 then interpreted using descriptive statistical techniques, and qualitative data were subjected to content analysis.

## 4. Findings

### 4.1. Common Teaching and Learning Approaches Applied in Biology Subject

From the findings, the dominant teaching and learning approaches used by Biology teachers were lecturing/chalk talk, questions and answers. The findings presented on table 2.

**Table 2.** Students' Response on application of different Teaching and Learning Approaches (n=93).

Teaching strategy	Always	Often	Rarely	Never	Total Percent
Lecturing and chalk talk	65 (69.9%)	16 (17.2%)	11 (11.8%)	1 (1.1%)	93 (100%)
Small group discussion	8 (8.6%)	41 (44.1%)	29 (31.2%)	15 (16.1%)	93 (100%)
Question and Answers	36 (38.7%)	41 (44.1%)	16 (17.2%)	0 (0.00%)	93 (100%)
Demonstration	25 (26.9%)	28 (30.1%)	28 (30.1%)	12 (12.9%)	93 (100%)
Experimentation	7 (7.5%)	14 (15.1%)	47 (50.5%)	25 (26.9%)	93 (100%)
Field Trip	0 (0.00%)	1 (1.1%)	12 (12.9%)	80 (86%)	93 (100%)

Source of Data: Field Survey (February, 2021).

As shown in Table 2 the questionnaire administered to students revealed that, the most common teaching and learning approach applied "always" by Biology teachers were lecturing and chalk talk, the responses were 65 equals to 69.9%. Small group discussion, question and answer as well as demonstration strategies were "often" applied, and the responses were 41 (44.1%), 41 (44.1%) and 28 (30.1%) respectively. The experiments/practical work approach were "rarely" applied, and the responses were 47 (50.5%). Moreover, 80 respondents equal to 86% said that teachers "never" use study field trip as teaching strategy when teaching Biology subject.

The overcrowding of the Biology syllabus compared to time allocated, were the reason some Biology teacher to use lecturing and questions and answers strategies in teaching to save time. Most of the teachers in secondary schools were rarely using discussion method as the only way of facilitating teaching and learning process to students. Students were less exposure to areas with field trips. Also, unwillingness use of the available instructional materials among Biology teachers for demonstration was noted during observation. Based on the findings it could mean that, students might fail to master the subject due to the inappropriate application of teaching method and strategies applied by teachers as the dominated teaching method was teacher-centred (especially lecturing approach and chalk talk). This is also supported by URT that "since 2005 the curriculum has changed from content into competence based approach. However, the changes were done without involving effectively education stakeholders such as classroom teachers, students, parents, and school quality assurers. As a result teachers teach without following teaching techniques and procedures of the current curriculum" [11].

In fact, some recent studies found that, teachers in primary, secondary schools, teacher education colleges, as well as universities still dominant use lecture-citation methods. Where small group discussion methods have been deployed, they were poorly utilized by many teachers, as students have been encouraged to work in groups of five to six, largely

discussing questions without proper direction. The use of discussions as a teaching strategy is advocated for implementing competence based education. However, not all teachers seem to use discussions as a teaching approach. Discussion would have made the lesson better because the students would have had a chance to argue on the various ways presented by the teacher and a better choice of the topic basing on the arguments of the strengths given by the majority. Where discussion strategy is applied, it enhances freedom and ability of learners to express themselves and hence improve learning as well mastering the subject. However, active and meaningful discussion is possible where the learners have mastered the language of instruction as well as better command of the English language.

#### 4.1.1. Teaching Approaches Toward Mastering Biology Subject

For the *field trip*, the scientific experiences outside the classroom captivate students' interest in and enthusiasm for science inside the classroom [12]. Field trips have effective instructional role to provide students meaningful understanding and consequently higher achievement of Biology. Through field trips, the events and the objects that cannot be brought into class are possible to be observed. Field trips are rich in educational possibilities as students learn from actual hands-on experience rather than by simply reading or hearing about something. The key to success in science is not just providing students with a science immersion experience, but also enabling them to conceptualize science as a creative process and of thinking other than a defined body of knowledge. The field trip must therefore be within the experimental world of the student. Hence, it involves leaning by doing between the student and his or her environment. The experiences involve in field-trip approach are learning by doing, problem solving and practical work which agrees with the pragmatist theory. Therefore, the field trip is a good approach toward mastering the subject.

For *experiments and practical works*, there is a common saying that "practice makes perfect." This means that competences are developed when learners engage in practical

activities. In a competence-based teaching and learning, it is required that students be engaged in various practical experiences (in and outside the classroom) that give them opportunities to apply their knowledge and skills to solve problems. This is accomplished through involving students in hands-on activities which enable them to gain experience that have a far-reaching impact as far as the students' comprehension of the taught content is concerned. To achieve this goal teachers' incessant in-service training is required to update them about practicals.

*Project-based activities* are still valuable in teaching science. For example, through practical work simulated to reaffirm the experimental nature of science are possible. Ornstein highlighted that behavioral assessment data have hypothesized that students have a more positive attitude toward science when the teacher regularly emphasizes practical practices and as the student progresses [13]. Biology project-based activities have created a more positive attitude for students. This is claimed to be effective when students are given the opportunity to create independent hypotheses and draw their own conclusions.

#### **4.1.2. The Active and Cooperative Teaching Approaches Towards the Higher Order Thinking (HOT)**

One of the main components that teachers want their students to use is higher-order thinking. This is when students use complex ways to think about what they are learning. Higher-order thinking might takes thinking to a whole new level. The teaching approaches that encourage high order thinking may include active learning in which students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class. The cooperative learning, students work in teams on problems and projects under conditions that assure both positive interdependence and individual accountability. The inductive teaching approach the student are first presented with challenges (questions or problems) and learn the course material in the context of addressing the challenges.

From the findings, Biology teacher held that critical thinking, creative thinking, problem solving, decision making and metacognition seems helpful for future reference of students to their life. Yen and Halili [14] opined that higher order thinking is an extremely needed skill for every individual in any educational setting. In other words, we need "thinking" students who can incessantly respond to real-world demands. In addition, Fisher [15] considers that the development of students' higher order thinking is complementary with the inculcation of lifelong learning among student. Hands-on learning in biology seem to recognize certain desirable outcomes and endorse student-centered instructional approaches. Students in a hands-on science program will remember the material better, feel a sense of accomplishment when the task is completed, and be able to transfer that experience easier to other learning situations. When more than one method of learning is accessed as in hands-on learning, the information has a better chance of being stored in the memory for useful retrieval.

A study done by Anwar [16] found that hand-on activity is the baseline for creative and critical thinking skills enhancement. The students should be motivated enough to achieve their actual potential. The most useful and effective method to teach concepts that are complex in nature is by involving students in interactive activities, which is also the backbone of activity based learning. By utilizing different activities in the classroom, critical thinking skills and creative skills of the students are also enhanced.

#### **4.2. Teacher's Competence on Using More Than Three Methods in Teaching Biology**

The second objective was to examine whether teachers are competent and possess the skills of using more than three methods in teaching Biology. The ability and competence of using more than three approaches could lead the mastering of the Biology subject to the students. Ability and competence in integrating more than three approaches could help the teacher to teach different kind of students depending on their nature and understanding capabilities. Teachers are known to be versatile or resourceful. They are equipped with different knowledge and skills for them to be prepared in handling the diversity of learners. It is a fact that each day, they are faced with this challenge as each learner is noted to be unique. Thus, they have different ways of how they should be taught in school. Therefore, they are necessary to be able to apply multi-teaching approaches to reach diversity of students.

The findings revealed that, most of the Biology teachers are competent and possess skills of using multi approach in teaching, though in apply them become a problem, some methods like discussion require much of time, and groups should not require more than 5 or 7 member. Therefore, due to overcrowded class and lack of enough time, teachers found themselves to use lecturing or question and answers rather than other approaches recommended for competence based curriculum. Furthermore, finding from the study show that about 8 teachers equal to 61.54% indicated that they had never attended any in-service Training related to Biology subject, while five teachers equal to 38.46% had attended in-service training. Lack of in-service training such as seminars and workshops for Biology teachers led to ineffective teaching of some topics in Biology subject, since in-service training helps and update teacher for current and modern teaching strategies. In-service training is very important for teachers since facilitate the update of knowledge, since the world is not static, it is moving as well as growth of science and technology lead changes in many things, therefore the in-service training are there for letting the teacher know how to handle those changes, and therefore students will benefits for those training obtained from the teachers.

## **5. Conclusion**

To achieve and maintain the nation aspirations of development vision 2025 as well as Millennium Development Goals (MDGs) which all aimed at reducing poverty, hunger, disease, illiteracy, environmental

degradation and discriminations by 2025, and the current move of establishing various industries in the nation for socio-economic development, Biology subject should be looked for the third eye and should not be ignored by any means. Among of students in Tanzanian secondary schools fail to master and apply what they studied after complete their studies at ordinary level due to the poor learning environment, lack of libraries and laboratories with their equipment, then this lead into ineffectiveness application of some strategies like demonstration, project work and other participatory methods of teaching. Some of the Biology teachers might have both content and pedagogical gaps since about 61.54% from the findings indicated they had never attended any in-service training that are promising factor that could influence the mastering of the subject among the students, therefore these factors were beyond to students control to master Biology subject. Teaching approaches has great role for the student to master the Biology subject if only they effectively utilized depending on the nature of the student and topic. Therefore, current syllabuses emphasize on competence, then to expect that student should be able to master well what they taught, and methods should not rely on teacher-centered but student-centered. Then, student centered approach like group discussion, field trip, experiments as well as Biology projects, those stimulate students' high thinking order. Most of teachers only look the approach that is easy and consume little time to complete the contents from the syllabus. Then this become as bias and brought difficultness to the students to master Biology subject and fail to apply basic skills to their societies after complete their ordinary studies.

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