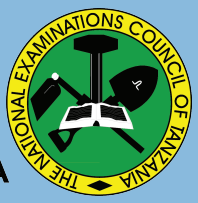
THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



FORM TWO LEARNING EVALUATION (FTLE) REPORT

Prepared by:
The National Examinations Council of Tanzania
P.O. Box 2624
Dar es Salaam.

NOVEMBER, 2023

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Dr Said Ally Mohamed
EXECUTIVE SECRETARY

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LIST OF ABBREVIATIONS AND ACRONYMS

ACSEE	Advanced Certificate of Secondary Education Examination
CAL	Collective Attendance List
CSEE	Certificate of Secondary Education Examination
DLI	Disbursement Linked Indicator
DLR	Disbursement Linked Result
DPP	Director of Printing and Publications
DSEE	Diploma in Secondary Education Examination
ES	Executive Secretary
FTLE	Form Two Learning Evaluation
FTNA	Form Two National Assessment
ICT	Information and Communication Technology
ISAL	Individual Student Attendance List
ISQA	Internal School Quality Assurance
ISQAT	Internal School Quality Assurance Team
IT	Information Technology
LGA	Local Government Authority
LMS	Learning Management System
MoEST	Ministry of Education, Science and Technology
MS Excel	Microsoft Excel
NECTA	National Examinations Council of Tanzania
NSR	Number of Students Registered for Form Two Evaluation
NSS	Number of Students Sat for Form Two Evaluation
OSRR	Overall Schools Response Rate
PO-RALG	President's Office, Regional Administration and Local Government

PReMS	Primary Record Manager for Secondary Education
R	R Statistical Software
RAS	Regional Administrative Secretary
SLRR	School-Level Response Rate
SPSS	Statistical Package for Social Sciences
SQA	School Quality Assurer
SQL	Structured Query Language
SRR	School Response Rate
TIE	Tanzania Institute of Education
TTCs	Teacher Training Colleges
PReMS	Primary Record Manager for Secondary Education
TTC	Teachers Training College

EXECUTIVE SUMMARY

Introduction

The National Examinations Council of Tanzania conducted Form Two Learning Evaluation (FTLE) in collaboration with the Ministry of Education, Science and Technology (MoEST) under the Secondary Education Quality Improvement Project (SEQUIP). The study targeted Form Two students in government and non-government secondary schools in mainland Tanzania.

Purpose

The FTLE study responds to secondary school students' poor performance in national assessments and examinations. Specifically, secondary school students' academic performance, reflected by national assessments and examinations, had been low in Basic Mathematics, English Language and Physics for several years. This situation reflected the unfavourable experiences students face in their learning. The study was an intervention to address the concerns by evaluating the Form Two students' learning process and environments in the three subjects. However, Biology, a compulsory subject for all students from Form One to Form Four, was also considered in the evaluation. Specifically, the study intended to meet the following objectives:

(a) Identifying differences in student learning in terms of gender, locality and school ownership;
(b) Establishing teacher qualifications, experience and grades attained in their teaching subjects;
(c) Exploring curriculum coverage in terms of topics/competences;
(d) Establishing student teachers' competence;
(e) Identifying learning and teaching gaps which hinder students from acquiring appropriate skills as per the curriculum; and
(f) Recommending policy and programme actions for consideration by the Government to improve learning outcomes at the secondary education level in Tanzania.

Methodology

Population

The study's population comprised Form Two students from government and non-government secondary schools in mainland Tanzania and the teachers who teach the subjects involved. The population was selected from mainland Tanzania because Zanzibar had its independent form of conducting secondary school assessments. The Primary Record Manager for Secondary Education (PReMS) system was used to prepare a list of all secondary schools with Form Two students to form the desired population for the project.

Sampling

The study employed a Two-Stage Stratified Sampling Technique to obtain the sample. The first stage applied Yamane's formula to determine the sample size for each of the twenty-six regions involved in the project. The inclusion of schools in the sample considered at least a class size of 25 students. The sample size of students for each region determined the total number of schools in each region. The researchers used the *Taro Yamane* formula to determine the number of students to be surveyed in each region.

Data Collection Tools

The data collection tools developed were assessment question papers for the four subjects: Basic Mathematics, Biology, English Language and Physics. Questionnaires were also developed for students, head teachers, teachers of Form Two students, Board members and parents. The tools were set up according to NECTA's guidelines. The data collection tools were piloted to ensure their validity and reliability. Questionnaires for students, teachers, heads of schools and parents/guardians/members of school boards were designed to collect information about variables that assisted in identifying the reasons for variations in the students' performance in the project. The questionnaires used both closed-ended and open-ended items. The closed-ended questions were used to elicit quantitative data, while the open-ended questions were used to elicit qualitative data, especially explanatory data. The questionnaires for heads of schools, teachers and students were in English, whereas the questionnaires for parents/guardians and members of school boards were in Swahili.

Data Collection

Data were collected using two instruments, namely subject assessments and questionnaires. The subject assessment papers were used to assess knowledge and skills acquired by the students as per learning outcomes in the topics tested. The questionnaires were used to collect information about variables that would help to gain insights into various reasons for the differences in students' performance in the assessment tests. The questionnaires were in four categories: Students' questionnaire to establish the challenges they encountered in learning; teachers' questionnaire to establish the challenges they encountered in teaching the targeted subjects; school heads' questionnaire to identify administrative issues about teaching and learning; and parents/guardians and board members' questionnaire to establish their participation in school activities in improving teaching and learning.

Data Cleaning

At this stage, 10 percent of data in Basic Mathematics, Biology, English Language and Physics were drawn randomly and assessed. A team of verifiers went through each script, comparing the hard copies to the computer-generated records. After cleaning the data, the team conducted a paired t-test to determine the relationship between the scores of the first entry (un-cleaned) and the second entry (cleaned) in Basic Mathematics, Biology, English Language and Physics. The results revealed a Pearson correlation of 1.00 for all four subjects, indicating a perfect positive correlation between the un-cleaned and cleaned data. However, the high p-values (>0.05) suggest no statistically significant difference between each subject's uncleaned and cleaned data.

Data Weighting

The weight for data analysis was calculated as the inverse of the selection probability for each student at each stratum to make the sample representative of the national population. One stage of weighting was used at the school level so that the sample of the students' scores could be representative of the overall national level of students' performance. All the scores reported in this study were calculated using the student weight to account for disproportionate sampling.

Data Analysis

The analysis of the FTLE data set was done using SPSS and Microsoft Excel computer programs. The analysis of students' performance considered the factors of gender (male and female), school location (urban and rural), and ownership (non-government and government); The performance indicators of each competence assessed were categorised into bands: *green* for Excellent; *light green* for Very Good*, yellow* for Good, *light red* for Satisfactory and *deep red for* Unsatisfactory. FTLE clean data files were merged using a unique identifier (code) to run specific analyses, such as school-level estimations.

Findings

Differences in Students' Learning According to Gender, Locality and Ownership

The study aimed to identify student learning differences by considering gender, locality and school ownership. Despite the differences in students' learning across gender, locality and school ownership, overall performance across the three variables was generally low in all four assessed subjects. Basic Mathematics was leading, followed by Physics. In terms of gender, the data revealed that the percentage of male students who scored from excellent to satisfactory was higher than that of female students in all the subjects.

In Basic Mathematics, the percentage of male students who scored excellent to satisfactory was 14.2 percent, whereas that of female students was 9.0 percent. In Biology, the percentage of male students was 44.2 percent, whereas that of female students was 32.0 percent. In English Language, the percentage of male students was 45.4, whereas that of female students was 35.9 percent. In Physics, the percentage of males was 36.0 percent, whereas that of females was 22.9 percent. Thus, the performance of male students was higher than that of female students.

The students' performance varied according to the location of the schools. The percentage of students who scored from *excellent* to *satisfactory* in urban schools was higher than that of students in rural schools. The percentage of students who scored from excellent to satisfactory in Basic Mathematics from urban schools was 13.8 percent, whereas in rural schools, it was 10 percent. In Biology, the urban students were 42.1 percent, whereas the rural students were 35.1 percent. In English Language, urban students were 49.4 percent, whereas rural students were 35.4 percent. In Physics, the percentage of urban students was 34.1 percent, whereas that of rural students was 25.9 percent. Thus, the urban schools performed better than the rural schools.

Lastly, in terms of school ownership, the percentage of students in government schools who scored from *excellent* to *satisfactory* was lower than those in non-government schools. In Basic Mathematics, the percentage of students in government schools was 8.1 percent, while in

non-government schools, it was 44.2 percent. In Biology, the percentage of students in government schools was 33.1 percent, while those in non-government schools was 81.8 percent. In the English Language subject, the government students were 35.7 percent, whereas the non-government ones were 84.9 percent. Likewise, in Physics, the government students were 24.3 percent, whereas the non-government ones were 73.5 percent. This difference indicates that the non-government schools performed better than government schools.

Teachers' Qualifications, Experience and Grades Attained in Teaching Subjects

The study aimed to establish teachers' qualifications, experience and grades in their teaching subjects during training. The results revealed that, in terms of teachers' qualifications, the non-government schools had 27.4 and 68.6 percent of teachers with diploma and Bachelor's degree qualifications, respectively. The government schools had 46.3 and 51.6 percent of teachers with diploma and Bachelor's degree qualifications, respectively. In general, the non-government schools had teachers with more educational qualifications than those in the government schools. Thus, with these statistics, the non-government schools were more advantaged than the government schools in terms of having highly qualified teachers. Additionally, schools in urban areas had better supply of highly qualified teachers than those in rural areas. Thus, the study observed that teachers' qualifications might have contributed to the better performance of the students in urban schools and non-government schools.

After examining the teachers' working experience, the study focused on the distribution of teachers based on qualifications. Results indicated that the less experienced teachers were more concentrated in rural schools than in urban schools. However, most of the highly experienced teachers were working in non-government schools. Moreover, most teachers with the longest working experience were working at rural schools. Thus, the poor performance of students in rural areas and the high performance of those in non-governmental schools was significantly contributed by the distribution of experienced teachers.

Exploring Curriculum Coverage in Terms of Topics and Competences

The study aimed to explore curriculum coverage in terms of topics and competences. This objective was achieved through the teachers' questionnaire. The teachers were asked to identify topics they had covered in their respective subjects from January 2022 to June 2023. The questionnaire targeted topics in Form One and the first term of Form Two according to the PO-RALG subject instructional calendar. The findings about competence coverage were then compared with students' performance per subject according to school ownership and locality variables.

Competence Coverage in Basic Mathematics Compared to the Students' Performance

Ten competences were assessed in Basic Mathematics. The competence of *distinguishing different types of numbers and solving problems* was the least covered (71.2%). In contrast, the competence coverage of *Finding relationships among logarithms, exponents and radicals* was 98.5 percent. The coverage difference between the two competences was 26.63 percent. However, the performance in all the competences was between 8.92 and 22.14 percent.

Competence Coverage in Biology Compared with Students' Performance

In Biology subject, seven competences were assessed. The competence coverage in Biology was between 97.3 percent and 98.9 percent. Thus, there was a slight difference (1.6%) in coverage. However, the performance in the competences varied; the highest performance was on the competence of u*sing of scientific procedures and practical skills in studying Biology* (64.11%), and the lowest was on the competence of u*sing of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals* (25.51%), whose difference is 38.60 percent.

Competence Coverage in English Language Compared with Students' Performance

In English Language, ten competences were assessed. The competence coverage in English Language was between 83.7 percent and 99.9 percent. The least covered was the competence *to answer questions on simple readers and report on what has been read*. Conversely, the highest performance was on the competence of *using simple English to communicate in social interactions and settings* (80.5%), and the lowest was on *describing past activities and personal experiences* (15.5%).

The Competence Coverage in Physics with Students' Performance

Physics subject had eight competences which were assessed. The competence coverage in Physics was from 97.4 to 98.4 percent; there was a slight (1.0%) coverage difference. However, the performance on the competences varied. The students had the highest performance on the competence in the *ability to practise safety rules in daily life* (59.76%) and the lowest on the *ability to apply the concepts of turning forces in daily life* (11.96%), whose difference is 47.80 percent.

The general results showed that, although the percentage of the topics' coverage was high, the performance on most competences was below 50.0 percent. For instance, the students' lowest performance was noted in the competence of *solving problems on perimeters and areas* in Mathematics, whose performance was 8.92 percent; however, the topic's coverage was 91.1 percent. A gap has also been noted in competence performance between and within subjects. The students had the lowest competence performance in Basic Mathematics, followed by Physics. This performance may be attributed to other relevant factors such as student and teacher motivation, teaching facilities and strategies.

Establishing Student Teachers' Competences

The FTLE study also sought to establish student teachers' mastery of subject contents in their areas of specialisation. Diploma in education finalist student teachers sat the same FTLE assessments that the Form

Two students sat for based on the subjects they would teach in secondary schools.

Most of the student teachers performed within the Good (45% – 64%), Very Good (65% – 74%), and Excellent (75% – 100%) performance levels in all four subjects: Basic Mathematics, Biology, English Language and Physics. A few demonstrated satisfactory performance. Despite this good performance, the study unearthed some performance challenges as reflected in individual subject performance analysis.

Student Teachers' Performance on Basic Mathematics Competences

Student teachers performed excellently in the competences of *using graphs and interpreting linear equations*; *solving problems on ratios*, *profit and loss and simple interest*; and *converting units*. Their performance was good on the competences of *finding relationships among logarithms*, *distinguishing different types of numbers and solving problems*, *factorizing and solving problems*, *verifying laws and proving theorems* and *estimating and computing numbers accurately*. However, they had satisfactory performance in the competence of *estimating and computing numbers accurately* and unsatisfactory performance in the competence of *solving problems on perimeters and areas*.

Thus, among the ten assessed competences in Basic Mathematics, student teachers had difficulties in the competence *of solving problems on perimeters and areas.* This challenge was also observed among the Form Two students' performance; 91.3 percent performed unsatisfactorily.

Student -Teachers' Performance on Biology Competences

Student teachers had excellent performance on three competences: *using scientific procedures and practical skills in studying Biology, grouping organisms according to their similarities and differences* and *demonstrating appropriate preventive measures and precautions against common accidents*, *infections and other health-related problems*. The student teachers' performance in the remaining four competences was good as they demonstrated the ability to *appreciate nature and ensure sustained interaction of organisms in the natural environment*; *demonstrate*

appropriate use of biological knowledge, concepts, principles and skills in everyday life; *use biological practical skills in studying various physiological processes in plants and animals* and *use basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals*.

Generally, the study concluded that student teachers were competent in all tested competences, except for a few students who had unsatisfactory performance in the competences of *using biological practical skills in studying various physiological processes in plants and animals* and *using basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals*. Similarly, the same competence, *use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals* was challenging to the Form Two students; 74.5 percent of them performed unsatisfactorily.

Student Teachers' Performance in English Language Competences

In the English Language, ten competences were tested. Six of them were excellently performed. These competences were the ability to interact in *writing for personal expression and enjoyment*, *ability to use simple English to communicate in social interactions and settings*, *ability to use English to obtain process*, *construct and provide subject matter information in written forms*, *ability to answer questions on simple readers and report on what he/she read*, *assessing the ability to engage in simple conversations and transactions on familiar topics*, and *ability to give and respond to directions/ requests using simple English sentences*.

The students had good performance on three competences: *Ability to express in English in writing, needs, feelings, and ideas using appropriate vocabulary*; *Ability to identify general and specific information on events in simple oral/written texts she/he encounters;* and the *Use* of *appropriate English pronunciation in a variety of settings*. They had unsatisfactory performance on the competence *of describing past activities and personal experiences*. Thus, the student teachers were not competent in describing past activities and personal experiences. Similarly, the Form Two students

demonstrated unsatisfactory performance on the same competence; *ability to describe past activities and personal experiences*.

Student Teachers' Performance on Physics Competences

Student teachers had excellent performance on three competences: *Ability to make appropriate measurements of physical quantities* (71.31%), *Ability to apply laws, theories and principles of Physics in daily life* and *Ability to use scientific skills to identify nature and properties of matter*. Good performance was observed in two competences: *Ability to use simple machines to simplify work* and *Ability to apply electricity and magnetism in daily life*. The student teachers performed satisfactorily on *Ability to practise safety rules in daily life*. They performed unsatisfactorily on the *ability to apply the concept of turning forces in daily life*.

The study concluded that the student teachers were not competent in applying the concept of turning forces in daily life competence. The same competence *Ability to apply the concepts of turning forces in daily life* was unsatisfactorily performed by 88.0 percent of the Form Two students.

Generally, the analysis revealed that the student teachers were competent in most of the tested competences, except for a few highlighted ones. It was also identified that the competences that challenged student teachers also challenged the Form Two students. This challenge calls for action from stakeholders in secondary and teachers' education colleges.

Identifying Learning and Teaching Gaps which Hinder Students from Acquiring Appropriate Skills as per Curriculum

The study discovered nine learning gaps that made students fail to acquire the intended competences.

Proficiency in the language of instruction

The analysis of students' responses in assessment scripts indicated low proficiency in the English language, which is the medium of instruction in all subjects at lower secondary level except for French, Arabic, Chinese and Kiswahili subjects. In contrast, the secondary school teachers were asked to indicate the language they use in teaching and learning, whether

English, Swahili or both. Their responses indicated that 59.7 percent of the teachers used English, 0.2 percent used Swahili, and 40.2 percent used both English and Swahili.

The teachers who use Swahili or Swahili and English were required to give reason(s). Among the reasons was that their students had Swahili backgrounds from primary schools; hence, switching to English only made it difficult for them to follow instructions or actively participate in classroom activities. Moreover, some students were used to vernaculars rather than Swahili, making it extremely difficult to acquire the expected skills. Likewise, teachers used Swahili when clarifying or elaborating concepts to ensure students understood the concepts taught well.

Use of teaching and learning methods as indicated in the syllabus for the specific competence

The study found that the common method used by most teachers was interactive lecturing (23.5%). This was closely followed by questions and answers (23.1%) and directed discussion (22.4%) methods. Case and project-based learning methods were rarely used. They were opted for by 2.2 percent and 2.5 percent of teachers, respectively. Thus, the practice might have impacted the students' acquisition of the required skills. However, the government has been providing in-service training to Science and Mathematics teachers to improve their teaching skills.

Conduciveness of teaching and learning environment

The heads of schools and parents were asked about the general teaching and learning conditions in their respective schools and home-based environments. The questions that were responded to by parents focused on the availability of books, tables and chairs for students at home. The head teachers were asked to indicate whether the schools take measures to ensure that the teaching and learning environments were conducive such as the presence of a safety security plan, a special program to identify who is in danger of dropping out, a suggestion box, follow up for students at risk of dropping out, a mechanism of handling students complains and

collaboration with the community on the issues related to violence against children and gender violence.

Analysis revealed that the schools' environments were good. Efforts to ensure safe environments at schools were made by 84.5 percent to 97.2 percent; they needed only some improvements. Parents were also asked about how the home environment facilitated learning. The analysis further showed that light was the most frequently mentioned item available at home at 89.5 percent while textbooks were 58.9 percent. Hence, essential items which facilitate students' learning were available at home.

Use of the Learning Management System (LMS)

To establish the extent to which the teachers used the Learning Management System (LMS), the researchers asked whether they used LMS in their teaching. Only 10.4 percent of teachers largely used LMS. The majority of teachers (42.1%) moderately used LMS. Furthermore, to establish the reasons for the failure to use LMS, teachers were provided with various inhibiting factors and were required to identify the appropriate ones. The data indicated a weak or poor internet connection was the leading limiting factor (36.0%), followed by a lack of internet bundles (32.6%) and a lack of computers (25.7%). The last factor was a lack of smartphones (5.7%).

Accessibility to school

The percentage of day scholars who mentioned this factor was 79.4 percent, whereas that of boarders (staying in dormitories and hostels) was 20.6 percent. Moreover, 37.1 percent and 20.2 percent of teachers and heads of schools, respectively, stayed far from the schools. Only 37.9 percent and 26.6 percent of teachers and heads of schools lived near the premises. This factor impacted students' performance directly since it reduced the student-teacher interaction time and lead to poor concentration in the classroom; both students and teachers reached their schools and homes already exhausted. However, the government has been building teachers' houses and students' dormitories and hostels through different

projects to address the problems. Similarly, on joining secondary schools, students are allocated to the nearest school to their home residence.

Teachers' availability

The analysis also revealed the shortage of teachers. Biology was most affected, with a shortage of teachers accounting for 33.7 percent of the total. This subject was followed by English Language (29.5%), Basic Mathematics (29.5%) and Physics (28.5%). The shortage of teachers resulted in teacher overload, which might have negatively affected the acquisition of knowledge and skills in secondary schools.

Teachers' job satisfaction

Data indicated that 50.9 percent of the teachers from non-government schools were satisfied with their job to a large extent. However, 47.3 percent of the teachers from government schools were moderately satisfied with their job. Nonetheless,1.2 percent and 0.6 percent of teachers from government and non-government schools, respectively, were dissatisfied with their job. Notwithstanding, the percentage of teachers from government schools who were satisfied with their job to a small extent (13.0%) and not at all (1.2%) was higher than that of the teachers from non-government schools, which was 8.9 percent and 1.1 percent, respectively.

Likewise, data indicated a minimal difference (0.1% to 0.5%) in job satisfaction between teachers in rural and urban localities. Since job satisfaction is a primary requisite for the teacher to remain in the profession and contribute positively, dissatisfied teachers may affect students' acquisition of the required knowledge and skills.

The main reasons for dissatisfaction were large class sizes and the teaching load (44.3%); insufficient salary (27.3%); and inadequate teaching and learning materials, facilities, books and ICT equipment (25.7%). Even though, the government has been making efforts to address the situation including building new classrooms and teachers' houses, reallocating

teachers, providing textbooks, and providing training to ICT teachers through SEQUIP, much effort is required to achieve optimum requirement.

Use of teaching aids

Analysis revealed that 61.2 percent of teachers used teaching aids to a moderate extent, and 26.5 percent used them to a large extent. In contrast, 11.3 percent of teachers used teaching aids to a small extent, and 1.1 percent did not. With these data, the study maintained that teaching aids are essential in teaching and learning. Thus, teachers should use various teaching aids to elevate students' learning process. Failure to use the aids may hamper teaching and learning, leading to failure in acquiring appropriate skills.

Effectiveness of Internal School Quality Assurance Team (ISQAT)

Proper implementation of Internal School Quality Assurance (ISQA) is expected to improve teaching and learning in secondary schools and performance. Data indicated that 52.6 percent of teachers were moderately supported by *ISQAT,* and 29.4 percent were largely supported. Only 14.7 percent of teachers were supported to a small extent, and 3.3 percent were not supported at all. Thus, the heads of schools have made good efforts, though more effort is still needed to achieve the maximum functioning of ISQA.

Recommending Policy and Program Actions

The study recommends policy and program actions for consideration to improve learning outcomes at the secondary education level in Tanzania. The evaluation has established differences in students' performance based on gender, school ownership and locality. The study has also identified some teaching and learning gaps in secondary schools. Based on the finding, the study recommends considering policy and programme actions to improve learning outcomes at the secondary education level in Tanzania as follows:

Continuing to ensure that the English Language subject is effectively taught at the secondary school level to improve students' understanding, fluency and competency in national and international communication.

Strengthening teachers' skills on methodologies and strategies for teaching all subjects, especially Basic Mathematics and Physics, at all levels of education, including teacher-training colleges

Continuing improving school infrastructures to facilitate the use of science and technology in education training at all levels including LMS.

Improving working environments and recruitment procedures by continuing to create a supportive working environment, such as providing housing within or close to school premises and maintaining equal distribution of teachers across localities: This action programme will address the shortage of teachers in schools.

Conclusion

The FTLE study was a response to the intervention in teaching and learning to address the problem of poor performance in Basic Mathematics, English Language and Physics in the national assessments and examinations. This poor performance implied challenges the students face in their learning. The study also intended to monitor performance in Biology, a compulsory secondary school subject. Thus, the study evaluated the students' learning environment and established several issues, as follows:

First, the school's locality and ownership affected students' learning. Students from urban schools had better learning outcomes than those from rural schools. Furthermore, students from non-government schools had better learning outcomes than government school students.

Second, teachers' professional qualities, such as qualifications, working experience, and grades attained by their students in their teaching subjects, are essential factors in the teaching profession. However, the distribution of these qualities among school categories was not even. More specifically, schools located in urban areas and owned by non-government agencies had more qualified teachers, more experienced teachers, and better grades and vice versa.

Third, teachers adequately accomplished curriculum coverage almost equally in all school categories. However, the study observed that curriculum coverage did not contribute significantly to variation in learning outcomes.

Fourth, student teachers were found to be competent in most of the tested competences, except for a few.

Fifth, the study identified teaching/learning gaps hindering students from acquiring appropriate skills per the curriculum. These gaps are low proficiency in the language of instruction, insufficient use of teaching and learning methods, unconducive teaching and learning environments, ineffective use of ICT (LMS), long distances from home to school, teachers' availability, teachers' job satisfaction, inadequate use of teaching aids and inadequate internal School quality assurance Team.

CHAPTER ONE

CONTEXT OF FORM TWO LEARNING EVALUATION

1.1 Introduction

For many years, the academic performance of secondary school students in Basic Mathematics, English Language and Physics has been poor, as national assessments and examinations show. This situation reflects the challenges students encounter during the learning process. These challenges adversely affect students' learning, and their expected learning outcomes in terms of competences, knowledge, skills and attitudes are insufficient. This scenario has prompted the Ministry of Education, Science and Technology (MoEST) to conduct the Form Two Learning Evaluation (FTLE) to identify potential challenges and ultimately take appropriate interventions. It strategically targets Form Two students in both government and non-government secondary schools in Tanzania mainland by evaluating their learning process and environment. The evaluation also intends to monitor students' learning progress in Biology since it is a subject all secondary school students learn.

This chapter highlights the importance of obtaining information on students' learning as a policy and management decision basis. It also provides an overview of the variables assessed. Moreover, the chapter outlines the specific and main objectives of the study. It finally concludes by signposting the content and organisation of this report.

1.2 Importance of Obtaining Information on Students Learning as A Basis for Policy and Management Decision

The conduct of education in Tanzania aligns with the priorities of the country, which are set out in the Tanzania Development Vision 2025, the 2014 Education and Training Policy, the Sustainable Development Goals (SDG) and the Five-Year National Development Plan 2021/22–2025/26. The policy documents mentioned above emphasise the country's aim to realise competitiveness and industrialisation for human development that aims to increase efficiency and productivity in manufacturing using the abundant resources available in the country. Thus, the fundamental role of the education sector is to prepare human resources for the country's socio-economic development. The education system in Tanzania constitutes two years of pre-primary education, seven years of primary education, four

years of secondary education, two years of advanced secondary education and three or more years of tertiary education. Specifically, secondary education is the post-primary formal education offered to learners who have successfully completed seven years of primary education. One of the fundamental aims of secondary education is to inculcate a sense of and ability for self-study, self-confidence and self-advancement in new frontiers of science and technology, academic and occupational knowledge, and skills.

Thus, The Ministry of Education, Science and Technology (MoEST) under the Secondary Education Quality Improvement Project (SEQUIP) has organised the Form Two Learning Evaluation (FTLE) project. Among other objectives, the project intends to recommend policy and programme actions for consideration by the Government to improve learning outcomes at the secondary education level in Tanzania. Thus, data collected from the students' learning serve as the base for subsequent informed decisions to be made. Since Form Two students are the main participants in this project, information about learning in their learning process is essential for research, policy, management and decision-making purposes by the government and other organisations.

Generally, accurate information on students' learning generates meaningful assessment data that delivers a snapshot of what students know, what students do not know yet, and what students should know. Such information helps policymakers take the necessary measures to make decisions that positively influence students' anticipated academic achievements.

1.3 Contextual Variables Assessed

The first phase of the FTLE project seeks to find out how Form Two students learn in the four subjects: Basic Mathematics, Biology, English Language and Physics. The project focuses on measuring the students' learning achievements against the following contextual variables:

(a) Personal particulars of their teachers: to establish whether or not personal particulars such as residential status, working experience and level of education significantly contribute to the students' learning achievement.

(b) Classroom environment: to establish whether or not factors such as class size and safety affect students' learning.

(c) Availability and accessibility of teaching and learning resources: to establish whether or not factors such as the availability of teaching aids, electricity and adequate books contribute significantly to students' learning.

(d) Topic coverage: to explore whether or not the number of topics covered up to the time of learning evaluation significantly contributes to students' performance.

(e) Home environment: to explore whether or not factors such as the presence of desks, books, lights and a conducive learning environment at home affect students' learning achievement.

(f) Teaching and learning process: to establish whether or not factors such as the language of instruction, student-teachers' competency in the teaching subjects, the teaching methodology used and the use of the Learning Management System (LMS) contribute significantly to students' learning achievement.

(g) School Environment: to see whether factors such as the safety of the teaching and learning environment contribute significantly to students' learning achievements.

(h) Motivation to teachers: to establish whether teachers' job satisfaction and adequacy in schools significantly affect the teaching and learning process.

These contextual variables were the focus of the questionnaires, which required information from five categories of respondents: Form Two students, subject teachers, heads of schools, students' parents/guardians, and members of school boards.

1.4 Objectives of Evaluation

The main objective of conducting the Form Two Learning Evaluation was to monitor students' learning and inform education policymakers and other stakeholders about what students know and what they can do, and thereby guiding improvements in policy and education delivery. This objective was achieved through the following specific objectives:

(a) Identifying the differences in student learning (gender, locality and school ownership)

(b) Establishing teacher qualifications, experience, and grades attained in their teaching subjects

(c) Exploring curriculum coverage in terms of topics
(d) Establishing student - teachers' competence
(e) Identifying learning and teaching gaps that hinder the students from acquiring appropriate skills as per the curriculum
(f) Recommending policy and programme actions for consideration by the Government to improve learning outcomes at the secondary education level in Tanzania

1.5 Report Organisation

This report is organised into five chapters. Chapter One presents the Introduction, highlighting the importance of obtaining information on students learning as a basis for policy and management decisions. It further outlines the contextual variables assessed and states the main and specific objectives of the evaluation.

Chapter Two presents the framework of the FTLE evaluation, focusing on what was assessed, the evaluation tools developed, the subjects who were assessed, the basis for interpreting and reporting results, and the dissemination of the report.

Chapter Three describes the methodology used, focusing on the sampling details, pilot assessment tools, administration of the assessment tools, marking and scoring, and item scaling.

Chapter Four presents the findings, analysis and discussion of each specific objective of the FTLE. It covers a statistical summary of the results per subject regarding proficiency levels. It also examines the patterns of performance and factors for students' performance. It further provides evidence by gender, locality (urban/rural), language use and school ownership (public/private). Moreover, it describes how various selected variables (such as students, teachers, heads of schools, parents/guardians, and members of school boards) link with students' achievements and the technical aspects involved in the analysis.

Chapter Five presents conclusions and recommendations.

CHAPTER TWO
THE FRAMEWORK FOR THE FORM TWO LEARNING EVALUATION

2.1 Introduction

The Form Two Learning Evaluation (FTLE) framework shows an overall plan that describes students' knowledge and skills attained from Form One to the middle of their Form Two studies. The framework gives a general picture of how the FTLE was conducted. The chapter describes how the assessment tests, questionnaires and administration manuals were developed. It also identifies the population target, the basis for interpreting results and how the assessment results will be reported and disseminated to different audiences.

2.2 Form Two Learning Evaluation (FTLE)

The FTLE was designed to assess the learning outcomes as indicated in the 2005 subjects' syllabi. It also aimed to account for the students' performance by considering their background characteristics and to assess teachers' competences in their areas of specialisation.

2.3 Evaluation Tools

The evaluation tools developed were the evaluation guidelines and assessment tests for the subjects involved in the first evaluation phase. These subjects are Basic Mathematics, Biology, English Language and Physics. Other tools developed were five types of background questionnaires; for students, subject teachers, heads of schools, parents/guardians, and members of school boards, as well as the tools' administration manual. The tools were piloted to ascertain their validity and reliability.

2.3.1 Development of the Assessment Tests

Professional teachers of the respective subjects from secondary schools set the assessment items. Each respective setter had an experience teaching the subject for not less than five years. Then, professionals recruited from higher learning institutions who are subject matter experts moderated the set items. Subject coordinators who were NECTA subject

specialists supervised the setting and moderation of questions for each subject. The following things were accomplished during setting the items.

(a) The items were set based on the topics covered by students by the middle of their second year as per PO-RALG guidelines for the curriculum implementation calendar.

(b) Items equivalent to three sets of assessment papers of equal weight were prepared for each subject.

(c) The English language was used since it is used in teaching and learning the subjects involved in the assessment.

(d) Assessment test items for students with special educational needs were prepared.

(e) The security of the assessment tests was highly observed according to NECTA's guidelines.

Typesetting assessment papers and their marking guides were done by NECTA's subject coordinators, and proofreading was done by NECTA senior examination officers. One paper set of each subject was used in the first round of evaluation.

2.3.2 Development of the Questionnaires

NECTA's experts in educational assessment developed five types of questionnaire, following the targeted respondents, namely students, teachers, heads of schools, parents/guardians and members of the school boards. The development also involved participants from the Ministry of Education, Science and Technology (MoEST), the President's Office - Regional Administration and Local Governments (PO-RALG) and the School Quality Assurance (SQA) department. The questionnaires included both closed-ended and open-ended questions. The closed-ended questions were for collecting quantitative data, whereas the open-ended questions were for collecting qualitative responses. English was used in the questionnaires for the students, teachers and heads of schools since it is the language of instruction in secondary school. However, Swahili was used in the questionnaires for the parents/guardians and members of school boards since not all members were conversant with the use of the English language.

2.3.3 Pretesting and Selecting Final Assessment Tools

A pilot test of the developed assessment tests was done to determine their validity and reliability. The training manual, supervision guidelines, and questionnaires for students, teachers, heads of schools and members of school boards were also piloted. The identified challenges were addressed to improve their overall design before the actual implementation to get valid evaluation results.

2.3.4 Target Population and Exclusion Criteria

(a) Target Population

The target population were the Form Two students in the Tanzania mainland. This population was selected because, if learning gaps were identified, it would be possible to take remedial measures to address the challenges identified before sitting for the Form Two National Assessment (FTNA) and later the Certificate of Secondary Education Examination (CSEE).

(b) Exclusion Criteria

Exclusion criteria are the conditions or specific characteristics that are used purposely to exclude students and schools from having homogeneous data for the planned study and finally have meaningful conclusions after the evaluation process. In this study, the school and student exclusion criteria were as follows:

(i) School Exclusion Criteria

Schools with less than 25 students were excluded to avoid a significant impact of schools with fewer students on the overall estimates of the performance at the national level.

(ii) Student Exclusion Criteria

Students whose conditions hindered them from responding to the evaluation questions and foreign students who had used English for less than one year as the medium of instruction were excluded from the evaluation. The overall exclusion rate of students was below 5 percent of the target population for FTLE.

2.3.5 Basis for Interpreting and Reporting Results

The FTLE results were given in proficiency levels for assessment tests, and the selected key variables were compared with student achievements.

(a) Key Variables Associated with the Test Scores

The key variables compared with the test scores/student achievements include gender; locality; school ownership; teacher qualifications; teachers' experience; grades the teachers' got in teaching subjects in their Certificate of Secondary Education Examination (CSEE), the Advanced Certificate of Secondary Education Examination (ACSEE) or the Diploma in Secondary Education Examination (DSEE); curriculum coverage in terms of competences; and the establishment of student teachers' competence.

(b) Proficiency Levels Used to Report Test Scores

Students' performance indicators in the assessment tests were categorised into three bands, with five performance levels: from 75 to 100 percent, green for *excellent*; from 65 to 74 percent, light green for *very good*; from 45 to 64 percent, yellow for *good*; and from 30 to 44 percent, light red for *satisfactory*, and from 0 to 29 percent, red for *unsatisfactory*. These categories are shown in Table 1.

Table 1: Categorisation of Students' Performance

S/N	Band	Scores (%)	Grade	Category of Performance
1.	Green	75—100	A	Excellent
		65—74	B	Very good
2.	Yellow	45—64	C	Good
3.	Red	30—44	D	Satisfactory
		0—29	F	Unsatisfactory

Each assessment question reflected a certain competence, and it had three items categorised into three cognitive levels. Level 1 questions assessed remembering and understanding skills; Level 2 assessed application and analysing skills. Lastly, Level 3 questions assessed evaluating and creating skills. The total scores at Levels 1 and 2 were three marks, whereas at Level 3

was four marks. The performance on each level was further categorised into five bands. The students' performance on each competence for each subject in the assessment was categorised as Table 2 shows.

Table 2: Categorisation of Performance in Competences

Cognitive Level	Designated Level	Marks/Scores	Proficiency Level	Band Colour
Understanding and Remembering	1	2.5 - 3	Excellent	Green
		2	Very Good	Light green
		1.5	Good	Yellow
		1	Satisfactory	Light red
		0 - 0.5	Unsatisfactory	Dark red
Applying and Analysing	2	2.5 - 3	Excellent	Green
		2	Very Good	Light green
		1.5	Good	Yellow
		1	Satisfactory	Light red
		0 - 0.5	Unsatisfactory	Dark red
Evaluating and Creating	3	3 - 4	Excellent	Green
		2.5	Very Good	Light green
		2	Good	Yellow
		1.5	Satisfactory	Light red
		0 - 1	Unsatisfactory	Dark red

2.3.6 Reporting and Disseminating the FTLE Results

The FTLE results are disseminated through this Main Evaluation Report, which has incorporated the technical components involved in the evaluation. The FTLE data and report will be published in at least two national newspapers and on the MoEST and PO-RALG websites.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter presents the study's methodology to enable the reader to understand the evaluation design, the study's population, sampling criteria, replacement criteria and sampling design. It also highlights the preparation of the data collection tools, pilot testing of the tools, data collection process and data analysis. The chapter further highlights the methodological limitations encountered during data collection.

3.2 Evaluation Design

A survey design was used to conduct the Form Two learning evaluation. Two methods of data collection were used. The first method involved using subject assessment papers to capture scores on knowledge and skills acquired by students as indicated in the learning outcomes for the focused competences. The second method involved using questionnaires to collect background information related to students, teachers, heads of schools, parents/guardians and members of school boards.

3.3 Population

The population was Form Two students from both government and non-government secondary schools in mainland Tanzania. The Primary Record Manager for Secondary Education (PReMS) system was used to prepare a list of all secondary schools with Form Two students to form the desired population for Form Two Learning Evaluation (FTLE). In the PReMS database, all schools were classified by School Code, School Name, School Address, Region, Council and School Ownership (Government and Non-Government). The school's locality was identified by the council's locality. When a council was categorised as rural, all schools were treated as rural schools and vice-versa. The database also included a list of all students up to Form Four being identified by name, gender, birth date and disability.

3.4 Sample Size and Sampling Procedures

3.4.1 Sampling Design

The FTLE used a two-stage stratified sampling technique. In the first stage, the *Taro Yamane* formula was applied to determine the sample size for each region that was involved in the evaluation. The inclusion of schools in the sample considered at least a class size of 25 students. The sample size for each region determined the total number of schools in each region. *Taro Yamane's* formula was used to determine the number of students to be included from each region. The formula is as follows:

$$S = \frac{N}{1 + Ne^2}$$

Where S = Regional sample size, N = Total number of Form Two students at the regional level, e = Level of precision or margin of error ($\pm$5%), and Confidence level (95%).

This was done for each region as per data on the PReMS database for Form Two students of the year 2023. A total of 10,758 students were sampled out of 761,851 enrolled Form Two students in the PReMS database.

The desired class size was 30 students per school. Hence, the number of schools in the regions was derived from the class size. All students were assessed in a school with an enrolment of 25 students or above but not more than 30 students. However, only 30 students were sampled from a school of more than 30 students. Thus, a total of 359 out of 5,546 schools were sampled, and an average of 12–15 schools per region. Table 3 shows the number of students per region and the number of sampled students per region.

Table 3: Sampled Students and Schools per Region

Region Enrolment	Form II Students Enrolment in PReMS	Sampled Students	Sampled Schools
Arusha	36,080	420	14
Dar es Salaam	72,279	390	13
Dodoma	30,740	420	14
Geita	32,490	420	14
Iringa	22,112	420	14
Kagera	39,994	420	14
Katavi	8,452	388	13
Kigoma	29,590	419	14
Kilimanjaro	32,846	420	14
Lindi	12,638	390	13
Manyara	19,404	419	14
Mara	41,678	420	14
Mbeya	35,923	449	15
Morogoro	44,596	416	14
Mtwara	18,457	420	14
Mwanza	59,309	450	15
Njombe	13,786	390	13
Pwani	34,685	420	14
Rukwa	15,635	360	12
Ruvuma	20,729	420	14
Shinyanga	24,389	450	15
Simiyu	20,854	417	14
Singida	21,702	420	14
Songwe	15,083	360	12
Tabora	24,547	420	14
Tanga	33,853	420	14
Total	**761,851**	**10,758**	**359**

3.4.2 Distribution of the Sampled Schools Based on School Ownership and Locality

Proportionate stratified sampling was applied to the school ownership and locality strata. Each region had four strata: government urban schools, government rural schools, non-government urban schools and non-government rural schools.

Systematic random sampling of schools from regions was applied to four strata: government urban schools, non-government urban schools, government rural schools, and non-government rural schools. The list of schools in each stratum was first sorted by students' enrolment followed by school names. A neighbouring school from each sampled school was selected for replacement purposes. Table 4 presents a summary of the

sampled schools per region from the PReMS data for Form Two students of the year 2023.

Table 4: Distribution of Sampled Schools in Regions Based on Ownership and Locality

Region	Actual Number of Schools				Selected Number of Schools			
	Government		Non-Government		Government		Non-Government	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Arusha	28	140	27	69	2	7	1	4
Dar es Salaam	172	0	167	0	6	0	7	0
Dodoma	47	157	20	11	3	9	1	1
Geita	22	138	10	12	2	10	1	1
Iringa	28	92	27	42	2	7	2	3
Kagera	17	204	14	53	1	10	1	2
Katavi	13	42	3	2	3	8	1	1
Kigoma	40	118	23	28	3	7	2	2
Kilimanjaro	14	209	11	109	1	8	1	4
Lindi	17	109	2	5	2	9	0	2
Manyara	28	125	11	11	2	10	1	1
Mara	43	177	15	24	2	10	1	1
Mbeya	36	154	21	50	2	9	1	3
Morogoro	51	165	42	24	3	8	2	1
Mtwara	43	108	10	3	4	8	1	1
Mwanza	60	177	54	31	3	8	3	1
Njombe	26	68	18	25	2	7	2	2
Pwani	19	123	25	58	1	8	2	3
Rukwa	18	55	13	12	2	8	1	1
Ruvuma	38	119	22	35	2	8	2	2
Shinyanga	41	99	24	5	4	9	1	1
Simiyu	16	139	2	11	1	11	1	1
Singida	18	135	8	16	1	11	1	1
Songwe	14	93	6	23	1	9	1	1
Tabora	34	154	15	14	2	10	1	1
Tanga	44	209	25	22	2	10	1	1
Total	**927**	**3,309**	**615**	**695**	**59**	**219**	**39**	**42**

In the second stage, the systematic random sampling method was used to select Form Two students in each selected school. The list of students in each school was first sorted by students' gender followed by their names. A neighbouring student from each sampled student was selected for replacement purposes.

3.4.3 Sampling Subject Teachers, Heads of Schools, Parents/Guardians and School Board Members

One (1) teacher of each subject involved in the evaluation and one (1) head of school were purposively selected. Each participant filled in the questionnaire. One (1) member of the school board and one (1) parent/guardian of a student from each sampled school were randomly selected. Likewise, each of them filled in their respective questionnaires.

3.4.4 Sampling Teacher Training Colleges and Student Teachers

In addition to school-based samples, the evaluation aimed to establish teachers' mastery of the subject content in their areas of specialisation by using student teachers who were in their final year of training. The sample size of Teacher Training Colleges (TTCs) was 10 percent of the total TTCs from the Tanzania mainland. Five TTCs were selected using systematic random sampling. Thus, five TTCs with 892 sampled student teachers participated in the FTLE. The sampled student teachers were those in their second year of training in Basic Mathematics, Biology, English Language and Physics. All these student teachers took the assessment tests in their respective teaching subjects.

3.4.5 Replacement Schools and Students

In this study, a total of 359 schools neighbouring the 359 sampled schools were sampled as replacement schools in case of a low response rate. A total of 1,078 students (10.02%) out of 10,758 selected students for the study were replaced due to truancy. Moreover, out of the 359 selected schools for the study, 2 (0.56%) schools were replaced due to the reasons indicated in Table 5.

Table 5: Reasons for School Replacement

S/N.	Reason(s)	No. of Schools
1	Technical school: No physics students enrolled	1
2	Actual number of students at the school was less than 25.	1
	Total	**2**

3.4.6 Exclusion Criteria

To ensure that the sampled schools and students were relevant and homogeneous, the researchers set the school/college exclusion and student exclusion criteria as follows:

(a) School Exclusion Criteria

Schools with less than 25 students were excluded to avoid a significant impact of schools with fewer students on the overall estimates of the performance at the national level. Moreover, out of the 5,546 schools in the PReMS database, 389 (7.01%) with less than 25 students in their Form Two enrolments were excluded. Moreover, a sample of 359 schools was drawn from the sample frame of 5,157 (92.99%) schools.

(b) Student Exclusion Criteria

Student exclusion criteria were set to be applied during data analysis. Students whose conditions hindered them from responding to the evaluation and foreign students who had used English for less than one year as the medium of instruction were excluded from the evaluation. However, all schools selected met the criteria; no student was thus excluded from the study.

3.4.7 Exclusion Rates

The study allowed an exclusion of not more than 5 percent of the FTLE target population. However, as described in Section 3.4.6(b), no schools or students sampled were excluded during the analysis.

3.4.8 Response Rates Criteria

The following response rate criteria were taken into account:

(a) The School Level Response Rates (SLRR) and College Level Response Rates (CLRR) were calculated as follows:

$$SLRR = \frac{Number\ of\ \ participated\ schools}{Total\ number\ of\ \ sampled\ schools} \times 100\%$$

$$CLRR = \frac{Number\ of\ \ participated\ TTCs'}{Total\ number\ of\ \ sampled\ TTCs'} \times 100\%$$

Since all sampled schools (359) and Teacher Training Colleges (5) participated in the evaluation, the SLRR were between 70 and 100 percent, and CLRR were between 95.16 and 97.93 percent. The higher response rate observed in schools and colleges was attributed to clear information from NECTA to regional and district educational authorities about the aim and importance of FTLE. Subsequently, the schools and colleges were frequently reminded about the evaluation. The higher SLRR and CLRR indicate that the study reflected the conditions and characteristics of the sampled schools.

The response rate target for the schools was 85 percent, and a minimum of 65 percent response rate for comparison purposes since the response rate targets for both schools and colleges were 100 percent. Moreover, the schools and TTCs can be compared with other studies as the response rate exceeds a minimum percent for comparison purposes.

(b) The minimum target for Aggregate Participation Rate (APR) for all students and student teachers was 80 percent. The actual APR for students and student teachers were calculated as follows:

$$\text{APR (All Students)} = \frac{\sum \text{NSS}}{\sum \text{NSR}} \times 100$$

$$= \frac{10625}{10758} \times 100\%$$

$$= 98.8\%$$

$$\text{APR(All student teachers)} = \frac{\sum \text{NSTC}}{\sum \text{NSTR}} \times 100\%$$

$$= \frac{868}{892} \times 100\%$$

$$\text{was} = 97.3\%$$

The observed APR value for students is 98.8 percent, and for student teachers, it is 97.3 percent, higher than the 80 percent minimum target set. This indicates that the students and student teachers offered effective cooperation while conducting the study. This can also justify that the communications made with the regional and district educational authorities, as well as the participants, were effective.

3.5 Data Collection

Data were gathered using two main instruments: first, the subject assessment papers were used to assess knowledge and skills acquired by the students as per learning outcomes for the topics involved, and second, the questionnaires were used to collect information about variables that would help to gain insights into reasons for differences in students' performance in the assessment tests.

3.5.1 Developing Evaluation Tools

The assessment tests and questionnaires for Form Two Learning Evaluation were set up according to NECTA's guidelines. The tools were piloted to ensure their validity and reliability in data collection.

(a) Setting Assessment Items

(i) The assessment items were set for the four subjects: Basic Mathematics, Biology, English Language and Physics. The assessment items were prepared based on the learning outcomes indicated in the 2005 subjects' syllabi for Basic Mathematics, Biology and English Language. As for Physics, the 2007 syllabus was used. Assessment items for students with special educational needs (physically and visually impaired) were developed. The items were based on all Form One topics and the Form Two topics covered by the end of June 2023 as per the PO-RALG guidelines for the curriculum implementation calendar.

(ii) Three papers of equal weight were set for each subject. The papers were also set for students with special educational needs.

(iii) The setting of the items was done through a workshop. The item setters were 17 professional teachers from secondary schools. These were experienced in teaching their respective subject for not less than five years. The items were moderated by 12 subject experts. These were appointed from higher learning institutions. The setters and moderators were trained in setting and moderation principles by NECTA's educational assessment experts. The setting and moderation processes in each subject were supervised by NECTA's subject coordinators.

(iv) The process of typesetting assessment papers and marking guides was done by NECTA's subject coordinators. The papers and marking guides were proofread by NECTA's senior officers, modified, and then printed.

(v) The duration allocated for each paper was 3 hours for regular students and 3:30 hours for students with special educational needs.

Appendices 1–4 present the Table of Specifications (ToS) of the assessment papers for each subject and the nature of the tasks involved based on Form One topics/competences and Form Two topics/competences covered by the end of June 2023 as per the PO-RALG guidelines for the curriculum implementation calendar.

(b) Developing Questionnaires

The development of questionnaires was supervised by experts in research involving educational assessment at the National Examinations Council of Tanzania. Questionnaires for students, teachers, heads of school and parents/guardians/members of school boards were designed to collect information about variables that assist in identifying the reasons for variations in students' performance in FTLE. The design considered the following things:

(i) The use of both closed-ended and open-ended items in the questionnaires, where the closed-end questions were for collecting quantitative data and the open-ended questions for collecting qualitative data.

(ii) The use of English in designing the questionnaires for the students, teachers and heads of schools since it is the language of instruction in secondary school.

(iii) The use of Swahili language in designing the questionnaires for parents/guardians/members of school boards because some of these members were not proficient in English.

Appendix 5 shows the background characteristics of each questionnaire captured.

(c) Developing Manuals for Tools' Administration

Administration manuals were developed to guide the administration of developed evaluation tools for valid and reliable data according to the FTLE guidelines. The administration manuals/tools developed were the training manual, administration guidelines, checklist for supervisors that indicated the requirements needed for administering the tools, invigilators' checklist that listed the activities to be done to ensure that every process was effectively accomplished and administration report guidelines. The development of administration manuals/tools was done in line with the development of evaluation tools at the NECTA's Mbezi-wani marking centre. Each manual comprised important issues to consider as per the NECTA's examination regulations of 2016.

The developed training manual stipulated the roles of the regional and district coordinators. It also specified the roles of supervisors and invigilators at the school level. The administration guidelines explained the roles of the supervisors and invigilators with respect to the duties they would be performing before, during and after the administration of the evaluation tools. Checklists were developed to capture specific tasks for handling evaluation tools at the specified place and time.

Administration report guidelines were drawn up to enable the supervisors to fill in the required information on the supervision of the FTLE in their respective centres.

The constructed tools were piloted to determine their validity and reliability. The training manual, supervision guidelines, designed test items and questionnaires for students, teachers, heads of school, members of school boards and parents/guardians were also piloted. The identified challenges during and after pre-testing the tools were cross-checked, and evaluation tools were improved before conducting the actual evaluation to get valid evaluation results.

3.5.2 Sampling Students and Schools for Pre-testing

The sampling of schools and students was done in June and was followed by the pre-testing of the evaluation tools from 17th July 2023 to 24th July 2023.

(a) Sampling of Schools

A total of ten schools were sampled based on ownership. The ratio of government to non-government schools was 3:1. Thus, out of the ten schools involved in the pre-testing, eight were government and two were non-government schools. Nine schools were obtained through systematic random sampling. One school with a student with special educational needs was purposively selected from Dar es Salaam region. Hence, a total of ten schools from nine regions were involved in the pre-testing.

(b) Sampling of Students

In each sampled school, systematic random sampling was used to obtain 40 students. However, Ifati Secondary School (a government school in Kilimanjaro) had 42 sampled students because the percentage of students sampled exceeded 50 percent of all Form Two students in that school. Hence, all 42 students were involved in pre-testing. One student with special educational needs was also purposively selected from Misitu Secondary School. Thus, out of ten sampled schools with a total of 1,518 registered Form Two students, 402 students were sampled for pre-testing the evaluation tools. The sampled regions and schools are shown in Tables 6, 7 and 8.

Table 6: Government Schools

SN	Region	Council	Centre	Name of School	Registered Students	Piloted
1.	Arusha	Karatu DC	S0868	Awet	132	40
2.	Geita	Chato DC	S6323	Mbuye	285	40
3.	Kilimanjaro	Moshi DC	S0943	Ifati	42	42
4.	Mara	Bunda TC	S2207	Kunzugu	165	40
5.	Mtwara	Tandahimba DC	S2329	Nachunyu	125	40
6.	Rukwa	Sumbawanga MC	S3690	Kanda	282	40
7.	Singida	Itigi DC	S1032	Itigi	230	40
		Total			**1261**	**282**

Table 7: Non-government Schools

SN	Region	Council	Centre	Name of School	Registered Students	Piloted
1.	Dar es Salaam	Kinondoni MC	S0189	Feza Boys'	68	40
2.	Mwanza	Sengerema DC	S6040	Millenium Girls'	40	40
		Total			**108**	**80**

Table 8: Special Educational Needs School (Government)

Region	Council	Centre	Name of School	Registered Students	Piloted
Dar es Salaam	Dar es Salaam CC	S2753	Misitu	149	40

3.5.3 Training the Council's Coordinators and Invigilators in Pre-testing the Tools

The training of the Council's coordinators and invigilators/supervisors was done in two phases. The first phase involved NECTA's examination officers, who were the Council's pilot coordinators, and it was done in NECTA's offices in Dar es Salaam. The second phase involved students' invigilators and supervisors, and it was done at the school level. In the first phase, district coordinators, supervisors and invigilators were trained. The areas covered during training were as follows:

(a) Receiving and keeping evaluation tools and related documents according to the provided checklist.

(b) Administering the tools as per the timetable provided.

(c) Guiding students through signing Collective Attendance List (CAL) and Individual Subject Attendance List (ISAL) respectively.

(d) Collecting and verifying that the number of the scripts collected tallies with that of the students who attended.

At the school level, a district coordinator trained supervisors and invigilators in administering the tools. Thereafter, the coordinator tested them to check whether they mastered all the requirements. A minimum score of 85 out of 100 was required. All the trainees were qualified.

3.5.4 Pre-testing Assessment Tests, Questionnaires and Administration Manuals

The assessment tools were administered to 391 Form Two Students from 10 secondary schools in 9 regions of mainland Tanzania. Three sets of assessment tests for each subject (English Language, Physics, Biology and Basic Mathematics) were administered to the same students. The assessment tools were administered using the administration manuals developed. After the administration of assessment tests, questionnaires were filled in by all students who wrote the test, teachers of each subject involved in the assessment, the head of school and a parent/guardian or a member of the school board. The duration for filling in the student questionnaire was one hour. Other respondents filled in the questionnaires at their convenience but within the scheduled time for administering the tools.

The duration for the administration of one set of papers was 3 hours for regular education students and 3:30 hours for students with special educational needs.

3.5.5 Doing Item Analysis of Each Subject Set and Equating the Papers

Item analysis of all three sets of assessment tools administered in each subject was done to determine item difficulty index, item discrimination index, point biserial correlation, and their reliability, which ultimately provided essential indices for deciding which items were appropriate and which ones needed improvement. Equally, psychometric analyses were conducted to equate student results on the same proficiency scale for each set of subjects involved in testing.

(a) Item Difficulty and Item Discrimination

Item difficulty and item discrimination were done on all four subjects, which were English Language, Physics, Biology and Basic Mathematics, to assess the quality of the test items. Each set of assessment tools consisted of 30 items. Three items in each tool represented a particular competence to be measured. Item analysis was done to indicate the difficulty level of each item and to check whether the item managed to discriminate between higher-performing

and lower-performing students by calculating the item difficulty index, item discrimination index, point-biserial correlation, and the reliability of the assessment instruments. The classification of difficulty index and discrimination of scores used are indicated in Tables 9 and 10.

Table 9:Classification of the Difficulty Index Values

S/N	Difficulty Index	Classification of Difficulty Level	Interpretation
1.	P < 0.3	Too hard	Modify
2.	0.3 < P < 0.8	Moderate	Accept
3.	P ≥ 0.8	Too easy	Modify

Table 10: Classification of Discrimination Index Values

S/N	Discrimination Index	Description	Interpretation
1.	D = Negative	Defective Item	Rejected or improved
2.	D between 0 - 0.19	Poor discrimination	Poor items to be rejected
3.	D between 0.2-0.29	Acceptable discrimination	Marginal items usually need or are subject to improvement
4.	D between 0.3-0.39	Good discrimination	Reasonably good but subject to improvement
5.	D = 0.4	Very good discrimination	Very good item: accept
6.	D > 0.4	Excellent discrimination	Very good item: accept

(b) Item Analysis of Each Paper Set for Each Subject

The general statistics showing the results of item analysis for each paper that was set are shown in Tables 11-14.

Table 11: General Statistics of Item Analysis in Basic Mathematics

Set	Descriptive Statistics							Cronbach's Alpha
	N	Mean	SD	Min. Score	Max. Score	95% Confidence Interval		
						LCL	UCL	
1st	391	13.22	19.25	0	93	11.28	15.17	0.76
2nd	391	15.56	20.82	0	90	13.45	17.67	0.76
3rd	391	15.57	20.66	0	84	13.48	17.66	0.76

Source: NECTA FTLE Pilot Study, 2023

Table 12: General Statistics of Item Analysis in Biology

Set	Descriptive Statistics							Cronbach's Alpha
	N	Mean	SD	Min. Score	Max. Score	95% Confidence Interval		
						LCL	UCL	
1st	391	24.06	17.18	5	88	22.32	25.80	0.76
2nd	391	21.54	17.58	4	84	19.77	23.32	0.76
3rd	391	30.98	18.84	6	96	29.07	32.89	0.76

Source: NECTA FTLE Pilot Study, 2023

Table 13: General Statistics of Item Analysis in English Language

Set	Descriptive Statistics							Cronbach's Alpha
	N	Mean	SD	Min. Score	Max. Score	95% Confidence Interval		
						LCL	UCL	
1st	391	35.37	23.34	7	95	33.01	37.73	0.76
2nd	391	37.07	24.02	6	96	34.64	39.50	0.76
3rd	391	33.32	22.31	9	94	31.07	35.58	0.76

Source: NECTA FTLE Pilot Study, 2023

Table 14: General Statistics of Item Analysis in Physics

Set	Descriptive Statistics							Cronbach's Alpha
	N	Mean	SD	Min. Score	Max. Score	95% Confidence Interval		
						LCL	UCL	
1st	391	15.82	13.20	3	70	14.89	17.16	0.76
2nd	391	23.45	15.44	5	75	21.89	25.01	0.76
3rd	391	22.99	18.47	4	95	21.12	24.86	0.76

Source: NECTA FTLE Pilot Study, 2023

Generally, the item analysis results for all subject papers indicated that the item difficulty and discrimination index values were acceptable, except for a few items, which were improved before the final items were written.

(c) Psychometric Analyses

Psychometric analyses were conducted to equate student results on the same proficiency scale for each set of subjects tested. In this study, three sets of papers on each subject were administered to similar students, resulting in a repeated measures design. A comparison or equating of the means of all three sets of assessment

instruments was performed using a one-way repeated measures Analysis of Variance (ANOVA). Cronbach's coefficient Alpha, as presented in Table 15, was used to determine the internal consistency of the papers.

Table 15: The Internal Consistency Value

S/N	Cronbach's coefficient, α	Interpretation of Internal Consistency/Reliability Test
1.	$\alpha \geq 0.9$	Excellent (High - Stakes testing)
2.	$0.7 \leq \alpha < 0.9$	Good (low-stakes testing)
3.	$0.6 \leq \alpha < 0.7$	Acceptable
4.	$0.5 \leq \alpha < 0.6$	Poor
5.	$\alpha < 0.5$	Unacceptable

Cronbach's coefficient for internal consistency reliability was above 0.70 (two decimal places) for all sets, implying that the assessment tests had acceptable internal consistency. The comparability results of all paper sets for each subject were good.

The equating study indicated that the paper sets for each subject were comparable. The paper sets which were more closely related were English Language, first and second; Physics, second and third; Biology, first and third; and Basic Mathematics, second and third.

(d) Analysis and Improvement of the Questionnaires

Four different types of questionnaires were administered in each of the ten selected secondary schools. These questionnaires were administered to the students, subject teachers, school heads and parents/guardians/board members to ensure reliability and validity. The gathered questionnaire data were analysed to identify challenges the respondents encountered in filling out the questionnaires and understanding the requirements of the questions. Analysis was done to determine the internal consistency of the questionnaire by running Cronbach's alpha. However, due to a small number of respondents and lack of consistency in scales, it resulted in higher Cronbach's alpha values, which could not be used to evaluate the internal consistency of the questionnaires. In students' and teachers' questionnaires with 391 and 40 respondents, respectively, some questions lacked consistency in their scales. This led to higher non-

responses, and thus, the missing data resulted in a higher value of Cronbach's alpha that could be accepted to qualify the internal consistency of the questionnaire because only fewer cases were processed. A summary of Cronbach's alpha 15 on the questionnaires is presented in Tables 16 to 19.

Table 16: Cronbach's Alpha Case Processing Summary on Students Questionnaire

Case Processing Summary		
Cases	**N**	**%**
Valid	55	14.1
Excluded	334	85.9
Total	**389**	**100**

Source: NECTA FTLE Pilot Study, 2023

Table 17: Cronbach's Alpha on Students Questionnaire

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.83	24

Source: NECTA FTLE Pilot Study, 2023

Table 18: Cronbach's Alpha Case Processing Summary on Subject Teachers Questionnaire

Case Processing Summary		
Cases	**N**	**%**
Valid	33	82.5
Excluded	7	17.5
Total	**40**	**100**

Source: NECTA FTLE Pilot Study, 2023

Table 19: Cronbach's Alpha on Subject Teachers' Questionnaire

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.067	10

Source: NECTA FTLE Pilot Study, 2023

Thus, to address the challenges due to the inconsistency of scales and higher non-responses of the questionnaire items, an expert review was done to improve the questionnaire items. Moreover, there was a need to separate respondents of the parents/guardians/members of the school board questionnaire. Thus, this questionnaire was separated into two: for parents or guardians and for school board members. The language used in these questionnaires was Swahili because not all members were proficient in the English language. It was also noted that about 80 percent of the students were yawning and dozing at the time of filling in the questionnaire, as it was scheduled from 2:00 to 5:00 pm. This prompted changing the time for filling in the students' questionnaire; they filled it early on the first day during the actual administration of the tools.

3.5.6 Selecting Regional and District Coordinators for Tools Administration

A total of 179 coordinators were selected by NECTA. Of these, 26 were regional coordinators who were selected from among NECTA staff, and 153 were district coordinators selected from among NECTA staff and professional teachers in secondary schools. The appointed teachers were those with at least three years' experience in supervising examinations.

3.5.7 Selecting Supervisors and Invigilators for Tools' Administration

Supervisors and invigilators were appointed by regional education officers after receiving instructions and selection criteria from NECTA. The criteria for the selection of supervisors and invigilators included having at least three years of teaching experience in secondary school, the ability to follow instructions, the ability to stay focused, efficiency in performing tasks effectively, and coming from a nearby school. Thus, 728 teachers were selected to be supervisors and invigilators for the 359 sampled schools and five (5) teacher training colleges.

3.5.8 Training Regional and District Coordinators, Supervisors and Invigilators in Tools Administration

Before administering evaluation tools, coordinators, supervisors and invigilators received training in two phases. In the first phase, a total of 26 regional coordinators and 153 district coordinators were trained by the

FTLE secretariat on 15th September 2023 at the Mbezi-wani marking centre. In the second phase, 364 supervisors and 364 invigilators were trained by regional and district coordinators in one of the sampled schools in their respective districts. The training was conducted on 19th September 2023; it followed the training manual, which emphasised different activities for administering the evaluation tools, as follows:

(a) Receiving, transporting and keeping evaluation tools and related documents according to the provided checklist

(b) Administering the tools as per the timetable provided

(c) Guiding students through signing the Collective Attendance List (CAL) and Individual Subject Attendance List (ISAL), respectively

(d) Collecting and verifying that the number of the scripts collected tallies with that of the students who attended

(e) Adhering to the roles of supervisors and invigilators in administering evaluation as indicated in the guidelines

(f) Closing the security envelope with worked scripts and related documents

(g) Guiding students through filling in all items in the questionnaires

(h) Reporting on the administration of the evaluation tools

3.5.9 Quality Control Measures During and After the Administration of Evaluation Tools

Quality in administering the evaluation tools was ensured as follows:

(a) Students were inspected for unauthorised materials like smartwatches, books and notes before entering the evaluation rooms.

(b) Supervisors and invigilators were not allowed to take assessment papers outside the rooms during administration.

(c) Equipment such as pens, pencils, rulers, tables and chairs, and security envelopes were made readily available.

(d) Invigilators collected, counted, rechecked, witnessed and enclosed worked scripts and related documents in security envelopes.

(e) Coordinators monitored their respective evaluation centres to check for any assessment malpractices and make the necessary clarification whenever needed.

(f) A checklist to ensure that the tools were received and administered according to guidelines was filled out by invigilators and supervisors at the end of each assessment paper and was enclosed with student scripts.

(g) The assessment tools were enclosed in security envelopes, and the same was done at the end of the administration process.

(h) Coordinators inspected and ensured that the assessment tools were kept in the school's strong room or security cabinets, and the keys were kept by supervisors.

(i) A checklist was used to hand evaluation tools to district coordinators, who in turn used the checklist to submit the tools to the FTLE secretariat at NECTA's headquarters.

3.5.10 Marking the Scripts, Scoring the Questionnaires and Capturing the Data

The marking process adhered to NECTA's procedures for marking national assessments. A total of 119 markers were involved in marking the subject scripts. These were subject teachers from secondary schools. Their minimum education qualification was a diploma of education in the respective subjects. In addition, the selected teachers had three years or more of experience in teaching at the secondary education level. The questionnaires were scored by 64 participants. Among them, 14 were NECTA staff members, and 48 were secondary school teachers. These were experienced in using computers to mark national examinations. The teachers who marked the subject scripts and entered questionnaire responses into the SPSS computer program were selected from NECTA's inventory of markers. During the process of marking and data capturing, the following things were taken into account.

(a) Students' assessment scripts were marked using a conveyor belt marking system.[1]

(i) Scripts were checked by a group of checkers to ensure that each question was fairly marked and the total marks were accurately entered into the computer system.

(ii) Entering the students' scores into the computer system was done at the marking station. After data entry, further validation was done by comparing the printouts of each school with the scores on the students' scripts.

(b) Designing and coding the codebook or the data dictionary for the questionnaire to facilitate data analysis were done by NECTA's professional statisticians. The questionnaires were assigned an identification number for reference, and the responses reported therein were captured.

(c) Data capturing from the questionnaires was done by some NECTA officers and secondary school teachers who had been identified as experienced in computer applications during the marking of national examinations.

3.5.11 Data Cleaning, Weighting and Analysis

(a) Data Cleaning

The relationship between first entry data and cleaned data for the secondary schools' scores and questionnaires is shown in Table 20-21, and for the teachers colleges' scores is shown in Table 22.

[1] In this system, an examiner marks only a question(s) assigned to him/her and then passes the script on to another examiner who also marks another set of question before passing the script on to another examiner and so on to the last examiner in the "belt."

Table 20: Relationship Between First Entry Data and Cleaned Data for Secondary Schools' Scores

Subject	Mean		SD		Standard Error (SE)		Test of relationship				Remarks
	Un-cleaned data	Cleaned data	Un-cleaned data	Cleaned data	Un-cleaned data	Cleaned data	Pearson Correlation	P-Value	t-Stat	t-Critical two-tail	
Mathematics	2.74	2.74	2.32	2.32	0.073	0.073	1	0.98	0.00	1.96	No Difference
Biology	32.03	32.03	18.25	18.25	0.564	0.564	1	0.99	0.01	1.96	No Difference
English	3.09	3.09	2.18	2.18	0.674	0.674	1	1	0.00	1.96	No Difference
Physics	28.62	28.62	18.83	18.83	0.578	0.578	1	0.99	0.12	1.96	No Difference

Null Hypothesis (H_0): The null hypothesis typically states that there is no true difference or effect between the categories.

Ten (10) percent of the data in Basic Mathematics, Biology, English Language and Physics were assessed and drawn randomly. A team of verifiers went through each script, comparing the hard copies and the computer-generated records. After cleaning the data, a paired t-test was conducted to determine the relationship between the scores of the first entry (un-cleaned) and the second entry (cleaned) in Basic Mathematics, Biology, English Language and Physics. The test results revealed a Pearson correlation of 1.00 for all four subjects, indicating a perfect positive correlation between the un-cleaned and cleaned data. However, the high p-values (>0.05) suggest that there is no statistically significant difference between the uncleaned and cleaned data for each subject. The t-statistics are close to zero, supporting the conclusion of no significant difference.

Table 21: Relationship Between First Entry Data and Cleaned Data for Secondary Schools Questionnaires

Type of Questionnaire	Total Entry	Error Entry	Probability of Error	Margin of Error
Parents/Guardian	36	1	0.028	<0.05
Member of School Board	36	0	0.000	<0.05
Head of School	36	0	0.000	<0.05
Subject Teacher	144	3	0.021	<0.05
Students	1061	38	0.036	<0.05

Questionnaires were validated by re-entering code 0 for correct records and 1 for wrong records. Hard copies and 10 percent computer-generated records were used for comparison. After capturing the entries, probabilities were calculated to determine the relationship between the first entry (un-cleaned) and the second entry (cleaned) in the questionnaires of Parents/Guardians, Members of the School Board, Head of Schools, Subject Teachers and Students. The margin of error (e) was set to be <0.05.

The probability of wrong entry was 0.028 in the Parents/Guardians questionnaire, 0.000 for Members of the School Board, 0.000 for Heads of Schools, 0.021 for Subject Teachers and 0.036 for Students. The results of the test show that all questionnaires met the criteria for further analysis as the margin of error was less than 0.05 for all questionnaires. Therefore, the data was clean to proceed with the analysis. The formula used to calculate the probability of errors was;

$$ErrorsP = \frac{Total\ number\ of\ Records\ with\ errors}{10\%\ Sample\ Drawn}$$

Table 22: Relationship Between First Entry Data and Cleaned data for Teachers Colleges Scores

Subject	Mean		SD		Standard Error (SE)		Test of relationship				Remarks
	Un-cleaned data	Cleaned data	Un cleaned data	Cleaned data	Un cleaned data	Cleaned data	Pearson Correlation	P-Value	t-Stat	T-Critical two-tail	
Mathematics	5.86	5.86	1.27	1.27	0.24	0.24	1	1.00	0.00	1.96	No Difference
Biology	66.78	66.74	8.91	8.91	1.313	1.314	1	0.98	-0.23	1.96	No Difference
English	66.33	66.33	11.77	11.77	3.396	3.396	1	1.00	0.00	1.96	No Difference
Physics	59.33	59.33	12.63	12.63	2.43	2.43	1	1.00	0.00	1.96	No Difference

For all four subjects, there is no significant difference between uncleaned and cleaned data. The Pearson Correlation coefficient is consistently 1.00, indicating a perfect positive correlation between uncleaned and cleaned data. P-values are consistently 1.00, suggesting that the observed correlations are not statistically significant. The t Stat is consistently 0.00, supporting the conclusion of no observed difference.

In summary, the analysis suggests that the cleaning process did not result in a statistically significant difference in the mean scores for the evaluated subjects. The correlation between uncleaned and cleaned data is perfect, indicating a strong linear relationship.

(b) Data Weighting

The weight for data analysis was calculated as the inverse of the selection probability for each student at each stratum to make the sample representative of the national population. One stage of weighting was used at the school level so that the sample of student scores could be representative of the overall national level of student performance. To account for disproportionate sampling, all the scores reported for this study were calculated using the student weight. Thus, the formula for calculating the student weight was as follows:

$$\text{Student Weight} = \frac{\text{Number of F2 Students in the Region}}{\text{Number of Sampled Schools in the Region} \times \text{Number of F2 Students in the Selected School}}$$

For the overall performance in each subject at the national level, the performance was calculated based on the students' weight at the school level based on strata. Furthermore, the SPSS software was used to weigh all the cases.

(c) Data Analysis

Analysis of the FTLE data set was done using SPSS and MS Excel computer programs. The weighted scores of all the students' scores on the corresponding subjects were computed. Moreover, omitted unanswered items for a student who attempted a paper were treated as incorrect responses. A total of 4,247 scripts of the students from the four subjects (10%) were drawn randomly. A team of verifiers went through each script, comparing the hard copies and the computer-generated records. After data cleaning, a paired t-test was conducted to determine the relationship between the scores of the first entry (un-cleaned) and the second entry (cleaned) in all four subjects. The test results revealed that the correlation between the first and second entries was 99.9 percent for all records. Therefore, the margin of error for Physics was 1.2 percent, Biology was 1.2 percent, Basic Mathematics was 1.2 percent and English Language was 1.3 percent. The test of the relationship used to establish the similarities between the two datasets is presented in Table 20; reveals a high degree of precision during data entry and, thus, the reliability of the dataset. Thus, during data analysis the following were considered:

(i) Data analysis was done by considering the factors of gender (male and female), school location (urban and rural), and ownership (non-government and government);

(ii) The performance indicators of each competence to be assessed were categorised into bands: *green* for Excellent and Very Good performance*, yellow* for Good performance and *red* for Satisfactory and Unsatisfactory performance.

(iii) FTLE clean data files were merged using a unique identifier (code) to run specific analyses such as school-level estimations.

Descriptive and subjective judgments were conducted based on the students' scripts and background questionnaires.

CHAPTER FOUR
PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents, interprets and discusses the assessment results of the FTLE in Basic Mathematics, Biology, English Language and Physics. The chapter also discusses the findings using data from the questionnaires administered to students, subject teachers, heads of schools, parents/guardians and school board members on the students' learning environment in general. The analysis in this chapter was done based on the six objectives of the study, namely identifying the differences in students' learning (gender, locality and school ownership); establishing teacher qualifications, experience, and grades attained in teaching subjects; establishing curriculum coverage in terms of topics; establishing student teachers competence; identifying teaching and learning gaps which hinder students from acquiring appropriate skills as per the curriculum; and recommending policy and program actions for consideration by the government to improve learning outcomes at the secondary education level in Tanzania.

4.2 Differences in Students' Learning

Identifying differences in students' learning was one of the objectives of conducting FTLE, especially by focusing on gender, school locality and ownership. Data analysis revealed differences in students' learning across gender, locality and school ownership. The differences were reflected by the students' assessment performance and their responses. The analysis also established students' performance in different competences and skills' levels.

4.2.1 Students' Performance in Basic Mathematics

The data indicated that 88.7 percent of the students performed unsatisfactorily in Basic Mathematics. The data also indicated that 0.7 percent of the students had excellent performance, 1.0 percent had very good performance, 3.8 percent had good performance, and 5.8 percent had satisfactory performance. Figure 1 shows the different categories of students' performance in Basic Mathematics.

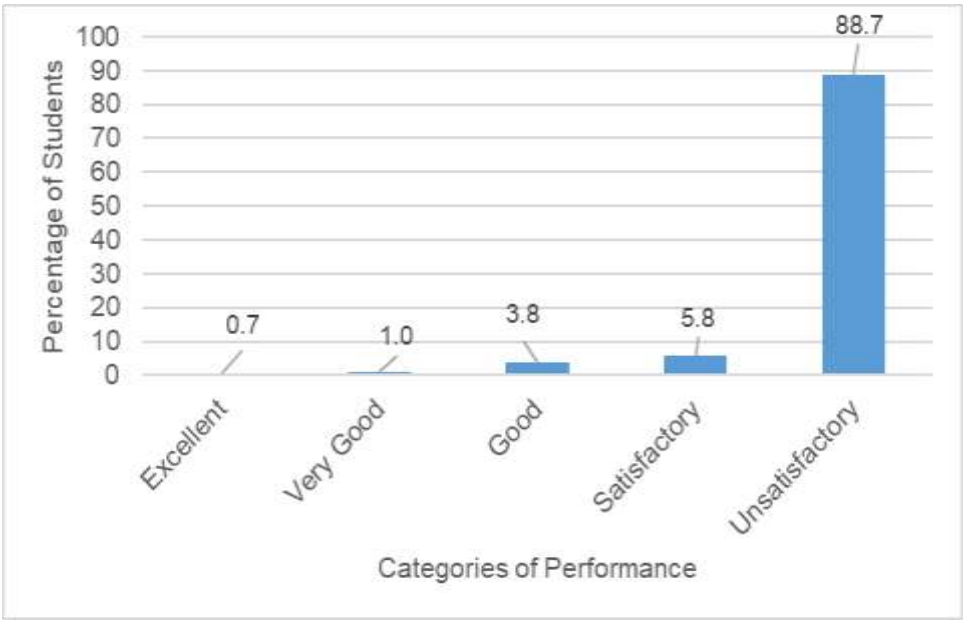

Figure 1: *Students' General Performance in Basic Mathematics*

(a) Students' Performance in Basic Mathematics as per Gender

The data was analysed to compare students' performance in Basic Mathematics according to gender. The performance of male and female students in different categories is presented in Table 23.

Table 23: Students' Performance in Basic Mathematics as per Gender

Gender	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Females	0.5	0.9	2.7	4.9	91.0	100.0
Males	1.0	1.0	5.2	7.0	85.8	100.0

Table 23 reveals that 14.2 percent of male students scored from the excellent to the satisfactory bands in Basic Mathematics compared to 9.0 percent of female students, who scored in the same bands. Additionally, 91.0 percent of female students performed unsatisfactorily compared to 85.8 percent of male students, who also performed unsatisfactorily. Therefore, in terms of gender, the male students' performance was higher than that of female students in Basic Mathematics[2].

[2] The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between male and female students is statistically significant. The t-statistic is 96.786, which exceeds the t-critical value, reinforcing the statistical significance of the difference.

(b) Students' Performance in Basic Mathematics as per School Locality

Further, the analysis sought to determine whether there was a difference in performance in Basic Mathematics based on school locality. Table 24 presents students' performance in the different categories between urban and rural schools.

Table 24: Students' Performance in Basic Mathematics as per School Locality

School Locality	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Urban	1.2	1.3	4.8	6.4	86.3	100.0
Rural	0.5	0.8	3.3	5.5	89.9	100.0

The data in Table 24 show that 13.7 percent of students from urban schools scored from the excellent to the satisfactory bands in the Basic Mathematics assessment compared to 10.1 percent of students form rural schools, who scored in these bands. However, 89.9 percent of the rural area students performed unsatisfactorily compared to 86.3 percent of the urban area students whose performance was unsatisfactory. Thus, in terms of locality, the performance of students from urban schools in Basic Mathematics was slightly higher than that of those from rural schools[3].

(c) Performance in Basic Mathematics as per School Ownership

The data were analysed to determine if there was a difference in students' performance regarding school ownership. The performance data in Basic Mathematics according to school ownership is presented in Table 25.

[3] The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between students from rural and urban areas is statistically significant. The t-statistic is -76.205, which far exceeds the t-critical value, reinforcing the statistical significance of the difference.

Table 25: Performance in Basic Mathematics as per School Ownership

School Ownership	Performance Categories (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Government	0.2	0.5	2.5	4.9	91.9	100.0
Non-government	5.5	5.6	17.4	15.7	55.8	100.0

Table 25 shows that 44.2 percent of students from non-government schools scored from the excellent to satisfactory bands in the Basic Mathematics assessment compared to 8.1 percent of students from government schools, who scored in these bands. In addition, 91.9 percent of students from government schools performed unsatisfactorily compared to 55.8 percent of those from non-government schools, whose performance was unsatisfactory. Therefore, regarding school ownership, students from non-government schools performed higher than students from government schools[4].

(d) Students Performance on Different Competences and Skill Levels in Basic Mathematics

The students' performance on each competence in Basic Mathematics is shown in Table 26.

[4] The mean in Mathematics score for the non-government group is substantially higher (29.84) than that of the government group (8.82). The p-value is 0.000 which indicates that this difference is statistically significant. The t-statistic is -366.560 which is quite large, reinforcing the evidence of a significant distinction between the two groups. Overall, these results suggest that ownership (government vs. non-government) is associated with a significant difference in Mathematics scores.

Table 26: Students' Performance in Basic Mathematics Competences

S/N	Competence	Categories of Performance				
		Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Distinguish different types of numbers and solve problems.	3.0	1.6	7.7	9.8	77.9
2.	Convert units	3.4	1.5	4.6	6.9	83.5
3.	Estimate and Compute Numbers Accurately	1.9	0.6	5.5	8.4	83.6
4.	Do sale Drawing and Geometrical Transformations	2.6	1.5	4.4	5.4	86.1
5.	Solve problems on perimeters and areas	2.0	0.8	2.7	3.2	91.3
6.	Factorize and solve Problems	0.7	1.3	3.8	4.6	89.5
7.	Solve Problems on ratios, profit and loss and simple interest	6.5	2.3	4.2	7.5	79.5
8.	Graph and interpret linear equations	1.8	0.8	2.5	13.6	81.3
9.	Find relationships among logarithms, exponents and radicals	0.7	0.3	5.0	7.3	86.7
10.	Verify Laws and prove theorems	1.1	0.9	3.6	6.2	88.2

Table 26 indicates that the students performed unsatisfactorily (77.9%–91.3%) on all ten competences assessed in Basic Mathematics. The competence *Solve problems on perimeters and areas* was the least satisfactorily performed (91.3%), followed by *Factorize and solve problems* (89.5%); *Verify laws and prove theorems* (88.2%); and *Find relationships among logarithms, exponents and radicals* (86.7%). However, the competence *Distinguish different types of numbers and solve problems* was relatively performed well, as the percentage of students who performed unsatisfactorily was 77.9.

The analysis also determined students' performance on different skill levels in Basic Mathematics. The data indicated that in six out of ten competences (S/N 1, 2, 7, 8, 9 and 10), the order of difficulty was 3>2>1. This shows that items at Level 3 were the least unsatisfactorily performed. However, in competence S/N 3, the order was 1>2>3. A summary of performance at different levels in Basic Mathematics is shown in **Appendix 6.**

The analysis of their scripts revealed that most students had insufficient knowledge of the tested concepts. Thus, they faced challenges such as failure to apply the correct formulae, theorems, postulates and mathematical procedures to solve problems; lack of

skills in simplifying mathematical expressions and stating coefficients of terms; lack of skills in solving inequalities involving two inequality signs; lack of knowledge and skills in using mathematical tables correctly to solve problems; inability to interpret geometrical figures and word problems mathematically; failure to apply angle properties to solve geometrical problems; lack of skills of locating coordinates of points in the *xy*-plane; inability to estimate quantities expressed in different phenomena; lack of skills in determining the place values of numbers; failure to convert metric units of time, length and capacity as well as to compare units of a quantity of the same volume in relation to a litre; lack of skills to perform mathematical computations involving division and multiplication of units; and lack of drawing skills and knowledge of interpreting graphical and geometrical results.

Other challenges include the inability to express quantities of the same kind in ratios; lack of arithmetic skills in performing addition, subtraction, multiplication and division of numbers accurately; lack of knowledge of distinguishing types of numbers and fractions; inability to solve problems involving fractions and to compare types of fractions such as proper fractions, improper fractions and mixed numbers; failure to convert fractions into decimals and to represent real-life quantities as fractions; and language barrier.

4.2.2 Students' Performance in Biology

The performance of students in Biology according to different categories is shown in Figure 2.

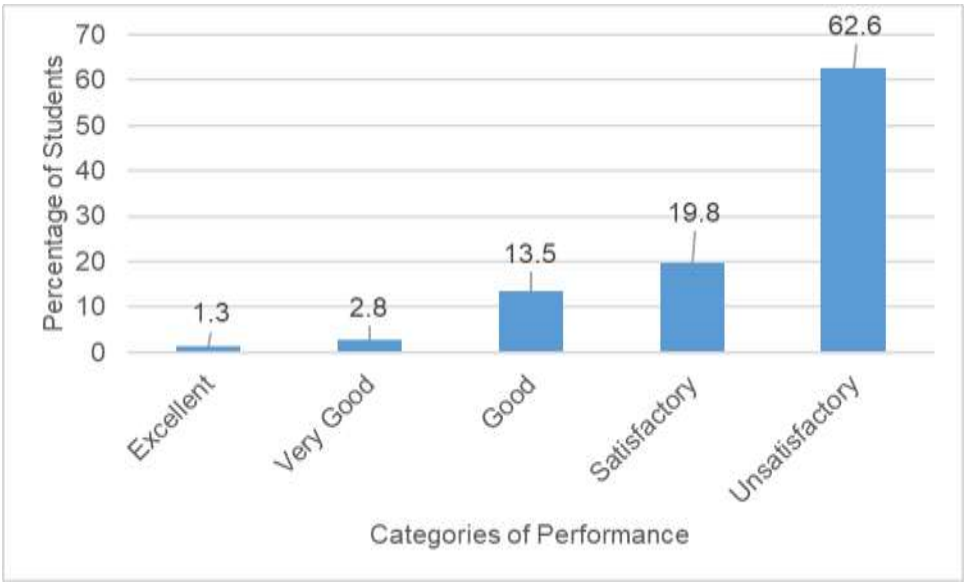

Figure 2: *Students' General Performance in Biology*

Figure 2 shows that a very low percentage of students had high performance. The students with excellent performance were only 1.3 percent; those with very good performance were 2.8 percent; and 13.5 percent had good performance. The majority performed unsatisfactorily (62.6%).

(a) Students' Performance in Biology as per Gender

Further analysis was conducted to assess whether there were significant differences in performance between female and male students. Students' performance in Biology according to gender is presented in Table 27.

Table 27: Students' Performance in Biology as per Gender

Gender	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Females	1.2	2.0	10.9	17.9	68.0	100.0
Males	1.6	3.7	16.7	22.2	55.8	100.0

The data in Table 27 show that 44.2 percent of male students scored from the excellent to the satisfactory bands in Biology compared to 32.0 percent of female students, who scored in these bands. On the other hand, 68.0 percent of female students performed unsatisfactorily compared to 55.8 percent of male students who performed unsatisfactorily. Therefore, in terms of gender, the male students' performance was higher than that of female students in the Biology assessment[5].

(b) Students' Performance in Biology According to School Locality

Further analysis was conducted to assess whether there were significant differences in performance between schools located in urban areas and those in rural areas. Their performance in Biology according to school locality is presented in Table 28.

Table 28: Students' Performance in Biology as per School Locality

School Locality	Performance Categories (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Urban	2.1	3.2	15.5	21.3	57.9	100.0
Rural	1.0	2.6	12.5	19.0	64.9	100.0

The data in Table 28 show that 42.1 percent of students from urban area schools scored from the excellent to the satisfactory bands in Biology compared to 35.1 percent of students from rural area schools, who scored in these bands. Conversely, 64.9 percent of rural area students performed unsatisfactorily compared to 57.9 percent of urban area students whose performance was unsatisfactory. Nevertheless, the data indicate that the performance difference within the bands is not big. The smallest difference is in the very good band (0.6%), and the biggest is in the Good band (3.0%). However, in terms of locality, the performance of students from urban areas was generally slightly higher than that of those from rural areas in the Biology assessment[6].

[5] The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between male and female students is statistically significant. The t-statistic is 108.717, which far exceeds the t-critical value, reinforcing the statistical significance of the difference.

[6] The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between students from rural and urban areas is statistically significant. The t-statistic is -64.011, which far exceeds the t-critical value, reinforcing the statistical significance of the difference.

(c) Students' Performance in Biology as per School Ownership

The data were further analysed based on school ownership to compare students' performance in government and non-government schools. The performance in Biology according to school ownership is presented in Table 29.

Table 29: Students' Performance in Biology as per School Ownership

School Ownership	Performance Categories (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Government	0.6	1.7	11.2	19.6	66.9	100.0
Non-government	9.3	13.2	38.1	21.2	18.2	100.0

The data in Table 29 indicate that 81.8 percent of students from non-government schools scored from the excellent to the satisfactory bands in the Biology assessment compared to 33.1 percent of students from government schools, who scored in these bands. On the other side, 66.9 percent of students from government schools performed unsatisfactorily compared to 18.2 percent of those from non-government schools, who performed unsatisfactorily. Therefore, regarding school ownership, the performance of non-government school students was higher than that of government school students in the Biology assessment[7].

(d) Students' Performance in Different Competences and Skill Levels in Biology

Students' performance on each competence in Biology assessment is shown in Table 30.

[7] The results suggest a highly significant difference in Biology scores between the government and non-government groups. Specifically, the mean Biology score for the non-government group (49.19) is substantially higher than that of the government group (26.85). The p-value of 0.000 indicates that this difference is statistically significant. The t-statistic of -371.321 is quite large, reinforcing the evidence of a significant distinction between the two groups. Overall, these results suggest that ownership (Government vs. Non-Government) is associated with a significant difference in Biology scores.

Table 30: Students' Performance on Biology Competences

S/N	Competence	Categories of Performance				
		Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.	4.9	2.1	8.9	15.4	68.8
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems.	8.1	4.9	18.8	24.7	43.6
3.	Use of scientific procedures and practical skills in studying biology.	10.8	9.7	24.7	19.0	35.9
4.	Group organisms according to their similarities and differences	3.9	3.1	9.5	12.9	70.7
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals.	1.9	2.0	8.3	13.3	74.5
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment.	4.0	3.1	13.0	21.8	58.1
7.	Use of biological practical skills in studying various physiological processes in plants and animals	2.6	3.0	9.9	29.6	54.9

Table 30 reveals that students' performance in the Unsatisfactory band was highest in all competences; extreme cases being on the competences *Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals* (74.5%); *Group organisms according to their similarities and differences* (70.7%); and *Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life* (68.77%).

Further analysis indicated that the students' performance in different skill levels in the Biology assessment showed that 3 out of 7 competences, S/N 1, 3 and 4 and S/2, 6 and 7 had the 3>2>1 and 3>1>2 orders of difficulty, respectively. A summary of their performance at different levels in Biology is shown in **Appendix 7**.

Their scripts revealed that most students who attained low scores had insufficient knowledge of the tested concepts. Another challenge was

their inability to understand the demands of the questions. Hence, the students either provided responses that were contrary to the requirements of the questions or gave partially correct responses. Moreover, some students had poor proficiency in the English language, which hindered them from expressing their ideas well. The poor proficiency also hindered some of them from understanding the requirements of the questions.

4.2.3 Students' Performance in English Language

Students' performance in the English Language according to different categories is shown in Figure 3.

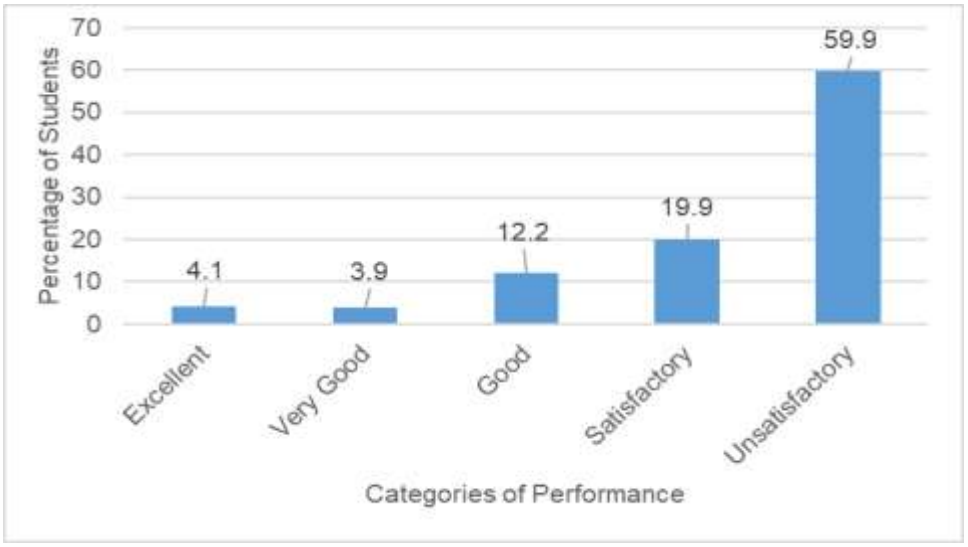

Figure 3*: Students' General Performance in English Language*

Figure 3 indicates that most students (59.9%) were in the unsatisfactory category. Their performance in other categories is very low: Excellent (4.1%), Very good (3.9%), Good (12.2%) and Satisfactory (19.9%).

(a) Students' Performance in English Language as per Gender

The data was further analysed based on gender to compare the performance of the two groups of students. The students' performance in the English Language according to gender is presented in Table 31.

Table 31: Students' Performance in English Language as per Gender

Gender	Performance Categories (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Females	4.3	3.5	9.8	18.3	64.1	100.0
Males	3.8	4.5	15.2	21.9	54.6	100.0

Table 31 shows that 45.4 percent of male students scored from the excellent to the satisfactory bands in English Language compared to 35.9 percent of female students, who scored in these bands. Conversely, 64.1 percent of female students performed unsatisfactorily compared to 54.6 percent of male students, who also performed unsatisfactorily. However, in the excellent band, female students performed higher (4.3%) than male students (3.8%). Nonetheless, the male students generally performed higher in English Language than the female students[8].

(b) Performance in the English Language as per School Locality

Further analysis was done to assess whether there were significant differences in performance between students in rural schools and those in urban schools. Their performance in English Language according to the school's locality is presented in Table 32.

[8] The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between male and female students is statistically significant. Also, the t-statistic is 64.531, which far exceeds the t-critical value, reinforcing the statistical significance of the difference.

Table 32: Students' Performance in English Language as per School Locality

School Locality	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Urban	6.8	6.4	14.5	21.7	50.6	100.0
Rural	2.7	2.7	11.0	19.0	64.6	100.0

The data in Table 32 indicates that 49.4 percent of students from urban schools scored from the excellent band to the satisfactory band in English Language compared to 35.4 percent of students from rural schools, who scored in these bands. However, 64.6 percent of the rural school students performed unsatisfactorily compared to 50.6 percent of the urban school students, who performed unsatisfactorily. Thus, in terms of locality, the performance of students from urban schools in English Language assessment was higher than that of those from rural schools[9].

(c) Students' Performance in English Language Assessment per School Ownership

The data analysis further sought to find whether there was a significant difference in students' performance based on school ownership. The students' performance in the English Language according to school ownership is presented in Table 33.

Table 33: Students' Performance in English Language as per School Ownership

School Ownership	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Government	1.5	2.7	11.1	20.4	64.3	100.0
Non-Government	30.1	17.0	23.4	14.4	15.1	100.0

[9] The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between students from rural and urban areas is statistically significance. The t-statistic is -145.863, which far exceeds the t-critical value, reinforcing the statistical significance of the difference.

Table 33 indicates that 84.9 percent of students from non-government schools scored from the excellent band to the satisfactory band in English Language assessment compared to 35.7 percent of students from government schools, who scored in these bands. In contrast, 64.3 percent of students from government schools performed unsatisfactorily compared to 15.1 percent of those from non-government schools, whose performance was also unsatisfactory. Therefore, in terms of school ownership, the performance of students from non-government schools in the English Language was higher than that of students from government schools[10].

[10] The results suggest a highly significant difference in English scores between the Government and non-Government groups. Specifically, the mean percentage score in English for the non-Government group (58.56%) is substantially higher than that of the Government group (28.54%). The p-value of 0.000 indicates that this difference is statistically significant. The t-statistic of -454.013 is quite large, reinforcing the evidence of a significant distinction between the two groups.

(d) Students' Performance on Different Competences and Skill Levels in English Language

Students' performance on each competence in the English Language is shown in Table 34.

Table 34: Students' Performance on English Language Competences

S/N	Competence	Categories of Performance				
		Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Use simple English to communicate in social interactions and settings.	15.8	8.4	27.8	28.5	19.5
2.	Describe past activities and personal experiences	2.0	0.4	4.5	8.6	84.5
3.	Engage in simple conversations and transactions on familiar topics	10.3	5.3	19.5	21.8	43.1
4.	Express in English in writing, needs, feelings and ideas using appropriate vocabulary	8.2	4.4	13.9	19.1	54.3
5.	Give and respond to directions/requests using simple English sentences.	9.4	3.7	10.2	9.6	67.1
6.	Identify general and specific information on events in simple oral/written texts she/he encounters	3.3	3.4	13.5	20.9	59.0
7.	Use English to obtain, process construct and provide subject matter information in written forms	13.3	3.0	21.8	38.6	23.3
8.	Use appropriate English pronunciation in a variety of settings	8.9	6.3	19.1	20.3	45.3
9.	Interact in written for personal expression and enjoyment	7.1	3.3	12.5	17.5	59.6
10	Answer questions on simple readers and report on what he/she read	4.8	1.5	8.8	12.7	72.2

Data in Table 34 indicates that most of the students performed unsatisfactorily in eight competences but satisfactorily in two competences. They did not achieve excellent or very good or good performance on any competence. The competence *Describe past activities and personal experiences* was the most unsatisfactorily performed (84.5%), followed by *Answer questions on simple readers and report on what he/she read* (72.2%) and *Give and respond to directions/requests using simple English sentences* (67.1%). The competences on which most students performed satisfactorily were *Use English to obtain, process, construct and provide subject matter information in written form* (38.6%) and *Use simple English to communicate in social interactions and settings* (28.5%).

Data also indicated that the order of difficulty in five out of ten competences (S/N 2, 4, 5, 9 and 10) was 3>2>1, whereas that of four competences (S/N 1, 3, 6 and 7) was 3>1>2. Only one competence (S/N 8) had the order of difficulty 1>3>2. This shows that the items on level 3 were the most unsatisfactorily performed. The summary of performance on different levels in the English Language is shown in **Appendix 8.**

The analysis of the students' responses revealed that they faced challenges due to their inability to correctly follow the instructions and their inadequate knowledge of the concepts related to past activities. Other challenges include a poor command of English, inability to use the principles that govern the formation of past tense sentences and poor knowledge of the regular and irregular verbs.

4.2.4 Students' Performance in Physics

The performance of students in Physics according to different categories is shown in Figure 4.

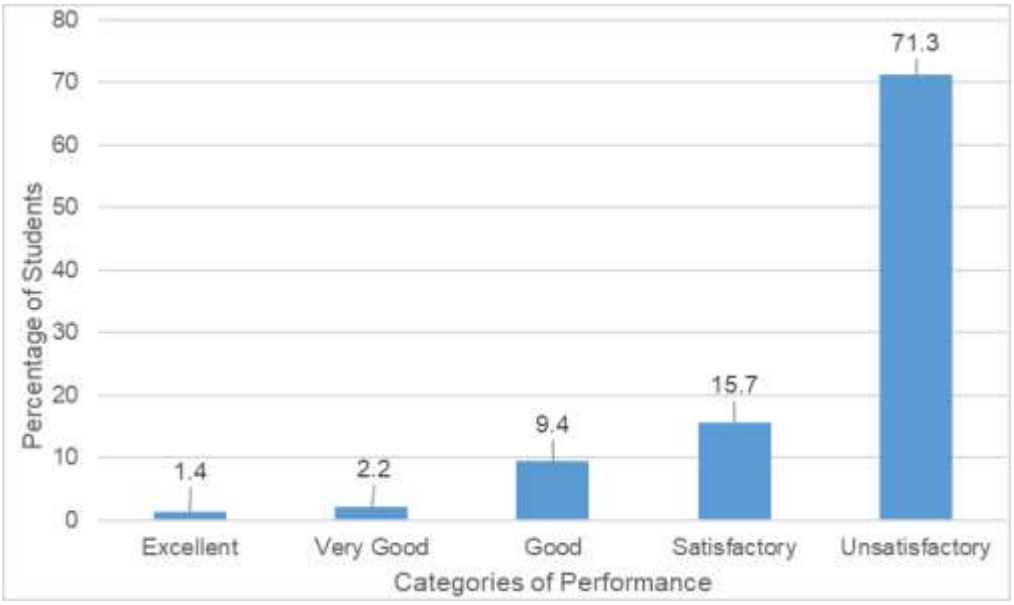

Figure 4*: Students' General Performance in Physics*

The data in Figure 4 indicate that most students (71.3%) were in the unsatisfactory performance category. Very few students (1.4 %) and (2.2%) achieved excellent and very good performance levels, respectively.

(a) Students' Performance in Physics Assessment as per Gender

The data was further analysed based on gender to compare the performance of the two groups of students. Their performance in Physics according to gender is presented in Table 35.

Table 35: Students' Performance in Physics as per Gender

Gender	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Females	1.1	1.5	7.2	13.1	77.1	100.0
Males	1.7	3.1	12.2	19.0	64.0	100.0

Table 35 shows that 36.0 percent of male students scored from the excellent band to the satisfactory band compared to 22.9 percent of female students, who scored in these bands. However, 77.1 percent of female students performed unsatisfactorily compared to 64.0 percent of male students, whose performance was also unsatisfactory. Therefore, in terms of gender, the male students' performance was higher than that of the female students in Physics assessment[11], although the general performance in Physics was low.

(b) Students' Performance in Physics as per School Locality

Analysis was also done to determine whether there was a significant difference between the schools in urban areas and those in rural areas. The students' performance in Physics according to school locality is presented in Table 36.

[11] Male students had a mean score of 27.61 percent in Physics, whereas female students had a mean score of 22.49 percent. This suggested that, on average, male students scored higher in Physics than female students. The p-value associated with the t-test is very low (0.000), indicating that the difference in the mean scores between the male and female students is statistically significant. The t-statistic is 137.124, exceeding the t-critical value, reinforcing the statistical significance of the difference.

Table 36: Students' Performance in Physics as per School Locality

Locality	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Urban	1.8	2.7	11.7	17.9	65.9	100.0
Rural	1.2	1.9	8.2	14.6	74.1	100.0

The data in Table 36 indicate that 34.1 percent of students from urban schools scored from the excellent band to the satisfactory band in the Physics assessment compared to 25.9 percent of rural area students, who scored in these bands. Furthermore, 74.1 percent of rural area students performed unsatisfactorily compared to 65.9 percent of urban area students, whose performance was unsatisfactory. In terms of performance in different bands, analysis shows a slight difference of 0.6 percent in the Excellent band between rural and urban; the same was noted in the Very Good band (0.8%). However, in terms of locality, the general performance of students from urban schools in Physics assessment was higher than that of students from rural schools[12].

(c) Students' Performance in Physics as per School Ownership

The data were also analysed to determine whether there was a significant difference in students' performance between government and non-government schools. Table 37 presents students' performance in Physics according to school ownership.

[12] Students from rural schools had a mean score of 23.67 percent Physics, while students from urban schools had a slightly higher mean score of 26.89 percent. The p-value associated with the t-test is very low (0.000), indicating that the difference in mean scores between the students from rural and urban schools is statistically significant. The t-statistic is -81.217, which far exceeds the t-critical value, reinforcing the statistical significance of the difference.

Table 37: Students' Performance in Physics as per School Ownership

Ownership	Performance Categories/Bands (%)					Total (%)
	Excellent	Very Good	Good	Satisfactory	Unsatisfactory	
Government	0.6	1.4	7.5	14.8	75.7	100.0
Non-government	9.5	10.5	29.0	24.5	26.5	100.0

Table 37 reveals that 73.5 percent of the students from non-government schools scored from the excellent band to the satisfactory band in the Physics assessment compared to 24.3 percent of students from government schools, who scored in these bands. In contrast, 75.7 percent of students from government schools performed unsatisfactorily compared to 26.5 percent of those from non-government schools, whose performance was also unsatisfactory. Therefore, in terms of school ownership, the non-government school students performed higher in Physics than the government school students did[13].

(d) Students' Performance on Different Competences and Skill Levels in Physics Assessment

The students' performance on each competence in the Physics assessment is shown in Table 38.

[13] The results suggest a highly significant difference in Physics scores between the government and non-government groups. Specifically, the mean score in Physics for the non-government group (45.25%) is substantially higher than that of the Government group (22.75%). The p-value of 0.000 indicates that this difference is statistically significant. The t-statistic of -371.152 is quite large, reinforcing the evidence of a significant distinction between the two groups. Overall, these results suggest that ownership (Government vs. Non-Government) is associated with a significant difference in Physics scores.

Table 38: Students' Performance on Physics Competences

S/N	Competence	Categories of Performance				
		Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Apply laws, principles of Physics in daily life.	14.0	5.1	11.6	12.1	57.2
2.	Practice safety rules in daily life.	2.7	1.4	4.1	9.6	82.2
3.	Make appropriate measurements of physical quantities.	11.0	3.8	12.4	11.4	61.4
4.	Use scientific skills to identify nature and properties of matter.	7.6	6.0	21.7	24.5	40.2
5.	Apply the laws of reflection of light in daily life.	3.0	1.8	4.2	5.2	85.8
6.	Apply electricity and Magnetism knowledge in daily life.	1.1	1.3	8.2	15.4	74.0
7.	Apply the concepts of turning forces in daily life	2.3	1.9	3.1	4.6	88.0
8.	Use simple Machines to simplify work	8.1	2.9	15.1	14.0	59.9

Table 38 indicates that the students' performance on all eight competences was unsatisfactory. More than 73 percent of the students performed unsatisfactorily in four competences, as follows: *Apply the concepts of turning forces in daily life* (88.0%), *Apply the laws of reflection of light in daily life* (85.8%), *Practise safety rules in daily life* (82.2%), and *Apply electricity and Magnetism knowledge in daily life* (74.0%).

Moreover, data indicated seven out of eight competences (S/N 1, 2, 3, 5, 6, 7 and 8) had the 3>2>1 order of item difficulty. However, competence S/N 4 had the 2>3>1 order. This shows that the students performed more unsatisfactorily on the items at level 3 than the items at levels 2 and 1 in Physics. The summary of performance on different levels in Physics is shown in **Appendix 9**.

The analysis revealed that students faced significant challenges in attempting the items. Inadequate knowledge and skills in the tested concepts were among the main reasons for most students' unsatisfactory performance. Many of them provided extraneous responses, contrary to the requirement of the questions, yet others skipped some questions or part of.

Another challenge observed was the lack of mathematical skills, which made many students fail to manipulate questions that needed

calculations, ending up with incorrect answers. Likewise, lack of drawing skills affected the students' performance, particularly on items that required them to draw diagrams, such as the pulley system and safety symbols of different materials. Moreover, some students responded with grammatical errors, especially to the questions requiring descriptions. This situation indicated that the students had difficulty in learning by using English.

Generally, students performance was low in all four assesed subjects. The students' performance in terms of gender showed a difference between male and female students in all four subjects. Male students performed better than female students. The study also found a difference in performance between government and non-government schools, with non-government schools performing higher than government schools. Likewise, a difference in performance was noted between urban and rural schools of which the urban secondary schools performed better than rural schools.

Regarding students' performance on different competences and skills, the analysis indicated that many competences fell into the unsatisfactory (red) band in all assessed subjects. Basic Mathematics and Physics had the highest percentage of students in the unsatisfactory band when compared with Biology and English Language. The findings also indicated that the assessment items at Level 3 were unsatisfactorily performed, followed by the items at Level 2 and then Level 1. The students' poor performance stemmed from the lack of sufficient knowledge, mathematical skills, and drawing skills; misinterpretation of questions; and poor mastery of English. Thus, although the government and other education stakeholders have made effort to provide in-service training to teachers including Science and Mathematics, more effort is still needed to improve teachers' teaching and assessment skills.

4.3 Teachers' Qualifications, Experience and Grades Attained in Teaching Subjects

The study also intended to establish teachers' qualifications, teaching experience and grades attained in their teaching subjects. This section establishes whether background information affected the students' performance.

4.3.1 Teachers' Qualifications

Teachers' qualifications are essential for shaping students' performance and academic outcomes. Teachers with higher levels of education and specialised training are expected to be more effective in the classroom, fostering a positive learning environment and enhancing students' cognitive development.

Furthermore, teachers who hold advanced degrees in their teaching subjects are better equipped to impart in-depth knowledge and critical thinking skills. These well-qualified educators can inspire and engage students, leading to improved performance and general achievements.

(a) Teachers' Qualifications as per School Locality

Table 39 presents statistics on teachers' qualifications according to the localities of the schools where they teach. The term *locality* in this context refers to whether the school is in a rural or urban area.

Table 39: Teachers' Qualifications as per Locality

Qualification	School Locality	
	Rural (%)	Urban (%)
Diploma	44.8	34.6
Bachelor	53.2	61.2
Master	1.3	2.8
PhD	0.0	0.5
Other	0.7	0.8
Total	**100.0**	**100.0**

Table 39 shows that diploma holders in rural schools exceeded those who were in urban schools by 10.2 percent. However, teachers with Bachelor's degrees were 61.2 percent in urban schools, whereas in rural schools, they were 53.2 percent. Additionally, schools located in urban areas had 2.8 percent of teachers with Master's degrees, compared to 1.3 percent of teachers in rural schools with the same qualification. A tiny percentage of teachers with PhDs were found in some urban schools. Thus, urban schools had more qualified teachers than rural ones. A few teachers had no teaching qualifications as they only completed Form VI studies. These teachers were found in non-government schools, in the Full Technician Course (FTC) and Postgraduate Diploma in Education (PGDE).

(b) Teachers' Qualifications as per School Ownership

Table 40 presents statistics of teachers' qualifications according to ownership of the schools where they teach.

Table 40: Subject Teachers' Qualifications as per School Ownership

Qualification	School Ownership (%)	
	Government	Non- Government
Diploma	46.3	27.4
Bachelor	51.6	68.6
Master	1.7	1.6
PhD	0.1	0.3
Other	0.3	2.1
Total	**100.0%**	**100.0%**

Table 40 shows that teachers with Bachelor's degrees in non-government schools were 68.6 percent, whereas those with similar qualifications in government schools were 51.6 percent. Government schools had a larger percentage of teachers with diplomas (46.3%) than the non-government schools had (27.4%); moreover, there was a minor difference of 0.1 percent of the teachers with Master's degrees between the two ownership categories. The statistics show that, generally, the non-government schools had more qualified teachers than those owned by the government. Some teachers had other qualifications, such as the Full Technician Course (FTC) and Postgraduate Diploma in Education (PGDE). Moreover, others were Form Six leavers.

The teachers' qualification statistics indicated that schools located in urban areas and those owned by non-government individuals or agencies were well supplied with more qualified teachers than those in rural areas and those owned by the Government. Additionally, the schools located in urban areas performed better than those in rural areas. Likewise, the non-government schools performed better than government schools did. The higher percentage of teachers with Bachelor's degrees (61.2%) in urban schools than those in rural schools (53.2%) might have accounted for the differences in performance according to locality. Likewise, teachers with Bachelor's

degrees in non-government schools were 68.6 percent, while those with similar qualifications in government schools were 51.6 percent.

Thus, teachers' qualifications might have contributed to the higher performance of urban and non-government schools.

4.3.2 Teachers' Teaching Experience

Teachers' teaching experience is vital for shaping students' learning outcomes. Experienced teachers have adequate knowledge, refined pedagogical skills, and a deep understanding of student needs in the classroom, which positively impacts the quality of instruction and student engagement.

Furthermore, experienced teachers are better equipped to adapt their teaching methods to meet their students' diverse learning styles and needs, creating a more inclusive and effective learning environment. Experienced teachers are more skilled in managing classroom behaviour, fostering positive relationships with students, and providing timely and constructive feedback as they navigate various classroom challenges. Ultimately, students under the guidance of experienced teachers tend to achieve better academic outcomes as these teachers offer a blend of subject expertise and effective instructional strategies that nurture student growth.

(a) Teachers' Experience According to School Locality

Table 41 presents statistics of teachers' teaching experience per the locality of the schools at which the teachers work.

Table 41: Subject Teachers' Experience per School Locality

Ranges of Years of Teaching Experience	School Locality (%)		Total (%)
	Rural	Urban	
0 – 10	74.7	25.3	100.0
11 – 20	61.4	38.6	100.0
21 – 30	56.7	43.3	100.0
31 – 40	80.0	20.0	100.0

Table 41 shows that rural schools have larger percentages of teachers in terms of their years of teaching experience in all four range categories. Eighty (80) percent of the teachers with the longest working experience work at rural schools. Although the most experienced teachers were at rural schools, their students performed poorly. The poor performance can partly be attributed to teachers' insufficient exposure to new pedagogical skills to improve their teaching methods.

(b) Teachers' Experience as per School Ownership

Table 42 presents statistics of teachers' teaching experience per ownership of the schools at which they teach.

Table 42: Subject Teachers' Experience as per School Ownership

Ranges of Years within Teaching Experience	School Ownership (%)		Total
	Government	Non-Government	
0 – 10	76.8	23.2	100.0
11 – 20	83.5	16.5	100.0
21 – 30	60.0	40.0	100.0
31 – 40	0.0	100.0	100.0

Table 42 shows that government schools had larger percentages of teachers than non-government schools had in all categories of working experience, except in the 31 to 40 years' category. The teachers with the longest working experience (31 years or above) worked at non-government schools. The longest experienced teachers might have been retired from government schools and secured teaching opportunities at the non-government secondary schools. However, it seems they contributed significantly to the teaching and learning process since students' performance in non-government schools is promising.

The FTLE findings revealed that the less experienced teachers were more concentrated in rural schools than urban ones. However, the more experienced teachers were working in non-government schools. Thus, the poor performance in rural areas and high performance in non-governmental schools might have been caused by the distribution of experienced teachers.

4.3.3 Teachers' Attained Grades

The relationship between attained grades and the teacher's ability has been a subject of interest in educational research. Several studies have shown a positive relationship between teachers' academic performance during their training and their subsequent teaching effectiveness. Teachers who earned higher grades in their teacher preparation programmes are likely to be more effective in teaching. These observations emphasise the importance of rigorous teacher training and the potential impact of academic performance during training on the teacher's ability to facilitate student learning.

However, it is essential to note that the teacher's performance is a complex interplay of various factors. Academic grades are just one of them. Other qualities such as instructional skills, classroom management and professional development also contribute significantly to the teacher's overall competency.

(a) Teachers' Attained Grades as per School Locality

Table 43 presents statistics of teachers' grades in their Certificate of Secondary Education Examination (CSEE) as per the localities of the schools where they taught.

Table 43: Subject teachers' Attained Grades in CSEE as per School Locality

Locality	Subjects	CSEE Grades (%)					Total
		A	B+	B	C	D	
Rural	Basic Mathematics	8.0	9.2	22.7	50.8	9.2	100.0
	Biology	4.9	11.5	20.5	57.8	5.3	100.0
	English Language	3.0	6.9	19.5	61.9	8.7	100.0
	Physics	4.3	9.8	21.0	57.6	7.2	100.0
Urban	Basic Mathematics	17.6	11.0	29.7	37.4	4.4	100.0
	Biology	5.5	11.0	33.0	45.1	5.5	100.0
	English Language	2.8	8.3	25.0	58.3	5.6	100.0
	Physics	7.7	5.5	29.7	45.1	12.1	100.0

The data in Table 43 show that the total percentages of the good grades (A, B+ and B) attained by teachers in their CSEE in rural schools are 39.9 percent (Basic Mathematics), 36.9 percent (Biology),

29.4 percent (English Language) and 35.1 percent (Physics). In the urban schools, the total percentages were 58.3 percent (Basic Mathematics), 49.5 percent (Biology), 36.1 percent (English Language) and 42.9 percent (Physics). Thus, more teachers at urban schools obtained good grades than teachers at rural schools.

Table 44 presents statistics of teachers' grades in their Advanced Certificate of Secondary Education Examination (ACSEE) as per the locality of the schools where they taught.

Table 44: Subject Teachers' Attained Grades in ACSEE as per School Locality

School Locality	Subjects	ACSEE Attained Grades (%)								Total
		A	B+	B	C	D	E	S	F	
Rural	Basic Mathematics	0.4	4.0	7.1	23.5	36.3	20.8	7.5	0.4	100.0
	Biology	0.4	3.8	8.0	18.5	26.9	37.0	5.0	0.4	100.0
	English Language	1.4	3.6	9.5	30.8	29.0	21.7	4.1	-	100.0
	Physics	0.4	1.9	1.5	21.2	33.7	29.5	10.6	1.1	100.0
Urban	Basic Mathematics	1.1	6.7	9.0	22.5	29.2	23.6	7.9	-	100.0
	Biology	1.2	3.5	14.0	14.0	26.7	34.9	5.8	-	100.0
	English Language	1.4	11.6	14.5	31.9	27.5	11.6	1.4	-	100.0
	Physics	1.1	1.1	10.2	12.5	34.1	27.3	13.6	-	100.0

Table 44 shows that the total percentages of good grades (A, B+ and B) attained by teachers in their ACSEE in rural schools were 11.5 percent (Basic Mathematics), 12.2 percent (Biology), 14.5 percent (English Language) and 3.8 percent (Physics). In urban schools, the total percentages were 16.8 percent (Basic Mathematics), 18.7 percent (Biology), 27.7 percent (English Language) and 12.4 percent (Physics). Thus, teachers who taught at urban schools attained a larger number of good grades than those who taught at rural schools.

Moreover, Table 45 presents statistics of teachers' grades in their Diploma in Secondary Education Examination (DSEE) per the locality of the schools where they taught.

Table 45: Subject Teachers' Attained Grades in DSEE as per School Locality

Locality	Subjects	DSEE Grades (%)							Total
		A	B+	B	C	D	E	S	
Rural	Basic Mathematics	9.1	10.7	18.2	43.0	15.7	3.3	-	100.0
	Biology	6.3	8.9	17.9	48.2	16.1	0.9	1.8	100.0
	English Language	4.5	6.4	15.5	44.5	27.3	1.8	-	100.0
	Physics	3.2	10.1	12.7	44.9	26.6	1.9	0.6	100.0
Urban	Basic Mathematics	21.3	14.9	19.1	42.6	2.1	-	-	100.0
	Biology	7.9	10.5	10.5	57.9	10.5	-	2.6	100.0
	English Language	-	10.7	35.7	35.7	14.3	3.6	-	100.0
	Physics	10.7	16.1	10.7	39.3	19.6	3.6	-	100.0

In terms of the grades the teachers got in their DSEE data, Table 45 shows that the total percentages of good grades (A, B+ and B) by teachers in rural schools were 38.0 percent (Basic Mathematics), 33.1 percent (Biology), 26.4 percent (English Language) and 26.0 percent (Physics). In urban schools, the total percentages were 55.3 percent (Basic Mathematics), 28.9 percent (Biology), 46.4 percent (English Language) and 37.5 percent (Physics). Thus, good grades were attained more by teachers teaching at urban schools than those teaching at rural schools.

(b) Teachers' Grades Attained as per School Ownership

Table 46 presents statistics of teachers' grades in their CSEE as per the ownership of the schools where they taught.

Table 46: Subject Teachers' Attained Grades in CSEE as per School Ownership

School Ownership	Subjects	CSEE Grades (%)					Total (%)
		A	B+	B	C	D	
Government	Basic Mathematics	5.4	9.6	22.9	52.5	9.6	100.0
	Biology	3.8	6.5	24.3	59.3	6.1	100.0
	English Language	2.8	5.7	19.1	63.0	9.3	100.0
	Physics	4.5	7.3	19.7	59.5	9.0	100.0
Non- government	Basic Mathematics	24.7	10.1	29.2	32.6	3.4	100.0
	Biology	9.7	29.2	22.2	36.1	2.8	100.0
	English Language	3.5	14.0	28.1	52.6	1.8	100.0
	Physics	7.7	14.1	35.9	35.9	6.4	100.0

The data in Table 46 shows that the total percentages of good grades (A, B+ and B) the teachers in government schools got in CSEE were 37.0 percent (Basic Mathematics), 34.6 percent (Biology), 27.6 percent (English Language) and 31.5 percent (Physics). In non-government schools, the total percentages were 64.0 percent (Basic Mathematics), 61.1 percent (Biology), 45.6 percent English Language) and 57.7 percent (Physics). Thus, more teachers in non-government schools got good grades than those in government schools.

In addition, Table 47 presents statistics of teachers' grades in their ACSEE as per the ownership of the schools where they taught.

Table 47: Subject Teachers' Attained Grades in ACSEE as per School Ownership

School Ownership	Subjects	ACSEE Grades (%)								Total (%)
		A	B+	B	C	D	E	F	S	
Government	Basic Mathematics	-	1.7	4.7	23.5	36.3	23.1	0.4	10.3	100.0
	Biology	0.4	2.7	5.5	15.7	26.3	42.7	0.4	6.3	100.0
	English Language	1.7	3.4	8.0	30.0	29.5	23.2	-	4.2	100.0
	Physics	0.7	1.4	0.7	17.4	35.5	30.4	1.1	12.7	100.0
Non-government	Basic Mathematics	2.5	13.6	16.0	22.2	28.4	17.3	-	-	100.0
	Biology	1.4	7.2	24.6	23.2	29.0	13.0	-	1.4	100.0
	English Language	-	15.1	22.6	35.8	24.5	1.9	-	-	100.0
	Physics	-	2.6	14.5	25.0	27.6	23.7	-	6.6	100.0

Table 47 indicates that the percentages of good grades (A, B+ and B) attained by teachers in ACSEE in government schools were 6.4 percent (Basic Mathematics), 8.6 percent (Biology), 13.1 percent (English Language) and 2.8 percent (Physics). In non-government

schools, the total percentages were 32.1 percent (Basic Mathematics), 33.2 percent (Biology), 37.7 percent English Language) and 17.1 percent (Physics). Thus, good grades were attained more by teachers who taught in non-government schools than by those who taught in government schools.

Moreover, Table 48 presents statistics of teachers' grades in their DSEE as per the ownership of the schools where they taught.

Table 48: Subject Teachers' Attained Grades in DSEE as per School Ownership

School Ownership	Subject	DSEE Attained Grades (%)							Total (%)
		A	B+	B	C	D	E	S	
Government	Basic Mathematics	10.6	11.3	19.0	43.7	13.4	2.1	-	100.0
	Biology	6.7	8.1	15.6	51.9	14.8	0.7	2.2	100.0
	English Language	2.4	4.8	19.2	45.6	26.4	1.6	-	100.0
	Physics	5.5	8.7	11.5	45.4	26.2	2.2	0.5	100.0
Non-government	Basic Mathematics	23.1	15.4	15.4	38.5	3.8	3.8	-	100.0
	Biology	6.7	20.0	20.0	40.0	13.3		-	100.0
	English Language	15.4	30.8	23.1	15.4	7.7	7.7	-	100.0
	Physics	3.2	29.0	16.1	32.3	16.1	3.2	-	100.0

In terms of the teachers' grades obtained in their DSEE, Table 48 shows that the total percentages of good grades (A, B+ and B) attained by teachers in government schools were 40.9 percent (Basic Mathematics), 30.4 percent (Biology), 26.4 percent (English Language) and 25.7 percent (Physics). In non-government schools, the total percentages were 53.9 percent (Basic Mathematics), 46.7 percent (Biology), 69.3 percent (English Language) and 48.3 percent (Physics). Thus, more teachers in non-government schools got good grades than those in government schools.

Findings revealed that the schools that performed better were those in urban areas and owned by private institutions/individuals. The same school categories had teachers who obtained high percentages of good academic grades in their CSEE, ACSEE and DSEE. Thus, the good performance in urban schools and those owned by private agencies might have been accounted for by the good academic grades of the teachers during their training.

4.4 Establishing Curriculum Coverage in Terms of Competences

A curriculum refers to the knowledge and skills students are expected to learn. It includes the learning standards the students are expected to meet, the units and lessons that teachers teach, the assignments and projects given to students, and books, materials, videos, and presentations used in a given subject. The curriculum covers competences such as content, methods, activities, and resources. In a program of study, the curriculum specifies what will be taught and what students will do. It consists of resources created by teachers, textbooks and national standards.

One of the specific objectives of this investigation was to establish curriculum coverage in terms of topics. This objective was achieved through the teachers' questionnaire. The teachers were asked to identify topics they had covered in their respective subjects from January 2022 to June 2023. The targeted topics were Form One and the first term of Form Two topics according to the PO-RALG subject instructional calendar. However, the competences represented the topics in the questionnaire. The findings from the competence coverage were then compared with students' performance as per subject by considering school ownership and locality variables.

(a) Competence Coverage with Students' Performance in Biology

Teachers' coverage of Biology competences is compared with students' performance in Table 49.

Table 49: Comparing Competence Coverage with Students' Performance in Biology

S/N	Competence	Coverage (%)	Students' Performance (%)
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.	98.4	31.23
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems.	98.9	56.42
3.	Use of scientific procedures and practical skills in studying biology.	98.8	64.11
4.	Group organisms according to their similarities and differences	98.6	29.34
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals.	98.2	25.51
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment.	98.4	41.99
7.	Use of biological practical skills in studying various physiological processes in plants and animals	97.3	45.10

The data in Table 49 show that competence coverage in Biology is high (from 97.3 to 98.9%). There is only a slight difference (1.6%) in terms of coverage. However, the performance on the competences varies. The highest performance is on the competence *Use of scientific procedures and practical skills in studying Biology* (64.11%), and the lowest is on the competence *Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals* (25.51%). The difference between these two competences is 38.60 percent.

(b) Competence Coverage with Students' Performance in English Language

The coverage of English Language competences with students' performance is shown in Table 50.

Table 50: Comparing Competence Coverage with Students' Performance in English Language

S/N	Competence	Coverage (%)	Students' Performance (%)
1.	Use simple English to communicate in social interactions and settings.	99.9	80.5
2.	Describe past activities and personal experiences.	91.5	15.5
3.	Engage in simple conversations and transactions on familiar topics.	97.4	56.9
4.	Express in English in writing, needs, feelings and ideas using appropriate vocabulary.	95.3	45.7
5.	Give and respond to directions/requests using simple English sentences.	93.8	32.9
6.	Use appropriate English pronunciation in a variety of settings.	91.9	54.7
7.	Interact in writing for personal expression and enjoyment.	88.8	40.4
8.	Answer questions on simple readers and report on what he/she read.	83.7	27.8

Table 50 indicates that the competence coverage in the English Language is high (from 83.7 to 99.9%). The competence *Use simple English to communicate in social interactions and settings* had the highest coverage, and it was the most performed (80.5%). On the one hand, the competence *Answer questions on simple readers and report on what he/she read* was the lowest covered, and the lowest performance was on the competence *Describe past activities and personal experiences* (15.5%).

(c) Competence Coverage with Students' Performance in Basic Mathematics

The coverage of the Basic Mathematics competences and students' performance is shown in Table 51.

Table 51: Comparing Competence Coverage with Students' Performance in Basic Mathematics

S/N	Competence	Coverage (%)	Students' Performance (%)
1.	Distinguish different types of numbers and solve problems.	71.2	22.14
2.	Convert units.	76.7	16.50
3.	Estimate and compute numbers accurately.	85.4	16.44
4.	Do scale drawings and geometrical transformations.	84.6	13.93
5.	Solve problems on perimeters and areas.	91.0	8.92
6.	Factorize and solve problems.	95.6	10.5
7.	Solve problems on ratios, profit and loss, and simple interest.	96.9	20.5
8.	Graph and interpret linear equations.	96.3	18.7
9.	Find relationships among logarithms, exponents and radicals.	98.5	13.3

The data in Table 51 show that the competence *Distinguish different types of numbers and solve problems* was covered by 71.2 percent of teachers, which is the lowest. In contrast, the competence *Find relationships among logarithms, exponents and radicals* was covered by 98.5. percent of the teachers. The difference in coverage between the two competences is 27.3 percent. However, the performance on all the competences is low (from 8.92 to 22.14%).

(d) The Competence Coverage with Students' Performance in Physics

The coverage of the Physics competences and students' performance is shown in Table 52.

Table 52: Comparing Competence Coverage with Students' Performance in Physics

S/N	Competence	Coverage (%)	Students Performance (%)
1.	Apply laws, principles of Physics in daily life.	98.3	42.83
2.	Practice safety rules in daily life.	97.7	59.76
3.	Make appropriate measurements of physical quantities.	97.7	38.59
4.	Use scientific skills to identify nature and properties of matter.	97.6	17.84
5.	Apply the laws of reflection of light in daily life.	97.8	14.17
6.	Apply electricity and Magnetism knowledge in daily life.	98.4	26.04
7.	Apply the concepts of turning forces in daily life.	98.0	11.96
8.	Use simple Machines to simplify work.	97.4	40.14

Table 52 shows that the competence coverage in Physics was high (97.4%– 98.4%), with only a small difference of 1 percent coverage. However, the performance on the competences varied. The highest performance was on the competence *Practice safety rules in daily life* (59.76%), and the lowest was on the competence *Apply the concepts of turning forces in daily life* (11.96%). Hence, the performance difference between the highest and the lowest was 47.8 percent.

The general results presented in Tables 49 to 52 show that although the percentage of competence coverage was high (71.2%– 99.9%), the performance on most competences was low (below 50.0%). For instance, the students' lowest performance was on the topic *Solving problem of perimeters and areas* (8.92%) in Basic Mathematics; however, its competence coverage was 91.1 percent. There was also a gap between performance on the topics — between and within subjects. This indicates that the students' performance did not rely only on competence coverage, but might be other factors such as teaching method, facilities and teaching and learning environment.

4.4.1 Competence Coverage and Students' Performance Based on School Ownership

Analysis was done on the difference between government and non-government schools in terms of competence coverage with respect to performance in the four subjects.

(a) Competence Coverage and Students' Performance in Biology between Government and Non-Government Schools

Competence coverage and students' performance in Biology between government and non-government schools is shown in Table 53.

Table 53: Comparing Competence Coverage with Students' Performance in Biology between Government and Non-Government Schools

S/N	Competence	Government		Non-Government	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.	98.5	27.2	97.5	72.7
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems.	99.1	53.4	97.5	87.3
3.	Use of scientific procedures and practical skills in studying biology.	98.9	61.8	97.5	87.4
4.	Group organisms according to their similarities and differences.	98.8	25.6	97.5	68.1
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals.	98.2	21.8	98.8	63.7
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment.	98.5	38.6	97.5	76.1
7.	Use of biological practical skills in studying various physiological processes in plants and animals.	97.4	42.6	96.3	71.0

Table 53 shows that the competence coverage in Biology was slightly higher in the government schools in all competences, except in the competence *Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals,* which was slightly higher by 0.6 percent in the non-government schools. Students' performance in Biology in the non-government schools was generally higher than in the government schools. The highest difference of 45.5 percent was noted on the competence *Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.*

(b) Competence Coverage and Students' Performance in English Language between Government and Non-Government Schools

Competence coverage and students' performance in English Language between government and non-government schools is shown in Table 54.

Table 54: **Comparing Competence Coverage with Students' Performance in English Language between Government and Non-Government Schools**

S/N	Competence	Government		Non-Government	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Use simple English to communicate in social interactions and settings.	99.8	79.0	100	95.4
2.	Describe past activities and personal experiences.	90.5	11.4	100	57.4
3.	Engage in simple conversations and transactions on familiar topics.	97.1	53.7	100	89.6
4.	Express in English in writing, needs, feelings and ideas using appropriate vocabulary.	94.7	41.7	100	86.8
5.	Give and respond to directions/requests using simple English sentences.	93.2	28.7	98.8	76.6
6.	Use appropriate English pronunciation in a variety of settings.	90.9	51.8	100	83.9
7.	Interact in written for personal expression and enjoyment.	87.8	36.5	97.5	80.2
8.	Answer questions on simple readers and report on what he/she read.	82.3	23.7	95.0	70.6

Table 54 shows that both competence coverage and performance in the English Language were higher in non-government schools than in government schools. The highest difference in coverage was 12.7 percent on the competence *Answer questions on simple readers and report on what he/she read*. The difference in performance on all competences is big, and the biggest was 47.9 percent on the competence *Give and respond to directions/requests using simple English sentences.*

(c) Competence Coverage and Students' Performance in Basic Mathematics between Government and Non-Government Schools

Competence coverage and students' performance in the Basic Mathematics between government and non-government schools is shown in Table 55.

Table 55: Comparing Competence Coverage with Students Performance in Basic Mathematics between Government and Non-Government Schools

S/N	Competence	Government		Non-Government	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Distinguish different types of numbers and solve problems.	67.0	18.5	93.8	59.5
2.	Convert units.	73.1	13.9	96.3	43.6
3.	Estimate and compute numbers accurately.	83.1	13.1	97.5	50.3
4.	Do scale drawings and geometrical transformations.	82.2	10.9	97.5	45.3
5.	Solve problems on perimeters and areas.	90.0	6.2	96.3	34.8
6.	Factorize and solve problems.	95.2	8.4	97.5	32.2
7.	Solve problems on ratios, profit and loss, and simple interest.	96.8	17.0	97.5	56.8
8.	Graph and interpret linear equations.	96.1	15.7	97.5	49.6
9.	Find relationships among logarithms, exponents and radicals.	98.6	11.3	97.5	33.7

Based on the data in Table 55, the difference in competence coverage between the government and non-government schools in Basic Mathematics is small, except in the competence *Distinguish different types of numbers and solve problems*. The lowest competence coverage in the non-government schools was 93.8 percent, where that of the government schools was 67.0 percent, a stark difference of 26.8 percent. The data also indicate that the performance on the competences was higher in the non-government schools. The biggest difference was 41.0 percent in the competence *distinguishing different types of numbers and solving problems*.

(d) Competence Coverage and Students' Performance in Physics between Government and Non-Government Schools

The comparison of competence coverage with students' performance in Physics between the government and non-government schools is shown in Table 56.

Table 56: Comparing Competence Coverage and Students' Performance in Physics between Government and Non-Government Schools

S/N	Competence	Government		Non-Government	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Apply laws, principles of Physics in daily life.	98.1	40.3	100	69.2
2.	Practice safety rules in daily life.	97.4	14.3	100	54.4
3.	Make appropriate measurements of physical quantities.	97.6	35.0	98.8	75.8
4.	Use scientific skills to identify nature and properties of matter.	97.3	57.1	100	86.7
5.	Apply the laws of reflection of light in daily life.	97.6	10.2	100	54.5
6.	Apply electricity and Magnetism knowledge in daily life.	98.2	22.6	100	61.5
7.	Apply the concepts of turning forces in daily life.	97.8	9.1	100	41.6
8.	Use simple Machines to simplify work.	97.2	36.9	100	73.4

Table 56 shows that competence coverage in the non-government schools was slightly higher than in the government schools. Besides, competence performance in the non-government schools was much higher than in the government schools. The competence *Apply the laws of reflection of light in daily life* had the largest performance gap (43.3%) between the government and non-government schools.

The results show that there was a difference in competence coverage between the government schools and non-government schools. In all four subjects (Basic Mathematics, Biology, English Language and Physics), the non-government schools covered more competences than the government schools with marginal difference. The findings also show that non-government school students performed higher

than government school students. Moreover, there was a significant difference between the students' performance in government and in non-government schools. Basic Mathematics had the lowest performance percentage (32%) in non-government schools and (6.2%) in government schools. In English, the competence *Use simple English to communicate in social interactions and settings* had the highest performance in the government schools (79%) and in the non-government schools (95%). On the other hand, Biology was the most covered in government schools, Basic Mathematics was the least covered; however, the difference was marginal. In non-government schools, Physics was the most covered subject, whereas Basic Mathematics was the least covered. Likewise, the coverage difference was marginal. Thus, although the coverage was roughly similar, students' performance differed based on school ownership, which can be attributed to factors such as teaching and learning facilities and motivation for teaching and learning.

4.4.2 Competence Coverage and Students' Performance as per School Locality

Analysis was done to determine the competence coverage compared to students' performances in rural and urban schools.

(a) Competence Coverage and Students' Performance in Biology between the Rural and Urban Schools

The competence coverage and students' performance in the Biology subject between rural and urban schools is shown in Table 57.

Table 57: Comparing Topic Coverage with Students' Performance in Biology between Rural and Urban Schools

S/N	Competence	Rural		Urban	
		Coverage (%)	Performance (%)	Coverage (%)	performance (%)
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.	98.9	28.4	95.0	36.9
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems.	99.7	54.9	94.0	59.4
3.	Use of scientific procedures and practical skills in studying biology.	99.8	63.4	92.0	65.5
4.	Group organisms according to their similarities and differences.	99.7	28.8	92.0	30.4
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals.	99.5	24.4	90.0	27.7
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment.	99.4	39.7	92.0	46.2
7.	Use of biological practical skills in studying various physiological processes in plants and animals.	98.6	43.9	89.0	47.5

Table 57 shows that the coverage of Biology competences was higher in the rural schools than in the urban schools. The biggest difference in the coverage was 9.6 percent in the competence *Use of biological practical skills in studying various physiological processes in plants and animals,* whose coverage in the rural schools was 98.6 percent and in the urban schools was 89.0 percent. Analysis also indicates that performance was lower in the rural schools than in the urban schools. The biggest difference between the two school categories was 8.5 percent on the competence *Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life*. Hence, the data do not show relationship between coverage and performance.

(b) Competence Coverage and Students' Performance in English Language between Rural and Urban Schools

Competence coverage and students' performance in English Language between the rural and urban schools is shown in Table 58.

Table 58: Comparing Competence Coverage with Students' Performance in English Language between Rural and Urban Schools

S/N	Competence	Rural		Urban	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Use simple English to communicate in social interactions and settings.	100	78.6	99.1	84.2
2.	Describe past activities and personal experiences.	91.0	12.1	94.5	22.3
3.	Engage in simple conversations and transactions on familiar topics.	97.2	53.8	99.1	63.1
4.	Express in English in writing, needs, feelings and ideas using appropriate vocabulary.	94.6	40.8	99.1	55.6
5.	Give and respond to directions/requests using simple English sentences.	93.0	29.7	98.2	39.4
6.	Use appropriate English pronunciation in a variety of settings.	91.6	52.2	93.6	59.6
7.	Interact in written for personal expression and enjoyment.	88.2	37.0	92.7	47.2
8.	Answer questions on simple readers and report on what he/she read.	83.3	23.4	86.2	36.8

Table 58 shows that competence coverage in the English Language was higher in urban schools than in rural schools, except for the competence *Use simple English to communicate in social interactions and settings,* whose coverage was slightly higher (0.9%) in the rural schools. In the same way, students' performance in English Language was higher in urban schools than in rural schools. The competence *Express in English in writing, needs, feelings and ideas using appropriate vocabulary* had the biggest difference (14.8%) in students' performance, where performance was 55.6 percent in the urban schools and 40.8 percent in the rural schools.

(c) Competence Coverage and Students' Performance in Basic Mathematics between Rural and Urban Schools

Table 59 compares competence coverage with students' performance in Basic Mathematics between the rural and urban schools.

Table 59: Comparing Competence Coverage with Students' Performance in Basic Mathematics between Rural and Urban Schools

S/N	Competence	Rural		Urban	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Distinguish different types of numbers and solve problems.	66.5	18.6	89.5	29.1
2.	Convert units	71.8	14.7	96.2	20.0
3.	Estimate and compute numbers accurately	82.2	14.4	98.1	20.5
4.	Do scale drawings and geometrical transformations	82.7	12.4	92.4	17.0
5.	Solve problems on perimeters and areas	89.2	7.8	98.1	10.5
6.	Factorize and solve problems.	94.5	9.6	100	12.3
7.	Solve problems on ratios, profit and loss, and simple interest.	96.4	18.7	99.0	24.2
8.	Graph and interpret linear equations.	96.1	17.7	97.1	20.8
9.	Find relationships among logarithms, exponents and radicals.	98.3	12.8	99.0	14.4

Table 59 shows that competence coverage and performance in Basic Mathematics were higher in urban schools than in rural schools for all the competences assessed. The highest difference in coverage was 24.4 percent on the competence *Convert units,* whereby the coverage in the urban schools was 96.2 percent and in the rural schools was 71.8 percent. The highest difference in performance was 10.5 percent on the competence *Distinguish different types of numbers and solve problems,* whose performance in the urban schools was 29.1 percent and in the rural schools was 18.6. However, the data did not show any significant relationship between competence coverage and students' performance on the competences.

(d) Competence Coverage and Students' Performance in Physics Subject between Rural and Urban Schools

Table 60 compares competence coverage with students' performance in Physics between rural and urban schools.

Table 60: Comparing competence Coverage with Students' Performance in Physics between Rural and Urban Schools

S/N	Competence	Rural		Urban	
		Coverage (%)	Performance (%)	Coverage (%)	Performance (%)
1.	Apply laws, principles of Physics in daily life.	99.7	41.1	89.5	46.2
2.	Practice safety rules in daily life.	99.0	16.5	89.5	20.6
3.	Make appropriate measurements of physical quantities	99.1	26.3	88.6	43.1
4.	Use scientific skills to identify nature and properties of matter	98.9	55.6	89.5	68
5.	Apply the laws of reflection of light in daily life.	99.0	13.1	90.4	16.3
6.	Apply electricity and Magnetism knowledge in daily life.	99.1	14.4	93.4	29.4
7.	Apply the concepts of turning forces in daily life.	99.0	11	92.1	13.9
8.	Use simple Machines to simplify work	97.4	40.4	97.4	39.7

Table 60 indicates that the coverage of Physics competences in rural schools was slightly higher than in urban schools. The competence *Use simple machines to simplify work* was covered equally (97.4%) in both urban and rural schools. However, students' performance was higher in the urban schools than rural schools, except for the competence *Use simple machines to simplify work,* whose performance was 0.7 percent higher in the rural schools. There was no observed relationship between competence coverage and students' performance.

The data from Tables 57 to 60 indicate that competence coverage in Biology and Physics was higher in the rural schools than in the urban schools. In contrast, the coverage in English Language and Basic Mathematics subjects was higher in urban schools than in rural ones. Several factors might have contributed to the variations between the

rural and urban schools, including the number of teachers and the available infrastructures. Though more competences were mostly covered in Physics and Biology in the rural schools, the performance on most competences in all subjects was higher in the urban schools than in the rural ones. In rural schools, the least covered competences were from Basic Mathematics, and the most covered competences were from English Language; however, the difference was small. In the urban schools, the least covered subject was Physics, and the most covered was English Language; likewise, the difference was small.

The students' lowest performance by competence in rural schools was 7.8 percent in Basic Mathematics, and the highest was 78.6 percent in English Language. In the urban schools, the students' lowest performance by competences was 10.5 percent in Basic Mathematics, whereas the highest was 84.2 percent in English Language. These results show that performance in Basic Mathematics was very low in both the rural and urban schools. This shows that Mathematics needs prompt measures to reach the same level of performance as the other subjects.

Generally, the results on the competences coverage in the four subjects were good. This signifies that the teachers made considerable efforts to ensure they covered all competences in time per the PO-RALG calendar. However, competence coverage was slightly higher in non-government than in government schools. On most competences, the difference in coverage was below 10 percent; however, the difference was highest (26.8%) in the competence *Distinguish different types of numbers and solve problems* in Basic Mathematics. Moreover, competence coverage in the rural schools was slightly higher in Biology and Physics. In urban schools, competence coverage was somewhat higher in English Language and Basic Mathematics. Similarly, the difference between the rural and urban schools was below 10 percent in most competences, except for a few. For instance, the competence *Convert units* in Basic Mathematics had the highest coverage difference of 24.4 percent between the two school categories.

Although teachers covered most competences in all four subjects well, students' performance was unsastifactory. Moreover, the non-

government schools significantly outperformed the government schools (>30%). The highest difference was 47.9 percent in the competence *Give and respond to directions/requests using simple English sentences* in English Language. The difference in performance between rural and urban schools in most competences was below 10 percent; however, the highest was 16.8 percent in the competence *Make appropriate measurements of physical quantities* in the Physics subject.

The low performance could be attributed to several reasons. These include large class sizes in some schools in urban areas and insufficient numbers of teachers (teaching load) in some rural areas, inappropriate teaching and learning methods and difficult accessibility of the school to some students and teachers.

4.5 Establishing Student Teachers' Competences

The fourth objective of this study was to establish student teachers' competences in the subject content in their areas of specialisation. Finalist student teachers who were pursuing their diploma in education studies took the same FTLE assessment taken by the Form Two students based on the subjects they would be teaching in secondary school. The subjects and the number of student teachers who participated in the assessment were as follows: Basic Mathematics (250), Biology (408), English Language (100), and Physics (244).

4.5.1 Student Teachers' General Performance

The analysis of the student teachers' performance was based on five categories: 75–100 percent (Excellent), 65–74 percent (Very good), 45–64 percent (Good), 30–44 percent (Satisfactory) and 0–29 percent (Unsatisfactory). Figure 5 presents their general performance in the four subjects.

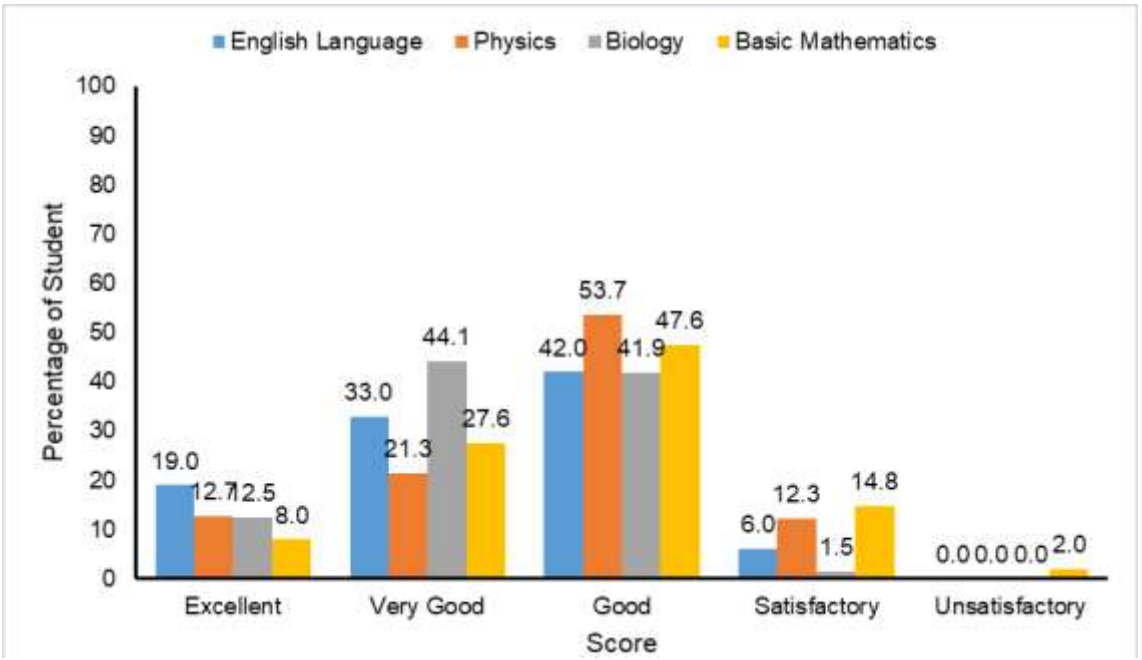

Figure 5: *The student teachers' general performance in the four subjects*

Figure 5 shows that most of the student teachers had Good, Very Good and Excellent performance, and a few had satisfactory performance in the four subjects. However, in Basic Mathematics, a few student teachers (2%) had unsatisfactory performance. This shows that considerable efforts were being taken in the teacher colleges to equip student teachers with the necessary competences for teaching at the secondary school level. However, Basic Mathematics needed more effort to improve the unsatisfactory performance of the 2.0 percent of student teachers.

4.5.2 Student Teachers' Performance on Different Competences

Further analysis was done to establish the student teachers' performance on each competence in the four subjects. Their results are presented in five categories: Excellent, Very Good, Good, Satisfactory and Unsatisfactory, using different colours according to performance.

(a) Student Teachers' Performance on Basic Mathematics Competences

Table 61 shows the student teachers' performance on each competence in Basic Mathematics.

Table 61: Student Teachers' Performance on Each Competence in Basic Mathematics

S/N	Competence	Categories of Performance				
		Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Distinguish different types of numbers and solve problems.	26.4	16.8	32.4	16.0	8.4
2.	Convert units.	34.4	13.6	21.6	12.0	18.4
3.	Estimate and compute numbers accurately.	3.2	2.4	31.2	41.2	22.0
4.	Do scale drawing and geometrical transformations.	29.6	16.4	26.8	17.6	9.6
5.	Solve problems on perimeters and areas.	18.4	12.0	21.6	14.4	33.6
6.	Factorize and solve problems	14.0	28.4	31.6	9.2	16.8
7.	Solve problems on ratios, profit and loss, and simple interest.	53.2	14.8	19.2	8.8	4.0
8.	Graph and interpret linear equations	74.8	10.4	8.4	4.8	1.6
9.	Find relationships among. logarithms, exponents and radicals	13.2	12.8	58.0	10.0	6.0
10.	Verify laws and prove theorems.	17.6	12.4	31.6	18.4	20.0

Table 61 shows that the student teachers performed excellently on *graphs and interpreting linear equations* (74.8%); *solving problems on ratios, profit and loss and simple interest* (53.2%) and *converting units* (34.4). Their performance was good in *finding relationships among logarithms* (58.0%), *distinguishing different types of numbers and solving problems* (32.4%), *factorizing and solving problems* (31.6%), *verifying laws and proving theorems* (31.6%) and *estimating and computing numbers accurately* (31.2%). However, they had satisfactory performance in *estimating and computing numbers accurately* (41.2%) and unsatisfactory performance in *solving problems on perimeters and areas* (33.6%).

Thus, among the ten assessed competencies in Basic Mathematics, the student teachers had difficulties solving problems on perimeters and areas. This challenge was also observed in Form Two students' performance, in which 91.3 percent of the students performed unsatisfactorily.

(b) Student Teachers' Performance in Biology Competences

In Biology, seven competences were tested. Table 62 presents student teachers' performance on each competence.

Table 62*:* Student Teachers' Performance on Each Competence in Biology

S/N	Competencies	Categories of Performance				
		Excellent	Very Good	Good	satisfactory	Unsatisfactory
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life	32.8	13.5	43.1	10.0	0.5
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems	47.1	14.8	27.4	8.4	2.3
3.	Use of scientific procedures and practical skills in studying biology	74.5	11.5	10.0	2.9	1.0
4.	Group organisms according to their similarities and differences	74.0	14.7	10.0	0.5	0.7
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals	15.6	12.9	41.7	22.5	7.4
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment	20.1	22.1	47.8	8.6	1.5
7.	Use of biological practical skills in studying various physiological processes in plants and animals.	18.1	19.4	42.6	13.0	6.9

Table 62 shows that the student teachers had excellent performance on three competences, namely *using scientific procedures and practical skills in studying Biology* (74.5%), *grouping organisms according to their similarities and differences* (74.0%) and *demonstrating appropriate preventive measures and precautions against common accidents, infections and other related health problems* (47.1%). The performance on the remaining four competencies was good since the student teachers demonstrated the *ability to appreciate nature and ensure sustained interaction of organisms in the natural environment* (47.8%); demonstrated *appropriate use of biological knowledge, concepts, principles and skills in everyday life* (43.1%); *used biological practical skills in studying various physiological processes in plants and animals* (42.6%); and *used basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals* (41.7%).

Generally, it can be concluded that the student teachers were competent in all competences tested, except for a few candidates who had unsatisfactory performance on the use of biological practical skills in studying various physiological processes in plants and animals (6.9%) and the use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals (7.4%). Similarly, the same competence of using basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals was a challenge to the 74.5 percent of Form Two students who performed unsatisfactorily.

(c) Student Teachers' Performance on English Language Competences

In the English Language, ten competences were assessed. Table 63 summarises the student teachers' performance on each competence in this subject.

Table 63: Student Teachers' performance on Each Competence in English Language

S/N	Competencies	Categories of Performance				
		Excellent	Very Good	Good	satisfactory	Unsatisfactory
1.	Use simple English to communicate in social interactions and settings	63.0	18.0	18.0	1.0	0.0
2.	Describe past activities and personal experiences	9.0	0.0	14.0	31.0	46.0
3.	Engage in simple conversations and transactions on familiar topics	38.0	21.0	28.0	13.0	0.0
4.	Express in English in writing, needs, feelings and ideas using appropriate vocabulary	24.0	13.0	52.0	9.0	2.0
5.	Give and respond to directions/requests using simple English sentences.	38.0	7.0	26.0	11.0	18.0
6.	Identify general and specific information on events in simple oral/written texts she/he encounters	24.0	14.0	44.0	12.0	6.0
7.	Use English to obtain, process construct and provide subject matter information in written forms	57.0	7.0	28.0	8.0	0.0
8.	Use appropriate English pronunciation in a variety of settings	24.0	20.0	38.0	12.0	6.0
9.	Interact in written for personal expression and enjoyment	68.0	9.0	17.0	5.0	1.0
10.	Answer questions on simple readers and report on what he/she read	45.0	7.0	39.0	7.0	2.0

Data in Table 63 show that out of ten competences tested in the English Language, six had excellent performance; of which, the *ability to interact in writing for personal expression and enjoyment* was the highest, (68.0%). Three competences had a good performance. The competences were the ability to *express in English in writing, needs, feelings, and ideas using appropriate vocabulary* (52.0%), to *identify general and specific information on events in simple oral/written texts she/he encounters* (44.0%) and *use appropriate English pronunciation in a variety of settings* (38.0%). The competence *to describe past activities and personal experiences* had the lowest score, as most candidates had unsatisfactory performance (46.0%). Thus, the student teachers were not competent in *describing past activities and personal experiences*. Similarly, 46.0 percent of the Form Two students demonstrated unsatisfactory performance on the competence of describing past activities and personal experiences.

(d) Student Teachers' Performance on Physics Competences

The Physics subject involved eight competences. Table 64 presents the student teachers' performance on these competences.

Table 64: Student Teachers' Performance on Each Competence in Physics

S/N	Competence	Categories of Performance				
		Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Apply laws, principles of Physics in daily life.	62.50	13.73	11.48	4.10	8.20
2.	Practice safety rules in daily life.	5.33	6.97	32.79	33.20	21.72
3.	Make appropriate measurements of physical quantities.	71.31	9.84	14.34	4.51	0.00
4.	Use scientific skills to identify nature and properties of matter.	54.51	9.02	16.39	14.75	5.33
5.	Apply the laws of reflection of light in daily life.	17.21	9.84	27.05	24.18	21.72
6.	Apply electricity and Magnetism knowledge in daily life.	10.86	18.03	40.37	20.90	9.84
7.	Apply the concepts of turning forces in daily life.	18.03	14.34	15.98	13.11	38.52
8.	Use simple machines to simplify work.	17.21	5.74	42.21	16.80	18.03

Table 64 shows that the student teachers had excellent performance on three competencies, namely the *ability to make appropriate measurements of physical quantities* (71.31%); *the ability to apply laws, theories and principles of physics in daily life* (62.50%); and the *ability to use scientific skills to identify nature and properties of matter* (54.51%). They had good performance in two competencies: the *ability to use simple machines to simplify work* (42.21%) and the *ability to apply electricity and magnetism in daily life* (40.37%). They had satisfactory performance on *the ability to practise safety rules in daily life* (33.20%) and unsatisfactory performance on *the ability to apply the concept of turning forces in daily life* (38.52%). Therefore, the student teachers were not competent in *the ability to apply the concept of turning forces in daily life* in the Physics subject. Likewise, the Form Two students (88.0%) had unsatisfactory performance on this competence.

Generally, the analysis revealed that the student teachers were competent in most of the tested competences, except for the few highlighted ones. This can be alleviated during teaching and learning.

4.6 Identifying Teaching and Learning Gaps

The fifth objective of the Form Two Learning Evaluation was to identify teaching and learning gaps that hindered students from acquiring appropriate skills per the curriculum. Acquiring appropriate skills is one of the challenges facing secondary school students. The acquisition of appropriate skills can be attributed to either learning gaps, teaching gaps, or both. On the one hand, the learning gaps can be defined as differences between what a student has learnt and what they are expected to learn in a particular class or grade. Various factors, such as a lack of prior knowledge, misconceptions, a lack of motivation, mastery of the language of instruction, environmental factors, learning styles and instructional or teaching methods, can cause learning gaps.

On the other hand, teaching gaps are differences between the kinds of teaching needed to achieve educational instructional objectives and the kind of teaching found in schools. Such differences are based mostly on the effectiveness of the teacher and the availability of supportive facilities and environments. Effective teaching is characterised in terms of specific teaching methods. Students make more academic gains when instruction is effectively connected to assessment.

In FTLE, analysis was done to identify challenges encountered by students in answering assessment questions in the four subjects. Moreover, students, teachers, heads of school, parents/guardians and members of school boards were given questionnaires to fill in information about the challenges encountered in teaching and learning. Thus, teaching and learning gaps were identified based on the teachers' adequacy and job satisfaction, students' mastery of the language of instruction, methods of teaching and learning, use of teaching aids, adequacy of laboratory equipment, teaching and learning environment, use of the Learning Management System (LMS), distance from home to school and Internal School Quality Assurance (ISQA) processes.

4.6.1 Teachers' Adequacy

Teachers help students acquire knowledge, competence and virtue. They simplify complex phenomena and make abstract concepts accessible to students. Teachers also expose learners to ideas, topics and concepts they could otherwise not have come into contact with. Therefore, the study sought to examine the availability and adequacy of teachers for the four subjects. Table 65 presents the results.

Table 65: The Status of Teachers' Availability

Subject	Available (%)	Not Available (%)
Basic Mathematics	70.8	29.2
English Language	70.5	29.5
Biology	66.3	33.7
Physics	71.5	28.5

The data in Table 65 shows that Biology has a greater teacher deficit (33.7%) than other subjects. The shortage of teachers might have negatively impacted the process of acquiring the required knowledge and skills in these schools.

4.6.2 Teachers' Job Satisfaction

The study also sought to establish the extent to which the teachers were satisfied with their job. In the present study, job satisfaction can be defined as a combination of psychological, physiological and environmental circumstances that cause a teacher to enjoy working. It is a complex phenomenon involving various personal, institutional and social aspects. When the teacher is satisfied with their job, they are happy with the teaching and prepared to continue working at the institution and contribute their maximum potential towards students' achievement. Therefore, the collected data were analysed according to school ownership (i.e., government and non-government schools) and locality (rural and urban areas) to establish whether there was a difference in job satisfaction between those categories, as illustrated in Tables 66 and 67.

Table 66: Teachers' Job Satisfaction According to School Ownership

S/N	Satisfaction Extent	School Ownership	
		Government (%)	Non-Government (%)
(i)	Large	38.4	50.9
(ii)	Moderate	47.3	39.6
(iii)	Small	13.0	8.9
(iv)	Not at All	1.2	.6
	Total	**100.0**	**100.0**

Table 66 indicates that 50.9 % percent of teachers in non-government schools were largely satisfied with their job; in contrast with 38.4 percent of teachers from government schools. However, 47.3 percent of teachers from government schools were moderately satisfied with their job as compared to 39.6 percent of teachers from non-government schools. Only 1.2 percent and 0.6 percent of teachers from government and non-government schools respectively were unsatisfied with their job. Thus, teachers from both government and non-government schools were generally satisfied with their job.

Table 67: Teachers' Job Satisfaction According to School Locality

S/N	Satisfaction Extent	Locality	
		Rural (%)	Urban (%)
(i)	Large	41.4	41.2
(ii)	Moderate	45.4	45.9
(iii)	Small	12.0	12.1
(iv)	Not at All	1.2	.8
	Total	**100.0**	**100.0**

Table 67 indicates that teachers in rural and urban schools were equally satisfied with their job. The percentage of teachers who are largely satisfied with their job is 41.4 percent in rural schools and 41.2 percent in urban schools, with a difference of only 0.2 percent. Similarly, in other categories, there are minor differences (0.1 to 0.5%) in job satisfaction between teachers in rural and urban schools.

4.6.3 Teachers' Job Satisfaction Based on their Teaching Subjects

The teachers were also asked to indicate the extent to which they were satisfied with teaching their respective subjects. The results are shown in Table 68.

Table 68: Teachers' Satisfaction with Teaching Their Subjects

S/N	Satisfaction Extent	Subjects (%)			
		Basic Mathematics	Biology	English Language	Physics
(i)	Large	35.4	41.1	47.1	41.6
(ii)	Moderate	49.3	46.3	39.2	47.4
(iii)	Small	13.8	11.4	12.5	10.5
(iv)	Not At All	1.4	1.1	1.2	.6
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 68 indicates that 47.1 percent of English Language teachers were largely satisfied with teaching, followed by Physics (41.6%) and Biology (41.1%) teachers. The data also indicate that 49.3 percent of the Basic Mathematics teachers were moderately satisfied with teaching, followed by Physics (47.4%) and Biology (46.3%), whose differences are not big.

On the other hand, teachers who were not satisfied with teaching their subjects, their dissatisfaction might have hindered them from teaching, hence affecting their students' acquisition of the required skills and knowledge. Furthermore, the researchers asked them to indicate the reasons to establish why some teachers were satisfied to a small extent or not at all. The major reasons given were large class sizes and teaching load (44.3%); insufficient salary (27.3%); and insufficient teaching and learning materials, facilities, books and ICT facilities (25.7%), as Table 69 illustrates.

Table 69: Reasons for Teachers' Job Dissatisfaction

S/N	Reason	(%)
1.	Large class size and teaching load.	44.3
2.	Insufficient salary.	27.3
3.	Insufficient teaching and learning materials, books, ICT facilities.	25.7
4.	Accommodation, long distance from school.	18.6
5.	Lack of allowances, motivation, overtime, promotion, seminars.	17.5
6.	Poor teaching and learning condition, infrastructure.	14.2
7.	Poor students' response to learning.	11.5
8.	Insufficient social services; electricity, water and health.	7.7
9.	Lack of cooperation, support and treatment from peer teachers, supervisor, administration	3.8
10.	Job security	2.2
11.	Politics in education	1.1
12.	Respect and teacher status in the society	1.1

4.6.4 Students' Inability to Master the Language of Instruction

To ensure effective learning, teachers should use the language of instruction that learners well understand. Fluency in the language of instruction gives all learners the best chance to acquire the intended skills. Students may struggle to acquire essential skills when the language of instruction is not learned effectively at the appropriate stages. This situation can create a learning gap.

In the United Republic of Tanzania, Kiswahili is the language of instruction in Kiswahili medium primary schools, whereas English is the language of instruction in English medium schools. However, in secondary schools, English is the language of instruction, except for language subjects such as Kiswahili, French, Arabic and Chinese. The study sought to determine students' mastery of the language of instruction (English) in their studies. This was achieved through questionnaire responses from subject teachers. The teachers were asked to rate the extent to which they encountered challenge(s) in their teaching. They were supposed to respond by indicating whether the extent was large, moderate, small or not at all. The teachers' responses are summarised in Table 70.

Table 70: Teachers' Responses on Challenges in Teaching

S/N	Extent of Challenges	Percentage (%)
1.	Not at all	2.3
2.	Small	21.3
3.	Moderate	58.7
4.	Large	17.7

Table 70 indicates that 58.7 percent of teachers encountered challenges to a moderate extent, whereas 17.7 percent faced challenges to a large extent. Only 2.3 percent of teachers did not encounter challenges. The teachers who faced challenges moderately and largely were also required to say which of the following challenges greatly affected their teaching: *Students' incompetence in the language of instruction, insufficiency teaching and learning materials, large class size, and ineffective school administration.* Table 71 presents the teachers' responses.

Table 71: Reasons for the Faced Challenges

S/N	Reason	Percentage (%)
1.	Students' incompetence in the language of instruction	88.2
2.	Insufficiency of teaching and learning materials	37.8
3.	Large class size	32.7
4.	Ineffective school administration	2.9

Table 71 indicates that 88.2 percent of the teachers faced challenges due to students' incompetence in English, and 37.8 percent identified the insufficiency of teaching and learning materials. The data also show that large class sizes contributed 32.7 percent. Thus, these data signify that students' incompetence in the language of instruction was the main challenge in teaching.

Moreover, teachers were asked to indicate the language they used in teaching and learning. The options were either English or Kiswahili or both Kiswahili and English. The teachers' responses are presented in Table 72.

Table 72: The Language of Instruction in Teaching and Learning

S/N	Language Used	Percentage (%)
1.	English	59.7
2.	Kiswahili	0.1
3.	Both English and Kiswahili	40.2
	Total	**100.0**

Table 72 reveals that, in secondary schools, most teachers (59.7%) used English as the language of instruction, and 40.2 percent used both English and Kiswahili. Only 0.1 percent of the teachers used Kiswahili in teaching.

The teachers who used either Kiswahili or both Kiswahili and English were required to give reason(s). They said their students had Kiswahili backgrounds from primary schools; hence, switching to English made it difficult for them to follow classroom instruction or participate actively in learning. They added that some of their students were more proficient in their ethnic community languages than in Kiswahili, making it even more difficult to acquire the expected competences. Likewise, the teachers used Kiswahili to clarify and elaborate concepts for their students' adequate understanding.

4.6.5 Methods of Teaching and Learning

Teaching methods are approaches that help students to achieve the expected learning outcomes. These methods can be affected by maturity, age, motivation, previous learning, intelligence, mental health, physical need, attention, aspiration level and goal setting.

This study asked the subject teachers to describe different methods they were using in teaching their students to learn effectively. Table 73 presents the teachers' responses.

Table 73: Teaching and Learning Methods Used

S/N	Teaching and Learning Methods	Responses (%)
(i)	Interactive lecture	23.5
(ii)	Question and answer	23.1
(iii)	Directed discussion	22.4
(iv)	Experimentation	12.7
(v)	Lecture Methods	4.9
(vi)	Problem-based learning	8.7
(vii)	Project-based learning	2.5
(viii)	Case-based learning	2.2
	Total	**100.0**

Table 73 indicates that most teachers commonly used interactive lectures (23.5%) and questions and answers (23.1%). These were closely followed by the directed discussion method (22.4%). The rarely used methods were case based learning (2.2%) and project based learning (2.5%).

4.6.6 The Use of Teaching Aids

Teaching aids are devices (e.g., computers & DVDs), instructional aids (e.g., books, chalkboards, & pictures), or objects (e.g., specimens, maps, & globes). Teachers use teaching aids to enhance classroom instruction, extract learners' attention and create motivation for learning. Teaching aids can facilitate the learning process by making it exciting and efficient. They can also help learners to use hearing or seeing abilities and actively learn by doing. The study sought to determine the extent to which teachers use teaching aids in their respective subjects. Table 74 presents the findings.

Table 74: The use of Teaching Aids

S/N	Extent of Using Teaching Aids	Percentage (%)
(i)	Large	26.5
(ii)	Moderate	61.2
(iii)	Small	11.3
(iv)	Not at All	1.1
	Total	**100.0**

Table 74 indicates that 61.2 percent of the teachers used teaching aids to a moderate extent, and 26.5 percent did so to a large extent. This is a good indicator that most teachers know the role of teaching aids in enhancing teaching and learning. Only 11.3 percent used teaching aids to a small extent, and 1.1 percent did not use teaching aids at all which might have negatively impacted teaching and learning.

4.6.7 Adequacy of Laboratory Equipment

To learn science effectively, students must participate in practical activities. Students learn better and faster when exposed to experimentation. Conversely, they learn less when they are exposed to practical-oriented concepts only theoretically. For every student to participate meaningfully in practical work, sufficient laboratory equipment to cater adequately for secondary school instructional needs is essential.

The researchers used a questionnaire for teachers to determine the adequacy of laboratory facilities. The questionnaire required them to indicate the extent to which their schools' science laboratory facilities were adequate for teaching and learning. Table 75 shows the general availability of laboratory facilities in the schools, while Tables 76 and 77 show the availability of laboratory facilities based on school locality and ownership, respectively.

Table 75: General Adequacy of Laboratory Facilities

S/N	Extent of Adequacy	Percentage (%)
1.	Large	17.3
2.	Moderate	51.3
3.	Small	20.6
4.	Not at All	10.7

Table 75 indicates that 51.3 percent of teachers saw that the laboratory equipment was adequate to a moderate extent, and 17.3 percent saw that it was adequate to a large extent, indicating that the government had taken bold initiatives to ensure that laboratories for science lessons are available at schools. Only 20.6 percent of the teachers indicated that laboratory equipment was available to a small extent, and 10.7 percent opined that it was completely unavailable.

Additionally, the teachers who said *to a small extent* or *not at all* were required to give reasons. The major reason was a lack of adequate funds to purchase laboratory apparatuses and chemicals (100%), followed by the absence of science laboratories/classrooms for storing laboratory apparatuses (66.1%) and insufficiency of the laboratories for three subjects: Biology, Chemistry and Physics (44.4%).

(a) Adequacy of Laboratory Facilities According to School Locality

The adequacy of laboratory facilities based on school locality is presented in Table 76.

Table 76: Adequacy of Laboratory Facilities According to School Locality

S/N	Extent of Adequacy	Locality (%)	
		Rural	Urban
1.	Large	14.9	23.8
2.	Moderate	51.4	51.0
3.	Small	22.5	15.8
4.	Not at All	11.2	9.4

Table 76 shows that the adequacy of laboratory facilities in urban and rural schools is moderate, which is 51.4 percent and 51.0 percent, respectively. Moreover, 14.9 and 23.8 percent of teachers said that laboratory facilities in rural and urban schools were available to a

large extent, respectively. This indicates a fair distribution of laboratory facilities in both rural and urban schools. Therefore, teachers had an equal opportunity to use laboratory facilities to teach science subjects more practically. In contrast, 11.2 percent of rural schools had no laboratory facilities compared with 9.4 percent of schools in urban areas.

(b) Adequacy of Laboratory Facilities According to School Ownership

Adequacy of laboratory facilities based on school ownership is presented in Table 77.

Table 77: Adequacy of Laboratory Facilities According to School Ownership

S/N	Extent of Adequacy	Ownership (%)	
		Government	Non- Government
1.	Large	10.6	39.4
2.	Moderate	51.6	50.4
3.	Small	25.2	5.5
4.	Not at All	12.6	4.7

Table 77 reveals that the availability of laboratory equipment in government and non-government schools was moderate at 51.6% and 50.4%, respectively. However, laboratory equipment in non-government schools was adequate to a large extent at 39.4 percent, compared with government schools, where the adequacy was only 10.6 percent. Conversely, the percentage of schools with no laboratory equipment was 12.6 percent in government schools, whereas in non-government schools, it was 4.7 percent.

Generally, the availability of laboratory equipment in secondary schools was good. However, it was better in non-government schools than in government schools and urban as compared with the rural schools.

4.6.8 Teaching and Learning Environment

The heads of school, students and parents were asked about the general condition of the teaching and learning environment in their respective schools and home environments. In particular, the head teachers were

asked about the measures being taken in their school to ensure the teaching and learning environments were conducive. Table 78 presents the head teachers' responses.

Table 78: Heads of Schools Responses on Teaching and Learning Environment

S/N	Item	Percentage (%)
(i)	Presence of a safety /security plan.	84.5
(ii)	A special program to identify students who are in danger of dropping out.	90.4
(iii)	Suggestion box.	86.4
(iv)	Follow up for students at the risk of dropping out.	91.5
(v)	A mechanism for handling students' complaints.	97.2
(vi)	Collaboration with the community on the issues. related to violence against children and gender violence.	93.5

Table 78 shows that schools have taken appropriate measures to improve teaching and learning environments to a large extent since the aspects evaluated ranged from 84.5 percent to 97.2 percent. Parents were also asked about their home environments, which could facilitate learning. Table 79 presents their responses.

Table 79: Parents' Response to Availability of Enabling Learning Environment at Home

S/N	Item	Percentage (%)
(i)	Availability of light	89.5
(ii)	Availability of chairs	76.2
(iii)	Availability of tables	74.8
(iv)	Availability of textbooks	58.9
(v)	Availability of a conducive home base learning environment	70.8

Table 79 shows that light was the most common item available at home (89.5%), while textbooks were the least common (58.9%). This implies that day scholar students needed support to get enough books at home. A lack of reference books at home hinders students from studying and doing their homework better, leading to poor performance.

4.6.9 The Use of the Learning Management System (LMS)

The study also sought to establish the extent to which the teachers used the Learning Management System (LMS). They were thus asked to say how much they used it in their teaching. Table 80 presents their responses.

Table 80: The Use of LMS in Teaching and Learning

Extent of Using LMS	Percentage (%)
Large	10.4
Moderate	42.1
Small	34.2
Not at all	13.3
Total	**100.0**

Table 80 shows that 42.1 percent of teachers used the Learning Management System to a moderate extent, and 10.4 percent used it to a large extent. This indicates that the teachers were aware of and used the LMS in most schools' teaching and learning. However, less than 50 percent of teachers used it to a small extent, and others did not. This might have negatively impacted students' performance in some schools. Furthermore, teachers provided several factors for their non-use of the LMS, as Table 81 illustrates.

Table 81: Limiting Factors for the Use of LMS

S/N	Items	Percentage (%)
(i)	Poor/weak internet connection	36.0
(ii)	Lack of computers/tablets	25.7
(iii)	Lack of smartphones	5.7
(vi)	Lack of internet bundles	32.6
	Total	**100.0**

As Table 81 illustrates, weak or poor internet connection was the leading limiting factor (36.0%), followed by a lack of internet bundles (32.6%), a lack of computers/tablets (25.7%), and a lack of smartphones (5.7%). However, the government has made significant efforts to facilitate e-learning such as providing tablets to secondary school teachers. Further, it has registered various agencies, which offer online teaching and learning materials such as the Tanzania Institute of Education (TIE) and *Shule Direct*.

4.6.10 Distance from Home to School and its Effect on Teaching and Learning

Distance is an important consideration that might negatively impact day scholar students. When students are to walk a long distance to school, they arrive while they are tired. Hence, they fail to concentrate in the classroom. Similarly, they cannot effectively do their homework when they reach home tired. Likewise, when teachers have to walk or travel a long distance, they may run short of time for lesson preparation or get tired. This situation negatively affects lesson presentation. Table 82 presents teachers' and students' responses concerning the residential homes.

Table 82: Residence of Students and Teachers

S/N	Category	Residence	Percentage (%)
(i)	Students	Boarding	11.1
		Hostel	9.5
		Day scholars	79.4
		Total	**100.0**
(ii)	Teachers	Within the school compound	25.0
		Near the school compound	37.9
		Far from the school compound	37.1
		Total	**100.0**
(iii)	Heads of Schools	Within the school compound	53.2
		Near the school compound	26.6
		Far from the school compound	20.2
		Total	**100.0**

As indicated in Table 82, the percentage of day scholar students is 79.4 percent, whereas that of boarders (staying in dormitories and hostels) is 20.6 percent. Regarding teachers and heads of school, 37.1 percent and 20.2 percent of them, respectively, lived far from the school premises. Only 37.9 percent and 26.6 percent of teachers and heads of schools lived within or near the school premises. This situation can affect students' performance directly as it reduces the time for their interaction with teachers. Likewise, it can affect classroom concentration as both students and teachers arrive at school while tired.

Students were also required to indicate how often they entered class on time. They were asked to indicate whether they did so *always*, *often*, *sometimes*, *rarely* or *never*. Figure 6 summarises the students' responses.

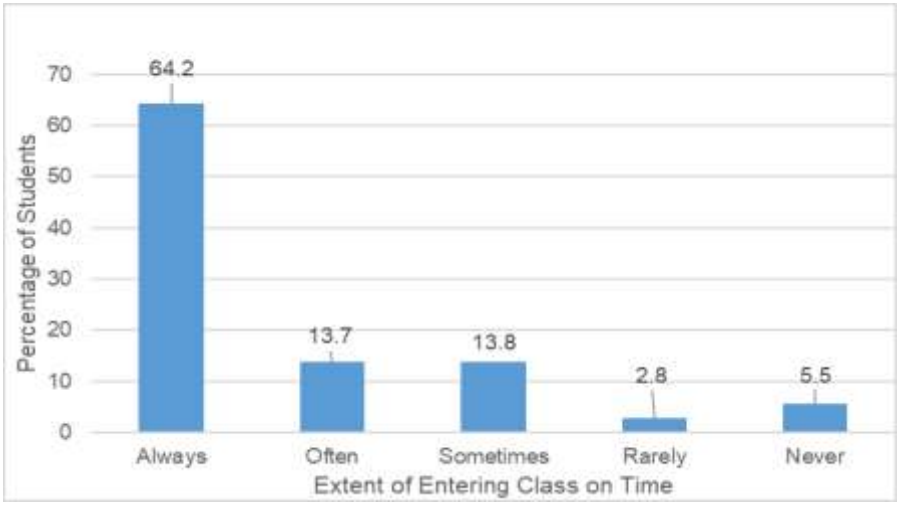

Figure 6: *The Extent the Students entered the Classroom on Time*

Figure 6 shows that most students (64.2%) always entered the classroom on time, which is a good indicator that most of the students are committed to the lessons. The data also show that the percentage of students who never entered the classroom on time was 5.5 percent, rarely 2.8 percent and sometimes 13.8 percent. When students enter the classroom late, they miss out on lessons or some parts of lessons. This situation may negatively affect their performance.

Furthermore, the students were asked to give reasons for not entering the classroom on time. The majority (46.7%) said it was because of the long distance from home; 19.9 percent said it was because of family problems; 18.1 linked it to economic constraints; 11.2% said it was because of geographical barriers; and 4.0% said it was because of too much traffic. Thus, the long distance from home is a major factor hindering students from entering the classroom on time.

4.6.11 Internal School Quality Assurance Team (ISQAT)

The school quality assurance exercise is a form of evaluation that involves measuring, testing, supervising, supporting and evaluating educational activities in school systems to improve the standards and quality of the

education programmes offered. Internal School Quality Assurance Team (ISQAT) is a new educational reform that was officially introduced in schools by the government of Tanzania in 2021. ISQAT systematically reviews educational programmes and processes to maintain and improve quality, equity and efficiency. In FTLE, teachers were asked about the extent to which the schools' internal quality assurance teams supported them during teaching and learning. Table 83 presents their responses.

Table 83: Teachers' Support from the Internal School Quality Assurance Unit

S/N	Extent of Support	Percentage (%)
(i)	Large	29.4
(ii)	Moderate	52.6
(iii)	Small	14.7
(iv)	Not at All	3.3
	Total	**100**

The data in Table 83 show that 52.6 percent of teachers were supported moderately by the ISQAT teams and 29.4 percent were supported to a large extent. A total of 14.7 percent were supported to a small extent, whereas 3.3 percent were not. The data indicate that the schools' IQA teams were performing their role effectively (82%). Therefore, the heads of schools made good efforts; nevertheless, more effort is still needed to achieve the maximum functioning of ISQAT.

4.7 Recommendations on Policy and Program Actions for Consideration by the Government to Improve Learning Outcomes

The sixth objective of the Form Two Learning Evaluation was to offer recommendations on policy and programme actions that the Government can consider to improve learning outcomes at the secondary education level in Tanzania. Policy and program actions refer to activities organised and coordinated by the government to achieve a particular objective. In this context, policy and program actions refer to activities and strategies initiated, organised and coordinated by the Government and other educational authorities to improve learning outcomes at the Form Two level. The successive learning outcomes achieved at the Form Two level will spill over to other higher secondary education levels, specifically Form Four and Form Six.

(a) The Use of Appropriate Language of Instruction for Both Students and Teachers

Teachers and students should be encouraged to use the appropriate language of instruction in the proper place. English is the language of instruction at the secondary school level, except for language subjects such as French, Arabic, Kiswahili and Chinese. However, 40.2 percent of the sampled teachers use both English and Kiswahili in teaching subjects that should be taught in English. They used both languages because some students failed to grasp the explained concepts. Thus, since teachers do not consistently use English in teaching throughout the lesson, students do not acquire adequate English input and do not have enough room to practise using the language in learning. Consequently, they will fail to acquire appropriate skills as per the curriculum. Hence, it is recommended that the government continues to ensure that English Language is effectively taught in secondary school to improve students' understanding, fluency and competency not only because of national communication but also for international communication.

(b) To Reinforce the Teaching of Basic Mathematics and Science

Teachers should use a wide variety of methods during teaching and learning. A combination of teaching methods will help students of different abilities to grab appropriate skills per the curriculum. This study has observed that some teaching methods were rarely used compared to others despite their importance. Teaching methods such as case-based learning and project-based learning had 2.2 and 2.5 percent, respectively, which were the least frequently used. However, these methods are important in teaching and learning as far as the competence-based approach is emphasised. However, there are some government initiatives which are still ongoing to strengthen both pre-service and in-service teachers on teaching methods and strategies in teaching Basic Mathematics and Physics at secondary and teacher training colleges.

It was also observed that 42.1 percent of teachers used the LMS to a moderate extent, and 10.4 percent used it to a large extent. The data also indicated that 47.5 percent used it to a small extent, and only a few did not use it. The main reasons for their inadequate use of the LMS were weak or poor internet connection (36.0%) and a lack of

internet bundles (32.6%). Although commendable efforts have been made to address the use of ICT, it is advised that school infrastructures be more improved to facilitate the use of science and technology in educational training at all levels.

(c) Improvement of School Buildings, Utilities and Facilities

The findings indicated that the adequacy of laboratory equipment was generally moderate (51.3%) and to a large extent (17.3%), indicating that the Government had taken highly commendable initiatives to ensure that laboratories for science practical activities are available at the schools. The data also show that 20.6 percent of the teachers indicated that laboratory services were available to a small extent, and only 10.7 percent said that the services were not available. The primary reason was inadequate funds to purchase laboratory apparatuses and chemicals. It was also found that the schools' teaching and learning environments were conducive: safety/security precautions were taken; special programmes to identify risk factors for absenteeism and students who were at risk of dropping out were implemented; Suggestion boxes were set up; Follow-ups on the students at risk of dropping out were done; mechanisms for handling students' complaints were devised; and collaboration with the community on issues pertaining to violence against children and gender-based violence was ensured, ranging from 84.5 percent to 97.2 percent. This report recommends that the Government continues to support the presence of conducive environments and adequate facilities and utilities in all schools.

(d) Shortage of Teachers and Class Sizes

The study identified a shortage of teachers in secondary schools. The scarcity of teachers in Biology was more severe (33.7%) than in Physics (28.5%), English Language (29.5%), and Basic Mathematics (29.5%). This study recommends that although the Government has made an effort to address the shortage and distribution of teachers, more effort is still needed to improve the situation in the areas identified.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusions drawn from the analysis, presentation and discussion of findings. Based on these conclusions, recommendations are given as presented in the following sections.

5.2 Conclusions

The study indicated that students' performance was generally unsatisfactory in all four subjects, with Basic Mathematics being the least performed, followed by Physics. Students' performance on different competences and skills indicated that in all the assessed subjects, the students' performance fell into the (red) unsatisfactory band. The findings also indicated that the assessment items at Level 3 were unsatisfactorily performed, followed by those at Level 2 and then Level 1.

The students' performance in terms of gender showed a difference between male and female students in all four subjects. Male students performed better than female students. The study also found a difference in performance between government and non-government schools, with non-government schools performing higher than government schools. Likewise, a difference in performance was noted between urban and rural schools. The urban secondary schools performed better than rural schools.

The teachers at the urban and non-government schools obtained high percentages of academic grades in their CSEE, ACSEE and DSEE. Thus, the good performance of schools located in urban areas and those owned by non-government individuals/agencies might have been linked to the good academic grades of the teachers during their training.

The results also indicated that the competence coverage in teaching in all schools, irrespective of ownership or locality, was generally good. This shows that the schools made deliberate efforts to ensure that all competences were covered in time as per the PO-RALG curriculum instruction calendar.

The study also revealed that student teachers performed well on most competencies tested in all four subjects. This implies that the recruited secondary school teachers are competent enough to teach their respective subjects.

5.3 Recommendations

Though the government has invested much in education and taken significant measures to address various challenges facing the education sector, however, based on the findings of this study, the following are recommended for the responsible authorities to improve students' learning.

(i) The SQA should continue to monitor and evaluate teaching strategies to improve students' understanding of the subjects. This will be successful if in-service training in secondary schools and pre-service training in teacher training colleges is provided to the teachers.

(ii) The heads of schools should continue to reinforce the implementation of the competence-based approach to teaching and learning to enable students to master concepts that require critical thinking.

(iii) Teachers and parents should design strategies for improving learning for female students while at school and home especially day scholars.

(iv) Teachers should improve English language learning by making it thoroughly communicative. Students should be motivated to learn the language communicatively using their immediate environment. Additionally, the Form One English Course Orientation Program should be enhanced. For instance, it should be provided for at least two months to ensure that the students develop adequate language control before beginning the actual Form One studies.

(v) Efforts should be made to address the shortage and distribution of teachers in the areas identified by this study. This should align with improving their well-being, such as housing and remuneration.

(vi) Although the government has built classrooms in most schools to a large extent, more initiatives are required to address the challenge of large class sizes.

(vii) Even though most of the teachers were aware of the importance of using teaching aids, heads of schools should make more effort to encourage their teachers to use teaching aids that are relevant to teaching and learning to achieve the intended learning outcomes.

(viii) Responsible stakeholders should take measures to ensure adequate distribution of laboratory equipment to all schools.

(ix) Parents should be encouraged to buy students' books for home study. Likewise, school management should ensure that essential reference books are available and keep them in the school library for the students.

(x) More improvement is needed to ensure the availability of free internet in all schools so that teachers can effectively utilise the Learning Management System (LMS).

(xi) The Internal School Quality Assurance Team should be strengthened, closely supervised and evaluated at a defined period. This program action would improve internal mechanisms such as school self-evaluation, staff appraisal and classroom-based assessment. It will also help as the balancing unit in advising teachers on how to deal with instructional materials, encouraging teachers to work hard and assisting them in improvising teaching and learning materials.

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APPENDIX 1: BASIC MATHEMATICS FRAMEWORK

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
1.	Distinguish different types of numbers and solve problems.	Numbers	(a) Base Ten Numeration	Identify the place value of a number written in base ten.	(1 short answer item, 3 marks)			3	1	10
				Read numbers in base ten numerations up to one billion.						
				Write numbers in base ten numerations up to one billion.						
			(b) Natural and Whole Numbers	Distinguish between natural and whole numbers.						
				Identify even, odd and prime numbers.						
				Show even, odd and prime numbers on the number line.						
				Use factors to find GCF.						
				Use factors or multiples to find LCM.						
			(c) Integers	Add, subtract, multiply and divide integers						
				Perform mixed operations on integers.						
			(d) Rational Numbers	Define a rational number						
				Perform the basic operations						
				on rational numbers						

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
			(e) Irrational Numbers	Solve problems related to practical problems on real numbers.						
				Find absolute value of real numbers.						
		Fractions	(f) Proper, Improper and Mixed Numbers	Distinguish between proper, improper and mixed numbers.						
			(g) Comparison of Fractions	Simplify fractions to lowest terms.						
				Arrange fractions in order of size.						
			(h) Operations on Fractions	Add, subtract, multiply and divide fractions.		(1 short answer item, 3 marks)				
				Perform mixed operations of fractions.						
				Solve word problems involving/ fractions.						
		Decimals and Percentages	(i) Decimals	Convert fractions to terminating and repeating decimal and vice versa.						
			(j) Operations on Decimal	Perform mixed operations with decimals.						
				Solve word problems involving decimals.						
			(k) Percentages	Express quantities as percentages			(1 short answer item, 4 marks)			
				Convert fractions into percentages and percentages into						

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
				fractions						
				Convert a decimal into percentage and percentage into decimal						
				Apply percentages in daily life.						
2.	Convert units	Units	(a) Units of Length	Convert one unit of length to another.			(1 short answer item, 4 marks)	3	1	10
				Compute calculations involving metric unit of lengths.						
			(b) Units of Mass	Convert one unit of mass to another.						
				Compute calculation involving metric units of mass.						
			(c) Units of Time	Convert one unit of time to another.		(1 short answer item, 3 marks)				
				Convert time in 12 hours to 24 hours clock.						
			(d) Units of Capacity	State the standard unit of measuring capacity.	(1 short answer item, 3 marks)					
				Measure capacity in litres.						
3.	Estimate and compute numbers accurately	Approximations	(e) Rounding off Numbers	Round off numbers to a given place value	(1 short answer item, 3 marks)			3	1	10
				Round off a number to a given number of decimal places.		(1 short answer item, 3				

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
						marks)				
			(f) Approximations in Calculations	Perform approximation of numbers in calculation.			(1 short answer item, 4 marks)			
4.	Do scale drawing and geometrical transformations	Geometry	(a) Points and Lines	Draw a line connecting given points.	(1 short answer item, 4 marks)			3	1	10
			(b)Angles/Constructions	Measure angles of different sizes using a protractor.						
				Construct a perpendicular bisector to a line segment						
				Bisect a given angle.						
				Identify relationships of angles formed by parallel lines and a transversal.						
			(c) Polygons and Regions	Construct different types of quadrilaterals.		(1 short answer item, 3 marks)				
			(d) Circles	Draw a circle when given radius or diameters.			(1 short answer item, 3 marks)			
				Describe parts of a circle.						
5.	Solve problems on perimeters and areas	Perimeters and Areas	(e) Perimeters of Triangles and Quadrilaterals	Find the perimeters of a triangles and quadrilaterals.	(1 short answer item, 3 marks)			3	1	10
			(f) Circumference of a Circle	Calculate the circumference of a circle.		(1 short answer item, 3				

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
						marks)				
			(g) Areas of Rectangles and Triangles	Calculate the area of a rectangle.			(1 short answer item, 4 marks)			
			(h) Areas of Trapezium and Parallelogram	Calculate the areas of trapezium and trapezium.						
			(i) Area of a Circle	Calculate the area of a circle.						
6.	Factorize and solve problems.	Algebra	(a) Algebraic Operations	Use symbols to form algebraic expressions.	(1 short answer item, 3 marks)			3	1	10
				Simplify algebraic expressions.						
			(b) Equations in One Unknown	Solve an equation in one unknown.						
			(c) Equations in Two Unknowns	Solve linear simultaneous equations by elimination and substitution. Method.						
				Form linear simultaneous equations from practical situations.						
			(d) Inequalities	Solve linear inequalities in one unknown.		(1 short answer item, 3 marks)				
				Form linear inequalities.						
		Quadratic Equations	(e) Factorization	Factorize quadratic expression.			(1 short answer item, 4 marks)			
			(f) Solving Equations	Determine the solution of a quadratic equation by factorization method.						
				Find the solution of quadratic equations by						

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
				completing the square.						
			(g) General Solution of a Quadratic Equation	Use the quadratic formula to solve quadratic equations.						
7.	Solve problems on ratios, profit and loss, and simple interest.	Ratio, Profit and Loss	(a) Ratio	Express a ratio in the simplest form	(1 short answer item, 3 marks)			3	1	10
				Divide a given quantity into proportional parts.						
			(b) Profits and Loss	Find profit and loss			(1 short answer item, 4 marks)			
				Calculate percentage profit and percentage loss.						
			(c) Simple Interest	Solve problems related to simple interest		(1 short answer item, 3 marks)				
8.	Graph and interpret linear equations.	Coordinate Geometry	(a) Coordinates of a Point	Plot a point given its coordinates	(1 short answer item, 3 marks)			3	1	10
				Read the coordinates of a given point.						
			(b) Gradient (Slope) of a Line	Calculate the gradient of a line given any two points.						
			(c) Equation of a Line	Find the equation of a line given two points.		(1 short answer item, 3 marks)				
			(d) Graphs of Linear Equations	Draw the graph of a linear equation.						
			(e) Simultaneous Equations	Solve linear simultaneous equations graphically.			(1 short answer item, 4 marks)			
9.	Find relationships among	Exponents and Radicals	(a) Exponents	Verify the laws of exponents.	(1 short answer item, 3			3	1	10
				Apply the laws of						

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
	logarithms, exponents and radicals.			exponents in performing computations.	marks)					
			(b) Radicals	Add subtract, multiply and divide radicals.		(1 short answer item, 3 marks)				
				Rationalize a given denominator.						
			(c) Transposition of Formula	Make one letter the subject of the formula.						
				Transpose formulae with letters involving roots and powers.						
		Logarithms	(d) Standard Form	Perform computations which involve multiplication and division of numbers when expressed in standard form.			(1 short answer item, 4 marks)			
			(e) Laws of Logarithms	Use the laws of logarithm to simplify logarithmic expressions correctly.						
			(f) Tables of Logarithms	Use logarithmic tables to find products and quotients of numbers.						
				Apply logarithmic tables to find roots and powers of numbers.						
10.	Verify laws and prove theorems.	Congruence	(a) Congruence of Triangles	Prove congruence of triangles.	(1 short answer item, 3 marks)			3	1	10
				Apply congruence theorems of triangles to		(1 short answer				

S/N	Competencies	Topic	Sub -Topic	Assessment	Level 1	Level 2	Level 3	Total Number of Items	Total Number of Questions	Total Marks
				solve related problems.		item, 3 marks)				
		Similarity	(b) Similar Figures	Identify similar polygons.			(1 short answer item, 4 marks)			
				Prove similarity theorems using triangles.						
				Solve problems using similarity theorems of triangles.						

APPENDIX 2: BIOLOGY ASSESSMENT FRAMEWORK

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.	Introduction to Biology	(a) Basic Concepts and Terminologies of Biology	Explain the meaning of the basic biological concepts and terminologies.	6MI, Understanding	3 SA, Analysing	4 SA Evaluating	32	2	20
				Outline the characteristics of living things.						
				Explain the importance of studying Biology.						
				Relate biological science with other related fields.						
			(b) Scientific Processes in Biology	Use sense organs to make correct observations.		9 SA, Applying				
				Carry out practical exercises to measure mass, length temperature and pulse rate.						
				Carry out simple biological experiments.						
			(c) The Biology Laboratory	Describe the common features of the Biology Laboratory.			4SA Creatin			
				Identify common apparatus and equipment of Biology laboratory.	12 MI, Understanding					
				Interpret correctly warning signs on containers of laboratory chemicals and apparatus.		3 SA, Analysing	4 SA Creatin			
				Differentiate Biology laboratory from other school facilities.						

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems.	Safety in our Environment	(a) First Aid	Explain the meaning and importance of First Aid Kit at home and at school.			4 SA, Evaluating	48	3	30
				Identify components of the First Aid Kit and their uses.	6MI	6 SA, Analysing				
				Outline proper procedure of giving First Aid to various victims.						
				Demonstrate different ways of giving First Aid to various victims.						
			(b) Safety at Home and School	Mention common accidents at home and school.						
				Outline proper ways of preventing accidents at home and school.	6 MI					
				Explain ways of maintaining peace and safety at home and school.						
			(c) Waste Disposal	Explain the meaning of waste and waste disposal.						
				Identify different types of waste.		6SA, Applying				
				Outline basic principle of waste disposal.						
				Demonstrate proper ways of disposing waste.	6 MI					
				Explain the effects of poor waste disposal at home and school.			8SA, Evaluating			
				Suggest proper ways of disposing waste.						
		Health and Immunity	(a) The Concept of Health and Immunity	Explain the concepts of “health” and “immunity”.		6 SA Applying				
				Mention types of body immunity and their importance.						

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				State factors affecting body immunity.			4 SA, Evaluating			
			(b) Personal Hygiene and Good Manners	Explain the concepts of personal hygiene and good manners.						
				Explain the importance of personal hygiene and good manners.						
				Outline principles of personal hygiene and good manner.		3 SA, Applying				
				Mention requirements of personal hygiene and good manners.						
				Outline ways of maintaining proper personal hygiene during puberty.						
			(c) Infections and Diseases	Explain the meaning of “Infection” and “Disease”.	12MI Understanding		4 SA Evaluating			
				Mention common infections and disease.						
				Investigate causes, symptoms, mode of transmission and effects of common infections and diseases.						
				Suggest appropriate preventive and control measures for common infections and diseases.						
			(d) Human Immune Deficiency Virus (HIV), Acquired Immune Deficiency Syndrome (AIDS), Sexually Transmitted	Explain the meaning of “HIV, AIDS”,						
				“STIs” and “STDs”.	12 MI, Understanding					
				Explain the causes, symptoms, mode of transmission and effects of STIs, HIV and AIDS.						
				Outline preventive and control						

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
			Infections (STIs) and Sexually Transmitted Diseases (STDs)	measures of HIV, AIDS, STIs and STDs.						
			(e) Management of STIs, HIV and AIDS	Explain ways of avoiding risky situations, risky behaviours and practices.						
				Demonstrate necessary skills for avoiding risky behaviours, practices and situations.						
				Explain the importance of curative health care for STIs and opportunistic diseases.						
			(f) Care and Support for People Living with HIV and AIDS (PLWHA)	Explain the importance of providing care and support to PLWHA in the family community and at school.			12SA, Evaluating			
				Outline necessary care and support services to be given to PLWHA.						
				Explain the effects of discrimination and stigma to PLWHA to the individual, family and society.						
3.	Use of scientific procedures and practical skills in studying biology.	Cell Structure and Organisation	(a) The Concept of Cell	Explain the meaning of the cell.	6MC, Understanding			16	1	10
				Mention characteristics of the cell.						
				Differentiate various types of cells.						
			(b) Plant and animal cells	Explain the functions of different parts of plant and animal cells.						
				Draw well labelled diagrams of plant and animal cells.			4SA, Creating			
				Outline similarities and differences of plant and animal		6 SA, Analysing				

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				cells.	6 MC, Understanding					
			(c) Cell Differentiation	Explain the concept of cell differentiation.						
				Outline the importance of cell differentiation and formation of tissues, organs and body system.						
4.	Group organisms according to their similarities and differences	Classification of Living Things	(a) The concept of Classification	Explain the concept of classification.		6SA, Analysing	4 SA, Evaluating	16	1	
				Explain the importance of classifying living things.						
				Group living things according to their similarities and differences.						
			(b) Classification Systems	Outline types of classification systems and their differences.						
				Explain the merits and demerits of each classification system.			4SA Evaluating			
				Carry out practical activities to classify living things according to artificial and natural classification systems.						
			(c) Major Groups of Living Things.	Mention major groups of living things.		3SA, Analysing	4 SA, Evaluating			
				Outline ranks of classification.						
				Carry out practical activities to group organisms into their major groups.	6 MC, Understanding					
			(d) Viruses	Explain general and distinctive features of viruses.						
				Describe the structure of viruses.						
				Outline advantages and disadvantage of viruses.						
			(e) Kingdom Monera	Explain general and distinctive features of the Kingdom Monera.						
				Describe structures of the						

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				representative organisms of the kingdom Monera.						
				Outline advantages and disadvantages of bacteria.						
				Outline the characteristics of pathogenic and non-pathogenic bacteria.						
			(f) Kingdom Protoctista	Explain general and distinctive features of the kingdom Protoctista.						
				Mention phyla of the kingdom Protoctista.						
				Describe the structures of Amoeba, Euglena and Paramecium.	6MI Understanding					
				Explain the advantages and disadvantages of Amoeba, Euglena Paramecium and Plasmodium.		6 SA Analysing				
			(g) Kingdom Fungi	Explain the general and distinctive features of the Kingdom Fungi.	12 MC Understanding					
				State the phyla of the kingdom Fungi.						
				Describe the structures of the representative organisms of each Phylum of the Kingdom Fungi (Yeast, Mushroom and mucor).						
				Outline advantages and disadvantages of the Kingdom Fungi.						
			(h) Kingdom Plantae	Explain the general and						

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				distinctive features of the Kingdom Plantae.						
				State the divisions of the Kingdom Plantae.						
			(i) Division Bryophyta	Explain the general and distinctive features of the division Bryophyta.						
				Describe the structures of Mosses.						
				Outline advantages and disadvantages of Mosses.						
			(j) Division Filicinophyta (Pteridophyta)	Explain general and distinctive features of the division Filicinopyta.						
				Describe the structure of Ferns.						
				Outline advantages and disadvantages of Ferns.						
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals.	Nutrition	(a) The Concepts of Nutrition and Food Nutrients	Explain the concepts of nutrition and food nutrients.	6MC, Understanding		4SA, Evaluating	32	2	
				Outline the importance of nutrition in living things.						
			(b) Nutrition in Mammals	Identify different types of food substances and their functions in human body.						
			(i) Human Nutrition	Explain the concept of balanced diet in terms of food quality and quantity.						
				Explain the nutritional requirements for different groups of people.						
				Outline different types of nutritional deficiencies and disorders in human being.						
				Explain causes, symptoms, effect	12 MC					

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				and control measures of nutritional deficiencies and disorders in human being.	Understanding					
			(ii) Digestive System in Human	Identify parts of the human digestive system and their adaptive feature.						
				Explain the process of digestion in human being.						
				Compare the human digestive system with that of other mammals.	12MI					
				Outline common disorders and diseases of the human digestive system.						
				Explain causes, symptoms, effects and control measures of common disorders/diseases of the digestive system in human being.			4 SA Evaluating			
			(c) Nutrition in Plants	Mention essential elements in plant nutrition.						
			(i) Mineral Requirement in Plants	Investigate the roles of essential mineral elements in plant nutrition.	6MC, Understanding					
				Explain the concept of photosynthesis.						
				Describe the structure of the leaf in relation to photosynthesis.		3 SA Applying				
			(ii) Photosynthesis	Explain the process of photosynthesis.						
				Outline the importance of photosynthesis in the real life situation.			4 SA Evaluating			
			(d) Properties of	Mention the basic food	6MC,					

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
			food Substances	substances and their properties.	Understanding					
				Identify common reagents and chemicals used to determine food properties.						
				Carryout food tests for reducing sugars, non-reducing sugars, starch proteins and lipids.						
			(e) Food Processing, Preservation and Storage	Explain the concepts of food processing, preservation and storage.	6MI Understanding					
				Explain the importance of food processing, preservation and storage.			4 SA Evaluating			
				Investigate various methods of processing, preserving and storing food.						
				Differentiate between traditional and modern methods of processing, preserving and storing food.						
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment.	Balance of Nature	(a) The Natural Environment	Explain the concept of natural environment.		3 SA Analysing				
				Describe biotic and abiotic components of the environments.	6MI Understanding					
				Identify various organisms in their natural environment.						
				Explain the importance of the natural environment in the community.			4SA Evaluating	16	1	10
			(b) Interaction of Organisms in the Environment	Identify ways in which living organisms interact with non living components of the environment.	6MI Understanding					
				Explain interaction of organisms.						

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
			(c) Food Chain and Food Web	Mention the components of a food chain and food web.						
				Explain the meaning of food chain and food web.						
				Differentiate between food chain and food web.						
				Construct diagrammatic representation of a food chain and food web.		6 SA Creating	4SAEvaluating			
				Explain the significance of food chain and food web in real life situation.						
7	Use of biological practical skills in studying various physiological processes in plants and animals	Transport of materials in living things	(a) The Concept of Transport of Materials in Living Things	Explain the concept of transport of materials in living things.	6SA Understanding					
				Outline the importance of transport of materials in living things.						
			(b) Diffusion, Osmosis and Mass flow	Explain the meaning of diffusion, osmosis and mass-flow.						
				Carry out experiments to demonstrate the processes of diffusion osmosis and mass flow.		3SA Analysing				
				Outline differences between diffusion and osmosis.						
				Explain the roles of diffusion,			4SA Evaluating			

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				osmosis and mass flow in movement of materials in living organisms.						
			(c) Transport of Materials in Mammals	Explain the functions of the external and internal parts of the mammalian heart.	6MI Understanding		4SA Evaluating			
			(i) The Structure of the Mammalian Heart	Explain the adaptations of the parts of the mammalian heart to their functions.						
				Describe the structure of arteries, veins and capillaries.						
				Distinguish between arteries, veins and capillary blood vessels.		3SA Analysing				
				Carry out experiments to determine pulse rates in human being.						
			(ii) The Blood	List major components of the blood.	6MC, Understanding					
				Explain functions of major components of the blood.						
				Explain the effects of HIV on white blood cells.						
			(iiii) Blood Groups and Blood Transfusion	Explain the concepts of blood groups and blood transfusion.						
				Outline the relationship between blood groups and blood transfusion.						
				Explain the advantages and disadvantages of blood transfusion.			4SA			

S/N	Competence	Topic	Sub -Topic	Assessment	Levels			Total number of Items	Total number of questions	Marks
					Level I	Level II	Level III			
				Outline precautions to be taken during blood transfusion			Evaluating			
			(iv) Blood Circulation	Describe blood circulation in human						
				Explain the importance of blood circulation in human.						
				Mention disorders and diseases of the human blood circulatory systems.						
				Outline causes, symptoms, effects and control measures of the disorders and diseases of the human blood circulatory system.						
				Carry out practical exercise to measure pulse rate and blood pressure.						

APPENDIX 3: ENGLISH LANGUAGE FRAMEWORK

S/N	COMPETENCIES	TOPIC	SUB TOPIC	ASSESSMENT	LEVEL 1 Remembering and understanding	LEVEL 2 Applying and analysing	LEVEL 3 Creating and evaluating	TOTAL NO. ITEMS	TOTAL NO. QUESTIONS	TOTAL MARKS
1.	Use simple English to communicate in social interactions and settings.	ASKING FOR SERVICES	• Making telephone calls. • Talking about reservation. • Talking about shopping	• Making telephone calls using appropriate language. • Use appropriate expressions for making a reservation. • Use appropriate expressions when shopping.	(6 MI items, 3marks)			16	1	10
		TALKING ABOUT ONES FAMILY	• Talking about family relations • Talking about occupation of family members • Talking about ownership or possession • Describing physical appearance	• Express family relationships • Talk about different occupation • Talk about ownership • Describe people's physical appearances		(6 MC items, 3marks)	(4 short answer items 4 marks)			
2	Engage in simple conversations and transactions on familiar topics.	EXPRESSING PERSONAL AND GROUP ROUTINE HABITS	Express personal and group routine/habits	Talk about ones and group's routines/habits	(6 MI items, 3marks)	(6 MC items, 3marks)		12	1	10

S/N	COMPETENCIES	TOPIC	SUB TOPIC	ASSESSMENT	LEVEL 1 Remembering and understanding	LEVEL 2 Applying and analysing	LEVEL 3 Creating and evaluating	TOTAL NO. ITEMS	TOTAL NO. QUESTIONS	TOTAL MARKS
		DESCRIBING THINGS.	Describing things	Describe things in terms of their quality and quantity			(4 short answer items 4 marks)	04		
3	Express in English orally and in writing, needs, feelings and ideas using appropriate vocabulary.	EXPRESSING OPINIONS AND FEELINGS.	Expressing personal opinions, state of health, feelings and point of view.	• Express opinions on familiar issues • Express heath condition • Express feelings	(6 MI items, 3marks)			06	1	10
		EXPRESSING LIKES AND DISLIKES	Expressing likes and dislikes, expressing preferences.	• Express likes and dislikes • Express preferences.		(6 MC items, 3marks)	(4 short answer items 4 marks)	10		
4	Give and respond to directions/requests using simple English sentences.	GIVING DIRECTIONS	Stating directions.	• Give and ask for directions • Show four points of compass	(6 MI items, 3marks)	(6 MC items, 3marks)		12	1	10
		LOCATING PLACES	Locating important places	Express the location of different places.			(4 short answer items 4 marks)	04		
5	Use English to obtain, process, construct and provide subject matter information in spoken and in	ANALYSING INFORMATION FROM THE MEDIA	Analysing factual and nonfactual information	Identify factual and non-factual information from the media			(4 short answer items 4 marks)	04	1	10
		EXPRESSING FUTURE PLANS/ACT	Talking about future plans/activities	Express future plans	(6 MI items, 3marks)			06		

S/N	COMPETENCIES	TOPIC	SUB TOPIC	ASSESSMENT	LEVEL 1 Remembering and understanding	LEVEL 2 Applying and analysing	LEVEL 3 Creating and evaluating	TOTAL NO. ITEMS	TOTAL NO. QUESTIONS	TOTAL MARKS
	written forms.	IVITIES								
		EXPRESSING ONGOING ACTIVITIES	Talking about on-going activities	Express on-going activities.		(6 MC items, 3marks)		06		
6	Identify general and specific information on events in simple oral/written texts she/he encounters	TALKING ABOUT EVENTS	Talking about celebrations, accidents, sports, visits, lections	Narrate about what took place in an event.		(6 MC items, 3marks)	(4 short answer items 4 marks)	10		
		TALKING ABOUT CULTURAL ACTIVITIES.	Talking about games, marriages, funerals.	• Explain how a particular game is played. • Describe marriage activities. • Describe what takes place in funerals.	(6 MI items, 3marks)			06	1	10
7	Use appropriate English pronunciation and intonation in a variety of settings	DICTIONARY USE	Dictionary use	Use a dictionary to obtain meanings and spellings of words.	(6 MI items, 3marks	(6 MC items, 3marks)	(4 short answer items 4 marks)	16	1	10
8	Describe past activities and personal experiences	TALKING ABOUT PAST EVENTS/ ACTIVITIES.	Expressing past activities.	Expressing past activities.	(6 MI items, 3marks	(6 MC items, 3marks)	(4 short answer items 4 marks	16	1	10
9	Interact in	WRITING	Writing friendly	Writing friendly letters.			(4 short	04	1	

S/N	COMPETENCIES	TOPIC	SUB TOPIC	ASSESSMENT	LEVEL 1 Remembering and understanding	LEVEL 2 Applying and analysing	LEVEL 3 Creating and evaluating	TOTAL NO. ITEMS	TOTAL NO. QUESTIONS	TOTAL MARKS
	spoken and written for personal expression and enjoyment	PERSONAL LETTERS	letters				answer items 4 marks			
		TAKING NOTES	Writing notes from oral and written texts.	Writing down important notes from oral/written texts.	(6 MI items, 3marks			06		10
		WRITING A VARIETY OF TEXTS	Filling in forms	Filling in forms with important information.		(6 MC items, 3marks)		06		
10	Ask and answer questions on simple readers and report on what he/she read	INTERPRETING LITERARY WORKS	Interpreting simple stories. Interpreting poems.	• Explain the message from simple stories orally and in writing. • Answer questions on poems orally and in writing.	(6 MI items, 3marks	(6 MI items, 3marks	(4 short answer items 4 marks	16	1	10

APPENDIX 4: PHYSICS ASSESSMENT FRAMEWORK

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	**Level 2 (b)**	**Level 3 (c)**			
1.	Apply laws, principles of Physics in daily life;	Introduction to Physics	(a) Concept of Physics	Explain the concept of Physics. Establish the relationship between Physics and other subjects. State the importance of studying Physics.	Remembering M.I (6 Items)	Applying SAQs (3 Items)	Evaluating (SAQs) 4 Items	32	2	20
			(b) Applications of Physics in Real Life	Explain the applications of Physics in real life. Apply Physics in daily life.	Understanding M.C (6 Items)	Analysing SAQs (3 Items)	Evaluating (SA) 2 Items			
		Force	(a) Concept of Force	Explain the concept of force. State the SI unit of force.	Remembering M.I (6 Items) Understanding M.C (6 Items)	Applying SAQs (3Items) Analysing SAQs (3 Items))	Evaluating (SA) 2 Items			
			(b) Types of Forces	Identify the types of force. Describe the properties of fundamental forces.						
			(c) Effects of Forces	Identify the effects of forces. Justify the effects of forces on materials.			Creating (SA) 2 Items)			
		Archimedes Principle and Law of Flotation	(a) Archimedes Principle	Explain the concept of upthrust. Verify the Archimedes principle. Determine the relative density of a substance by applying the Archimedes Principle.	Remembering M.I (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items			
			(b) Law of Flotation	Distinguish floating and sinking objects. Explain the conditions to substances to float in fluids. Relate upthrust and weight of	Understanding M.C (6 Items)	Analysing SAQs (3 Items)	Creating (SA) 2 Items			

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				floating body.						
				State the law of flotation.						
				Apply the law of flotation in daily life.						
				Describe the hydrometer.						
				Construct a simple hydrometer.						
				Determine the relative density of different liquids by using a hydrometer.						
		Pressure	(a) Concept of Pressure	Explain the concept of pressure.	Remembering M.I (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items			
				State the S.I unit of pressure.						
			(b) Pressure due to Solids	Explain the dependence of pressure on surface of contact.						
				Identify the applications of pressure due to solid.						
			(c) Pressure in Liquids	Describe the characteristics of pressure in liquids.	Understanding M.C (6 Items)	Analysing SAQs (3 Items)	Creating (SA) 2 Items			
				Examine the variation of pressure with depth in liquids.						
				Solve problems involving pressure in liquids.						
				Explain the principle of a hydraulic press.						
				Measure pressure of a liquid						
			(d) Atmospheric Pressure	Describe the existence of atmospheric pressure.						
				Identify the applications of atmospheric pressure.						
				Measure the atmospheric						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				pressure.						
	.	Work, Energy and Power	(a) Work	Explain the concept of work.	Remembering M.I (6 Items)	Applying AQs (3 Items)	Evaluating (SA) 2 Items			
				State the SI unit of work.						
				Determine the work done by the applied force.						
			(b) Energy	Explain the concept of energy.						
				State the S.I unit of energy.						
				Identify different forms of energy.						
				Distinguish between potential energy and kinetic energy.						
				Describe the transformation of energy.						
				State the principle of conservation of energy.						
				Explain the uses of mechanical energy.						
			(c) Power	Explain the concept of power.	M.C (6 Items) Understanding	Analysing SAQs (3 Items)	Creating (SA) 2 Items			
2.	Practice safety rules in daily life;	Introduction to Laboratory Practice	(a) Laboratory Rules and Safety	State Physics laboratory rules.	Remembering M.I (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items	16	1	10
				Explain safety measures in Physics laboratory.						
				Use of each item in a First Aid Kit.						
				Identify warning sign.						
				Use of warning signs in daily life.						
			(b) Basic Principles	Explain the concept of scientific						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
			of Scientific Investigation	investigation.						
				Identify the steps of scientific investigation.						
				Use the scientific investigation methods in solving problems.						
3.	Make appropriate measurements of physical quantities	Measurement	(a) Concepts of Measurement	Explain the concept of measurement.	Remembering M.I (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items	16	1	10
				State the importance of measurement.						
			(b) Fundamental Quantities	Define a fundamental quantity.						
				Mention the three basic fundamental quantities.						
				State S.I units of fundamental quantities.						
				Use instruments for measuring fundamental quantities.						
			(c) Derived Quantities	Explain derived quantities.	Understanding M.C (6 Items)		Creating (SA) 2 Items			
				State the SI units of derived quantities.						
			(d) Basic Apparatus/ Equipment and their Uses	Describe apparatus/ equipment used for measurement.						
				Identify sources of errors in measurement.						
			(e) Density and Relative Density	Explain the concept of density of a substance and its S.I unit.						
				Determine the density of regular, irregular solids and insoluble substance.		Analysing SAQs (3				
				Determine the density of liquids.						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				Define the relative density of a substance.		Items)				
				Determine the relative density of a substance.						
				Interpret applications of density and relative density in real life.						
				State the SI unit of force.						
4.	Use scientific skills to identify nature and properties of matter.	Structure and Properties of Matter	(a) Structure of Matter	Explain the concept of matter.	Remembering M.I (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items	16	1	10
				Justify the particulate nature of matter.						
				Explain the Kinetic theory of matter.						
				Classify the three states of matter.						
			(b) Elasticity	Explain the concept of elasticity.						
				Justify the relationship between tension and Extension of a loaded elastic material.						
				Identify the applications of elasticity in real life.		Analysing SAQs (3 Items)	Creating (SA) 2 Items			
			(c) Adhesion and Cohesion	Explain the concept of adhesion and cohesion force.						
				Apply adhesion and cohesion in daily life.						
			(d) Surface Tension	Explain the concept of surface tension.						
				Identify the applications of surface						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				tension in daily life.						
			(e) Capillarity	Explain the concept of capillarity.						
				Identify the applications of capillarity in daily life.						
			(f) Osmosis	Explain the concept of osmosis.						
				Identify the applications of osmosis in daily life.						
5.	Apply the laws of reflection of light in daily life	Light	(a) Sources of Light	Explain the concept of light.	Remembering M.C (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items	16	1	10
				Identify the sources of light.						
				Distinguish luminous from non-luminous bodies.						
			(b) Propagation and Transmission of Light	Explain the concept of rays and beam of light.						
				Verify that light travels in a straight line.		Analysing SAQs (3 Items)				
				Identify transparent, translucent and of opaque materials.						
			(c) Reflection of Light	Explain the concept of reflection of light.	Understanding M.I (6 Items)	Applying SAQs (3 Items)	Creating (SA) (2 Items)			
				Distinguish between regular and irregular reflection of light.						
				Apply the laws of reflection of light.						
				Describe image formed by a plane mirror.						
6.	Apply electricity and Magnetism	Static Electricity	(a) Concept of Static Electricity	Explain the concept of static electricity.	Remembering M.C (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) (4 Items)	32	2	10
				Explain the origin of charges.						
				Identify two types of charges.						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
	knowledge in daily life.			State the fundamental law of static electricity.						
				Charge bodies using different methods.						
			(b) Detection of Charges	Describe the structure of a leaf electroscope.						
				Determine the sign of charges.						
				Identify steps of charging and discharging of a gold leaf electroscope.						
			(c) Conductors and Insulators	Distinguish between a conductor and insulator.						
			(d) Capacitors	Explain the concept of capacitance.			Creating (SA) (4 Items)			
				Explain mode of action of a capacitor.						
				Describe the construction of an air-filled capacitor.						
				Determine equivalence of a combination of capacitors.						
			(e) Charge Distribution along the Surface of a Conductor	Recognize that charges on a conductor reside on its outer surface.	Understanding M.I (6 Items)	Analysing SAQs (3 Items)				
				Show that charges on a conductor is concentrated on sharply curved surfaces.						
			(f) Lightning Conductor	Explain the phenomenon of lightning conductor.						
				Describe the structure and the mode of action of lightning						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				conductor.						
				Construct a simple lightning conductor.						
		Current Electricity	(a) Concept of Current Electricity	Define current electricity.	Remembering M.C (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) (4 Items)			
			(b) Simple Electric Circuits	Identify different sources of current electricity in everyday life.	understanding M.I (6 Items)	Analysing SAQs (3 Items)	Creating (SA) (4 Items)			
				Identify basic circuit components.						
				Identify simple electric symbols.						
				Explain the concept of current, voltage and resistance.						
				State the S.I units of current, voltage and resistors.						
				Connect simple electric circuits.						
				Measure electric current and voltage.						
				Analyse simple electric circuits.						
		Magnetism	(a) Concept of Magnetism	Explain the origin of magnetism.	Remembering M.C (2 Items)	Applying SAQs (3 Items)	Evaluating (SA) (2 Items)			
				Identify magnetic and nonmagnetic materials/ substances.						
				State the properties of magnets.						
				Identify types of magnets.						
				Identify different applications of magnets.						
			(b) Magnetization and Demagnetiz	Explain the concept of magnetization and demagnetization.						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
			ation	Demonstrate magnetization and demagnetization.						
				Design methods of storing magnets						
			(c) Magnetic Fields of a Magnet	Explain the concept of magnetic fields of a magnet.	Understanding M.I (6 Items)	Analysing SAQs (3 Items)	Creating (SA) (2 Items)			
				Illustrate the magnetic lines of force around a magnet using iron fillings or compass needle.						
				Explain the method of magnetic shielding.						
			(d) Earth's Magnetic Field	Explain the phenomenon of earth's magnetism.						
				Determine direction of earth's magnetic field.						
				Locate the earth's magnetic lines of force about a bar magnet.						
				Measure angles of inclination (dip) and angles of declination.						
				State the applications of earth's magnetic field.						
7.	Apply the concepts of turning forces in daily life.	Forces in Equilibrium	(a) Moment of a Force	Explain the effects of turning forces.	Remembering M.C (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items	16	1	10
				Determine the moment of force.						
				State the principle of moments.						
			(b) Centre of Gravity	Apply the principle of moments in daily life.						
				Determine centre of gravity of a regular shaped body.						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				Determine the centre of gravity of an irregular shaped body.						
			(c) Types of Equilibrium	Explain the conditions for equilibrium.	Understanding M.I (6 Items)	Analysing SAQs (3 Items)	Creating (SA) 2 Items			
				Explain stable, unstable and neutral equilibrium.						
				Apply conditions of stable, unstable and neutral equilibrium in daily life.						
8.	Use simple Machines to simplify work.	Simple Machines	(a) Concept of Simple Machines	Explain the concept of a simple machine.	Remembering M.C (6 Items)	Applying SAQs (3 Items)	Evaluating (SA) 2 Items	16	1	10
				Explain the terms used in simple machines.						
				Identify different kinds of simple machines.						
			(b) Levers	Identify the three classes of levers.						
				Determine the mechanical, advantage velocity ratio and efficiency of a lever.						
				Use levers in daily life.						
			(c) Pulleys	Identify different pulley systems.						
				Determine mechanical advantage, velocity ratio and efficiency of pulley system.						
				Use pulleys in daily life.						
			(d) Inclined Plane	State the concept of inclined plane.	Understanding M.C (6 Items)	Analysing SAQs (3 Items)	Creating (SA) 2 Items			
				Determine mechanical						

SN	Competences	Topic	Sub -Topic	Assessment	Levels			Total No. of Items	Total Number of Questions	Total marks
					Level I (a)	Level 2 (b)	Level 3 (c)			
				advantage, velocity ratio and efficiency of inclined plane.						
				Apply inclined plane in daily life.						
			(e) Screw Jack	Describe the structure of a screw jack.						
				Determine the mechanical advantage, velocity ratio and efficiency of screw jack.						
				Use a screw jack in daily life.						
			(f) Wheel and (g) Axle	Describe the structure of a wheel and axle.						
				Determine mechanical advantage, velocity ratio and efficiency of a wheel and axle.						
				Use the wheel and axle in daily life.						
			(h) Hydraulic Press	Describe the structure of hydraulic press.						
				Determine mechanical advantage, velocity ratio and efficiency of a hydraulic press.						
				Use the hydraulic press in daily life.						

APPENDIX 5: BACKGROUND ISSUES QUESTIONNAIRES

A: Student Questionnaires

- Gender, age, Nationality, repeater and language background (These should be on the front page of the questionnaire)
- Educational records such as months or periods/sessions at school and away from school
- Opportunities to attend school
- Expectations of success
- Personal attitudes about value of the school
- Family attitudes about the value of the school
- Perceptions of classroom environment such as a sense of safety, friendliness of other students or support from teachers
- Presence of Teachers in all subjects
- Presence of teaching and learning materials such as books
- Subjects with no Teachers
- Teachers commitment to teach all lessons as per school time table

B: Teacher Questionnaires

- Gender, age and language background
- Class size
- Total number of lessons per week
- Education level
- Grade attained in teaching subjects at Secondary School, Teacher College and University.
- Access to resources
- Access to Learning Management Systems (LMS) such as online learning
- Percentage of students with text books

- Possibility of having replacement teachers whenever absent (e.g sick)
- Assistance with challenging students (difficult in learning)
- Access to, and interest in professional development
- Interest in teaching
- Time spent preparing for lessons and assignments
- Preparation of teaching notes
- Availability of instructional support through classroom visit by head of school, Quality assurer or supervisors
- Teaching methodology mostly adapted during teaching and learning process
- Language of instructions and use of assessment during teaching
- Topics covered up to the time of learning evaluation
- Challenges encountered during teaching and learning process
- Satisfaction with working condition such as tenure, rates of pay and level of supervision
- Relationship with school community such as parents/guardians
- Involvement in school committees and participation in local community events
- Distance from teacher's home to school
- Availability of teaching aids

C: Head teacher Questionnaires

- Gender and age
- Educational qualification and management experience
- School environment such as quality of buildings and facilities
- Availability of resources (human and physical)
- Availability of teaching and learning materials
- Availability/use of Learning Management Systems (LMS)
- School records such as fluctuations in student numbers

- The extent of student or teacher absenteeism
- The frequency of students changing schools (transferring to or away from the school)
- Professional engagement with educational leadership such as access to and interest in professional development and interest in education
- Leadership style
- Use/utilization of time
- Satisfaction with working condition such as tenure, rates of pay, and level and frequency of supervision
- Relationship with school community such as parents/guardians
- Involvement in school committees and participation in local community events

D: Parent/Guardian/Member of School Board Questionnaires

- Nationality and gender
- Professional/title
- Home environment such as access to light, desks and books
- Family backgrounds such as level of education of parents/guardians and the language spoken at home
- Attitudes or willingness or commitments towards education
- Attention to homework/school assignments that are given to children by their teachers
- Ability to afford and access education for children
- Expectations of educational achievements for children
- Participation or involvement with school activities such as school meetings
- Nature of school reports about children progress and their value

APPENDIX 6: STUDENTS' PERFORMANCE IN DIFFERENT SKILL LEVELS IN BASIC MATHEMATICS ASSESSMENT

S/N	Competence	Levels of Performance	Categories of Performance				
			Excellent	Very Good	Good	satisfactory	Unsatisfactory
1.	Distinguish different types of numbers and solve problems.	Level 1	16.4	9.0	10.5	11.5	52.6
		Level 2	3.7	12.0	2.2	11.8	70.4
		Level 3	4.0	1.0	1.8	1.7	91.5
2.	Convert units	Level 1	7.9	1.9	12.2	2.3	75.7
		Level 2	12.4	0.2	1.3	0.8	85.2
		Level 3	6.7	0.0	0.5	0.2	92.7
3.	Estimate and compute numbers accurately	Level 1	9.7	1.4	2.2	13.6	73.1
		Level 2	15.0	2.3	2.3	15.3	65.0
		Level 3	2.2	0.9	0.7	0.2	96.0
4.	Do scale drawing and geometrical transformations	Level 1	4.0	4.5	0.3	2.1	89.2
		Level 2	6.1	4.4	3.0	8.6	77.8
		Level 3	8.2	0.0	10.8	0.2	80.8
5.	Solve problems on perimeters and areas	Level 1	7.3	0.6	0.0	0.7	91.3
		Level 2	4.1	2.8	0.3	1.5	91.4
		Level 3	2.8	0.1	10.6	0.5	85.9
6.	Factorize and solve problems.	Level 1	2.8	4.3	4.5	3.1	85.2
		Level 2	0.8	0.4	0.5	0.8	97.5
		Level 3	10.0	0.1	2.3	0.2	87.3
7.	Solve problems on ratios, profit and loss, and simple interest.	Level 1	8.2	4.3	3.9	12.8	70.9
		Level 2	15.5	2.0	0.6	1.1	80.8
		Level 3	12.1	0.1	0.3	0.6	87.0
8.	Graph and interpret linear equations.	Level 1	24.7	4.4	3.1	2.8	65.0
		Level 2	3.7	1.9	0.6	2.2	91.6
		Level 3	2.6	0.5	0.5	0.7	95.7
9.	Graph and interpret linear equations.	Level 1	13.3	7.3	8.3	1.4	69.6
		Level 2	5.8	0.2	5.7	0.4	88.0
		Level 3	0.8	0.0	0.3	0.4	98.5
10.	Graph and interpret linear equations.	Level 1	6.0	3.2	1.3	18.9	70.5
		Level 2	9.1	5.6	3.2	5.0	77.2
		Level 3	1.1	0.3	5.3	0.3	93.1

APPENDIX 7: STUDENTS PERFORMANCE IN DIFFERENT SKILL LEVELS IN BIOLOGY ASSESSMENT

S/N	Competence	Levels of Performance	Categories of Performance				
			Excellency	Very Good	Good	Satisfactory	Unsatisfactory
1.	Demonstrate appropriate use of biological knowledge, concepts, principles and skills in everyday life.	Level 1	9.4	18.9	17.1	19.1	35.5
		Level 2	11.0	8.1	9.6	12.5	58.9
		Level 3	8.0	0.1	2.9	0.1	89.0
2.	Demonstrate appropriate preventive measures and precautions against common accidents, infections and other related health problems.	Level 1	14.7	14.3	18.7	24.3	28.0
		Level 2	18.3	21.2	12.6	22.1	25.7
		Level 3	12.0	0.1	17.4	0.3	70.2
3.	Use of scientific procedures and practical skills in studying biology.	Level 1	6.4	7.7	14.2	21.2	50.3
		Level 2	8.3	12.2	15.0	20.5	44.0
		Level 3	50.0	0.0	14.2	0.4	35.4
4.	Group organisms according to their similarities and differences	Level 1	2.7	7.6	17.3	29.3	43.1
		Level 2	6.2	6.5	10.1	13.9	63.3
		Level 3	12.7	0.0	9.8	0.1	77.3
5.	Use of basic biological concepts, principles and skills to evaluate the roles of various physiological processes in plants and animals.	Level 1	5.2	7.7	15.3	24.0	47.7
		Level 2	2.7	1.8	1.7	9.6	84.2
		Level 3	12.0	0.0	14.6	0.3	73.0
6.	Appreciate nature and ensure sustained interaction of organisms in the natural environment.	Level 1	6.9	11.1	19.5	27.6	34.9
		Level 2	26.9	10.7	14.5	14.3	33.5
		Level 3	4.7	0.1	6.2	0.4	88.5
7.	Use of biological practical skills in studying various physiological processes in plants and animals	Level 1	1.4	6.1	16.1	32.5	43.9
		Level 2	6.7	42.3	8.3	30.3	12.3
		Level 3	10.8	0.0	8.5	0.1	80.6

APPENDIX 8: STUDENTS' PERFORMANCE IN DIFFERENT SKILLS IN ENGLISH LANGUAGE ASSESSMENT

S/N	Competence	Levels of Performance	Categories of Performance				
			Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Use simple English to communicate in social interactions and settings.	Level 1	15.6	16.0	24.1	24.8	19.6
		Level 2	18.5	43.2	3.5	26.2	8.7
		Level 3	27.9	0.0	18.8	0.1	53.1
2.	Describe past activities and personal experiences	Level 1	8.3	7.2	12.9	23.8	47.7
		Level 2	4.8	5.1	6.1	9.3	74.7
		Level 3	2.3	0.1	0.7	0.1	96.8
3.	Engage in simple conversations and transactions on familiar topics	Level 1	34.1	9.7	9.8	14.4	32.0
		Level 2	16.0	13.0	17.7	23.5	29.8
		Level 3	9.1	0.0	9.6	0.4	80.9
4.	Express in English in writing, needs, feelings and ideas using appropriate vocabulary	Level 1	9.3	13.4	24.4	27.9	24.9
		Level 2	8.5	7.5	12.1	19.2	52.6
		Level 3	14.5	1.9	10.7	4.8	68.1
5.	Give and respond to directions/requests using simple English sentences.	Level 1	5.6	10.5	19.4	27.3	37.1
		Level 2	11.5	8.4	3.9	7.4	68.8
		Level 3	19.3	0.0	7.3	0.2	73.1
6.	Identify general and specific information on events in simple oral/written texts she/he encounters	Level 1	10.2	5.2	9.4	17.8	57.4
		Level 2	10.8	10.6	14.0	18.7	45.9
		Level 3	6.1	0.2	14.7	0.4	78.6
7.	Use English to obtain, process construct and provide subject matter information in written forms	Level 1	24.9	15.8	23.2	21.6	14.5
		Level 2	50.3	17.8	12.4	7.6	11.8
		Level 3	14.1	0.1	3.3	0.2	82.2
8.	Use appropriate English pronunciation in a variety of settings	Level 1	5.1	5.2	8.3	15.0	66.4
		Level 2	25.1	14.0	8.1	22.4	30.5
		Level 3	28.7	0.2	11.7	0.5	59.0
9.	Interact in written for personal expression and enjoyment	Level 1	11.7	13.6	13.0	19.1	42.8
		Level 2	28.0	13.2	8.9	6.2	43.7
		Level 3	9.2	0.0	5.8	0.2	84.8
10.	Answer questions on simple readers and report on what he/she read	Level 1	13.9	11.6	15.3	19.2	40.0
		Level 2	15.1	5.6	6.2	7.4	65.6
		Level 3	5.9	0.0	2.2	0.3	91.6

APPENDIX 9: STUDENTS' PERFORMANCE IN DIFFERENT SKILL LEVELS IN PHYSICS ASSESSMENT

S/N	Competence	Levels of Performance	Categories of Performance				
			Excellent	Very Good	Good	Satisfactory	Unsatisfactory
1.	Apply laws, principles of Physics in daily life.	Level 1	24.3	10.4	15.0	21.0	29.3
		Level 2	9.7	11.2	0.2	44.5	34.4
		Level 3	23.9	0.5	7.7	0.2	67.7
2.	Practice safety rules in daily life.	Level 1	18.2	10.9	13.1	20.3	37.6
		Level 2	3.1	0.1	5.5	1.0	90.4
		Level 3	3.5	0.0	4.9	0.1	91.4
3.	Make appropriate measurements of physical quantities.	Level 1	20.0	20.1	18.0	15.5	26.3
		Level 2	17.9	12.5	0.0	11.3	58.3
		Level 3	15.5	0.4	2.4	0.3	81.3
4.	Use scientific skills to identify nature and properties of matter.	Level 1	6.2	18.3	30.4	28.2	16.9
		Level 2	11.9	8.8	0.1	2.5	76.7
		Level 3	34.6	0.0	22.3	0.1	43.0
5.	Apply the laws of reflection of light in daily life.	Level 1	2.0	5.3	13.4	27.5	51.8
		Level 2	7.8	3.8	2.9	3.9	81.7
		Level 3	8.4	0.0	3.5	0.1	88.0
6.	Apply electricity and Magnetism knowledge in daily life.	Level 1	4.6	7.6	15.6	25.4	46.8
		Level 2	7.5	4.9	11.5	7.8	68.3
		Level 3	3.4	1.1	9.1	7.7	78.6
7.	Apply the concepts of turning forces in daily life.	Level 1	4.1	11.2	21.5	29.5	33.7
		Level 2	2.7	3.1	0.2	17.1	77.0
		Level 3	8.5	0.0	0.1	0.0	91.3
8.	Use simple Machines to simplify work	Level 1	6.7	12.8	22.6	28.5	29.3
		Level 2	29.9	6.8	0.1	4.1	59.1
		Level 3	12.4	0.0	8.5	0.0	79.0