NATIONAL EDUCATIONAL ASSESSMENT AND EXAMINATIONS AGENCY

ETHIOPIAN THIRD NATIONAL LEARNING ASSESSMENT OF GRADE 10 AND 12 STUDENTS ACHIEVEMENT (ETNLA)

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NEAEA, ADDIS ABABA

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Acronyms and Abbreviations

EFA	Education For All
CTT	Classical Test Theory
CEU	Council of the European Union
EGMA	Early Grade Mathematics Assessment
EGRA	Early Grade Reading Assessment
EMIS	Education Management Information System
ESDP	Education Sector Development Program
ETNLA	Ethiopian Third National Learning Assessments
FGD	Focused Group Discussion
GEQIP	General Education Quality Improvement Program
GTP	Growth and Transformation Program
HSD	Honest Significant Difference
HOT	Higher Order Thinking
HREOC	Human Rights and Equal Opportunity Commission
IATA	Item And Test Analysis
IBM	International Business Machines
IRT	Item Response Theory
MD	Mean Difference
MLC	Minimum Learning Competency
MOE	Ministry of Education
MS	Microsoft
NOE	National Agency for Examination
NEAD	National Educational Assessment Directorate
NEAEA	National Educational Assessment and Examinations Agency
NLA	National Leaning Assessment
REB	Regional Education Bureaus
SD	Standard Deviation
SES	Socio Economic Status
SPSS	Statistical Package for Social Sciences
TAP	Test Analysis Program
TGE	Transitional Government of Ethiopia
TOT	Training of Trainers
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development

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The contributions of regional and zonal coordinators as well as supervisors selected from each zones who traveled to the schools and invigilators recruited from are highly praiseworthy for collecting the required data. Finally, our many thanks also go to the sample school principals, teachers and student who enthusiastically participated in the study.

Executive Summary

In the past, quality education mainly referred to the enabling conditions for learning, what many consider as the major inputs to schooling such as student participation rates, physical facilities, curriculum materials, and teachers training. Today, emphasis of assessing the quality of education shifted from a concern with inputs to learning outcomes (such as the knowledge and skills that students have actually acquired as a result of their exposure to schooling) (Kellaghan and Greaney cited in UNESCO, 2001).

Objective

The main purpose of Ethiopian Third National Learning Assessments (ETNLA) was to measure the academic achievement levels of grades 10 and 12 students, detect subgroup differences, and identify determining factors related to achievement scores and finally inform stakeholders in the education system. Based on this, the study tried to answer the following basic research questions:

1. What does the overall achievements of Grade 10 and 12 students in core subjects look like?
2. What does the overall achievements of Grade 10 and 12 students look like in key subjects by content domains and cognitive levels?
3. What does the overall achievements of students look like in the proficiency levels for both grades in each subject?
4. To what extent students are achieving the target set in ESDP V (50% in grade 10 and 75% in grade 12 achieve at least 50% in composite mean score by the core subjects)?
5. Do particular sub-groups in the population perform poorly? Are there disparities between the achievements of boys and girls, of students in urban and rural locations, of students in government and non-government schools, of students in different regions of the country and school status/rank?
6. What factors are associated with student achievement? To what extent does achievement vary with characteristics of the learning environment (e.g. school resources, teacher preparation and competence, type of school) or with students' home and community circumstances?
7. Do the achievements of students change over time?
8. What are the implications of the third national learning assessment result to improve student learning achievement and education quality in Ethiopia?

Methods

Instrument Development

Ethiopian Third National Learning Assessment of Grades 10 and 12 (ETNLA) used two types' of assessment tools:

1. Tests that measure students' learning achievement, focusing on curriculum areas of core subjects namely: English, Mathematics, Physics, Chemistry, and Biology.
2. Background questionnaires for students, teachers and School principals to identify the variables that explain the achievement variations of students in these core subjects.

Sampling

The sample design framework used was a two-stage cluster sample design which was carried out first selecting schools and then students from class rooms using simple random sampling technique. Accordingly, 198 schools (7803) students from grade10 and 108 schools (4070) students from grade 12 were taken randomly as samples of the participants of the study. Sample was drawn from the list of schools/sample frame/ obtained from EMIS data 2015/16 (2008 E.C.) of Ministry of Education.

Data Collection Procedures

Over all Data were collected from 306 schools, and 11,873students, 300 principals and 1490 teachers from 9 regions and 2 city administrations. In the data collection process, 27 national coordinators, 58 route coordinators, 262 center chiefs, 300 school directors, 306 invigilators and 9 reginal coordinators with a total of 962 data collectors were participated.

Intensive hands on training for trainers (TOT) were given for 58 data collectors by the experts of National Educational Assessment and Examinations Agency (NEAEA) based on the ETNLA instrument administration manual. The trainers in turn provided the same training for center chiefs and invigilators.

Data Analysis and Reporting

After the data were collected both the quantitative and the qualitative methods were used to analyze the data. The statistical package for social science (SPSS) version 22 and Item and Test Analysis (IATA v 5.1.1.0) were employed to undertake the analysis. Summary of descriptive statistics to summarize central tendencies and dispersion were computed to each subject and to the average score. In addition, correlation and statistical tests of significance were also computed to detect relationships and differences. One-way analysis of variance followed by Post Hoc test was

computed to identify homogenous subset groups. Finally, qualitative descriptions were also employed for analysis and interpretation of the data obtained through questionnaires and focused group discussions.

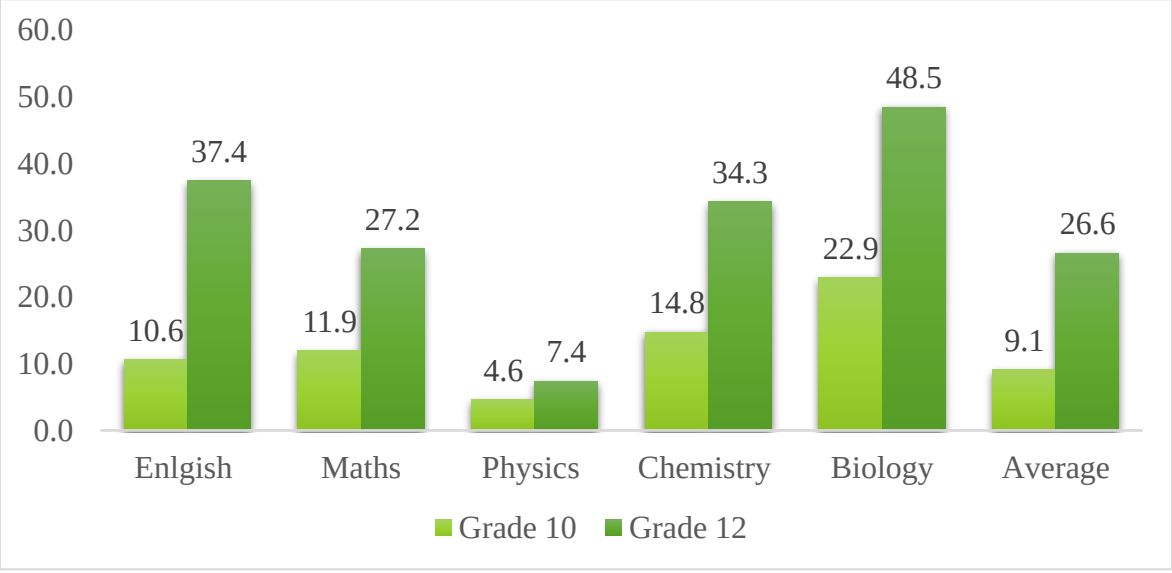
Findings

Overall achievement scores

The academic achievement of students as measured by the mean score of the five core subjects namely: English, Mathematics, Biology, Chemistry and Physics was found less than 50% which is the minimum achievement level set by the Education and Training Policy of Ethiopia in grade 10. The national mean score (the composite score in the five tested subjects) was only 33.3%. Similarly, in grade 12 the mean score of each of the tested subjects were below the minimum requirement (50%) except Biology (50%) and the composite mean score was also 41.7%

In grade 10, only 9.1% of students achieved a composite score 50% and above. When we look at the individual subjects, the percentages of students who achieved 50% and above were only 10.6% in English, 11.9% in mathematics, 4.6% in physics, 14.8% in chemistry and 22.9% in biology. In Grade 12, 37.4% of students in English, 27.2% in Mathematics, 7.4% in Physics, 34.3% in Chemistry and 48.5% in Biology had scores of 50% and above as shown in the figure below.

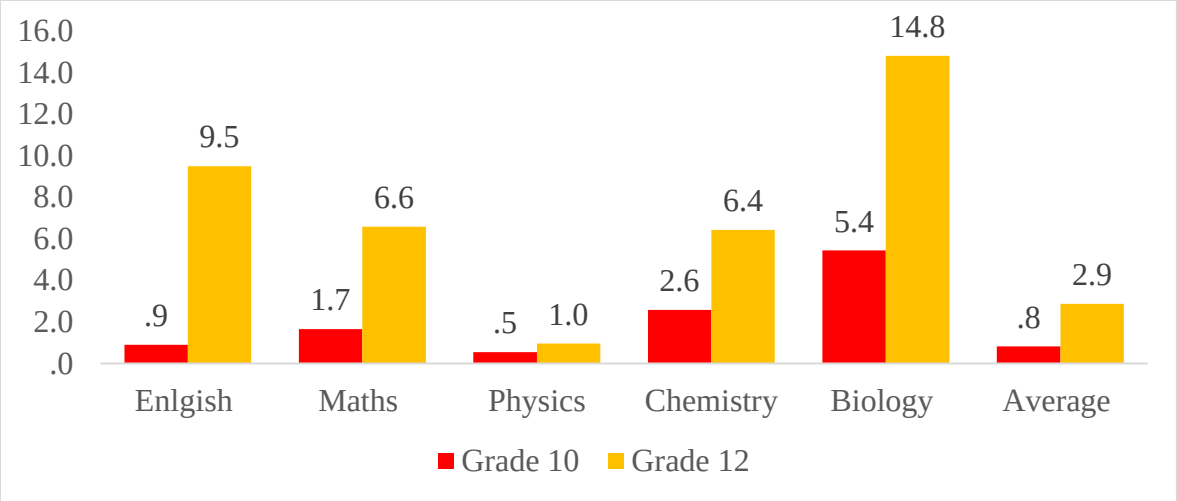
Percentage of students who scored 50% and above



In grade 10, only 0.8% students were scored 75% and above in national composite score. Looking at the subjects, 0.9% of students in English, 1.7% in Mathematics, 0.5% in Physics, 2.6% in

Chemistry, 5.4% in Biology scored 75% and above. In grade 12, only 2.9% of the students achieved 75% and above in national composite score. For the subjects, 9.5% of students in English, 6.6% in Mathematics, 1% in Physics, 6.4% in Chemistry and 14.8% in Biology scored 75% and above as figure below.

Percentage of students who scored 75% and above



Achievement of grade 10 and 12 students by content domain

Achievements of students were also analyzed in each subject by content domain. The findings from the analysis of grade 10 students by content domain indicates that, students performed lower in certain content domains than others. This also indicates students have more difficulties in some content areas such as reading and writing in English; trigonometry in mathematics; temperature and heat, and geometrical optics in Physics; chemical reaction and structure of the atom in Chemistry; and microorganisms and classifications in Biology.

Similarly in Grade 12, reading and writing in English; statistics in Mathematics; atomic physics, temperature and heat, electricity and magnetism in Physics; chemical reactions in Chemistry and behavior and genetics in Biology were the contents in which the least scores were recorded.

Achievement by sex

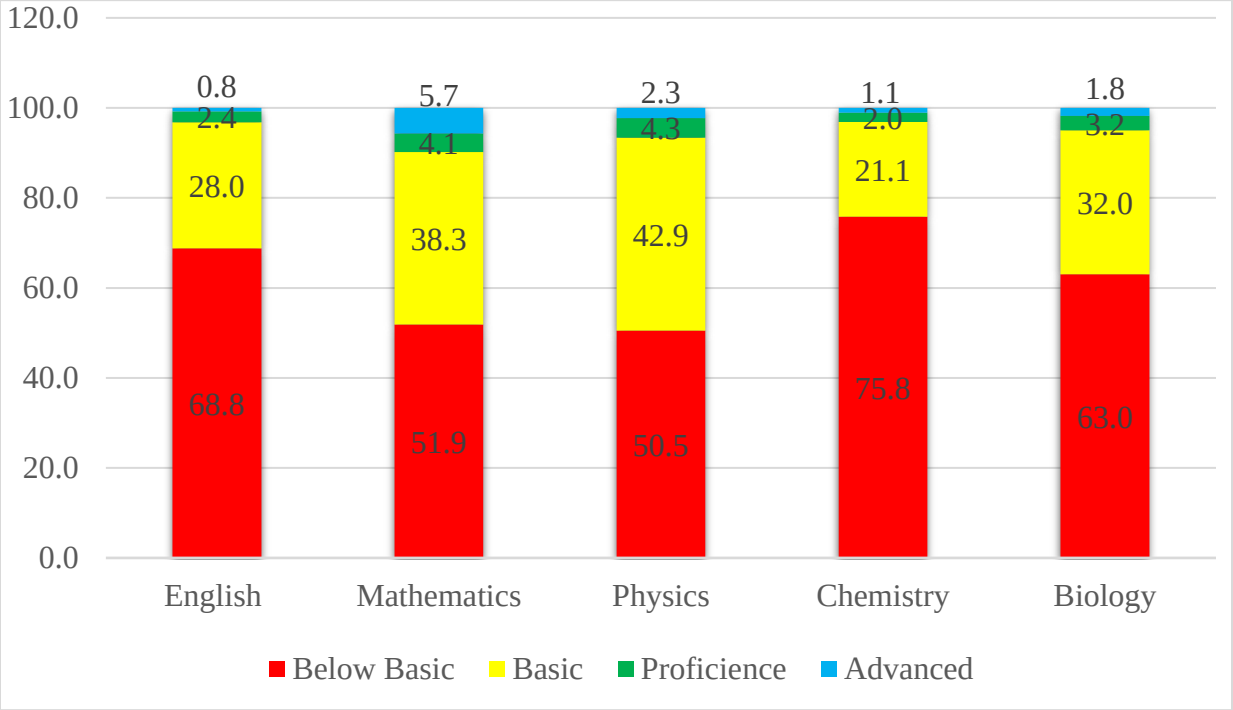
In all subjects in both Grades 10 and 12 boys performed better than girls. In grade 10, boys achieved a national composite score of (34.72%) and girls (31.65%) and in grade 12, boys scored

an average of (42.73%) whereas girls scored (38.41%). The differences were statistically significant in all cases.

Achievement by performance levels

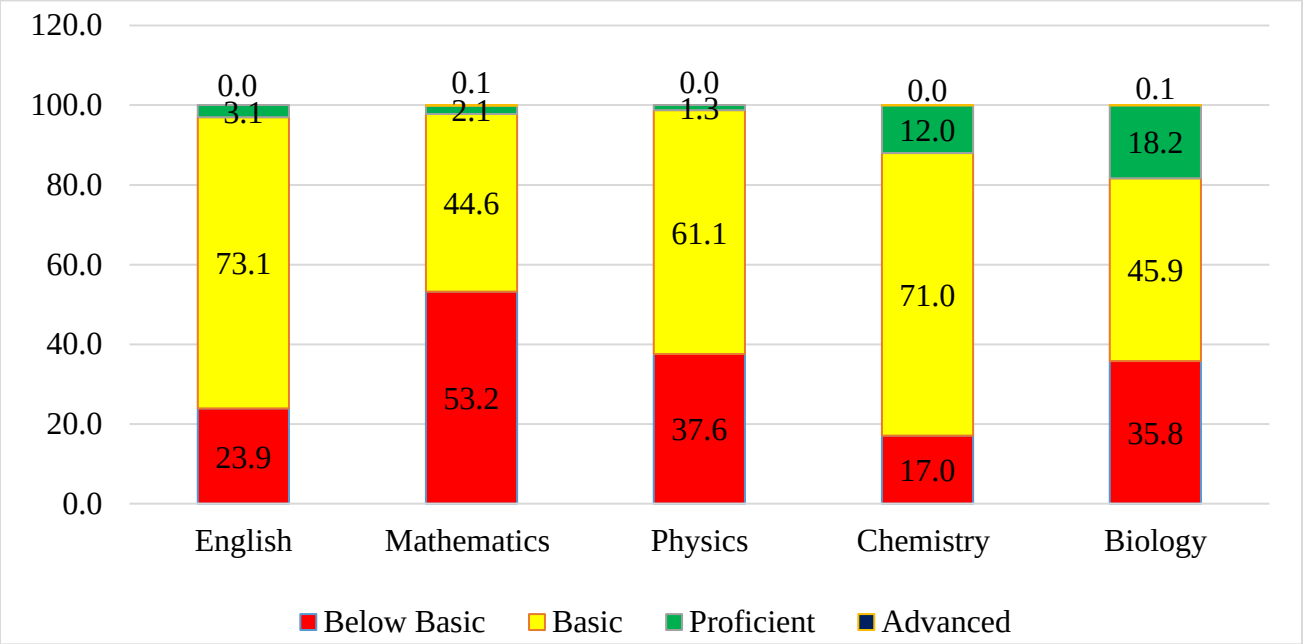
Achievement scores were also analyzed with regard to performance levels. The performance levels were divided into four standards as: 'below basic', 'basic', 'proficient' and 'advanced'. In Grade 10 as shown in the figure below, the proportion of students' at Advanced level was 0.8% for English, 5.7% for Mathematics, 2.3 % for Physics, 1.1% for biology, and 1.8% for Biology. Only from 4.3% to 2.0% of students were found at the proficient levels in each subjects. In all subjects 21.1% to 42.9% of students were belonging to Basic level. While from 50.5% to 75.8% of students were categorized under Below Basic level.

Grade 10 students' achievement by proficiency levels



In Grade 12 as presented in the figure below, no students were achieved at Advanced level for English, Physics and Chemistry. In Mathematics and Biology only 1% of students were classified under Advanced level. In all subjects, only 1.3% to 18.2% of students were found at the proficient levels. The proportion of students belonging to Basic level were in the rage of 44.6% to 73.1% for

each subjects. Likewise, the rage of 17% to 53.2% of students were categorized under Below Basic level.



Achievement by Region

Achievements of all the regions and city administrations were computed for the key subjects. In grade 10, performance of every region was found to be less than 50%. Addis Ababa (43.29%) followed by Harari (40.32%) were the highest achievers whereas Benishangul Gumuz (29.37%), Gambella (29.49%) and Tigray (29.62%) were the least achievers. Most regions achievement scores were below the national mean score. Only five regions; Addis Ababa, Harari, Dire Dawa, Ethiopia Somali, and Amhara scored above the national mean.

In grade 12, only Dire Dawa, Harai, Addis Ababa, Oromia and Amhara were performed above the national mean score 40.90%. The highest achiever among regions was Harari (52.63%) and the least was Ethiopian Somali with 30.16%.

Achievement by School Rank

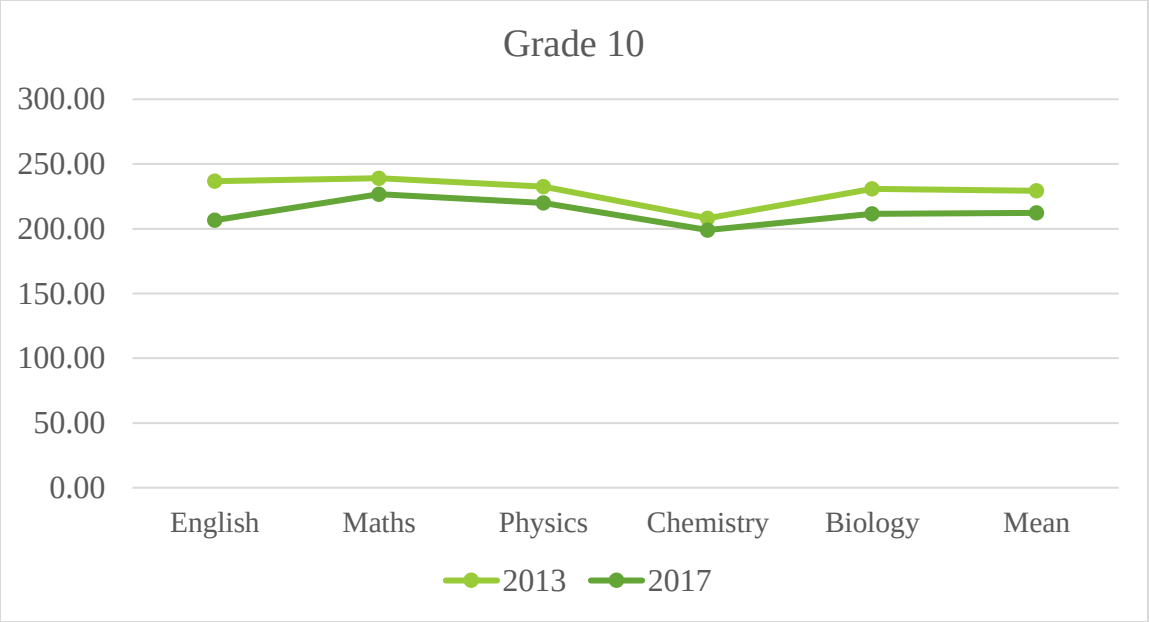
Based on the rank schools by inspection directorate, in grade 10 students, in all subjects the achievement of schools ranked as “Level 3” were relatively performed higher than “Level 2” and “Level 1” as well as “Level 2” performed better than “Level 1.” That is, “Level 3” schools

achieved 37.1% while “Level 2” and “Level 1” scored 32.9% and 32.0% respectively in average scores. In the same way, in grade 12 also schools ranked as “Level 3” was relatively achieve higher than “Level 2” and “Level 1” and “Level 2” performed better than “Level 1”. The average achievement of schools from rank “Level 3” was 44%. Whereas, schools ranked as “Level 2” and “Level 1” scored 40.2% and 38.6% respectively.

Trends of Achievement

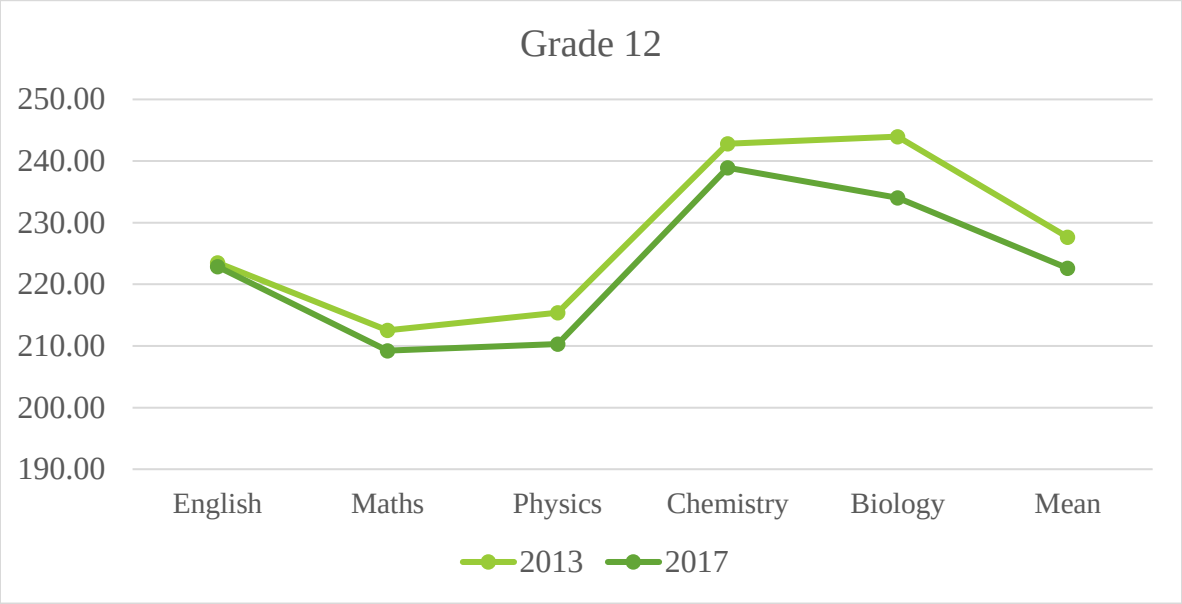
To compare the trends overtime, raw scores were transformed in to scale scores with a fixed common item parameter method in order to place the two tests on the same scale. In this regard, the performance of Grade 10 students in 2017 was significantly lower as comparison to 2013 assessment in all subjects in which the difference was higher in English and lower in Chemistry as shown in the figure below.

Grade 10 students’ achievement trend



Likewise, the performance of grade 12 students in 2017 was also significantly lower in comparison to 2013 assessment in all subjects. In his case, the difference was higher in Biology and lower English. In both years, the trends of each subjects similar in which Mathematics and Physics are the lowest scores while chemistry and Biology seems higher in relative to others as shown in the figure below.

Grade 12 students' achievement trend



Factors associated to students' achievement

Findings from the background variables obtained from students, teachers, principals and parents through the questionnaires and focused group discussion are described in the following brief summary.

Students' background like gender, age, parents' education, and attending pre-primary education are significantly correlated to students' achievement. These variables together explain 16.4% for grade 10 and 9.6%.for grade 12 students' achievement. On the other hand, teachers' background variables like age, experience, sex, level of education and the program they attended their education were significantly correlated to achievement and together explain students' achievement by 9.1% for grade 10 and 2.8% for grade 12. With regard to factors related to school principals, variables such as age and experience, qualification and training on leadership for grade 10 were positively correlated and brought statistically significant contribution.

Among the various factors affecting students' achievement, socio economic status, availability of instructional materials, availability of school resources/infrastructure, instructional time, shortage of teachers, school emphasis on academic success, student attitudes towards their school, and towards their teachers and the subject they learn, professional development, teachers and principals

satisfaction with the working conditions, relationship with school community, school climate were the factors that mainly affect students achievement in both grades 10 and 12. Generally, the correlations of these variables with achievement were statistically significant.

The regression analysis for each of the variables also shows that, student socio economic related variables explained 9.6% of grade 10 and 6.6% of grade 12 students' achievement.

The regression analysis result for principals' instructional materials access like adequate reference books in the library and teaching aids explain student achievement by 11.2% for grade 10 and by 7.8% for grade 12.

In general, variables related to school resources /infrastructures like school library, computers for student use, safe drinking water, separate toilet for male and female explained grade 10 students achievement by 10.6%, and 20.1% grade 12 students achievement as students' response.

On the other hand, factors related to instructional time like teacher absenteeism, time on task (time on homework, study and tutorial), school shift, and portion coverage were investigated in the regression analyses. They had statistically significant contribution to student achievement and could explained 10.2% for grade 10 and 8.4% for grade 12 students' achievement. Similarly, from principals response the regression result revealed that teaching and learning time like school shift and school closure explains students' achievement by 36.9% for grade 10 and 16.5% for grade 12.

The correlations between teacher professional development variables and student achievement are positively correlated in both grades and together explain 4.2% for grade 10 and 6.7% for grade 12 students' achievement. Professional development variables for principals collectively influence students' achievement by 10.5% and 3.6% for grade 10 and 12 respectively.

School climate in terms of attitudes and behaviors of students and teachers was also investigated in the study. Accordingly, the student misbehaviors as to the opinion and perception of teachers all the raised behaviors of students' and achievement correlations were statistically significant for both grades. In other words, when the extent of students' misbehavior like absenteeism, arriving late, classroom disturbance and so on increases, student achievement decreases. The regression analysis also showed that student behaviors explain 12.8% of grade 10 and 11.9% of grade 12 students' achievement.

According to the opinion and perception of teachers and principals, teachers' misbehaviors such as absenteeism in both grade 10 and 12 as well as low expectations to their students, and not

meeting individual students' needs for grade 10 were negatively correlated with students achievement which is statistically significant.

Conclusion

The purpose of ETNLA is to inform the education system on what students know and can do on upon completion of General Secondary Education and the Preparatory Program in core curriculum areas. It also helps the Ministry know the contributing factors that affect the quality of education. Therefore, based on the findings of the study, the following conclusions were made.

The national composite mean score was found to be 33.3% for grade 10 and 41.7% for grade 12. This result is below the minimum policy target of 50% achievement. Only 9.1% of grade 10 and 26.6% of grade 12 students achieved 50% and above by the composite mean score. The result is far below the expectation of the national performance level target stated as 50% of the students in grade 10 and 70% in grade 12 will score a composite mean score of 50% and above (*ESDP V, 2015*). Looking at the achievements of each subject, the mean score of physics was the least whereas mean score for Biology was found to be highest in both grades.

The achievement of students was also disaggregated by content domains. The result shows that in grade 10, students performed relatively good in content domains such as speaking and vocabulary in English; numbers in Mathematics; electronics, wave, motion and sound, and electricity and magnetism in Physics; organic chemistry, substances, and structure of substances in Chemistry; and cell biology and biology and technology in Biology. In grade 12, students achieved relatively higher in the content areas such as speaking and vocabulary in English; trigonometry and logic in mathematics; mechanics and wave and light in Physics; fundamental concepts in Chemistry and the science of biology in Biology.

However, students more face difficulty on certain content areas. In grade 10, such as writing in English, trigonometry in Mathematics; temperature and heat and geometrical optics in Physics; chemical reaction and structure of the atom in Chemistry; and microorganisms and classification in Biology. In grade 12, students more challenged in the areas of writing and reading skills in English; statistics in Mathematics; atomic physics, electricity and magnetism, temperature and heat in Physics; carboxylic acids, chemical reaction, and structure of substance in Chemistry and genetics in Biology.

Regarding achievement by proficiency level, majority of students' (more than 50%) in all subjects of grade 10 were found to be Below Basic. Only 3.3% in English, 9.8% in Mathematics, 4.6% in Physics, 3.1% in Chemistry and 5% in Biology were at proficient level and above. Whereas in grade 12, majority of students ranging from 45.9% to 73.1% in all subjects except in mathematics were found at Basic level. In mathematics majority of students (53.2%) were at Below Basic.

Performance disparities among different groups were also observed in both grade levels. Males outperformed females, urban students scored better than rural students, and nongovernment schools had better performance than government schools and differences were statistically significant in all cases. The result with school rank also indicated that grade 10 schools with rank A scored relatively higher than B, and B higher than C in all subjects in composite mean score. Similarly, in grade 12 the result is consistent with that of grade 10, except for mathematics in which schools with rank C slightly performed higher than rank B. Looking at performance differences among regions, Addis Ababa Harari and Dire Dawa respectively are the three top achievers where as Benshangul Gumuz, Gambella, Tigray and Afar were from the lower achievers in grade 10. In grade 12, Harari, Addis Ababa and Dire Dawa respectively are the top three and Somali and Afar were from the lower achievers.

Comparing the students' achievement across time or trends, in all subjects the students 'achievement in 2013 was higher than that of 2017 assessment in both grades. This implies that students' performance is decreasing as compared to the previous cycle.

Recommendations

- The achievement of grade 10 and 12 students was found to be far below the minimum standard set by the education policy and the ESDP V target. Moreover, the achievement trend is also declining overtime comparing from 2013 to 2017 assessment results. Hence, the ministry of education should focus on close monitoring and follow up of the implementation of the devised quality assurance programs in every school.
- In the study, teachers and principals motivation is significantly correlated to students' achievement that is teachers and school administrators are the key actors to provide quality education for citizens. Despite the motivational efforts done by the government so far, still large number of teachers (41%) and principals (44.7%) are not satisfied on their job and the

working conditions and most teachers perceive that teaching profession as undervalued by the society and their students. So, policy makers and regional authorities should consider whether sufficient, motivated and qualified teachers are available in every school. Differentiated and competitive type of reward and benefit package based on performance should be devised as a motivation system for teachers and principals.

- The study found that there are still a greater diversity in students' performance across gender, location, school type and regions. Policy makers should focus their attention on how basic skills performance varies between different groups of students and different schools within each region. Differentiated support mechanism seems important for those lagging behind groups. For instance, in resource supply and capacity building.
- The study found that pre-primary education was positively related to later academic success. Hence, policy makers and educationalists should more consider the expansion of pre-schooling. Attention should be paid to different forms of pre-schooling that may strengthen the academic performance of students in the long run without negatively affect the overall personal development of kids. The existing O-class approaches of pre-schooling which could help children from less advantaged socioeconomic backgrounds in the education system should be strengthen.
- In this study, student and teacher related behaviors like absenteeism, misbehavior, perception and attitude significantly contributed for students' achievement. So, policy makers, teachers and principals should work to build a conducive school climate.
- The availability of school infrastructure and educational resources especially like ICT and science laboratory have significant contribution to students' achievement. Therefore, policy makers and regional education bureaus should consider whether schools and teachers are adequately equipped to cope with the challenges of teaching and learning posed by the growing use of ICT for instructional purposes.
- There is a positive relationship between expectation, interest in and enjoyment of a subject, and the achievement scores of students. Thus, policy makers, parents, and teachers should consider initiatives for increasing the awareness and motivation/interest among students in learning and studying.
- Family education and support were also found as a significant contributor for students' achievement. As the fathers' and mothers' education level increases, students' achievement

also increased. Thus, policy makers and regional authorities should work on parents' education like strengthening adult education program.

- Researchers are encouraged to conduct their own studies on students learning at different educational levels such as classroom, school, sub city, zone, woreda, and region level to address the issue more widely and provide intervention according to the gap existed in each level.

CHAPTER ONE

INTRODUCTION

1.1 Background

Today the notion of measuring and evaluating learning to improve the quality of education is an international agenda. In the past, quality education mainly referred to the enabling conditions for learning, what many consider as the major inputs to schooling—for example, school infrastructure, textbooks, instructional time and trained teachers. At international conferences on Education for All at Jomtien (1990) and later at Dakar (2000), the promotion of quality education and the satisfaction of basic learning needs were viewed as crucial aspects of international policy targets (UNESCO, 2000). Evaluating the quality of education begins with understanding of learning outcomes. Over the past decade, access to basic education has increased, but often the education system struggles to provide a quality learning experience. Monitoring the quality of education requires identifying what students have learned and what they can do with their newly acquired skills.

What kinds of learning? For what purposes? Through which curricular means? As learning outcomes and skills development take center stage in policy statements and funding priorities, several fundamental questions emerge, which deserve careful consideration. What specific kinds of learning and skills do different stakeholders propose? In which settings (formal/non-formal) and through which curricular frameworks (or structures) are the learning and skills to be obtained? To what purposes and aims are learning outcomes and skill acquisition directed, and whose interests are being served? Who defines what is or is not 'relevant' learning in a particular setting? Which instructional means and teaching methods are advanced, if any, to effectively enable learners to acquire particular knowledge, competencies and skills? And how should learning processes and outcomes be monitored and assessed? (Benavot, 2011).

Educational assessment particularly both national and international assessments became extremely popular tools for determining the quality of education in the 1990s and 2000s. This increase in popularity reflects two important developments. First, it reflects increasing globalization and interest in global mandates, including Education for All (UNESCO, 2000). Second, it represents an overall shift in emphasis in assessing the quality of education from a concern with inputs (such as student participation rates, physical facilities, curriculum materials, and teacher training) to a

concern with outcomes (such as the knowledge and skills that students have acquired as a result of their exposure to schooling) (Kellaghan & Greaney cited in UNESCO, 2001).

The development of national assessment capacity has enabled ministries of education as part of their management function to describe national learning achievement levels, especially in key subject areas, and to compare achievement levels of key subgroups (such as boys and girls, ethnic groups, urban and rural students, and public and private school students). It has also provided evidence that enables ministries to support or refute claims that standards of student achievement are rising or falling over time. According to Clarke (2012), the best way to monitor quality of education system is conducting assessment and giving feedback to all stakeholders since it is a key to knowing whether an education system is producing the desired outcomes for students, the economy, and society at large. Being equipped with this information, various stakeholders determine where to target their energy and resources for the greatest improvement of learning outcomes. Effective assessment is to inform policy makers, help teachers improve their teaching practices, and empower parents with information about how well their children are being taught (World Bank, 2011).

To this regard, the Ethiopian Education and Training Policy and the General Education Quality Improvement Program (GEQIP) give emphasis on the importance of assessment for quality of education (TGE, 1994 & MoE, 2008). Moreover, according to GTP (2011-2015), the learning outcomes of students will be monitored and evaluated at regular scheme through national learning assessment (MoE, 2010). The Ministry under the National Educational Assessment and Examinations Agency (NEAEA) started to conduct national learning assessments by every four years since 2000 to monitor its system, at grade 4 and 8 since 2000 for five rounds and at grade 10 and 12 since 2010 for two rounds. Besides, Ethiopia conducted the base line early grade reading assessment (EGRA) by 2010 and early grade mathematic assessment (EGMA) by 2014 to monitor foundational skills of children in literacy and numeracy.

However, quality of education as indicated in successive national learning assessments is still a crucial challenge for the nation. The national learning assessment conducted since 2000 in five rounds on grade 4 and 8, confirmed the mean score of students achievement in the assessed subjects was below 50%. This was below the minimum score expected by the Ethiopian education

and training policy. Similarly, the study of the reading skills (EGRA) conducted in 8 regions of Ethiopia, showed that a significant number of children that were in grade 2 and 3 couldn't read a single word and understood a story at all (USAID, 2010).

To alleviate these problems of quality of education the Ministry of Education, Regional Education Bureau's, governmental and non-governmental organizations, educators and all the actors were exerting much efforts to assure quality through the quality improvement package and programs articulated by Ministry of Education. Hence, this report presents the findings of Ethiopian Third National Learning Assessment of grade 10 and 12 (ETNLA) study in Ethiopia that allows policy makers and stake holders to inform the achievement levels of students in core subjects and background variables that affect the students achievement.

1.2 Objectives

The main purpose of Ethiopian Third National Learning Assessments of grades 10 and 12 (ETNLA) is to inform the system on what students know and can do upon completion of General Secondary Education (Grade 10) and the Preparatory Program (Grade 12) in core curriculum areas. The specific objectives of the ETNLA are:

- To determine the achievement levels of grade 10 and 12 students in core curriculum areas and Standards.
- To analyze variation in students' achievements by school type, gender, location and region
- To identify factors those are associated with students' performance.
- To give feedback as to where improvements need to be made.

1.3 Basic Research Questions

- What does the overall achievements of Grade 10 and 12 students in core subjects look like?
- What does the overall achievements of Grade 10 and 12 students look like in core subjects by content domains and cognitive levels?
- What does the overall achievements of students look like in the proficiency levels for both grades in each subject?
- To what extent students are achieving the target set in ESDP V?
- How do particular sub-groups in the population perform? Are there disparities between the achievements of boys and girls, of students in urban and rural locations, of students in government and non-government schools, of students in different regions of the country and school status/rank?

- What factors are associated with student achievement? To what extent does achievement vary with characteristics of the learning environment/school (e.g. school resources, teacher preparation and competence, type of school) or with students' home and community circumstances?
- Do the achievements of students change over time?
- What are the implications of the third national learning assessment result to improve student learning achievement and education quality in Ethiopia?

1.4 Significance

- Provide feedback and objective evidence about what learners know, understand, and can do in relation to some or all of the learning goals determined in the curricula.
- Indicate where students' achievement in the country lies as compared to the stated profiles of the curriculum and standard indicated in the education policy.
- Serve as evidence from which progress can be measured at the end of a key stage in the education system of the country.
- Provide feedback to policy makers and implementers how to reform, allocate and manage scarce educational resources to improve quality of schooling in the country.
- Enhance the accountability of schools to government and the public in producing the required skills, competencies and attitudes for the transformation of the nation as planned.
- To serve as a base for further study on the area.

1.5 Limitations

- The national educational assessment directorate do not have its own scoring and scanning OMR machine or a designed program to marking students' achievement test. So, the machine designed for national examinations was used. This created additional burden, which was the main reasons for the delay of getting raw data in order to conduct analysis and disseminate the results on time.
- Due to the shortage of man power and resource, supervising all sample schools and making follow up during data collection was limited.
- Since the focus of this study was only on the core subject matters according to the national learning assessment framework, students with disabilities were not addressed in the study.

CHAPTER TWO

A REVIEW OF NATIONAL LEARNING ASSESSMENT

2.1. Overview of National Learning Assessment: The Global Experience

A national assessment sometimes called system assessment or learning assessment may be defined as an exercise designed to describe the level of achievements, not of individual students, but of a whole education system, or a clearly defined part of it (e.g. fourth-grade pupils or 11-year olds) Kellaghan and Greaney (2001, p. 33). It is a powerful agent to know whether an education system is producing the desired outcomes for students, for economy, and for the society at all. National assessment provides systemic information on levels of student achievement and related factors, supporting policy makers, educators and students with real-time information to improve teaching and learning process that shows the effectiveness of education system. It is also a key for change in schools by informing policymakers about the learning outcomes of students and helps teachers to understand how to improve classroom instruction, and influencing societies as they think about education quality and learning goals (Clarke, 2011).

Many countries are conducting national assessments after the declaration of the World Conference on Education for All, held in Jomtien, Thailand, in March 1990. The major issue of the conference was providing students with access to education is meaningful only if children actually acquired useful knowledge, reasoning ability, skills, and values as a result of their exposure to schooling. Using the national learning assessment, many countries have attempted to measure their students' achievement and to check the attainment of curriculum goals in key subjects at a certain level of the education structure (e.g. grade 4 or 8, or 10) (UNESCO, 2008).

According to Kellaghan and Greaney (2001) and Kellaghan and Greaney (2004) the national learning assessment addresses one or more of the following main issues.

- How well are students learning in the education system (with reference, for example, to general expectations, EFA goals, the aims of the curriculum, or preparation for life)?
- Is there evidence of particular strengths or weaknesses in the knowledge and skills students have acquired?

- Do the achievements of subgroups in the population differ? Are there, for example, disparities between the achievements of boys and girls, of students in urban and rural locations, of students from different language or ethnic groups, of students in different regions of the country, of students who drop out early or are repeating grades?
- To what extent is achievement associated with the characteristics of the learning environment (e.g., school resources, teacher preparation and competence, type of school) or with students' home and community circumstances?
- Do the achievements of students change over time? This can be particularly important at a time of major change in the system (e.g., when numbers are increasing; when new subjects or curricula are being implemented).

2.1.1 Assessment Systems in Different Countries

Experienc of different countries show that conducting learning assessment and giving feedback to all stakeholders is becoming the best way to monitor quality of education system. Since it is the best way to know whether an education system is producing the desired citizens for economic and social development of the country. Regarding this, Jomtien Declaration on Education for All states that the focus of basic education should be "on actual learning acquisition and outcome, rather than exclusively upon enrolment, continued participation in organized programs and completion of certification requirements" (*World Declaration on Education for All*, 1990, 5)

Countries assessment systems varies based on the frequency they administer, the scope of coverage in terms of school populations, the key subjects for assessment and institutional responsibility for this task or agency. For instance, the regions of Central Asia and Central East Europe and North America and Western Europe have the highest proportion of countries conducting assessments. Asia and the Pacific and the Arab states are the next in assessing learning. The numbers are lower for Latin America and Sub-Saharan Africa (UNESCO and Global Education Monitoring Report 2015) (see table 1).

Table 1: The proportion of countries that undertook assessments in each region since the 1990s.

Regions of countries	Total countries in the region	No of countries doing assessments	% countries doing assessments
Arab States	20	14	70
Asia and the Pacific	39	29	74
Central Asia and Central East Europe	29	25	86
Latin America	41	27	66
North America and Western Europe	24	21	88
Sub-Saharan Africa	45	28	62

Source: EFA Global Monitoring Report, 2015

Establishing a national assessment system is a challenging task requiring considerable resources and skills. The longer a country has carried out assessments, the more likely there is to be considerable high expertise developed over time (Lockheed et al., 2015).

2.2. National Learning Assessment in Ethiopia

Since the development of the new education and training policy in 1994, education access and fairness have been among the major concerns of Ministry of Education in Ethiopia. As a result, there has been a rapid increase of students' enrolment in all levels of education. Following this rapid expansion of schooling throughout the country, the issue of education quality became a big concern for educational stakeholders.

In contrast to the remarkable achievements in access, progress in raising the quality of education in Ethiopia has been limited. Efficiency and quality input indicators, achievement tests, and classroom observations suggest that it has been difficult to maintain the quality of education during a period of very rapid enrollment expansion. Learning achievement in the education system remains unacceptably low and this has become a source of concern for government officials, educators, parents, and other stakeholders (Joshi & Verspoor, 2013). So the national learning assessments in Ethiopia attempts to assess what and how much students are taught, and how much they learn the prescribed curriculum and to determine the variables that best facilitate effective learning.

As stated in the Education Sector Development Program (ESDP V) document, Ethiopia is strengthening the national learning assessments being carried out every four years at each exit levels or sub cycles of primary school grade 4 and grade 8; and at secondary school grade 10 and grade 12.

The National Educational Assessment and Examination Agency (NEAEA) is responsible for conducting national learning assessments including early grade assessment. Since 2000, NEAEA has conducted five national learning assessments on grade 4 and grade 8 students' academic performances in core subjects (Mathematics, English, Biology, Chemistry, and Physics for grade 8, and Mathematics, English, Mother Tongue and Environmental Science for grade 4). All the national learning assessments compared pupils' performance across regions, sex and location, and frequently explored factors that can have significant influence on academic achievements of learners. However, none of the results of assessment met the intended target out comes set in the Education sector Development Programs (MoE, 2015/16).

For instance, during ESDP IV, the students achievement target was set in Precise number in which 90% of the students at all grade levels would score at least 50% and above in examination and assessment of every subject (MoE, 2010). However, if we look at the recent national assessment results, In Grade 10, the share of students who achieved an average score of 50% across the five core subjects (mathematics, English, physics, chemistry, biology) is 23% in the 2014 assessment year. For Grade 12, in the same assessment year (2014), performance of students was slightly better, 34% of students achieved an average score of 50% and above across the five core subjects (mathematics, English, physics, chemistry, & biology) (MoE, 2015). This slight improvement is supposed due to the reason that students were assessed following the selection and filtration in Grade 10.

Moreover in ESDP V, the target is raised to a higher percentage which is stated 100% of the students at all grade levels will score at least 50% and above in national examinations and assessments in every subject (MoE, 2015).

2.3 Trends of National Learning Assessment in Ethiopia

2.3.1 Primary schools

Ethiopia have been conducted five National Learning Assessments from 2000 to 2016. The achievement tests used for grade 4 were in Reading, English, Mathematics and Environmental Science, while English, Mathematics, Physics, Chemistry and Biology tests were for grade 8 students. The students' performance comparisons had been made across regions, gender and location, and explored factors that influence academic achievements of learners. Table 2 presents the composite score achievements of students by grade levels and assessment cycles by years.

Table 2:The NLA 2000 to 2016 Composite Scores

Year	Grade 4 Composite Score in %	Grade 8 Composite Score in %
2000	47.90	41.10
2004	48.48	39.70
2008	40.90	35.60
2012	40.10	35.30
2016	44.74	41.14

2.3.2 Secondary Schools

In Ethiopia, two National Learning Assessments have been carried out from 2010 to 2014. The achievement tests used for both grade 10 and grade 12 were by key subjects namely English, Mathematics, Physics, Chemistry and Biology. Table 3 presents the composite score achievements of students by grade levels and assessment cycles by years.

Table 3: Grade 10 and 12 Achievement in Composite Scores

Year	Grade 10 Composite Score in %	Grade 12 Composite Score in %
2010	36.00	47.80
2014	40.64	45.52

2.4 Factors That Affect Students' Academic Achievement

There are several variables that influence students' academic achievements. They can be seen as school and out of school variables. However, all the variables do not have uniformly consistent

influence on students' learning outcomes throughout a system. Power of prediction varies contextually from one grade level to other grade level or from the variation in the location of schools.

Various international studies show that Students' gender, place of living, family background, attitudes to learning, interest or motivation to learn, schools infrastructure, school location, class size, school environment, and availability of curriculum materials are some factors that affect pupil's academic performance. Regarding teachers, professional training, attitudes to teaching, motivations, cooperation habits are also some of school related factors that can affect students' academic achievement. On the other hand, there are also out of school factors like community participation and parental involvement that can influence students' learning outcomes (Shoukat, Haider, Khan & Ahmed, 2013; CEU, 2009).

2.4.1. Factors related to effort and efficiency of student in learning: number of pages students read per day, students lack of respect for their teachers and misbehavior of students in class, school type, gender, distance student travel from school to home, lack of parents support for students during study, Parents/guardians educational status, insufficient discussion between parents/guardians and students about educational affaires, daily regular opportunity for meal, Availability of reference materials at home are factors that can affect the efficiency of student in learning**.**

2.4.2. Absenteeism: Poor educational performance is also related to the level of truancy or unexplained absence among students. Truancy can be a causal factor in explaining educational performance. Truancy tends to be higher among students from low SES backgrounds and associated with poorer academic performance at school (Sparkes, 1999).

2.4.3. Geographical Location: Students from rural areas are more likely to have lower educational outcomes in terms of academic performance and retention rates than students from urban areas (Cheers, 1990; HREOC, 2000). Issues affecting access to education in regional areas include costs, the availability of transport and levels of family income and support. In addition, inequity exists with regard to the quality of the education that rural students receive, often as a result of restricted and limited resource. Furthermore, students may also have limited recreational and educational facilities within their school (HREOC, 2000: 12).

2.4.4. Teachers' competency and performance

According to Barber and Mourshed (2007), an educational system is only as good as the teachers constituting it; meaning that successful learning cannot be imagined without quality teachers and teaching. For an excellent performance of a learner, teachers play a crucial role in the teaching learning process. A study conducted on teachers influence on achievement by Fuller also indicated that teachers strongly influence the achievements of students as cited NOE (2008).

The impact of teachers on performance in any subject is very high. The teachers are the facilitators who are to impact the theories and concepts into the students. This was why Adeniyi (1993) noted in his study that, a country's manpower development depends on the quantity of its well qualified teachers. The objectives of the education sector of any country cannot be attained, when the students are taught by incompetent teachers. Such teachers would not be able to properly and adequately disseminate the concepts to the students. The professional qualities of a well-trained teacher include: mastery of the subject matter, sense of organization, ability to clarify ideas, ability to motivate students, good imagination, ability to involve the students in meaningful activities throughout the period of teaching, management of the details of learning and frequent monitoring of students' progress (Ajayi, 2009).

2.4.6. Teacher–Student Interaction

The positive interaction that is initiated between teachers and students can help students learn easily and increases their academic achievement makes them adapt well in their class and develops their cognitive skills. (Sudweeks & Barbour, 2013). According to Allen, Gregory, Mikami, Lun, Hamre and Pianta (2013), emotional support, classroom arrangement and educational support were predictors of higher achievement among students.

Furthermore, there are several factors that may influence teacher-students interaction such as grouping of students and active teaching learning methods. For example, it was found that students with high level of academic accomplishment can accomplish higher and take in more when they are gathered with other students with high academic accomplishment (Gentry & Owens, 2002; Grossen, 1996; Hollified, 1987; Page & Keith, 1996).

2.4.7. Socio-economic status

According to Ainley, Brian, Michael and Margaret (1995), socioeconomic status can be defined as a persons' overall social position to which attainments in both the social and economic domain contribute. In line with studies of children's school achievement, it refers to the SES of the parents or family. Several comprehensive reviews of the relationship between SES and educational outcomes exist (Amato, 1987; Williams, Penelope, Connell & White, 1991; Mukherjee, 1995; Ainley et al., 1995). These studies and reviews make it clear that children from low SES families are more likely to exhibit the following patterns in terms of educational outcomes compared to children from high SES families:

- have lower levels of literacy, numeracy and comprehension;
- have lower retention rates (children from low SES families are more likely to leave school early);
- have lower higher education participation rates (children from low SES families are less likely to attend university);
- exhibit higher levels of problematic school behavior (for instance truancy);
- are less likely to study specialized mathematics and science subjects;
- are more likely to have difficulties with their studies and display negative attitudes to school. (Graetz, 1995).

The social and the economic components of socio-economic status, in other words, may have distinct and separate influences on educational outcomes. While both components are important, social factors (for instance, parents' educational attainments) have been found to be more significant than economic factors, such as a family's capacity to purchase goods and services, in explaining different educational outcomes. It is argued that families where the parents are advantaged socially, educationally and economically, foster a higher level of achievement in their children. They also may provide higher levels of psychological support for their children through environments that encourage the development of skills necessary for success at school (Williams, Clancy, Batten & Girling-Butcher, 1980; Williams, 1987; Williams, Long, Carpenter & Hayden., 1993).

2.4.8. Parental Support of their Children's learning

Studies about parental support reveal that Students' achievement can be influenced by the support they receive from their parents. For example, parental involvement in the educational process of their children was found to have a significant effect in improving their academic performance. Furthermore, Diaz (2003) believes that mothers' good academic preparation for their children and a positive cultural environment are the most effective elements standing out as factors influencing students' academic achievement. Parental expectations and family relations were found to be predictors of children academic performance (Buote, 2001). Concerning the relationship between the children's level of achievement and the support offered to them by their parents, it was found that low achievement among students is significantly linked with parents' less support for achievement (Boon, 2007).

CHAPTER THREE

METHODS AND PROCEDURES

3.1 Instrument Development

Ethiopian Third National Learning Assessment of Grades 10 and 12 (ETNLA) used two types' of assessment tools:

1. Tests that measure students' learning achievement, focusing on curriculum areas of core subjects namely: English, Mathematics, Physics, Chemistry, and Biology.
2. Background questionnaires to identify the variables that explain the achievement variations of students in these core subjects.

3.1.1 Achievement tests development

Test development process was managed by the National Educational Assessment Directorate (NEAD) team, who have considerable experience in national assessment of students' achievement. The following test development processes were applied to ensure the quality of each item and tests.

- **Developing table of specification /test blue print** – a plan that describes a curriculum areas/topics to be covered by a test and the number of items or points which will be associated with each topic. The tests were composed of multiple choice items based on MLC proportional to period allotment of grade 10 and 12 syllabus. It was developed by NEAD team using the curriculum documents such as Minimum Learning Competency (MLC), Syllabus and text books by two way chart or grid where the cognitive or thinking levels along the horizontal axis and contents or MLC along the vertical axis. In other words, by considering major content areas, learning outcomes or competencies and the time allotment for the content, and levels of the cognitive domain of Bloom's Taxonomy especially Knowledge, Understanding Application and Higher Order Thinking (HOT) a test blue print with the number of items was designed.
- **Test item writing** – test items were written by subject teachers who were selected based on their performance in consultation with Regional Education Bureaus / REB. The item writers were recruited with a contractual base and given an intensive training on test blue print, item and test development process, and item writing guidelines such as instructions, stems, alternatives, language, and fairness.

- **Review items /content validation** – after the items were written by subject specialists a panel of experts such as subject teachers, curriculum experts, national examination development experts in the subject and assessment experts reviewed the items with regard to the test development guidelines and test blue print or test framework. They exhaustively checked whether each items are valid and appropriate to the test objective.
- **Pilot test** – following content validation, the items were pretested to check whether the item statistically fit for the purpose or not.
- **Item Analysis** – using piloted data each items were analyzed using Classical Test Theory (CTT) with Test Analysis Program (TAP) and Item Response Theory (IRT) procedures with Item and Test Analysis (IATA) soft wares.
- **Re-validation based on the item statistics** - based on the results of the analyses, some items were further improved by a panel of subject experts who were participating in the revalidation workshop.
- **Operational item selection /Item Bank** - after revalidating based on the item statistics by participants, those items that were acceptable both by their difficulty level, discrimination power, fairness, language and so on were selected for operation and stored in our item bank data base. Hence, the ETNLA achievement tests were assembled and the final versions produced for each core subjects from the item bank.

The items were assembled from the item bank by a panel of experts such as subject teachers, curriculum experts, national exam developers and assessment experts based on a test blue print prepared by NEAD team. The blue print was planned to accommodate sufficient number of items that help to measure the achievement levels of students not only at subject level but also at content domain or thematic areas of the curriculum. It was designed to incorporate **Four Forms** with a rotated booklet design. A total of 150 questions /items for English, Chemistry and Biology and 125 for Mathematics and Physics for both grades. For each form the achievement tests comprised 60 items (30 are common items) for English, Chemistry and Biology and 50 items (25 are common items) for Mathematics and Physics. In each form 50% of the items are common/anchor items and the rest are equivalent both statistically and the constructs they measure. These common / anchor items were taken from year of assessment in order to be able to compare the achievement trends between the current and the previous cohorts, those psychometrically good test items of the 2013

were included in the final version of the 2017 achievement tests for both grades in the measured key subjects.

To measure changes in student achievement, trend assessments operate on a regular cycle, administering a comparable items using common item linking methods was used. This is because policymakers have become increasingly interested in student achievement trends that provide information about changing patterns of student achievement and enable them to monitor the results of educational reforms over time.

3.1.2 Background Questionnaires

To obtain information about factors that have been found affecting the students' learning achievement, background questionnaires were administered for students, teachers, and school directors. The questionnaires contained questions that can identify the association of various personal, home, school, and teaching-learning related variables with student achievement. These tools were taken from the previous years of assessment and updated with the current interventions to check their contribution with student achievement. The appropriateness of the questionnaire were validated with Regional and Federal educational experts, Directorate Directors and teachers with validation workshops. Hence, background questionnaires include variables such as background information of participants (gender, age, experience, qualification, parental education, school type and location, enrollment, class size, school inspection rank, preprimary education), socio economic status, professional development, school management, teaching and learning, school resources, attitude and perception of students to their teacher and school, parental support, satisfaction with working conditions, relationships with the community and school climate. Moreover, in order to investigate the main factors that affect students' achievement, focus group discussion guides were also designed for students as well as teachers, principals and parents. Since focus group discussion is useful to obtain enrich information regarding the problems of teaching learning process.

3.2 Sampling

To provide valid and reliable national and regional estimates of student achievement with group comparisons across gender and school types, all Grade 10 and 12 students of 2016/2017 academic year (2009 E.C.) attending in all administrative regions of the country were taken as the target population. The sampled secondary schools to be included in the population of study were based on MoE 2015/16 (2008 E.C.) EMIS data. School directors and teachers of the sampled students

were also asked to fill questionnaires. The general sample design framework used was a two-stage cluster sample design with an effective sample size of 400 and the minimum cluster size of 40. Taking the 2013 study of grades 10 and 12 average scores as dependent variable and the school as random factor, the variance component analysis resulted in an intra-class correlation commonly known as roh (a measure of the tendency of student characteristics to be more homogeneous within schools than would be the case if students were assigned to schools at random) were 0.20 and 0.11 for grade 10 and 12 respectively. In order to obtain a two-stage cluster sample from the sample design tables with an effective sample size of 400, it was necessary to select a sample of 88 schools which resulted in an expected total 3,520 sample students for grade 10 and 53 schools with 2,120 sample students for grade 12 . However, in order to have optimal samples for better representation of the regions, a fixed number of schools proportion to the number of schools in regions (10 and 5 for grades 10 and 12 respectively) were added in each region. The summary of the sampling process is given in Table 1 and Table 2 below.

As indicated in Table 4 below, from a total of 1658 grade 10 schools across regions, 11.9% (198) schools were taken randomly as samples of the study. Looking at planned and achieved sample sizes, the response rate at the first (schools) and the second (students) stages were 100% and 98.5% respectively. From the total of students participated in the study, the number of the males and females were 4,121 (52.8%) and 3,682 (47.2%) respectively.

Table 4: Distribution of samples of Grade 10

No	Region	Total Schools 2016					Sample Schools Selected								Sample Students				
											Proportion by Strata							Achieved by gender (%)	
		Urban	Rural	Government	Non-Gov.	Total	Proportion	Fixed	Planned	Achieved	Urban	Rural	Gov.	Non-Gov.	Planned	Achieved	% Achieved	Female	Male
1	Addis Ababa	209	1	61	149	210	6	10	16	16	16	0	8	8	640	635	99.2	54.5	45.5
2	Afar	19	13	29	3	32	1	10	11	11	7	4	10	1	440	396	90	43.9	56.1
3	Amhara	252	162	396	18	414	13	10	23	23	14	9	22	1	920	889	96.6	49.7	50.3
4	B/Gumuz	25	43	67	1	68	2	10	12	12	4	8	12	0	480	471	98.1	44.8	55.2
5	Dire Dawa	19	2	10	11	21	1	10	11	11	10	1	6	5	440	461	104.8	51.8	48.2
6	Gambella	24	27	48	3	51	2	10	12	12	6	6	11	1	480	491	102.3	44.8	55.2
7	Harari	13	1	5	9	14	0	10	10	10	9	1	5	5	400	385	96.3	48.6	51.4
8	Oromia	642	367	925	84	1009	32	10	42	42	27	15	38	4	1680	1647	98	47.6	52.4
9	SNNP	327	367	647	47	694	22	10	32	32	15	17	30	2	1280	1270	99.2	46.1	53.9
10	Eth. Somali	76	44	118	2	120	4	10	14	14	9	5	14	0	560	540	96.4	34.8	65.2
11	Tigray	52	107	142	17	159	5	10	15	15	5	10	13	2	600	618	103	49.4	50.6
National		1658	1134	2448	344	2792	88	110	198	198	122	76	169	29	7920	7803	98.5	47.2	52.8

Table 5: Distribution of samples of Grade 12

No	Region	Total Schools 2016					Sample Schools Selected								Sample Students				
											Proportion by Strata							Achieved by gender (%)	
		Urban	Rural	Government	Non-Gov.	Total	Proportion	Fixed	Planned	Achieved	Urban	Rural	Gov.	Non-Gov.	Planned	Achieved	% Achieved	Female	Male
1	Addis Ababa	122	0	21	101	122	6	5	11	11	11	0	6	5	440	412	93.6	50.2	49.8
2	Afar	13	4	14	3	17	1	5	6	6	5	1	5	1	240	208	86.7	44.2	55.8
3	Amhara	176	28	196	8	204	10	5	15	15	13	2	14	1	600	578	96.3	49.7	50.3
4	B/Gumuz	17	3	20	0	20	1	5	6	6	5	1	6	0	240	227	94.6	41.4	58.6
5	Dire Dawa	8	0	3	5	8	0	5	5	5	5	0	3	2	200	173	86.5	42.8	57.2
6	Gambella	7	5	12	0	12	1	5	6	6	3	3	6	0	240	228	95	29.4	70.6
7	Harari	5	0	2	3	5	0	5	5	5	5	0	2	3	200	174	87	58.6	41.4
8	Oromia	316	23	312	27	339	17	5	22	22	21	1	20	2	880	850	96.6	41.3	58.7
9	SNNP	160	30	171	19	190	9	5	14	14	12	2	13	1	560	550	98.2	36.4	63.6
10	Eth. Somali	55	20	75	0	75	4	5	9	9	7	2	9	0	360	308	85.6	35.4	64.6
11	Tigray	33	54	73	14	87	4	5	9	9	3	6	8	1	360	362	100.6	42	58
National		912	167	899	180	1079	53	55	108	108	90	18	92	16	4320	4070	94.2	42.6	57.4

Table 5 above depicts the distribution of the sample schools and students of grade 12 across regions. From a total of 912 schools, 11.8% (108) of sample schools were taken randomly for the study. As shown in this same table, the planned and achieved sample levels the response rate at the first (schools) and the second (students) stages were 100% and 94.2% respectively. The student's response rate becomes 94.2 %, is due to the total number of students in some of grade 12 students was below the planned cluster size 40. There were 2,335 (57.4%) males and 1,735 (42.6%) females in the grade 12 national samples.

To obtain a random sample of grade 10 and grade 12 students, a two-stage cluster sampling was followed by selecting: schools and then students from schools/class rooms using simple random sampling technique. Once the effective sample size of schools in each region is determined, the sample schools within strata were selected randomly from the list of schools at EMIS data of Ministry of Education 2011/2012 (2004 E.C.) by using IBM/SPSS version 20 software. In each school, one class was randomly selected from each grade level. Similarly, students were selected randomly with equal probability from each class. All students present on the day of assessment were stratified by gender. 20 boys and 20 girls - a total of 40 students were to be randomly selected from each school. If there were fewer than 20 girls at any given school, all of the girls were automatically selected and more boys were sampled to obtain a total of 40 students (the same procedure was followed if there were fewer than 20 boys) in each grade.

In addition to sampling students for the ETNLA, 194 (97.9%) grade 10 and 106 (98%) grade 12 principals (or representatives if principals were not available); and 974 (98.4%) grade 10 and 516 (95.6) grade 12 teachers (one teacher from each grade level and core subject per school) completed questionnaires to provide background information associated with students' performance.

3.3 Data Collection Procedures

Data collection took place in all 9 regions and 2 city administrations between May 8- 12/ 2017. Across these regions in the country data were collected from randomly selected 198 Grade 10 and 108 Grade 12 total 306 schools, and 11,873 students, 300 principals and 1490 teachers. In the data collection process, 27 national coordinators, 58 route coordinators, 262 center chiefs, 300 school directors, 306 invigilators and 9 reginal coordinators with a total of 962 data collectors were participated.

An intensive hands on training for trainers (TOT) were given for 58 data collectors from May 2-4/2017. The trainers in turn provided the same training for center chiefs and invigilators from May 6-7/2017. The TOT was given by the experts of National Educational Assessment and Examinations Agency (NEAEA) based on the ETNLA administration manual. The route coordinators were also required to work closely with the NEAEA staff, who were coordinating the data collection procedure.

3.4 Data Capturing and Management

Data from tests were scanned using OMR machine and the raw data was imported to MS Excel file. The questionnaires were captured using MS Access 2010. For the purpose of data cleaning and checking consistency, MS Excel 2010 and SPSS v22 were used.

3.5 Data Analysis and Reporting

After the data were collected both the quantitative and the qualitative methods were used to analyze the data. The statistical package for social science (SPSS) version 22 and Item and Test Analysis (IATA v 5.1.1.0) were used to undertake the analyses of the quantitative data. Descriptive summary statistics to summarize central tendencies and dispersion were computed to each subject and to the average score. Correlation and statistical tests of significance were also computed to detect relationships and differences. One-way analysis of variance followed by Post Hoc test was computed to identify homogenous subset groups. Variance component partitioning based on hierarchical linear modeling was computed to see the effects of the schools. Qualitative descriptions were also employed for analysis and interpretation of the data obtained through questionnaires and focused group discussions.

CHAPTER FOUR

DATA ANALYSIS AND RESEARCH FINDINGS

This section describes the analysis of collected data followed by a discussion of the research findings. The findings were presented based on the research questions that guided the study. Data were analyzed to identify the achievement levels of grade 10 and 12 students nationally and across regions, locations, gender and other curriculum standards. It also explores the relationship between achievement and background variables to know the potential factors that explain students' achievement.

The findings of this study was mainly focused on achievement tests of grade 10 and grade 12 students in five core subjects namely, English, Mathematics, Physics, Chemistry and Biology. The results were initially analyzed in percentage scores and scaled scores. In addition to the five core subjects achievement test scores, the background information collected from the students, parents, teachers and school principals' through questionnaires and FGD were analyzed and incorporated in the study.

4.1 Summary of Grade 10 and 12 Students' Achievement Descriptive Results

The academic achievements of students in each of the five subjects as measured by percent mean score and the composite mean score were less than 50% for both grades except Biology grade 12. This result shows that it is below the minimum requirement that the students are expected to achieve. Because, the minimum passing mark for each subject set by the Education and Training Policy is 50%. The mean score of physics was the least whereas the mean score for Biology was relatively the highest in both grades. Looking at the standard deviation, the widest variation in the achievement mean scores among the students were in Biology (17.27) for grade 10 and Mathematics for grade 12 (18.83).

Table 6: Grade 10 and 12 Students Mean Scores in Percent and Scale Score by Subject

Grade	Subject	N	Minimum	Maximum	Mean%	Scale Score	Std. Dev
10	English	7801	0	96	32.04	206.57	12.89
	Mathematics	7719	4	100	33.18	226.69	13.51
	Physics	7755	5	98	29.43	220.02	10.56
	Chemistry	7690	7	98	34.59	199.02	15.11
	Biology	7671	3	100	38.33	211.48	17.27
	Composite	**8279**	**13**	**96**	**33.30**	**212.24**	**11.34**
12	English	4077	8	95	45.59	224.79	18.73
	Mathematics	3894	6	100	39.73	209.54	18.83
	Physics	3897	6	96	30.90	209.48	11.84
	Chemistry	3970	8	97	43.69	241.60	17.78
	Biology	3936	3	98	50.01	238.47	20.44
	Composite	**4236**	**10**	**95**	**41.70**	**224.20**	**14.49**

4.1.1 Achievement of grade 10 and 12 students by content domain

As it can be seen from Table 7, achievement of grade 10 students was disaggregated in each subject by content domain. In English, students were able to perform the same mean score in speaking skills and vocabulary (35.11%). However, the least score from English content domains was in writing skills (27.81%). This indicates that students face more problem in writing skills than other skills. In Mathematics, the achievement of the students in numbers content domain (40.73%) was relatively highest score whereas trigonometry (28.65%) was the least mean score of all domains.

The achievement of physics content domain in electronics (34.22%), wave, motion and sound (33.42%), electricity and magnetism (31.16%) were relatively higher when compared to other physics contents. Whereas the result in temperature and heat (25.82%) and geometrical optics (24.39%) were the lower scores than other content domains.

Students' achievement by content domain in Chemistry shows that, organic Chemistry (37.04%), substances (36.42%), structure of substances (35.98%) were relatively higher than chemical reaction (31.32%) and structure of the atom (29.30%). The results obtained in Biology contents indicate that students were able to perform higher in cell Biology (43.72%) and Biology and technology (42.98%) than others like microorganisms (36.39%) and classification (35.18%).

To sum up, the findings from achievement of grade 10 students by content domain indicates that students have more difficulties in some content areas such as writing skills from English; trigonometry in mathematics; temperature and heat, and geometrical optics from Physics; chemical

reaction and structure of the atom from Chemistry; and microorganisms and classifications from Biology.

Table 7: Grade 10 Students Achievement by content domain in percent mean score

Subject	Content domain	N	Minimum	Maximum	Mean	Std. Dev
English	Language Focus	7801	0	100	32.46	16.88
	Reading	7801	0	100	32.75	19.02
	Speaking	7801	0	100	35.11	18.64
	Vocabulary	7801	0	100	35.11	27.41
	Writing	7801	0	100	27.81	15.93
Mathematics	Algebra	7719	0	100	32.09	15.83
	Geometry	7719	0	100	33.59	15.10
	Numbers	7719	0	100	40.73	29.51
	Set Theory	7719	0	100	32.58	33.41
	Statistics	7719	0	100	34.57	29.70
	Trigonometry	7719	0	100	28.65	25.14
Physics	Electricity and Magnetism	7755	0	100	31.16	21.36
	Electronics	7755	0	100	34.22	27.57
	Electrostatics	7755	0	100	26.95	27.83
	Geometrical Optics	7755	0	100	24.39	28.41
	Mechanics	7755	0	100	28.99	12.44
	Temperature and Heat	7755	0	100	25.82	28.09
	Wave, Motion and Sound	7755	0	100	33.42	22.82
Chemistry	Chemical Reaction	7690	0	100	31.32	17.09
	Chemistry and Industry	7690	0	100	32.48	24.93
	Classification	7690	0	100	34.60	20.22
	Organic Chemistry	7690	0	100	37.04	20.82
	Structure of Substances	3807	0	100	35.98	40.16
	Structure of The Atom	3852	0	100	29.30	38.95
	Substances	7690	0	100	36.42	18.65
Biology	Biology and Technology	7671	0	100	42.98	36.11
	Cell Biology	7671	0	100	43.72	28.96
	Classification	7671	0	100	35.18	27.47
	Environment	7671	0	100	39.88	23.40
	Heredity/Genetics	7671	0	100	42.89	32.18
	Human Biology and Health	7671	0	100	36.84	17.34
	Microorganisms	7671	0	100	36.39	24.44
	Plants	7671	0	100	37.22	24.47

Table 8 also depicts the achievement of grade 12 students by content domain in percent mean score. In English students were able to achieve better in speaking skills (51.56) and vocabulary (47.07) whereas in writing skills (40.18) and reading skills (39.89) the results were relatively low. In Mathematics content areas, the highest scores were obtained in trigonometry (41.43) and logic (40.97). The least score from all other Mathematics content domains was in statistics (34.90). In

Physics content domains all results were below 30 except mechanics (32.24) and wave and light (30.36).

Students were able to perform well only in fundamental concepts (58.87) in Chemistry, whereas achievements in all other content domains were below 50%. In Biology contents, the highest score was achieved in science of biology (60.06) while the lowest score was in genetics (42.72). Particularly, the result of Biology's content domains were relatively better than other subjects' content domains. Overall, students have more difficulties in learning reading skills in English, solving statistical problems in Mathematics, understanding atomic physics, chemical reaction and genetics in Physics, Chemistry and Biology science subjects respectively.

Table 8: Grade 12 Students achievement by content domain in percent mean score

Subject	Content domain	N	Minimum	Maximum	Mean	Std. Dev
English	Language focus	4077	0	100	45.71	22.76
	Reading	4077	0	100	39.89	21.49
	Speaking	4077	0	100	51.56	22.85
	Vocabulary	4077	0	100	47.07	25.42
	Writing	4077	0	100	40.18	22.55
Mathematics	Algebra	3894	0	100	40.46	23.11
	Geometry	3894	0	100	37.63	22.87
	Logic	3894	0	100	40.97	28.65
	Statistics	3894	0	100	34.90	26.01
	Calculus	3894	0	100	40.68	21.24
	Trigonometry	3894	0	100	41.43	49.27
	Numbers	3894	0	100	40.00	37.67
Physics	Atomic physics	3897	0	100	27.67	35.30
	Electricity and Magnetism	3897	0	100	29.54	15.25
	Mechanics	3897	0	100	32.24	14.33
	Temperature and Heat	3897	0	100	29.49	24.57
	Wave and Light	3897	0	100	30.36	23.15
Chemistry	Carboxylic acids	3970	0	100	44.57	25.47
	Chemical Reaction	3970	0	100	41.38	17.86
	Fundamental concepts	3970	0	100	58.87	31.64
	Structure of substance	3970	0	100	44.85	21.69
Biology	Behavior	3936	0	100	42.77	28.79
	Biochemical Molecules	3936	0	100	53.10	28.20
	Cell Biology	3936	0	100	46.82	26.43
	Ecology	3936	0	100	56.79	27.92
	Energy Transformations	3936	0	100	51.50	27.16
	Enzymes	3936	0	100	47.18	25.92
	Evolution	3936	0	100	47.49	27.56
	Genetics	3936	0	100	42.72	26.46
	Microorganisms	3936	0	100	51.25	27.48
	The Science of Biology	3936	0	100	60.08	28.59

4.1.2 Achievement of Grade 10 and 12 Students by cognitive domain

Table 9 below shows the achievement of grades 10 and 12 students in the core subjects by cognitive domain in percentage. In grade 10 English, the mean scores for knowledge (33.41) was relatively higher than comprehension (32.76) and application and above (29.52). The same is true for grade 12 English, where knowledge (46.74) which was relatively higher than comprehension (45.07) and application and above (39.62).

In grade 10 Mathematics, students were able to perform better in knowledge questions (35.60) than comprehension (33.57) and application and above (32.01). The result in grade 12 Mathematics also showed that the achievement in application and above (38.34) were relatively lower than comprehension (42.37) and knowledge (40.41) questions. This shows that both grades had low achievement in application and above skills.

The performance of students in grade 10 Physics showed that application and above (26.94) had lower sore than comprehension (32.77) and knowledge (30.67). On the other hand, grade 12 students scored relatively higher in knowledge (38.98) compared to other cognitive domains like comprehension (29.29) and application and above (31.45) in physics. In grade 10 Chemistry, the result obtained shows that students were able to score highest in comprehension (38.91) and knowledge (35.88) and the least score in application and above (32.75). The mean score of knowledge (45.76) and application and above (43.01) are relatively better than comprehension (42.32) for grade 12 Chemistry.

In grade 10 Biology, the mean score for knowledge (40.26) and comprehension (36.86) were also relatively higher than application and above cognitive domains (31.06). All cognitive domains in Biology grade 12 had mean score below 50 comprehension (49.96) and application and above (42.59) except knowledge (51.76).

In general, in all subjects and both grade levels students were performed better in knowledge cognitive domains than other cognitive domains except for Physics and Chemistry for grade 10 and Mathematics grade 12 in which students performed better in comprehension cognitive domain.

Table 9: Grade 10 and 12 Students Achievement by cognitive domain in percent mean score

Subject	Cognitive domain	Grade 10		Grade 12	
		Mean	Std. Dev.	Mean	Std. Dev.
English	Knowledge	33.41	16.44	46.74	19.84
	Comprehension	32.76	14.08	45.07	20.26
	Application and above	29.52	15.99	39.62	26.99
Mathematics	Knowledge	35.60	19.91	40.41	24.81
	Comprehension	33.57	18.32	42.37	22.11
	Application and above	32.01	14.11	38.34	19.67
Physics	Knowledge	30.67	16.41	38.98	30.91
	Comprehension	32.77	16.22	29.29	15.69
	Application and above	26.94	12.45	31.45	13.54
Chemistry	Knowledge	35.88	17.99	45.76	21.54
	Comprehension	38.91	22.05	42.32	20.66
	Application and above	32.75	15.56	43.01	18.28
Biology	Knowledge	40.26	19.31	51.76	22.52
	Comprehension	36.86	17.69	49.96	20.93
	Application and above	31.06	26.58	42.59	28.66

4.1.3 Achievement of grade 10 and 12 students at Five Key Marker Points

Table 10 below shows scores achieved at key benchmarks: 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles. Performance at the 10^{th} percentile may be taken as indicative of the standard among low achievers, while performance at the 90^{th} percentile can be taken as indicative of high achievers. In grade 10, students at the 90^{th} percentile only achieved scores of 48.9% at the composite average score. This means only 10% of the grade 10 students were able to achieve a score of 48.9% and above. On the other hand, students at 10^{th} percentile by the composite mean scored achieved only 23.3% and this means 10% of the students scored below chance level in all subjects. Differences between the 10^{th} and 90^{th} percentiles (25.6%) in the composite score is an indication of how wide spread the variation between high achieving and low-achieving students.

In Garde12, students at the 90^{th} percentile achieved scores of 62.2% in the composite mean. This means only 10% of the students were able to achieve a score of 62.2% and above. On the other hand, students at 10^{th} percentile scored only 25.7% and this means 10% of the students scored at about or below chance level in all subjects. Differences between the 10^{th} and 90^{th} percentiles

(36.5%) in the average score is an indication of how wide spread the variation between high-achieving and low-achieving students.

In general, the achievement of students from the percentile key marker point revealed that 50% of them in the composite mean scores were below or at 29.6% and 38.7% for grade 10 and 12 respectively.

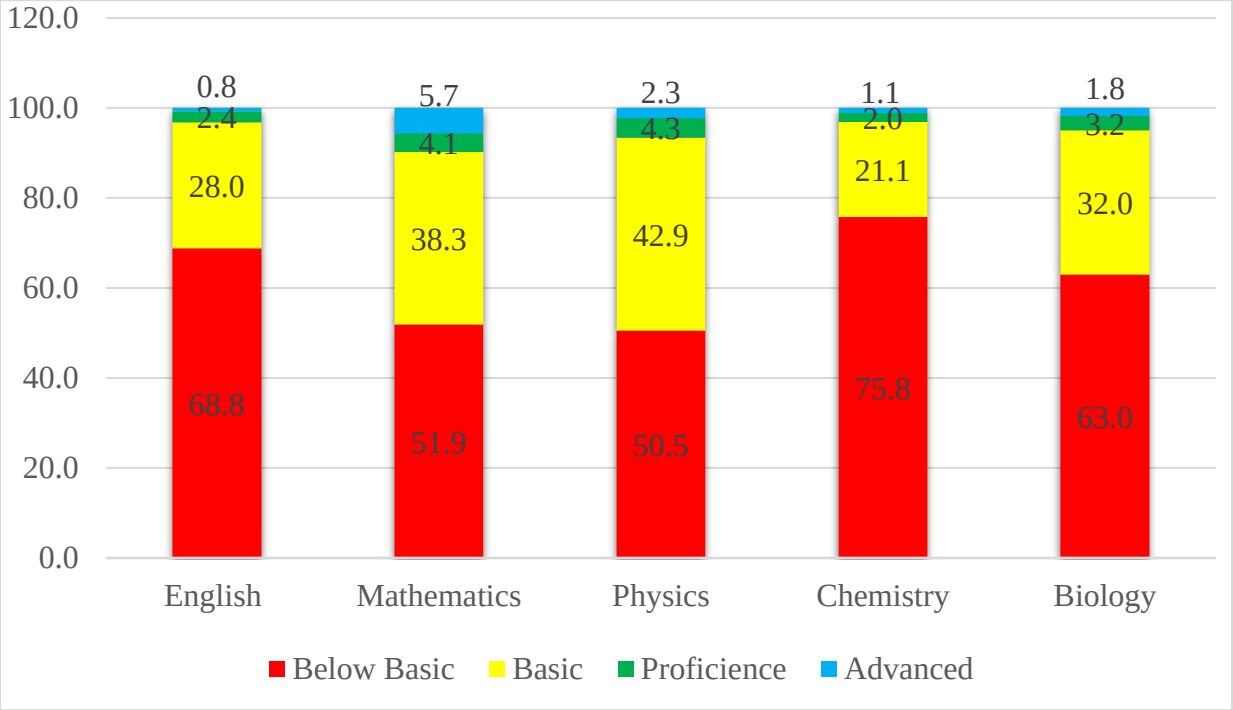
Table 10: Range of Achievement Scores (%) at Five Key Marker Points

	Grade 10 Percentiles					**Grade 12 Percentiles**				
	10th	**25th**	**50th**	**75th**	**90th**	**10th**	**25th**	**50th**	**75th**	**90th**
English	19.6	23.2	28.6	37.5	50.0	23.3	30.0	43.1	58.3	74.1
Mathematics	20.0	24.4	31.1	37.8	52.1	20.0	26.0	34.0	50.0	68.0
Physics	18.6	22.7	27.9	34.1	41.3	19.1	23.4	28.3	35.4	44.7
Chemistry	20.3	24.1	30.5	40.7	56.9	23.3	29.8	40.4	56.7	68.4
Biology	21.7	25.0	33.3	46.7	65.0	25.0	32.2	48.3	66.7	80.0
Composite	23.3	25.8	29.6	37.5	48.9	25.7	30.1	38.7	51.1	62.2

4.1.4 Achievement of Grade 10 and 12 Students by Proficiency Level

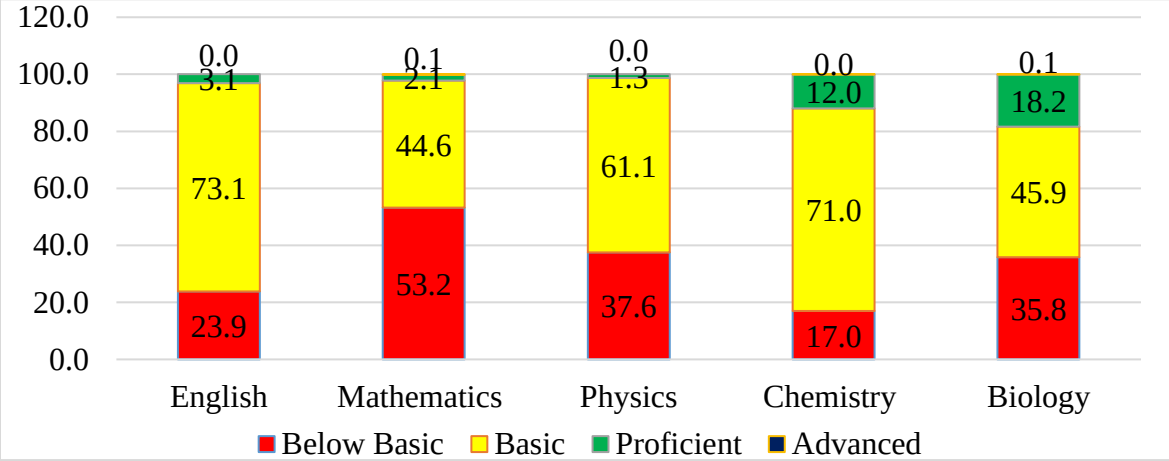
As shown in Figure 1, the proficiency level of students' achievement is divided into four levels as 'Below Basic', 'Basic', 'Proficient' and 'Advanced'. The proportion achieving at each level is presented in Figure 1 below. The number of students at Advanced levels were 0.8%, 5.7%, 2.3 %, 1.1% and 1.8% for English, Mathematics, Physics, Chemistry and Biology respectively. Only from the range of 2.0% to 4.3% of students were found at the proficient levels in each subjects at grade 10. A significant percentage of students ranging from 21.1% to 42.9% in five subjects were found at Basic level. However, the majority of (50.5% to 75.8%) of students were at Below Basic level. This implies that in all the key subjects of grade 10, more than half of students were at Below Basic level.

Figure 1: Grade 10 students' achievement by proficiency level



In Grade 12, based on the proficiency level as indicated in Figure 2, none of students were categorized as Advanced level except in Mathematics and Biology both 0.1%. Looking at the five subjects, students from 1.3% to 18.2% were at proficient level while from 44.6.2% to 73.1% were basic level. On the other hand, from 17.0% to 53.2% were at Below Basic level whereas, the majority of students (53.2%) in mathematics were at Below Basic.

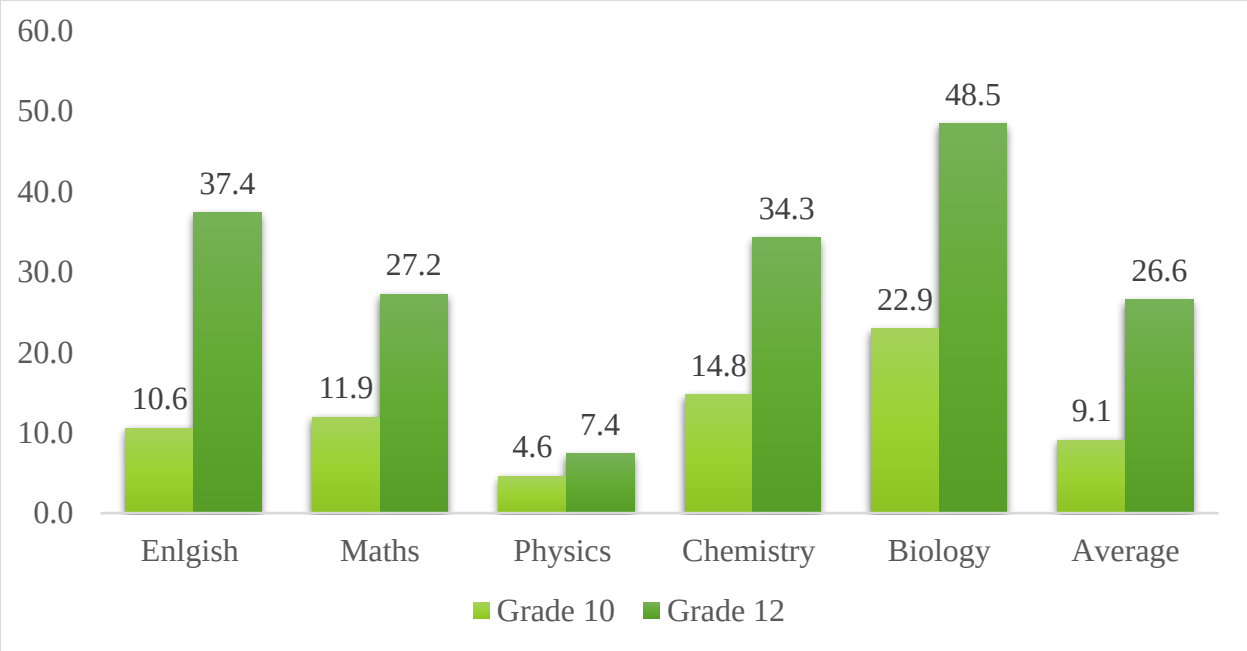
Figure 2: Grade 12 students' achievement by proficiency level



4.1.5 Achievement of Grade 10 and 12 Students by ESDP V Targets

Figure 3 below shows the percentage of students with scores of 50% and above against ESDP V targets. The highest percentage was in Biology (22.9%) and the lowest percentage in Physics (4.6%) for grade 10. Similarly, the performance of students for grade 12 were relatively higher in Biology (48.5%) and lower in physics (7.4%). The percentage of students who achieved 50% and above in the composite mean score were 9.1% for grade 10 and 26.6% for grade 12. In general, performance of grade 12 students were relatively higher than grade 10 students. However, this result is far below the expectation of the national performance level target stated in ESDP V that 50% of students in grade 10 and 70% in grade 12 will achieve composite mean score of 50 and above.

Figure 3: Grade 10 and 12 Students who scored 50% and above by subject



The percentage of students who scored 75% and above was also analyzed as shown in Figure 4. In grade 10, the result was found to be relatively higher in Biology (5.4%), Chemistry (2.6%) and Mathematics (6.6%) than other subjects. Only 0.5% of students performed 75% and above in Physics. Grade 12 students' performance in Biology (14.8%) and English (10.8%) were relatively higher than the other subjects, and only 1% of students scored 75% and above in physics. In all

key subject scores and composite mean score of grade 12 students who scored 75% and above were relatively higher than grade 10. On top of that, in all subjects and in both grade levels very negligible number of students achieved 75% and above scores.

Figure 4: Grade 10 and 12 Students who scored 75% and above by subject

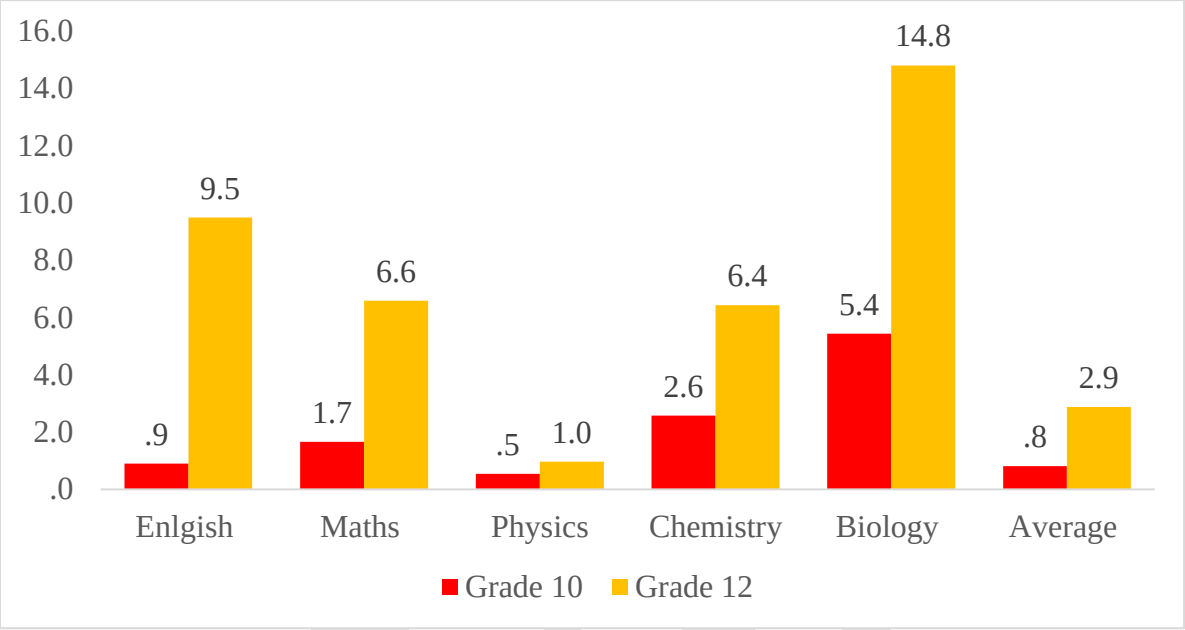


Table 11 below shows the mean difference in achievement of students and the minimum policy target of 50% achievement in each subject. In grade 10, the composite mean score in the five key subjects was 33.3% with standard deviation 11.34 in which the highest mean score was in Biology (38.33%) and the lowest mean score in Physics (29.43%). Similarly, in grade 12, the composite mean score was 41.7 in which the performance in Biology (50.01) slightly higher than the minimum target (50%) and the smallest mean score was found in Physics (30.9%). In general, there is a statistically significant difference between the minimum performance score target set by the ministry of education (50%) and students' performance in the national assessment in key subjects (English, Mathematics, Physics, Chemistry and Biology) in both grades at $p < 0.001$.

Table 11: the Mean Differences in Achievement of Grade 10 and 12 Students for each Subject as compared to 50%

Grade	Subject	N	Mean	Std. Dev.	Test Value = 50			
					MD	t	df	Sig.
10	English	7801	32.04	12.89	-17.96	-123.03	7800	0.000
	Mathematics	7719	33.18	13.51	-16.82	-109.42	7718	0.000
	Physics	7755	29.43	10.56	-20.57	-171.56	7754	0.000
	Chemistry	7690	34.59	15.11	-15.41	-89.48	7689	0.000
	Biology	7671	38.33	17.27	-11.67	-59.17	7670	0.000
	Composite	**8279**	**33.30**	**11.34**	**-16.70**	**-133.99**	**8278**	**0.000**
12	English	4077	45.59	18.72	-4.41	-15.04	4076	0.000
	Mathematics	3894	39.73	18.83	-10.27	-34.03	3893	0.000
	Physics	3897	30.90	11.83	-19.10	-100.76	3896	0.000
	Chemistry	3970	43.69	17.78	-6.31	-22.34	3969	0.000
	Biology	3936	50.01	20.43	0.01	0.03	3935	0.979
	Composite	**4236**	**41.70**	**14.49**	**-8.30**	**-37.27**	**4235**	**0.000**

4.1.6 Pearson Product Movement Correlation among each Subjects and Composite Score of Grade 10 and 12 Students

Table 12 below describes the Pearson product moment correlation among the five subjects and composite score. In grade 10, there were positive relationship between the five subjects and the composite mean score and the correlations were statistically significant in all cases at $p < .001$. This shows that students performing well in one subject also did the same in the others. The correlation between grade 10 Biology and Chemistry with the composite mean score were higher than the other subjects with correlation coefficient values (r=.875) and (r=.861) respectively. Looking at the relation between English and other subjects, it was the highest with Biology (r=.647). Subjects such as Biology and Chemistry when compared with the others are more influenced by English language ability.

In grade 12, there is also a positive correlation with in the five subjects and the correlations were statistically significant in all cases at $p < .001$. Moreover, the correlation between Biology with Chemistry (r=.725), and Biology with composite mean score (.874) were the highest as compared to others. Same to grade 10, the correlation between English and Biology is also strong than other subjects.

Table 12: Pearson Product Moment Correlations between the Five Subjects and Composite Score

Grade	Subject	English	Mathematics	Physics	Chemistry	Biology
10	Mathematics	.534**				
	Physics	.464**	.551**			
	Chemistry	.569**	.650**	.551**		
	Biology	.647**	.613**	.516**	.696**	
	Composite	.789**	.819**	.725**	.861**	.875**
	Subject	**English**	**Mathematics**	**Physics**	**Chemistry**	**Biology**
12	Mathematics	.495**				
	Physics	.450**	.554**			
	Chemistry	.596**	.661**	.564**		
	Biology	.687**	.596**	.465**	.725**	
	Composite	.807**	.816**	.697**	.872**	.874**

** Correlation is significant at the 0.01 level (2-tailed).

4.1.6 Relationship of Grade 10 and 12 Students Achievement between National and Classroom Assessments

Figure 5 below is an illustration of students' achievement in national and classroom assessments at grade 10. Due to the various systems of test development and test administration of different schools, it might be difficult to compare achievements of classroom assessment with the national assessment. However, the highest and lowest scores in classroom assessment were in Biology (64.5%) and in Mathematics (59.7%) respectively. On the other hand, the highest and lowest scores in national assessment were also Biology (39.1%) and Physics (29.9%).

Figure 5: Grade 10 Achievements in Percent Score on National and Classroom Assessments

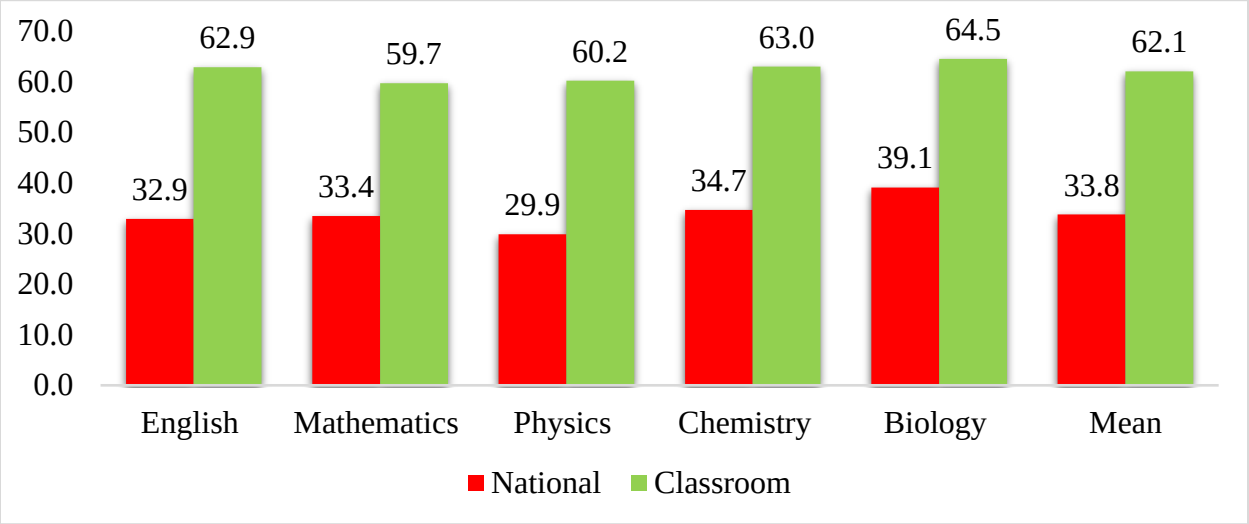
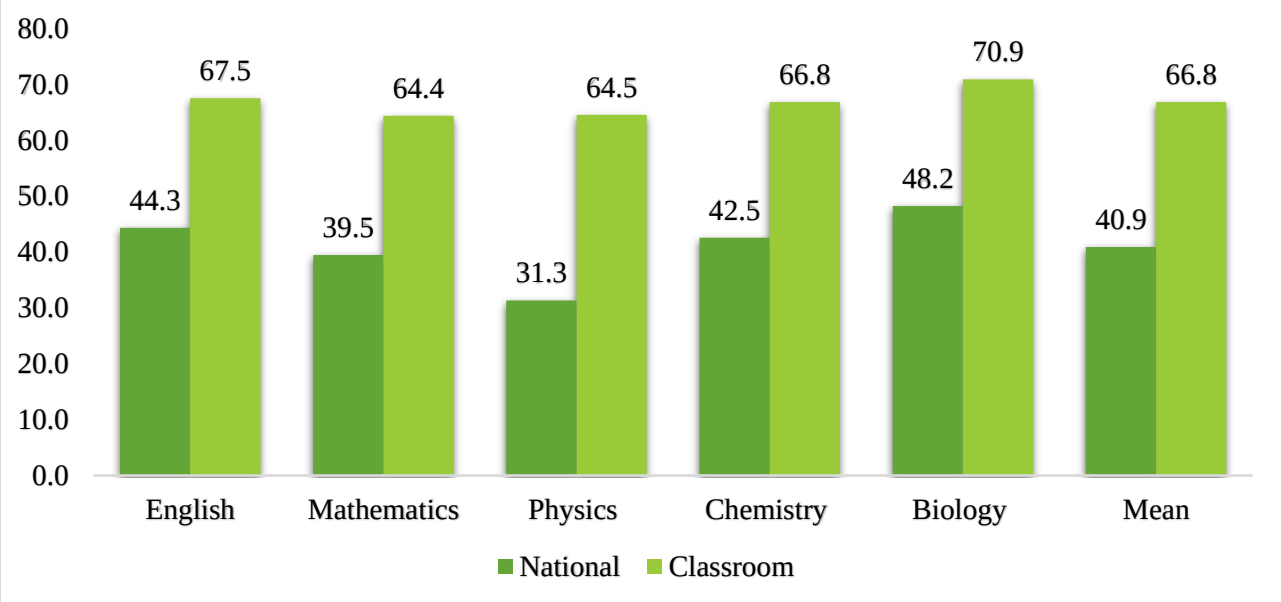


Figure 6 also shows the percent scores of national assessment and school based classroom assessment at grade 12. The mean score in classroom assessment were higher than that of the national assessment results in all key subjects. This indicates that there is visible distinction between the two assessment systems shown in the graph below.

Figure 6: Grade 12 Achievements in Percent Score on National and Classroom Assessments



The relationship between the classroom and national assessment scores was also analyzed as shown in Table 13 below. The achievement scores of the national assessment in the key subjects

and the first semester classroom room assessment score of the academic year obtained from the school rosters were also analyzed to see their relationships. The scores were correlated positively in all cases and in both grade levels and the relationships were statistically significant at p < .001though the relationships were weak. Regardless of the mean differences in the performances of the two assessment systems, the relationship shows that those students who did well at their school also did the same in the national assessment tests. However, this does not mean that the mean score of the two assessments are comparable.

Table 13; Grade 10 and 12 Pearson Product Moment Correlations between National and Classroom assessment Scores

Grade	Subject	English	Mathematics	Physics	Chemistry	Biology	Mean
10	English	.263**					
	Mathematics		.232**				
	Physics			.202**			
	Chemistry				.225**		
	Biology					.279**	
	Composite						.345**
12		English	Mathematics	Physics	Chemistry	Biology	Mean
	English	.199**					
	Mathematics		.074**				
	Physics			.159**			
	Chemistry				.178**		
	Biology					.244**	
	Composite						.287**

**. Correlation is significant at the 0.01 level (2-tailed).

4.2 Achievement of Grade 10 And 12 Students by Gender

The result in table 14 shows that in all the core subjects' males outperformed females with statistically significant difference at $p < .001$ including the composite mean score for grade 10 students. The table also showed that the effect sizes for the differences in achievements were medium for the composite mean score (d=.27), Biology (d=.31) and Chemistry (d=.29) while it was low for the rest subjects.

Table 14: Achievement of Grade 10 students by Gender

Gender of students		N	Mean	Std. Dev	MD	t	df	Sig.	Cohen's d
English	Male	4179	33.00	13.28	2.06	7.07	7799	.000	0.16
	Female	3622	30.93	12.34					
Mathematics	Male	4156	34.41	14.27	2.66	8.66	7717	.000	0.20
	Female	3563	31.75	12.40					
Physics	Male	4150	30.14	11.21	1.53	6.39	7753	.000	0.15
	Female	3605	28.61	9.69					
Chemistry	Male	4142	36.57	16.25	4.29	12.53	7688	.000	0.29
	Female	3548	32.28	13.29					
Biology	Male	4128	40.77	18.07	5.27	13.49	7669	.000	0.31
	Female	3543	35.50	15.82					
Composite	Male	4448	34.72	12.05	3.07	12.39	8277	.000	0.27
	Female	3831	31.65	10.21					

Note that Cohen's d is used to determine the effect size. Its interpretation is 0.20= small, 0.50 = moderate and 0.80 = large

Gender achievement disparity was also analyzed for grade 12 and the results are shown in Table 15. In all subjects, males outperformed females in a similar way as it was in grade 10. The differences were statistically significant in all the tested subjects. Males scored an average composite score of 43.23% (SD=14.92) whereas females had an average score of 39.45% (SD=13.53). In this case, even though, the difference is statistically significant Cohen's d shows that the effect sizes of all subjects are weak.

Table 15: Achievement of Grade 12 students by Gender

Gender of the students		N	Mean	Std. Dev	MD	t	df	Sig.	Cohen's d
English	Male	2426	46.68	18.23	2.70	4.52	4075	0.00	0.14
	Female	1651	43.98	19.33					
Mathematics	Male	2322	41.19	19.94	3.60	5.88	3892	0.00	0.19
	Female	1572	37.58	16.85					
Physics	Male	2299	32.13	12.75	3.01	7.86	3895	0.00	0.26
	Female	1599	29.13	10.13					
Chemistry	Male	2346	45.72	18.33	4.95	8.70	3968	0.00	0.28
	Female	1624	40.77	16.54					
Biology	Male	2344	52.14	20.46	5.26	7.99	3934	0.00	0.26
	Female	1591	46.88	19.99					
Composite	Male	2520	43.23	14.92	3.78	8.40	4234	0.00	0.26
	Female	1716	39.45	13.53					

4.3 Achievement of Grade 10 And 12 Students by Location

The overall percent mean score variations as shown in table 16 reveals that urban students performed significantly better than rural students ($p < .001$) for all the tested subjects. However, the disparity was higher in English with urban students mean score (32.76%) and rural students means score (29.16) and the lower in Mathematics with urban students mean score (33.42%) and rural students means score (31.61%). In the composite score, the mean difference (MD) was 2.74 and the difference was statistically significant with ($p < .001$). However, though, the difference is statistically significant Cohen's d shows that the effect sizes of all subjects are moderate.

Table 16: G10 Students Achievement by School Location

School Location		N	Mean	Std. Dev	MD	t	df	Sig.	Cohen's d
English	Urban	6234	32.76	8.10	3.59	17.65	7917	.000	0.49
	Rural	1685	29.16	4.01					
Mathematics	Urban	6234	33.42	8.21	1.81	8.41	7917	.000	0.23
	Rural	1685	31.61	6.38					
Physics	Urban	6234	29.79	5.85	2.18	14.97	7917	.000	0.41
	Rural	1685	27.61	2.50					
Chemistry	Urban	6234	35.00	8.48	2.64	11.65	7917	.000	0.32
	Rural	1685	32.36	7.44					
Biology	Urban	6234	38.85	10.36	3.46	12.85	7917	.000	0.35
	Rural	1685	35.39	7.35					
Composite	Urban	6234	33.96	7.77	2.74	13.74	7917	.000	0.38
	Rural	1685	31.23	4.91					

Similarly in grade 12, differences were significant in most of the tested subjects ($p < .001$) with the exception of Physics which had insignificant difference ($P > .05$) as shown in Table 17. In Physics, rural students achieved slightly higher mean score (30.79%) than urban students (30.60%). This is in contrast to the other four subjects in which urban students scored higher than rural. Nevertheless, though, the difference is statistically significant Cohen's d shows that the effect sizes of all subjects are moderate.

Table 17: G12 Students Achievement by School Location

School location		N	Mean	Std. Dev	MD	t	df	Sig.	Cohen's d
English	Urban	3860	45.25	10.88	5.26	7.02	4080	.000	0.48
	Rural	222	39.99	10.36					
Mathematics	Urban	3860	39.33	9.39	2.40	3.62	4080	.000	0.25
	Rural	222	36.93	13.06					
Physics	Urban	3860	30.60	4.64	-0.18	-0.58	4080	.565	0.04
	Rural	222	30.79	4.24					
Chemistry	Urban	3860	43.38	8.76	2.37	3.90	4080	.000	0.27
	Rural	222	41.01	9.61					
Biology	Urban	3860	49.39	10.96	2.62	3.49	4080	.000	0.24
	Rural	222	46.77	8.70					
Composite	Urban	3860	41.59	7.94	2.49	4.52	4080	.000	0.31
	Rural	222	39.10	8.89					

4.4 Achievement of Grade 10 And 12 Students by School Type

In grade 10, the achievement of students from nongovernment schools with composite score (47.95%) significantly outperformed students from government schools (31.99%) by the composite mean core (Table 18). The higher mean difference in students achievement were observed in English (MD = 19.36) and Biology (MD=20.10%). The highest and lowest scores achieved both in government and nongovernment schools were Biology and Physics respectively. Students from both types of schools achieved slightly higher in Biology than the other subjects. In all the subjects the effect size is also large according to the Cohen's d values.

Table 18: Achievement of Grade 10 students by School Type

School Type		N	Mean	Std. Dev	MD	T	df	Sig.	Cohen's d
English	Gov.	7161	30.45	11.01	-19.36	-39.92	7799	.000	-1.65
	Non-Gov.	640	49.81	18.12					
Mathematics	Gov.	7077	31.93	12.11	-15.03	-28.39	7717	.000	-1.17
	Non-Gov.	642	46.96	19.21					
Physics	Gov.	7113	28.48	9.20	-11.38	-27.40	7753	.000	-0.89
	Non-Gov.	643	39.86	17.04					
Chemistry	Gov.	7063	33.36	13.89	-15.09	-24.93	7688	.000	-1.04
	Non-Gov.	627	48.45	20.37					
Biology	Gov.	7039	36.68	15.82	-20.10	-29.59	7669	.000	-1.23
	Non-Gov.	632	56.78	21.53					
Composite	Gov.	7598	31.99	9.74	-15.96	-38.14	8277	.000	-1.53
	Non-Gov.	681	47.95	16.51					

Differences in performances were also computed for the types of schools in grade 12. As shown in Table 19 below, students mean score from nongovernment schools (55.58%) performed better than government schools (38.83%). Looking at each subject, students' achievement from the nongovernment schools were higher than government schools. The mean difference was higher in English (MD=25.24) than the other subjects. According to the Cohen's d value, the differences were large in English, Mathematics, Biology and mean score, even though, it was small and medium in Physics and Chemistry respectively.

Table 19: Achievement of Grade 12 students by School Type

Type school		N	Mean	Std.Dev	MD	t	df	Sig.	Cohen's d
English	Gov.	3604	40.81	8.81	-25.24	-62.49	4117	.000	-2.94
	Non-Gov.	515	66.05	6.71					
Mathematics	Gov.	3604	37.14	9.37	-15.70	-34.57	4117	.000	-1.63
	Non-Gov.	515	52.84	11.37					
Physics	Gov.	3604	29.79	3.74	-10.52	-48.89	4117	.000	-0.11
	Non-Gov.	515	40.30	8.30					
Chemistry	Gov.	3604	40.72	8.33	-13.71	-35.31	4117	.000	-0.66
	Non-Gov.	515	54.43	7.61					
Biology	Gov.	3604	45.69	9.65	-18.59	-41.66	4117	.000	-1.96
	Non-Gov.	515	64.29	8.12					
Mean	Gov.	3604	38.83	7.08	-16.75	-49.74	4117	.000	-2.34
	Non-Gov.	515	55.58	7.63					

4.5 Achievement of Grade 10 And 12 Students by Region

Achievements of all the regions and city administrations were computed for the key subjects as shown in Table 20 for all sample schools. The highest and the lowest scores were observed in Biology (38.33%) and Physics (29.43%) respectively. Addis Ababa was the highest achiever (43.29%) and Benishangul Gumuz was the least achiever (29.37%). Among the regions Addis Ababa, Harari, Dire Dawa, Ethiopia Somali, and Amhara scored above the national mean whereas the rests were below the national average (33.29%). However, the national mean score (33.29%) as well as performances of each region in grade 10 was found to be less than 50%.

On the other hand, when looking at the regions achievement mean scores for the government schools only, the national mean score was 32%. The highest and least achievers were respectively, Addis Ababa with 37% and Gambella with 28.3%. In this case, only Addis Ababa, Harari, Ethiopian Somali, Amhara and Oromia regions were scored above the national mean scores (See appendix A).

Table 20: Grade 10 Achievement by Region

Region	English	Mathematics	Physics	Chemistry	Biology	Mean
Tigray	28.32	30.29	27.78	31.04	31.41	29.62
Afar	30.57	29.07	27.19	31.73	35.23	30.57
Amhara	31.79	33.73	29.74	35.27	37.47	33.43
Oromia	29.46	33.34	28.36	33.95	36.79	32.22
Somali	31.05	32.74	31.13	34.34	40.26	33.45
Benshangul	28.74	27.94	27.07	28.97	34.41	29.37
SNNP	30.46	31.29	28.50	33.54	38.33	32.24
Gambella	30.17	26.79	25.75	30.74	35.56	29.49
Harari	39.63	39.88	33.17	42.41	48.21	40.32
Addis Ababa	45.78	42.50	36.44	43.38	51.20	43.29
Dire Dawa	37.25	36.50	31.10	35.86	42.21	36.27
National Mean	32.04	33.18	29.43	34.59	38.33	33.29

For grade 12, the national mean score was 40.90% as shown in Table 21 below. The performances of five regions; Dire Dawa, Harai, Addis Ababa, Oromia, Amhara were above the national mean. The highest achiever among regions was Harari (52.63%). This shows that Harari scored above the national mean, policy target of 50% and ESDP V in grade 12. Whereas Ethiopia Somali was the least achiever (30.16%). With regard to performance of regions in each subject, the highest and lowest composite mean scores were observed in Biology (50.01%) and physics (30.90%) respectively and this was similar to the achievement found in grade 10.

On the other hand, concerning the regions achievement mean scores for the government schools only, the national mean score was 41.4%. The highest and least achievers were respectively, Harari with 53.4% and Ethiopian Somali with 30.2%. In this regard, only Harari, Addis Ababa, Dire Dawa, Oromia and Amhara regions were scored above the national mean scores (See appendix A).

Table 21: Grade 12 Achievement by Region

Region	English	Mathematics	Physics	Chemistry	Biology	Mean
Tigray	40.84	40.87	30.52	42.83	42.39	39.61
Afar	35.55	32.67	27.28	34.16	37.69	33.59
Amhara	42.81	41.96	32.49	45.03	49.21	42.24
Oromia	44.61	44.43	31.99	45.20	51.52	43.30
Eth. Somali	33.72	25.98	26.34	30.10	33.81	30.16
Benshangul	39.29	32.07	29.39	38.82	44.36	36.69
SNNP	43.14	38.09	31.08	44.00	47.19	40.59
Gambellaa	41.57	29.26	27.72	39.96	51.77	37.88
Harari	60.38	47.23	39.17	53.76	64.49	52.63
Addis Ababa	57.34	41.82	29.29	47.14	56.24	46.01
Dire Dawa	48.02	42.53	30.26	45.51	54.07	44.43
Total	45.59	39.73	30.90	43.69	50.01	41.70

To identify the existence of performance differences among the different regions, analysis of variance was carried out by taking region as independent and the average score as the dependent variable. Accordingly in grade 10, a statistically significant difference was observed on the composite mean scores ($F_{(10, 8268)} = 91.15$, $p < .001$) and scores of each subject as shown in Table 22 below. According to Cohen (1988), Eta squared values interpreted as: 0.01 = small effect size, 0.06 = moderate effect size and 0.14 = large effect size. In this regard, the effect size among regions in physics and chemistry are moderate, while for that of English, Mathematics, Biology and composite scores are large.

Table 22: Achievement of Grade 10 Students by Regions Using One way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
English	Between Groups	169185.54	10	16918.55	116.88	.000	0.13
	Within Groups	1127655.74	7790	144.76			
	Total	1296841.27	7800				
Mathematics	Between Groups	102009.60	10	10200.96	60.21	.000	0.07
	Within Groups	1306017.20	7708	169.43			
	Total	1408026.81	7718				
Physics	Between Groups	47761.42	10	4776.14	45.28	.000	0.06
	Within Groups	816940.79	7744	105.49			
	Total	864702.21	7754				
Chemistry	Between Groups	86059.62	10	8605.96	39.61	.000	0.05
	Within Groups	1668466.86	7679	217.27			
	Total	1754526.48	7689				
Biology	Between Groups	175889.13	10	17588.91	63.81	.000	0.08
	Within Groups	2111336.88	7660	275.62			
	Total	2287226.01	7670				
Composite	Between Groups	105715.46	10	10571.55	91.15	.000	0.10
	Within Groups	958954.62	8268	115.98			
	Total	1064670.08	8278				

Similarly for grade 12, there was a statistically significant difference on the composite score of regions at least on two regions ($F_{(10,\ 4225\ )} = 56.93,\ p < .001$). With regard to the differences in each subject, significant difference was also observed in every subject as shown in Table 23 below. Similarly, the effect size of Eta Squared also indicated large values for all subjects including composite score except for physics which has moderate effect size.

Table 23: Achievement of Grade 12 Students by Regions Using One way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
English	Between Groups	224081.68	10	22408.17	75.61	.000	.16
	Within Groups	1204995.12	4066	296.36			
	Total	1429076.80	4076				
Mathematics	Between Groups	122112.32	10	12211.23	37.68	.000	.09
	Within Groups	1258442.62	3883	324.07			
	Total	1380554.94	3893				
Physics	Between Groups	30487.34	10	3048.73	23.00	.000	.06
	Within Groups	515256.01	3886	132.58			
	Total	545743.35	3896				
Chemistry	Between Groups	104217.95	10	10421.80	35.84	.000	.08
	Within Groups	1151192.45	3959	290.76			
	Total	1255410.40	3969				
Biology	Between Groups	178541.75	10	17854.17	47.85	.000	.11
	Within Groups	1464503.80	3925	373.15			
	Total	1643045.55	3935				
Mean	Between Groups	105591.67	10	10559.17	56.93	.000	.12
	Within Groups	783575.17	4225	185.46			
	Total	889166.84	4235				

To see the differences in each region, a Post Hoc Tests of ANOVA using Tukey HSD method were executed from the composite mean score results of grade 10 as shown in Table 24 below. The result showed that the regions were classified in to six categories of homogeneity subset groupings. Only students from Addis Ababa were found in the highest achievers group (Group 6). While students from Benishangul Gumuz, Gambela, Tigray and Afar, were categorized in Group 1 (the lowest composite mean score). Moreover, it is easy to observe from Table 24 that, the composite mean scores of Dire Dawa, Harari and Addis Ababa regions were greater than that of the national mean.

Moreover, with regard to the achievement of regions homogenous subset groupings in each subjects, in English and physics Addis Ababa, in Mathematics, Chemistry and Biology Addis Ababa and Harari regions were in the highest achievers groups. In the contrary, in English and Biology Tigray, in Mathematics and Physics Gambella and in Chemistry Benishangul Gumuz regions were the only regions found in the least achievers groups (see appendix B).

Table 24: Homogenous subset groupings of grade 10 composite mean scores by regions using One Way ANOVA (Tukey HSD method)

Region code	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
Benshangul	217	29.37					
Gambella	463	29.49					
Tigray	767	29.62					
Afar	224	30.57	30.57				
Oromia	1918		32.22	32.22			
SNNP	1319		32.24	32.24			
Amhara	1635			33.43			
Ethiopia Somali	490			33.45			
Dire Dawa	340				36.27		
Harari	260					40.32	
Addis Ababa	640						43.29
Sig.		0.86	0.43	0.83	1.00	1.00	1.00

In grade 12, the homogenous subset groupings by the composite mean scores were categorized in to eight homogeneity groupings. Table 25 shows that only students from Harari were found in the highest achievers group (Group 8). While students from Ethiopia Somali and Afar were categorized in Group 1 (the lowest composite mean score). The composite mean scores of Harari, Addis Ababa, Dire Dawa, Oromia and Amhara regions were greater than that of the national mean score (41.70).

Regarding the achievement of regions homogenous subset groupings in each subjects for grade 12, in all subjects Harari was in the highest achievers groups while Ethiopian Somali was found in the least achievers groups (see appendix B).

Table 25: Homogenous subset groupings of grade 12 composite mean scores by regions using One Way ANOVA (Tukey HSD method)

Region	N	Subset for alpha = 0.05							
		1	2	3	4	5	6	7	8
Eth. Somali	292	30.16							
Afar	165	33.59	33.59						
Benshangul	164		36.69	36.69					
Gambella	291			37.88	37.88				
Tigray	297			39.61	39.61	39.61			
SNNP	403				40.59	40.59			
Amhara	800					42.24	42.24		
Oromia	707					43.30	43.30	43.30	
Dire Dawa	156						44.43	44.43	
Addis Ababa	713							46.01	
Harari	243								52.63
Sig.		0.10	0.20	0.29	0.40	0.05	0.72	0.40	1.00

4.6 Achievement of Grade 10 And 12 Students by School Rank

Figure 7 shows the achievement of grade 10 students in each subject based on school rank. Accordingly, in all subjects the achievement of schools ranked as “Level 3” was relatively higher than “Level 2” and “Level 1”. The average achievement of students’ in five subjects according to the schools they were learning is shows that, ranked “Level 3” schools achieved 37.1%. Whereas, ranked “Level 2” and “Level 1” scored 32.9% and 32.0% respectively. From this, it is easy to understand that ranked “Level 3” schools scored relatively good result compare to ranked “Level 2” and “Level 1” schools. While, the average result of students of ranked “Level 2” and “Level 1” schools were almost the same in all subjects.

Figure 7: Achievement of grade 10 students by School Rank

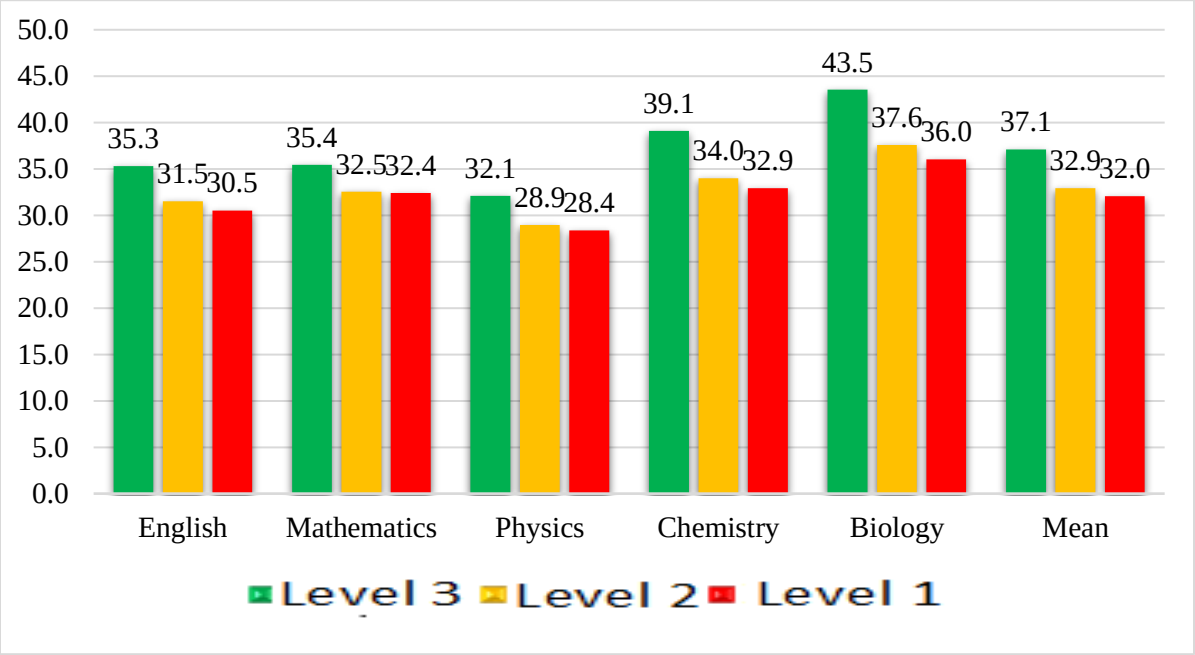
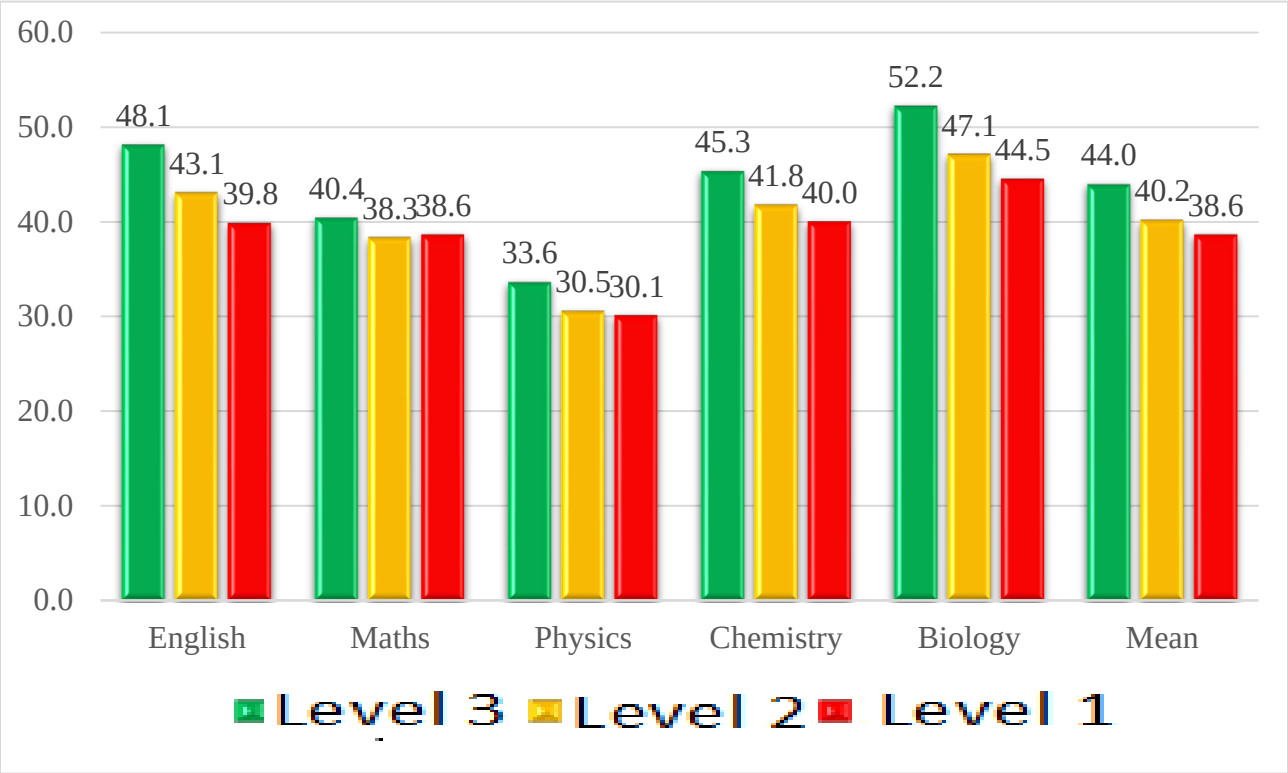


Figure 8 below also showed that, in all subjects the achievement of grade 12 schools ranked as "Level 3" was relatively higher than "Level 2" and "Level 3". The average achievement of students' in five subjects according to the schools they were learning is shows that, ranked "Level 3" schools achieved 44%. Whereas, ranked "Level 2" and "Level 1" scored 40.2% and 38.6% respectively. In general, school "Level 3" achieve better than "Level 2" and "Level 2" slightly achieve better than "Level 1".

Figure 8: Achievement of grade 12 students by School Rank



4.7 Achievement of Grade 10 And 12 Students Overtime

One of the main objective of this study is to know the trend of achievements across time. To measure changes in student achievement the achievement test followed different procedures that enable us to compare the trend. These are using common items in the successive year administration and relying on item response theory (IRT) methods to construct achievement scales for reporting student achievement and measuring trends from assessment cycle to assessment cycle.

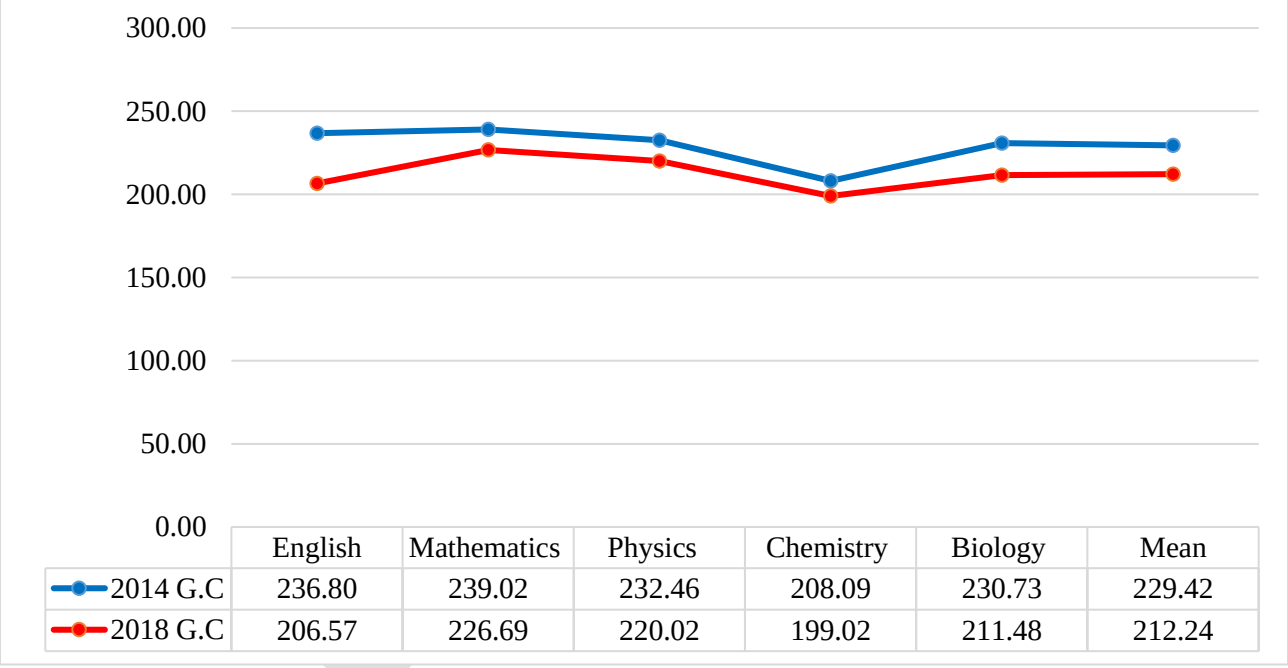
The IRT methods are valuable in this context because they provide a way to estimate achievement in a student population based on the measurement properties of the individual items comprising the assessment. The item properties, or item parameters were estimated from the assessment data through a process known as item calibration.

In the calibration method, both 2013 and 2017 NLA data were used to estimate item and person parameters at the same time. Given that all parameters are estimated at the same time and therefore

items common to both cycles receive the same estimates, item parameters from both cycles are on the same scale.

The score were transformed in to scale scores with a fixed common item parameter method in order to place the two tests on the same scale. Hence, the performance trends for the cohort of students' in grade 10 at 2013 and 2017 were shown in Figure 9. The result indicated that the result in 2017 was significantly lower in comparison to 2013 assessment in all subjects. The difference was higher in English (30.23 points) and lower in Chemistry (9.07 points). In the mean score, the difference between the achievement of students in cohort 2013 and 2017 was 17.18 points. This implies that the performance of students is deteriorating overtime.

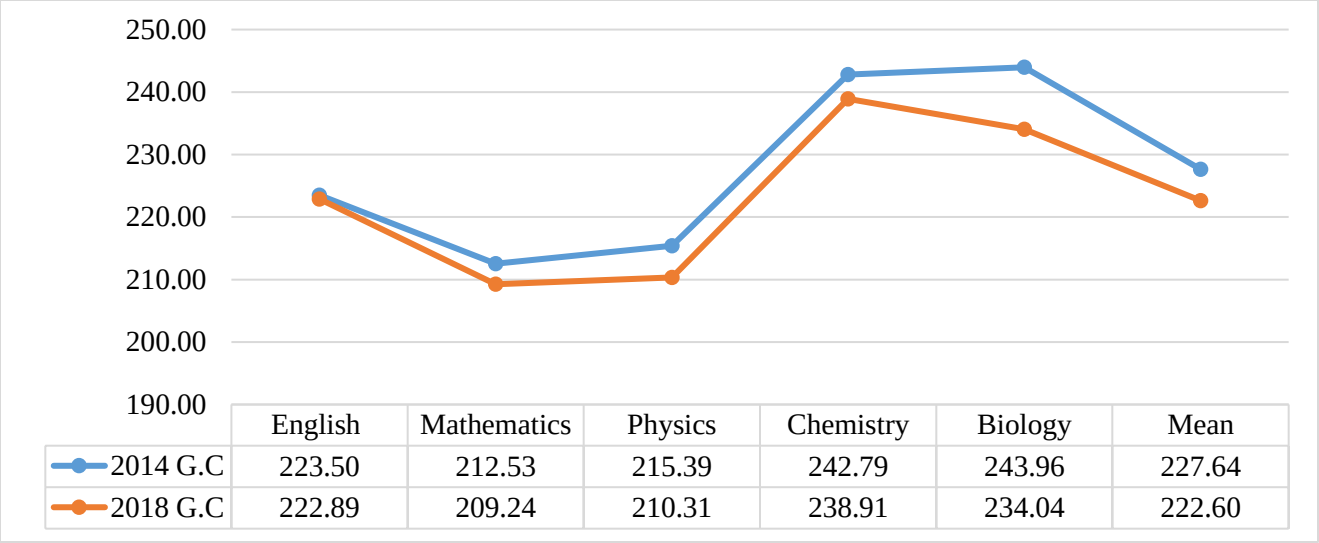
Figure 9: Trends of Grade 10 Achievement over time



	English	Mathematics	Physics	Chemistry	Biology	Mean
2014 G.C	236.80	239.02	232.46	208.09	230.73	229.42
2018 G.C	206.57	226.69	220.02	199.02	211.48	212.24

Figure 10 also showed that the performance of grade 12 students in 2017 was significantly lower in comparison to 2013 assessment in all subjects. The difference was lower in English (0.61 point) and higher in Biology (9.92 points). In the mean score, the difference between the achievement of students in cohort 2013 and 2017 was 5.04 points. This indicated that, the performance of students is declining across time.

Figure 10: Trends of Grade 12 Achievement over time



	English	Mathematics	Physics	Chemistry	Biology	Mean
2014 G.C	223.50	212.53	215.39	242.79	243.96	227.64
2018 G.C	222.89	209.24	210.31	238.91	234.04	222.60

4.8 Findings of Background Variables

This section presents the background information that would be the potential factors for grade 10 and 12 students' achievement. It describes the background data collected from a total of 306 (198 of them from grade 10 and 108 from grade 12) schools, and 7803 and 4070 students of grade 10 and 12 students respectively. Moreover, 194 (97.9%) grade 10 and 106 (98%) grade 12 principals; and 974 (98.4%) grade 10 and 516 (95.6) grade 12 teachers completed questionnaires to provide background information associated with students' performance.

4.8.1 Participants background information

4.8.1.1 Students Background Variables

Student related variables such as parents' education, home environment, socio-economic status, possession of educational materials, school resource, and students' characteristics among others were posed for students. These variables were analyzed for their contribution for the academic achievements that can affect either positively or negatively. Table 26 below shows the relationship between student background variables and their achievement.

In grade 10, the relation between gender (male=1 and female=2) and age of students' with achievement score had statistically significant correlation [gender (r = -.147) and age of students (r = -.221)] in the negative direction. This shows that although the effect size seems low gender of students explain the variation in the achievement of students. Similarly, students with high age were not performing high scores compared to that of lower ages. As age of students increase achievement decreases. In grade 12, almost similar result was obtained both in gender (Male=1 and Female=2) (r = -.158) and age of students (r = -.212) in their relationship with achievement.

Attending pre-primary education was assumed to have an effect on students' learning and their achievement. From the information provided by the sampled students, their achievement score was correlated to attending pre-primary education. The correlations were positive and statistically significant as shown in Table 26. In both grades, students who had the opportunity of getting attending pre-primary education scored higher than those who didn't get it. Regarding to parents' educational background, in both grades parents' education was significantly correlated with achievement. As Parental education level increase achievement also increases.

Hence, the student background variables described in Table 26 such as gender, age, attendance of pre-primary education, and parents' education had significant correlation with achievement in both grades

Table 26: Correlation between student background information and achievement

Variables	Correlation Coefficient	
	Grade 10	Grade 12
Gender (Male=1 and Female=2)	-.147**	-.158**
Age of students	-.221**	-.212**
Attending Pre-primary education	.197**	.074**
Highest level of education completed by mother/ female guardian	.315**	.196**
Highest level of education completed by father /male guardian	.326**	.211**

**. Correlation is significant at the 0.01 level (2-tailed).

A regression analyses were conducted to see the influence of students' background variables on students' achievement. . It also helps to know the effect and relative importance of student background variables. Table 27 summarizes the regression summary model and coefficient analysis results. The multiple regression model with all five predictors produced the adjusted R^2 = 0.164, $F(5, 6541) = 257.7$, $p < .001$ for grade 10 and adjusted $R^2 = 0.096$, $F(5, 3606) = 77.9$, $p < .001$ for grade 12. This result indicated that, the student background variables such as age, gender, pre-primary education and parental education as shown in the model together explains 16.4% of grade 10 and 9.6% grade 12 students achievement. As can be seen form regression coefficients from grade 10 student age, pre-primary education and fathers and mothers education level; and from grade 12 age, gender and fathers and mothers education level had significant weights in explaining achievement. For instance, a 1 unit increase in the mothers' education level is associated with a 0.78 rate of unit increase in the average achievement of students. However, gender from grade 10 and pre-primary education in grade 12 did not significantly contribute to students' achievement by the regression model.

Table 27: ANOVA, regression summary model and coefficients for students' background information

Grade	Groups	Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	85423.6	5	17084.7	257.7	0.406	0.165	0.164	0.000
	Residual	433668	6541	66.3					
	Total	519092	6546						
12	Regression	21898.9	5	4379.8	77.9	.312	.098	.096	0.000
	Residual	202666.3	3606	56.2					
	Total	224565.2	3611						
Regression Coefficients									
Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.			
		B	Std. Err	Beta					
10	(Constant)	39.21	1.19		32.98	0.000			
	Gender	-0.33	0.21	-0.02	-1.61	0.108			
	Age	-0.71	0.06	-0.15	-12.50	0.000			
	Attending pre-primary education	2.02	0.21	0.11	9.44	0.000			
	Highest level of Mother education	0.78	0.07	0.17	10.46	0.000			
	Highest level of father education	0.71	0.07	0.16	10.34	0.000			
12	(Constant)	66.02	2.43		27.18	0.000			
	Gender	-2.65	0.27	-0.16	-9.94	0.000			
	Age	-1.22	0.12	-0.16	-10.26	0.000			
	Attending pre-primary education	0.03	0.28	0.00	0.12	0.902			
	Highest level of Mother education	0.28	0.09	0.07	3.07	0.002			
	Highest level of father education	0.45	0.08	0.12	5.26	0.000			

4.8.1.2 Teachers' background information

Majority of participant teachers as shown in Figure 11 were male. Only 10% in grade 10 and 4% in grade 12 of the participants were female teachers.

Figure 11: Teachers Sex by Grade Level in Percent

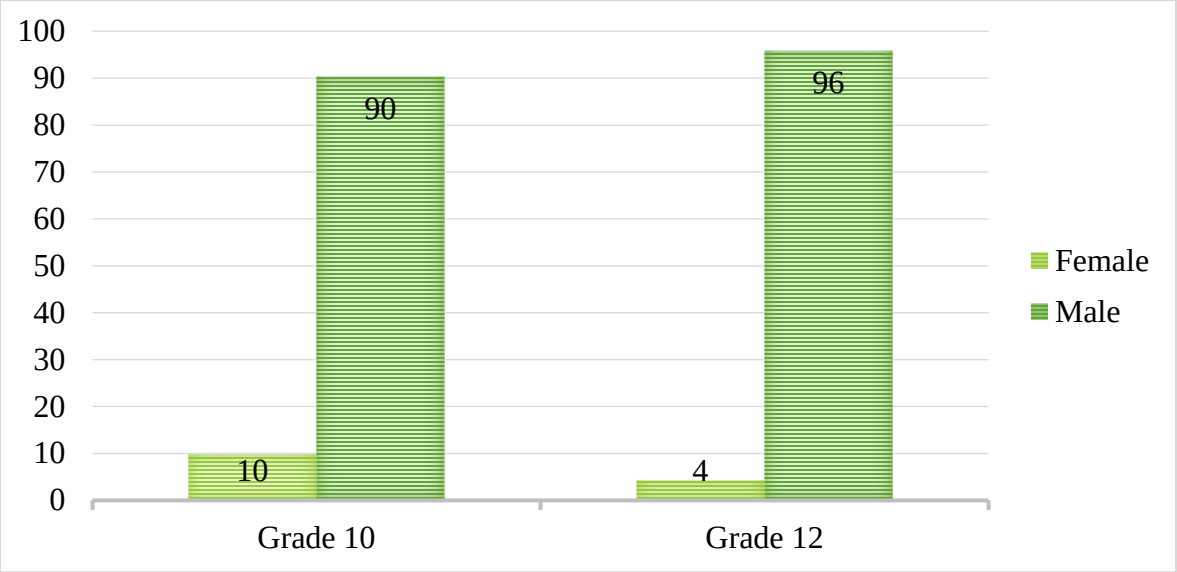


Table 28 describes the age ranges and teaching experiences of the participants. The result shows that age of participants were in a dispersed range. Majority of teachers were within the age range of 21-30 (62.6%) years in grade 10 and within the range of 31-40 (41.5%) years in grade 12. With regard to teaching experience, majority of teachers in grade 10 (32.4%) and grade 12 (36.7%) had experiences within the range of 6 -10 years. However, large percentage of teachers (31.3%) in grade 10 and (16.8%) in grade 12 had experiences five years and below.

Table 28: Age Category and Teaching Experience of Teachers by grade

	Grade 10		**Grade 12**	
	Frequency	Percent	Frequency	Percent
Age				
• ≤ 20 years	8	.9	10	2.0
• 21-30 years	589	62.6	202	40.3
• 31-40 years	239	25.4	208	41.5
• 41-50 years	74	7.9	58	11.6
• Above 50 years	31	3.3	23	4.6
Total	941	100	501	100
Teaching Experience				
• ≤ 5 years	308	31.3	83	16.8
• 6-10 years	319	32.4	181	36.7
• 11-15 years	142	14.4	127	25.8
• 16-20 years	36	3.7	33	6.7
• Above 20 years	91	9.2	69	14.0
Total	896	91.0	493	100

Participant teachers in the sampled schools were with different qualification including diploma, first degree and second degree as shown in Figure 11. The majority of the teachers (89.1%) in grade 10 and (69.5%) in grade 12 were first degree holders. Whereas, there were also 5% teachers in grade 10 and 2.5% teachers in grade 12 with diploma qualifications. The rest about 6% and 28% of teachers were masters (second degree) holders in grade 10 and 12 respectively.

Figure 12: Teachers Qualification by Grade in Percent

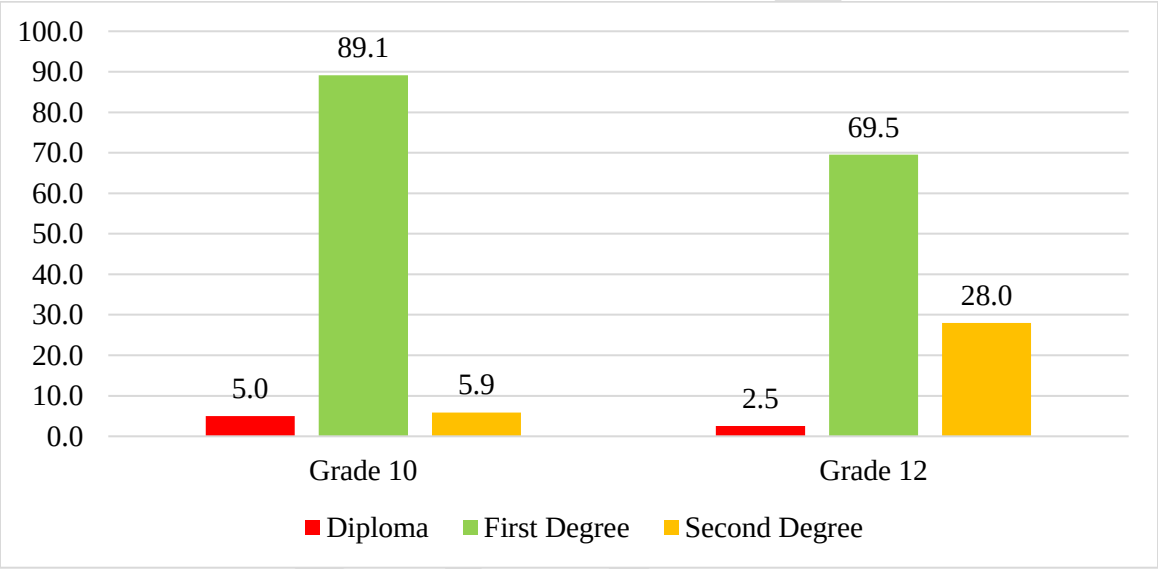
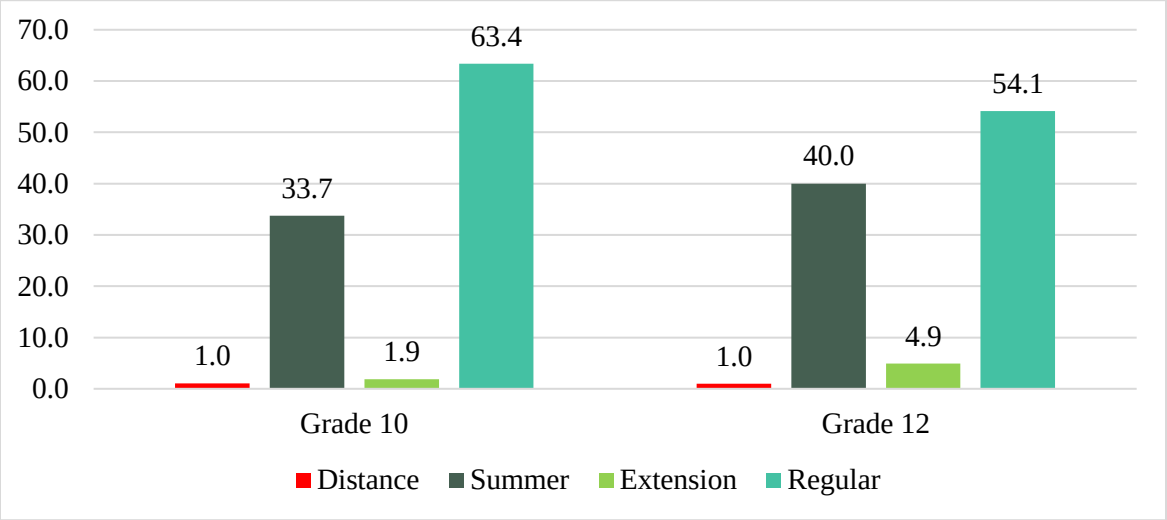


Figure 13 below shows the percentages of programs in which participant teachers attended. Accordingly, majority of teachers, 63.4% in grade 10 and 14.1% in grade 12 attended their education in a regular program. Whereas a significant number 33.7% in grade 10 and 40% grade 12 attended in a summer program. A few number of teachers in both grade levels were attended distance and extension programs.

Figure 13: Programs teachers attended to complete their last education level in percent



The relationship of teachers background variables such as gender, age, experience, level of education and program of study with student achievement were also analyzed as shown in Table 29. The result revealed that, there were a significant positive correlation between age, experience and level of education except gender of teacher and programs attended for their highest level education.

Table 29: Correlations of Teacher Background Information and Students Achievement

	Grade 10	Grade 12
Gender of teachers (Female =1, Male=2)	.039	-.021
Age of the Teachers	.230**	.200**
Teaching experience	.201**	.168**
Highest level of education	.155**	.102*
Program attended for highest level of education	.002	.064

**. Correlation is significant at the 0.01 level (2-tailed).

The multiple regression analyses result on teachers' background information as shown in Table 30 indicates that with all the predictor variables produced the adjusted $R^2 = 0.091$, $F(5, 806) = 17.3$, $p < .001$ for grade 10 and adjusted $R^2 = 0.028$, $F(5, 480) = 3.8$, $p < .001$ for grade 12. This result indicated that, the teachers' background variables as shown in the model explains 9.1% of grade 10 and 2.8% grade 12 students achievement. As can be seen from regression coefficients from grade 10 teachers' gender, experience, level of education and type of program attended; and from

grade 12 teachers age, level of education and type of program attended had significant weights in explaining achievement. However, the contribution of teachers' age from grade 10 and teachers' gender and experience in grade 12 to the students' achievement was insignificant as indicated in the regression model.

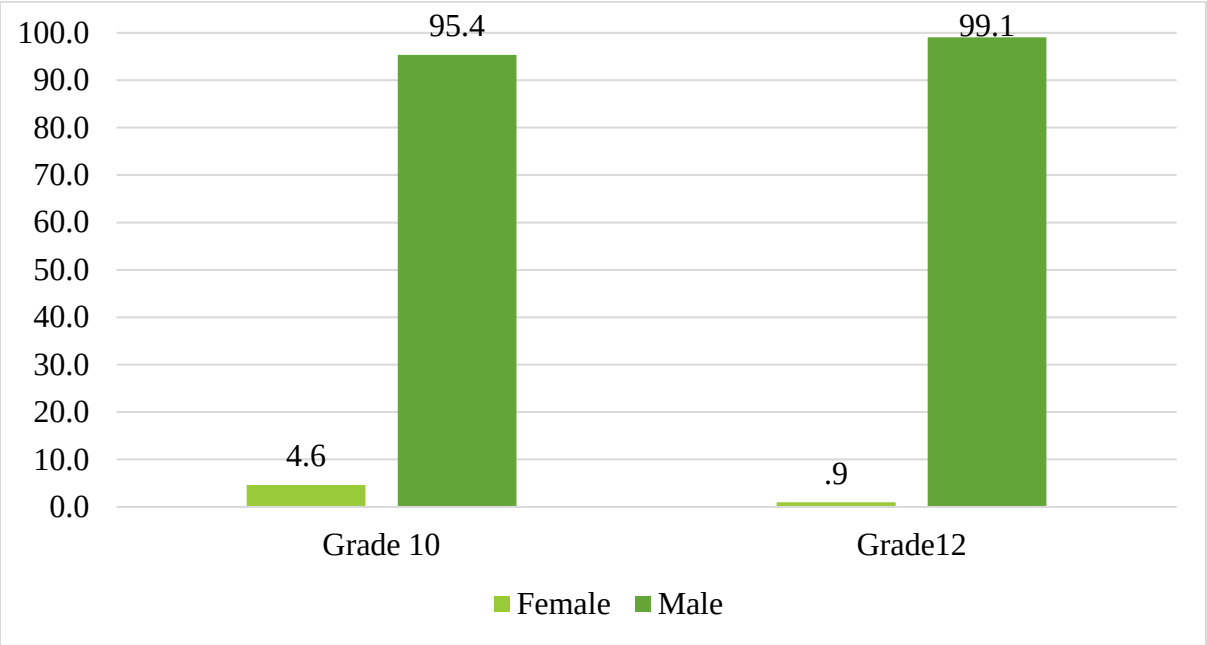
Table 30: ANOVA, regression summary model and coefficients for teachers background information

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	6011.1	5	1202.2	17.3	.311	.097	.091	.000
	Residual	56017.2	806	69.5					
	Total	62028.3	811						
12	Regression	1463.5	5	292.7	3.8	.194	.038	.028	.002
	Residual	37450.6	480	78.0					
	Total	38914.1	485						
Regression Coefficients									
Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.			
		B	Std. Err	Beta					
10	(Constant)	28.463	4.026		2.102	.036			
	Sex	2.114	1.009	.070	2.095	.036			
	Age	.120	.088	.105	1.368	.172			
	Teaching experience	.256	.095	.222	2.698	.007			
	Highest level of education	3.352	.910	.125	3.681	.000			
	Type of program attended	1.640	.366	.181	4.479	.000			
12	(Constant)	28.446	5.559		5.117	.000			
	Sex	-.181	2.143	-.004	-.084	.933			
	Age	.064	.026	.115	2.497	.013			
	Teaching experience	.003	.002	.065	1.447	.149			
	Highest level of education	2.037	.848	.112	2.402	.017			
	Type of program attended	1.307	.436	.144	3.000	.003			

4.8.1.3 Principals background information

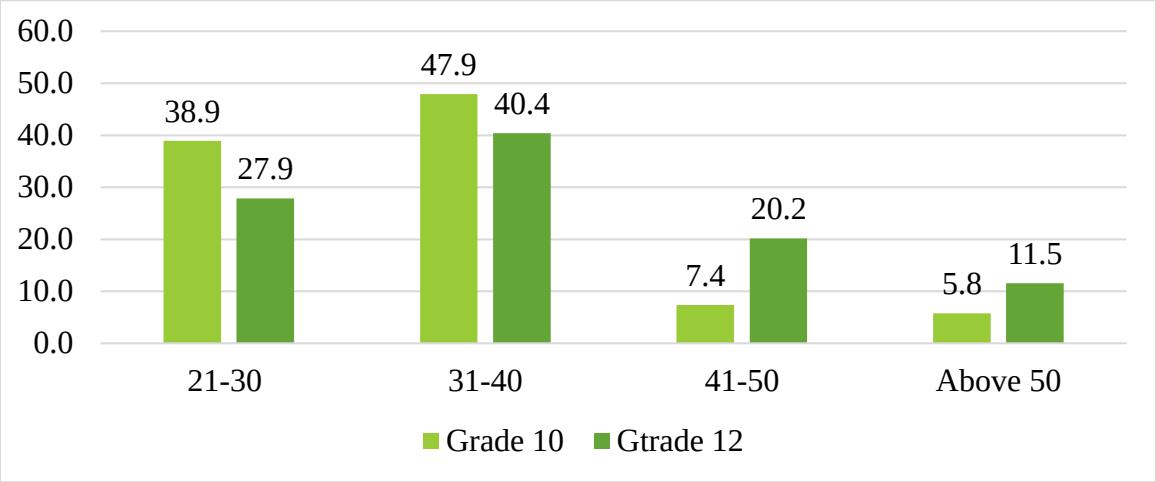
As shown in Figure 14, the majority of principals were males in both grades. Only 4.6% in grade 10 and 0.9% in grade 12 of the participants were female principals.

Figure 14: Percentage of Principals by Gender



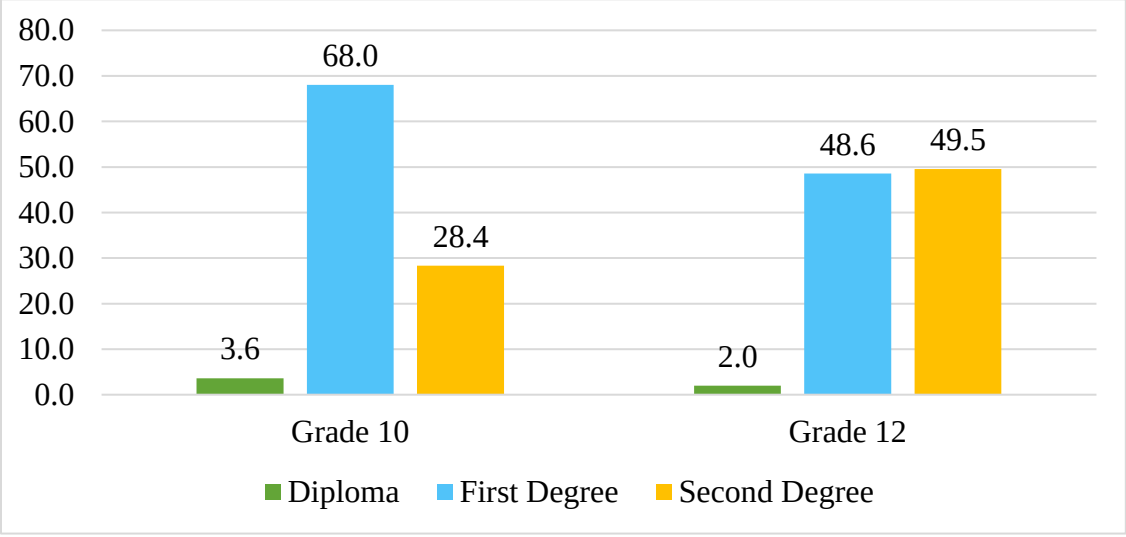
As indicated in Figure 15, most of principals' age category were found within the age range of 31-40 years (47.9% grade 10 and 40.4% grade 12). A significant number of principals were also found in the category of 21 – 30 where 38.9% are from grade 10 and 27.9% from grade 12. In general, the majority of principals (86.6% grade 10 and 68.3% grade 12) were found below or at the age of 40. Hence, the schools were led by young professionals.

Figure 15: Percentage of Principal by Age category



The majority of grade 10 principals (68%) were first degree holders whereas in grade 12 (49.5%) or nearly half of them were second degree graduates in their qualification (Figure 16). This indicates that only 28.4% in grade 10 and 49.5% in grade 12 principals meet the Ministry target and standard of secondary school principals. Though they are few in number, there were also principals' 3.6% and 2% grade 10 and 12 respectively with a diploma level.

Figure 16: Percentage of Principals by their Qualification



Moreover, principals were asked whether they are trained or qualified in educational leadership/administration or not (Figure 17). The majority, 69% of grade 12 and 52.6% of grade 10 principals responded that, as they were qualified in educational leadership/administration.

However, there were also large number of principals 47.7% from grade 10 and 31% from grade 12 whose highest qualification was not in educational leadership/administration.

Figure 17: Percentage of principals with qualification in educational leadership/administration

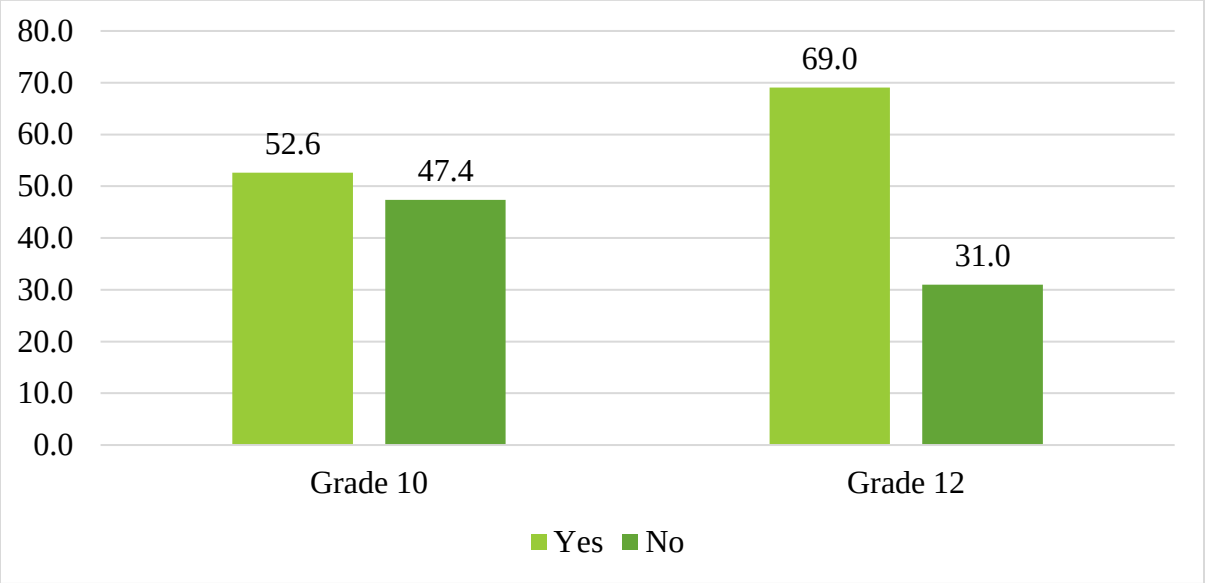
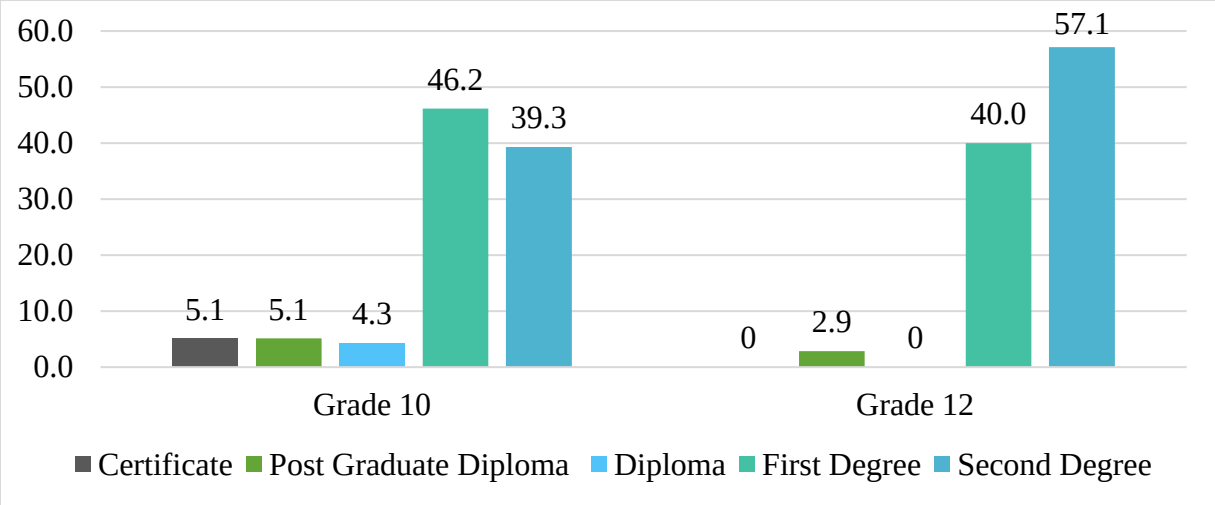


Figure 18 describes the percentage of principals with their highest qualification in educational leadership/administration. This chart summarizes those who said yes when asked whether they are trained or qualified in educational leadership/administration or not to know their maximum qualification level with school administration. Hence, the highest level qualification by educational leadership/administration in grade 10 was first degree (46.2%) and in grade 12 second degree (57.7%).

Figure 18: Percentage of Principals' with highest qualification in leadership/administration



With regard to leadership experience, Most of the principals (40.7%) of grade 10 and 43.3% of grade 12 had experiences within the range of 6 -10 years as shown in Table 31. Large percentage of principals (40.3%) in grade 10 and (28%) in grade 12 had also experiences five years and below. However, majority (76.2%) of grade 10 and 58.8% of grade 12 principals' experience in their current school were at or below five years. This indicates that principals are frequently changing their school by various reasons and hence they are mostly new for the school climate.

Table 31: Percentage of Principals by their Experience

	Grade 10		Grade 12	
	Frequency	Percent	Frequency	Percent
Years of experience as a school principal or deputy principal in total				
• ≤ 5	79	40.7	28	28.0
• 6-10	79	40.7	43	43.0
• 11-15	20	10.3	20	20.0
• 16-20	10	5.2	5	5.0
• 21-38	6	3.1	4	4.0
Total	194	100	100	100
Years of experience as a school principal or deputy in this school				
• ≤ 5	138	76.2	60	58.8
• 6-10	36	19.9	32	31.4
• 11-15	4	2.2	6	5.9
• 16-20	3	1.7	4	3.9
Total	181	100	102	100

Table 32 shows the relationship of principal background variables such as gender, age, experience and level of education with student achievement. The result revealed that there were a significant positive correlation between grade 10 principals' age and total years of experience as principal; and grade 12 education level (both in the level of qualification and/or educational leadership /administration). However, principals' gender and experience in the current school were not significantly correlated with students' achievement.

Table 32: Correlation among principals background and school achievement

	Correlation Coefficient	
	Grade 10	Grade 12
Gender of principals (Female=1, M=2)	.011	-.110
Age of principals	.328**	.121
Years of experience as a school principal or deputy principal in total	.163*	.170
Years of experience as a school principal or deputy principal in the present school	.123	.048
Qualification	.060	.230*
Highest level education in educational administration/leadership	.005	.514**

4.8.2 Socio Economic Status and Achievement

Family economic status is another factor that was expected to have an influencing potential on students' achievement. In this regard, the students were asked to label their family's economic status as "Low", "Medium" or "High". In both grade 10 and 12 as shown in Table 33, the correlations were statistically significant and in the positive direction (r = .030) and (r = .059).

The highest access to meals per day was assumed to have an impact on their learning and their achievement that might be affected by lack or less provision of meal. From the information provided by the students' themselves, their achievement score was correlated to the number of times they were provided meal in a day. The correlation was positive and statistically significant in both grades.

The distance students travel to or from school is supposed to have an impact on their achievement. Students traveling more distance seem to achieve less than the other groups. The correlations were statistically significant in both grades. On the other hand, large family size is hypothesized to be a factor for students' achievement. Based on this, students from large family size scored low achievement than small family size and in both grades 10 and 12, the correlations were statistically significant. Similarly, students who have reference books at home supposed to score high achievement compare to those students who do not have. Also the correlations were statistically significant and in a positive direction.

Table 33: Correlation between socio economic status and achievement

	Correlation Coefficient	
	Grade 10	Grade 12
The economic status of the family with relative to the others (low, medium, high)	.030*	.059**
The highest frequency of meals had per day	.134**	.161**
Long time taken to travel from home to school and vice versa	-.086**	-.017
Large family size	-.112**	-.137**
Having reference books at home	.140**	.118**
Presence of household properties (study place, radio, mobile etc)	.134**	.135**

**. Correlation is significant at the 0.01 level (2-tailed).

The regression analyses result on student socio economic status as shown in Table 34 indicated that with all the predictor variables produced the adjusted $R^2 = 0.096$, $F(5, 4966) = 106.1$, $p < .001$ for grade 10 and adjusted $R^2 = 0.066$, $F(5, 3306) = 47.6$, $p < .001$ for grade 12. This result indicated that, socio economic status as shown in the model explains 9.6% of grade 10 and 6.6% grade 12 students achievement. As can be seen from regression coefficients from all the variables entered in the model had significant weights in explaining achievement except distance travel from home to school by grade 12 students.

Table 34: ANOVA, regression summary model and coefficients for students' socio economic status

Grade	Groups	Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	42506.6	5	8501.3	106.1	.311	.096	.096	0.000
	Residual	398032.7	4966	80.2					
	Total	440539.4	4971						
12	Regression	13993.2	5	2798.6	47.6	.259	.067	.066	0.000
	Residual	194360.0	3306	58.8					
	Total	208353.2	3311						

Regression Coefficients

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	24.55	0.75		32.59	.000
	Frequency of eating meals per day	1.07	0.18	0.08	5.81	.000
	Distance travel from home to school	-0.01	0.00	-0.07	-5.00	.000
	Large family size	-0.19	0.04	-0.07	-5.21	.000
	Number of reference books at home	1.03	0.14	0.11	7.43	.000
	Family properties	0.82	0.06	0.19	13.26	.000
12	(Constant)	36.25	1.00		36.21	.000
	Frequency of eating meals per day	1.12	0.23	0.09	4.85	.000
	Distance travel from home to school	-0.01	0.00	-0.02	-1.16	.246
	Large family size	-0.41	0.04	-0.17	-9.71	.000
	Number of reference books at home	0.43	0.15	0.05	2.92	.003
	Family properties	3.16	0.56	0.10	5.61	.000

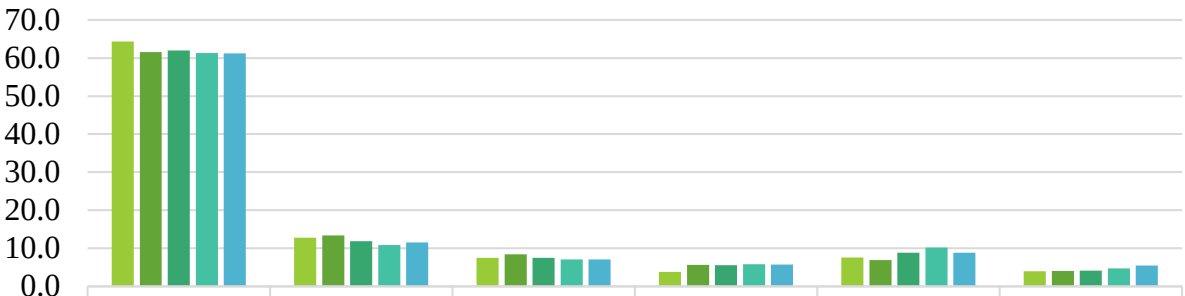
4.8.3 Instructional materials and student achievement

4.8.3.1 Instructional Materials by Students Response

4.8.3.1.1 Ratio of Textbooks to Students in Grade 10 and 12

As to the students' response shown in Figure 19, the majority of grade 10 students 64.3 %, 61.5%, 62.0%, 61.3% and 61.2% in Biology, Chemistry, English, Mathematics and Physics respectively had one to one text books in the five core subjects. Whereas about 4-5% of the students had no text books in these core subjects.

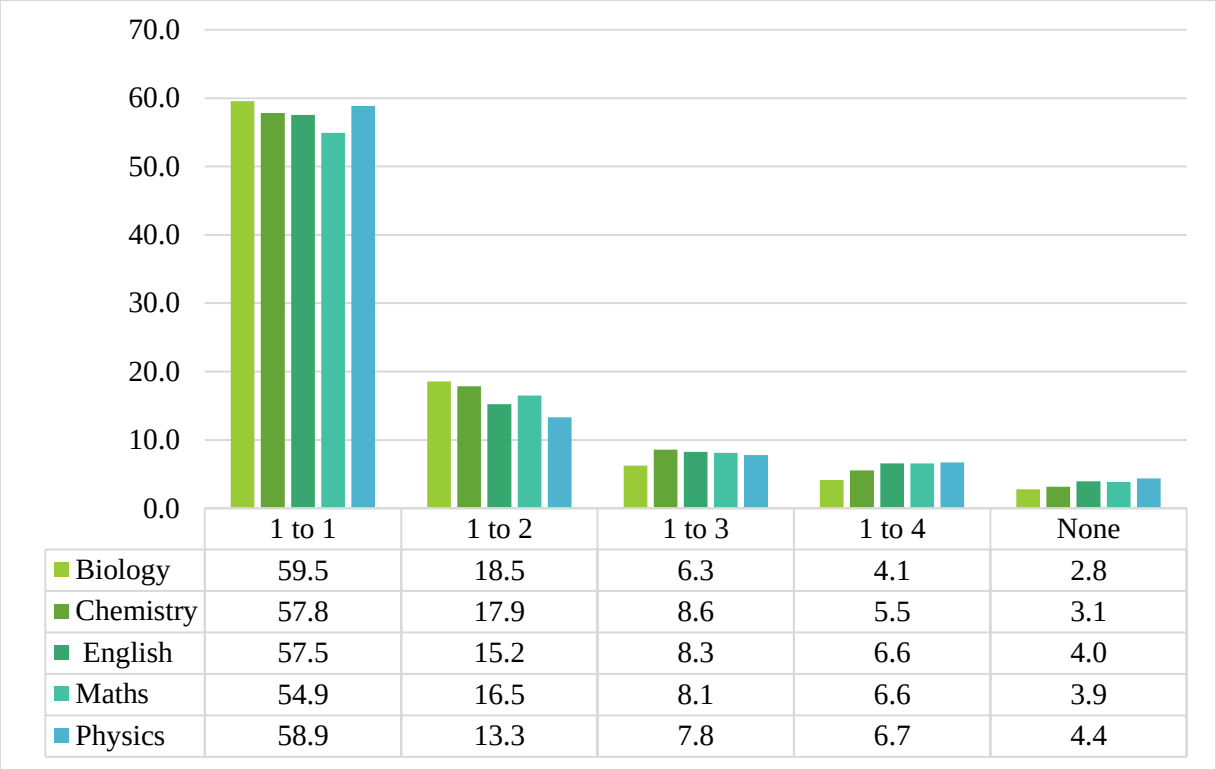
Figure 19: Percentage of Grade 10 Students by Text Book Ratio from Students Response



	1 to 1	1 to 2	1 to 3	1 to 4	Above 1 to 5	None
Biology	64.3	12.8	7.5	3.8	7.6	4.0
Chemistry	61.5	13.4	8.5	5.6	6.9	4.0
English	62.0	11.9	7.5	5.5	8.9	4.2
Maths	61.3	10.9	7.1	5.8	10.2	4.7
Physics	61.2	11.6	7.1	5.8	8.9	5.5

The information obtained from grade 12 sampled students as shown in Figure 20 indicates that the percentage of students that had one to one textbooks ranges from 54.9% -59.5%. Whereas, 13.3% of students had one to two physics textbooks and it is the least one compared to other subject text books. In another way, 2.8%, 3.1%, 4.0%, 3.9% and 4.4% of students have no Biology, Chemistry, English, Mathematics and Physics textbooks respectively.

Figure 20: Percentage of Grade 12 Students by Text Book Ratio from Students Response



	1 to 1	1 to 2	1 to 3	1 to 4	None
Biology	59.5	18.5	6.3	4.1	2.8
Chemistry	57.8	17.9	8.6	5.5	3.1
English	57.5	15.2	8.3	6.6	4.0
Maths	54.9	16.5	8.1	6.6	3.9
Physics	58.9	13.3	7.8	6.7	4.4

4.8.3.1.2 Frequency of students come to school with or without textbooks

Coming to school with textbooks is believed to have a positive impact on students achievement. As information obtained from students revealed in Figure 21, only 34% in grade10 and 32% in grade12 students come to school always with their textbooks. On the other hand, only 37% of students in grade 10 and 41% in grade 12 bring text book to class sometimes. This shows that more than half of the students do not bring textbook to the class.

Figure 21: Percentage of students who comes with textbooks to school in grade 10 and 12

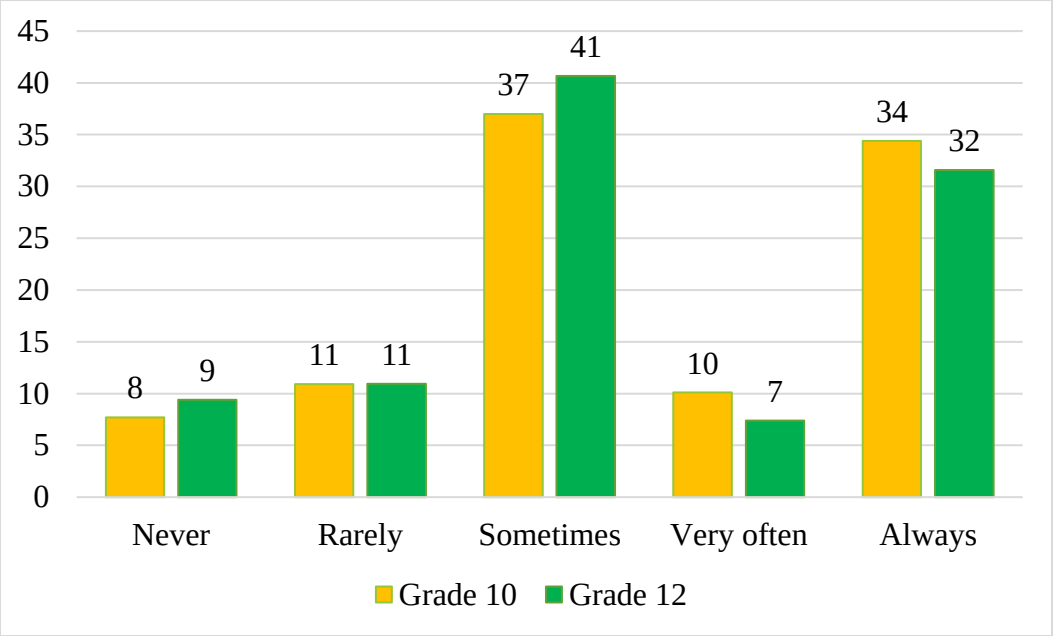


Table 35 shows the relationship between availability of textbooks for the students and their scores in the core subjects. It is assumed that students who have text books perform better than that of the students who do not have. The result indicated that both in grade 10 and 12 the correlation among textbook ratio for all the core subjects were in a negative direction and statistically significant except for10 grade Biology and English. This means as the text book to student ratio increases from 1 to 1 to 1 to 5 and above the achievement of students decreases. Hence, in most of the subjects, students having a text book have a significant contribution for their achievement.

Table 35: Correlations among textbook ratio and student achievements

Grade	Textbook Ratio	Correlation Coefficients				
		Biology	Chemistry	English	Mathematics	Physics
10	Biology text books ratio	-.024				
	Chemistry text books ratio		-.053**			
	English text books ratio			-.021		
	Mathematics the text books				-.026*	
	Physics text books ratio					-.024*
12	Biology text books ratio	-.105*				
	Chemistry text books ratio		-.110*			
	English text books ratio			-.178*		
	Mathematics the text books				-.129*	
	Physics text books ratio					-.065*

**. Correlation is significant at the 0.01 level (2-tailed).

4.8.3.2 Instructional Materials from Teachers Response

Availability of teachers' instructional materials obtained from the responses of teachers as shown in Table 36 revealed that the presence of reference books, teachers guide, syllabus and teaching aids had statistically significant correlation with students' achievement in both grade 10 and 12.

Table 36: Correlations among teachers instructional materials and students achievement

Availability of instructional materials	Correlation Coefficient	
	Grade 10	Grade 12
Teachers having personal reference books in their subject area at home	.089**	.245**
Presence teachers guide	.067*	.169**
Presence syllabus	.075*	.167**
Adequate reference books in the library	.249**	.241**
Teaching aids (e.g. periodic maps, charts, math's kits, science kits and equipment for language instruction)	.159**	.130**

4.8.3.3 Instructional Materials from Principals Response

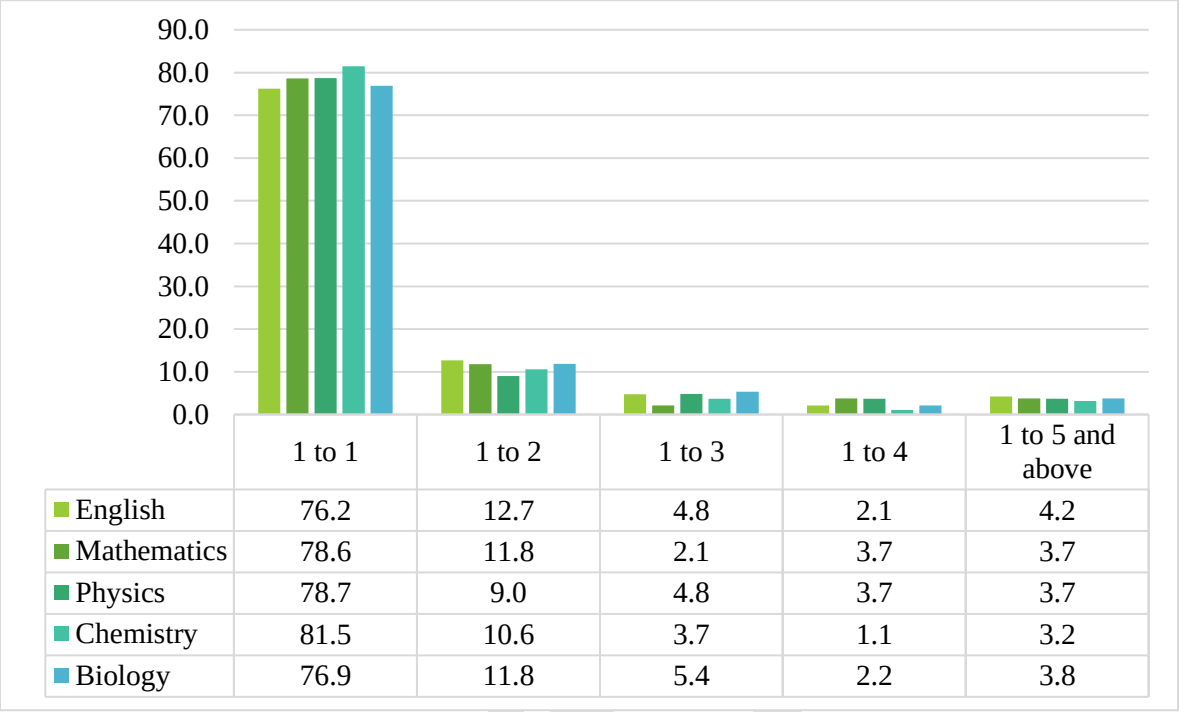
The school principals' response from grade 10 and 12 as shown in Table 37 indicated that majority of schools ranging from 65.4% to 81.7% had adequate teachers guide, syllabus and reference books in the library. However, more than half of the school principals responded that their schools had no adequate teaching aids for teaching science, mathematics and language instruction. The problem of getting adequate resources for special need students or students with disabilities were more severe than other materials. Only 15.3% of grade 10 and 18.1% of grade 12 school principals said 'Yes' for the presence of adequate resources materials for students with disabilities in their school.

Table 37: Availability of instructional materials from principals response

Instructional materials	Grade 10		Grade 12	
	No	Yes	No	Yes
Teachers guide and syllabus	21.4	78.6	18.3	81.7
Adequate reference books in the library	34.6	65.4	28.3	71.7
Adequate teaching aids such as periodic maps, charts, math's kits, science kits and equipment's for language instruction	54.7	45.3	51.4	48.6
Adequate resources materials for students with disabilities	84.7	15.3	81.9	18.1

Grade 10 principals were also asked about the textbook to student ratio of their school as shown in Figure 22. Nearly similar result was found with students' response, where the majority of schools had textbook to student ratio 1 to 1 in all the core subjects ranging from 76.2% to 81.5%. According to the principals' response, there is no school where their student are without a textbook. On the contrary, from the students' response the study found that about 4% of the students had no text books on these core subjects. Hence, by considering students as the primary users more reliable information would be found from them, this result would better conclude that more than 4% of grade 10 students had no textbook and needs to address them.

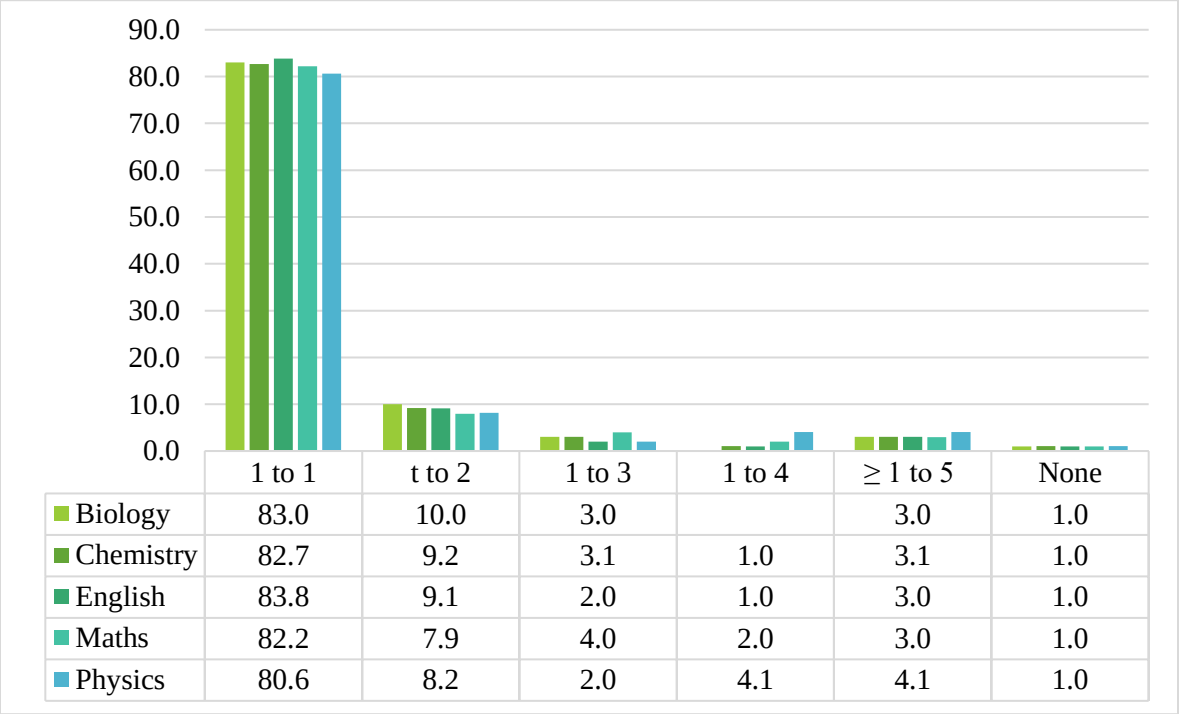
Figure 22: Percentage of Grade 10 Students by Text Book Ratio from Principals Response



	1 to 1	1 to 2	1 to 3	1 to 4	1 to 5 and above
English	76.2	12.7	4.8	2.1	4.2
Mathematics	78.6	11.8	2.1	3.7	3.7
Physics	78.7	9.0	4.8	3.7	3.7
Chemistry	81.5	10.6	3.7	1.1	3.2
Biology	76.9	11.8	5.4	2.2	3.8

Figure 23 shows textbook to student ratio as grade 12 principals' response. The result revealed that the majority of schools ranging from 80.6% to 83.8% had 1 to 1 textbook to student ratio. And only 1% of grade 12 students had no textbook. This result has also some contradicts with student response. Practically, grade 12 students responded that percentage of students that have one to one textbooks ranges from 54.9% -59.5% and students those have no text books ranges from 2.8% to 4.4% in the core subjects as shown in Figure 20 above. Hence, taking students' response, more than 40% of grade 12 students didn't get textbooks one to one ratio.

Figure 23: Percentage of Grade 12 Students by Text Book Ratio from Principals Response



	1 to 1	t to 2	1 to 3	1 to 4	≥ 1 to 5	None
Biology	83.0	10.0	3.0		3.0	1.0
Chemistry	82.7	9.2	3.1	1.0	3.1	1.0
English	83.8	9.1	2.0	1.0	3.0	1.0
Maths	82.2	7.9	4.0	2.0	3.0	1.0
Physics	80.6	8.2	2.0	4.1	4.1	1.0

In line with the quantitative data findings indicated above, the results from the FGD also confirmed that the students' text book ratio was one to one for most subject matters in both grade levels across all regions except Gambella as to the opinion of the students, teachers, principals and parents. However, the participants indicated the existence of the shortage of textbooks in some subjects such as Amharic, Mother tongue (Afan Oromo, Tigrigna and Harari), History, and Physical education. On the other hand, students from all region except Harari revealed lack of reference books at their home as well as in the school library.

The finding from FGD was also consistent with the results from quantitative data with regard to students bringing their textbooks to the school. The response of students from all regions assured that, as most of them do not bring textbooks to the classroom. Participant teachers and parents also agreed with response of the students. For this problem, the participants mentoned various reseans. Some of them were: large size of textbooks, long distance from school to home, lack of teachers follow up and monitoring and above all participants bolded lack students in learning.

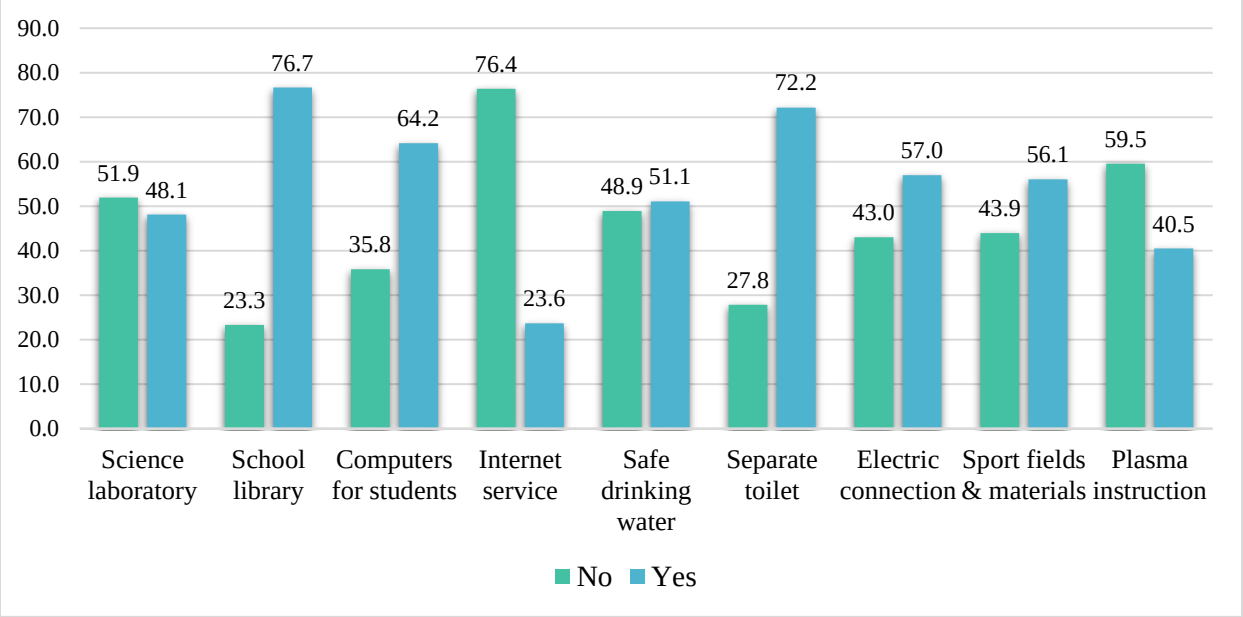
With regard to the content of the textbooks, majority of the participants agreed that the diffuculty of the content areas were medium in most subjects . However, all students and teachers agreed as physics is the most difficult subject, though, some of them also revealed mathematics is too (Appendix C).

4.8.4 School infrastructure and student achievement

4.8.4.1 Availability of school infrastructures from students' response

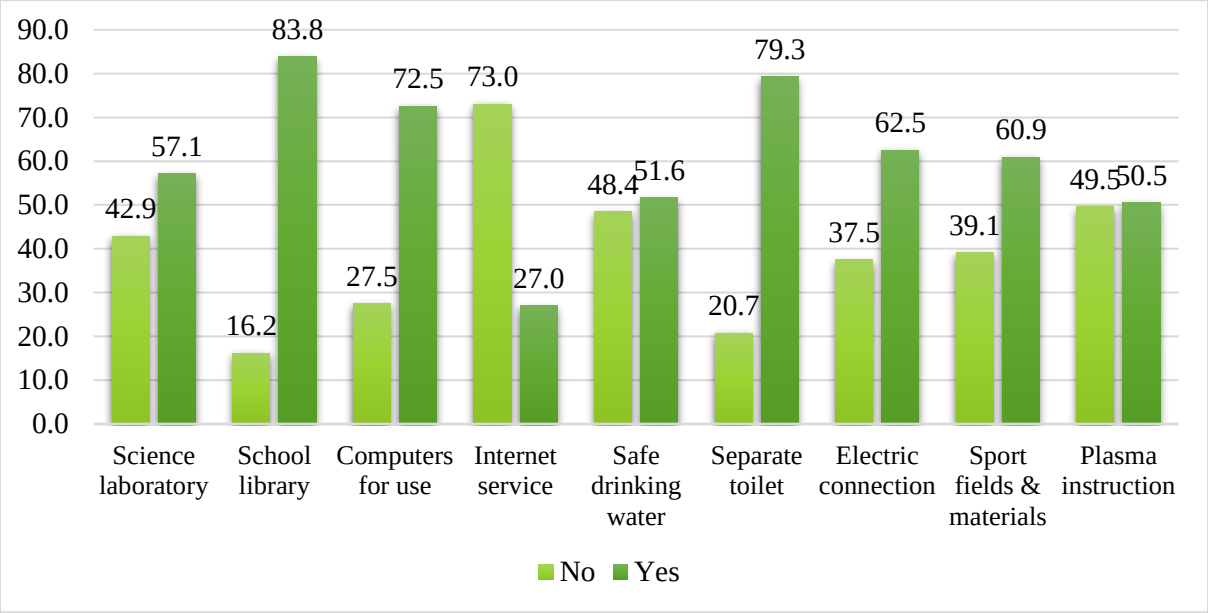
Figure 24 below shows the responses of grade 10 student on the availability of school resources/infrastructures. In grade 10, only 48.1% of the schools have science laboratory while 51.9% (more than half) do not have science laboratory. As the information obtained from the students shows, 76.7% of the schools have school library. Regarding the internet access in the schools, only 23.6% of the schools were providing internet service. While majority of the schools 76.4% couldn't give internet service for their students. As it is shown on the graph below, 72.2% of the schools have separate toilet for both male and female and also only 40.5% of the schools' classroom instruction were supported by plasma instruction whereas majority (59.5%) were not using plasma instruction.

Figure 24: Grade 10 students response for infrastructure availability in their School (%)



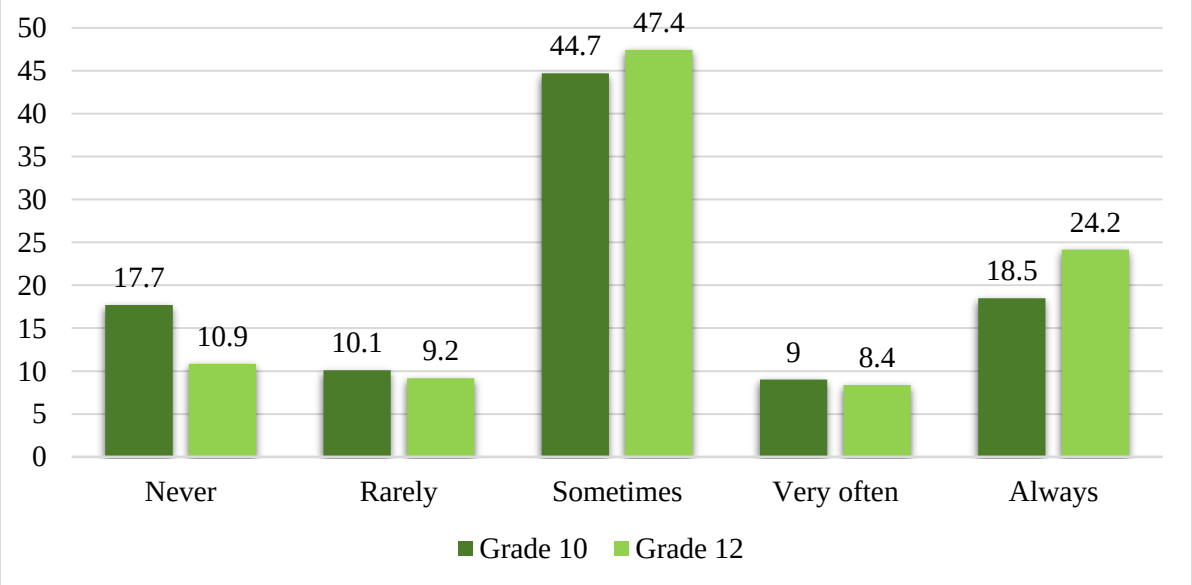
Similarly, questions of the availability of school infrastructure were posed for grade 12 sampled students as shown in Figure 25. Accordingly, 57.1% of the schools had science library while 42.9% do not access. As information obtained from sampled schools indicates, 83.8% have school library, 79.3% have separated toilet for male and female, 60.9% sport fields whereas, the number of schools using or not using plasma instruction is almost the same 50.5% and 49.5% respectively.

Figure 25: Grade 12 students response for infrastructure availability in their School (%)



The frequency of using library in their school as asked by grade 10 and 12 students was described in Figure 26 below. This result indicated that only 18.5% and 24.2% of students use library always in grade 10 and 12 respectively. Whereas 47.4% from grade 12 and 44.7% from grade 10 use library only some times. On the other hand, the percentage of students never use library was 17.7% in grade 10 and 10.9% in grade 12.

Figure 26: Percentage of the frequency of using library by grade 10 and 12 students



Students were asked series of questions whether their schools have science laboratory, school library, computers for students use, internet service, safe drinking water, separate toilet for boys and girls, electric connection, sport field and materials and plasma instruction. The correlation analysis to check the relationship with achievement was computed as shown in Table 38. The result indicated that the correlation for all the infrastructures stated were positive and statistically significant for both grade 10 and 12.

Table 38: Correlations between school resources and students achievement as students response

School Resources	Correlation Coefficient	
	Grade 10	Grade 12
Science laboratory	.204**	.286**
School library	.225**	.234**
Computers for student use	.140**	.202**
Internet service	.047**	.230**
Safe drinking water	.028*	.240**
Separate toilet for boys and girls	.208**	.251**
Electric connection	.109**	.235**
Sport fields and materials	.095**	.165**
Plasma instruction	.055**	.096**

**. Correlation is significant at the 0.01 level (2-tailed).

The regression analyses result on school resources as shown in Table 39 indicated that for all the predictor variables produced the adjusted $R^2 = 0.106$, $F(9, 5391) = 71.96$, $p < .001$ in grade 10 and adjusted $R^2 = 0.201$, $F(12, 3158) = 67.33$, $p < .001$ in grade 12. This result indicated that, school resource from the students' response as shown in the model explains 10.6% of grade 10 and 20.1% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement except computers for student use by grade 10 students.

Table 39: ANOVA, regression summary model and coefficients for the availability of school resource from students' response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	50692.55	9	5632.51	71.96	0.327	.107	.106	0.000
	Residual	421982.00	5391	78.28					
	Total	472674.56	5400						
12	Regression	40066.84	12	3338.90	67.33	.451	.204	.201	0.000
	Residual	156591.66	3158	49.59					
	Total	196658.50	3170						

Regression Coefficients

Grade		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Err	Beta	t	Sig.
10	(Constant)	18.399	1.152		15.965	.000
	Science laboratory	3.735	.301	.198	12.418	.000
	School library	1.502	.376	.065	3.995	.000
	Computers for student use	.294	.326	.015	.901	.368
	Internet service	-1.352	.334	-.058	-4.048	.000
	Separate toilet for boys and girls	3.277	.315	.152	10.389	.000
	Electric connection	.784	.298	.041	2.630	.009
	Plasma instruction	1.772	.284	.092	6.243	.000
	Frequency of using library	.302	.110	.041	2.751	.006
	Frequency of coming to school with textbooks	-.363	.101	-.048	-3.615	.000
12	(Constant)	27.322	1.017		26.863	.000
	Science laboratory	2.761	.313	.173	8.829	.000
	School library	1.326	.419	.058	3.166	.002
	Computers for student use	1.010	.340	.055	2.966	.003
	Internet service	1.696	.311	.095	5.449	.000
	Safe drinking water	1.857	.269	.118	6.893	.000
	Separate toilet for boys and girls	2.329	.347	.115	6.705	.000
	Electric connection	1.590	.296	.097	5.374	.000
	Plasma instruction	2.135	.285	.136	7.486	.000
	Frequency of using library	.330	.110	.051	2.994	.003
	High textbook ratio	-.549	.099	-.091	-5.536	.000
	Frequency of coming to school with textbooks	-.762	.102	-.123	-7.483	.000

4.8.4.2 Availability of school infrastructures from teachers' response

Grade 10 teachers of the five core subjects were asked whether the resource facilities indicated in Figure 27 are available in their school or not. The result shows that the majority of teachers responded school resources like school library (80.7%), computers for student use (64.7%), separate toilet for boys and girls (76%), electric connection (62.9%), sport fields and materials (55.2%), and classrooms (59.3) were adequately available. However, the resource facilities such as science laboratory (60%), internet services (85.4%), plasma instruction (71%) and safe drinking water (53.2%) were not available or inadequate (said 'No' response) as the response of the majority of grade 10 teachers.

Figure 27: Percentage of grade 10 teachers response for infrastructure availability in their School

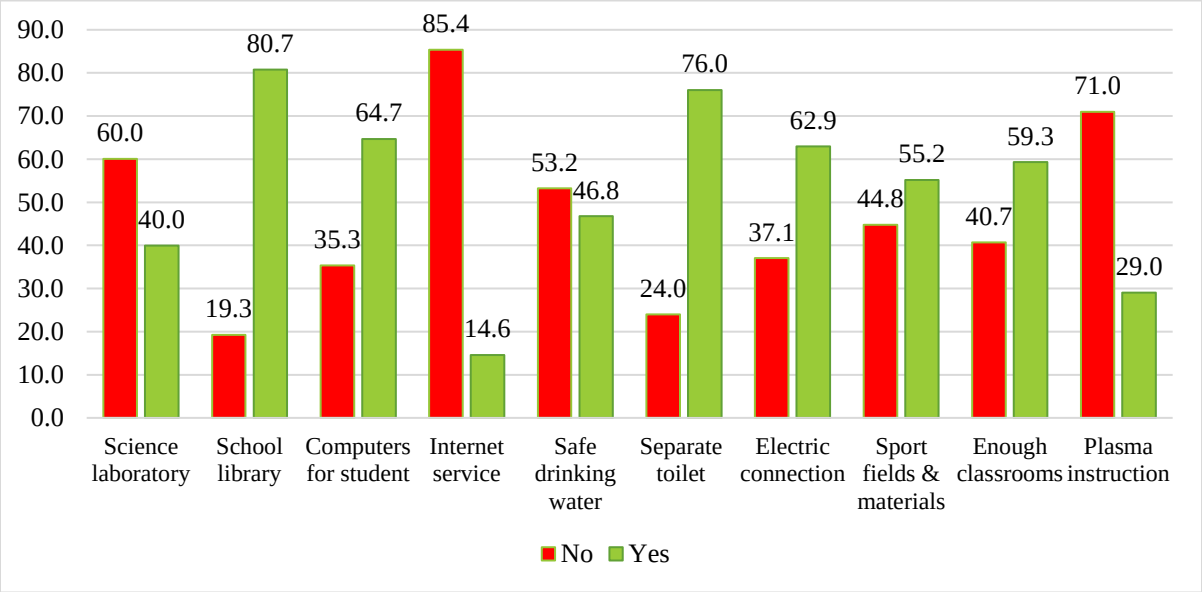
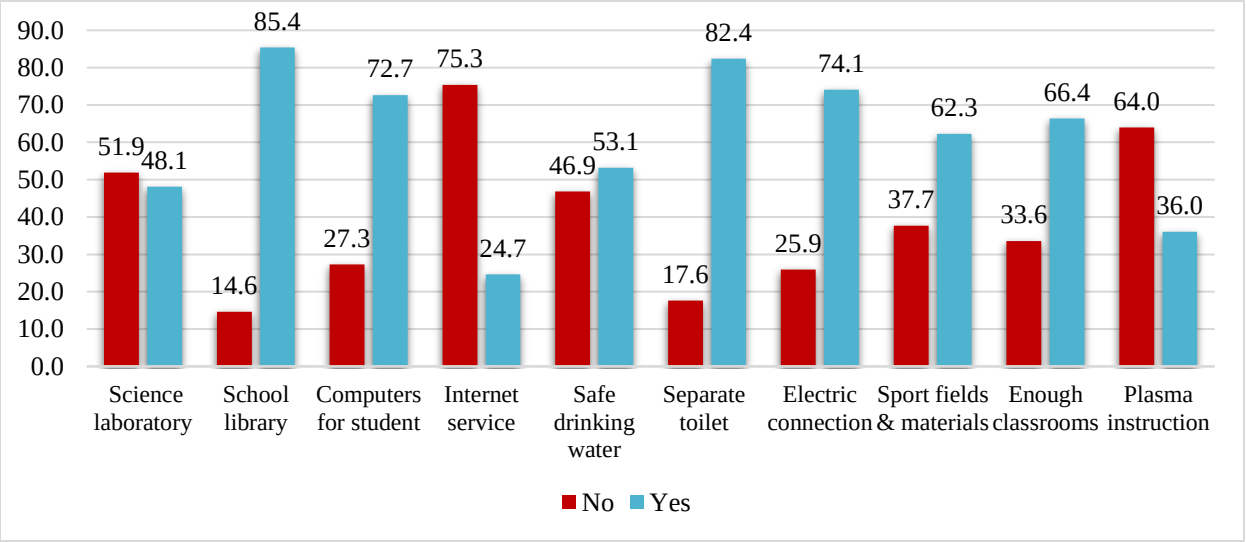


Figure 28 below also shows the response of teachers of the five core subject's grade 12 on the availability of school infrastructures. The result showed that the majority of teachers responded school resources like school library (85.4%), computers for student use (72.7%), separate toilet for boys and girls (82.4%), electric connection (74.1%), sport fields and materials (62.3%), safe drinking water (53.1%) and classrooms (66.4%) are adequately available. However, the resource facilities like science laboratory (51.9%), internet services (75.3%) and plasma instruction (64%) were not available or inadequate (said 'No' response) as the response of grade 12 teachers. This

means schools both in grade 10 and 12 are in a similar status in terms of school resource or infrastructure availability by teachers' observation.

Figure 28: Percentage of grade 12 teachers response for infrastructure availability in their School



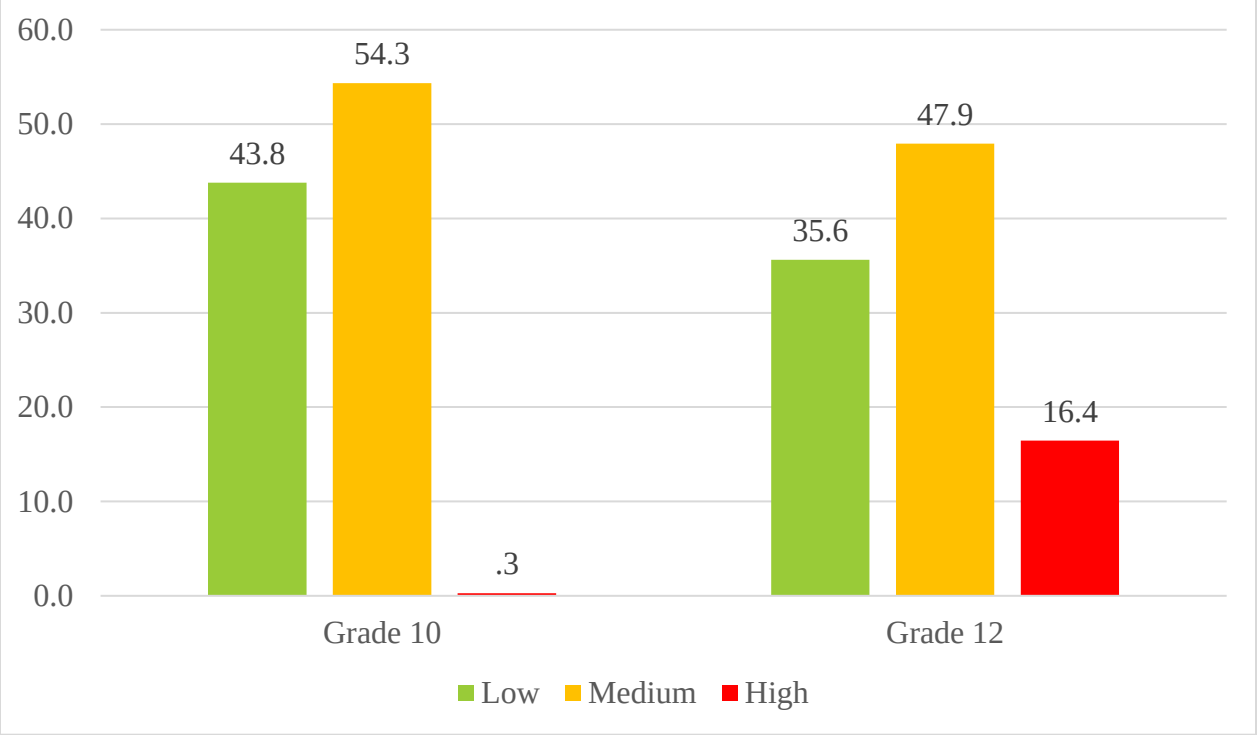
The correlation between school resource or infrastructure and student achievement from the response of teachers as shown in Table 40 revealed that all the stated variables were found to be statistically significant in both grades except plasma instruction and class size at grade 12.

Table 40: Correlations between school resources/infrastructure and students achievement from the response of teachers

School Infrastructures/ Resources	Correlation Coefficient	
	Grade 10	Grade 12
Science laboratory	.313**	.387**
School library	.296**	.285**
Computers for student use	.240**	.332**
Internet service	.216**	.308**
Safe drinking water	.213**	.214**
Separate toilet for boys and girls	.150**	.092*
Electric connection	.161**	.154**
Sport fields and materials	.112**	.332**
Enough classrooms	.222**	.273**
Large class size	-.099**	-.056
Plasma instruction	.113**	.013

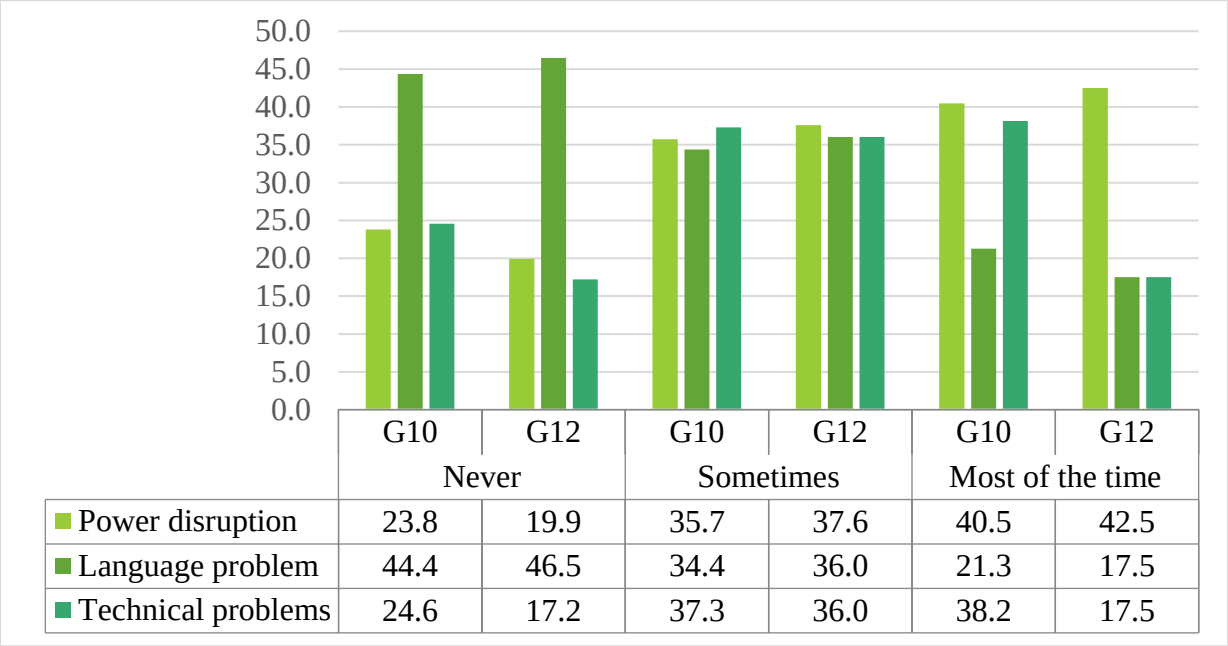
Teachers were also asked to evaluate the effectiveness of plasma instruction system by their subject as shown in Figure 29. The result depicts that majority of them 54.3% grade 10 and 47.9% grade 12 teachers agree with medium level of its effectiveness. However, only 0.3% grade 10 and 16.4% grade 12 teachers agreed its effectiveness as high. The rest 43.8% and 35.6% of grade 10 and 12 teachers respectively evaluated the effectiveness of plasma instruction as low.

Figure 29: Teachers evaluation on the effectiveness of the plasma instruction system by their subject



Teachers were also asked to identify the problems that affect plasma instruction program as shown in Figure 30. The most frequent problem in both grades as observed by teachers was power disruption in both grade levels. A significant number of grade 10 schools (38.2%) were also suffered with technical problems of plasma instruction system.

Figure 30: Problems that affect plasma instruction from teachers observation



	G10	G12	G10	G12	G10	G12
	Never		Sometimes		Most of the time	
Power disruption	23.8	19.9	35.7	37.6	40.5	42.5
Language problem	44.4	46.5	34.4	36.0	21.3	17.5
Technical problems	24.6	17.2	37.3	36.0	38.2	17.5

In general, teachers were asked for their opinion to what extent their school's capacity was limited by general resource and subject level instructional factor mentioned in Table 41 with a Likert scale option ranging from 'Not a problem' (1) to 'Serious problem' (4). The correlation of teachers' opinion to what extent their school's capacity limited by the following instructional factors and achievement showed that all the variables stated were negatively correlated and statistically significant in both grades except for insufficient time allocation for teaching/learning in mathematics grade 12. The negative direction indicates that as seriousness of the problem increases achievement of students decrease and vice versa. Of the instructional factors listed, the effect of some of the variables such as all the general resources (educational material, infra structure, ICT, resources for disabilities), shortage of library resources relevant to mathematics and science instruction, shortage of science equipment and materials for experiments, and inadequate library resources relevant to reading for language instruction are higher to explain achievement.

Table 41: Correlations between teachers opinion on the school's instructional factors and students achievement

Teachers opinion on the instructional factors	Correlation Coefficient	
	Grade 10	Grade 12
General School Resources		
Inadequate or poor quality educational materials (e.g., textbooks, IT equipment, library or laboratory material)	-.349**	-.315**
Inadequate or poor quality physical infrastructure (e.g., building, grounds, electricity, etc.)	-.351**	-.379**
Inadequate or poor quality of ICT for teaching and learning (e.g., computers for student use, internet, plasma)	-.376**	-.392**
Lack of resources for students with disabilities	-.293**	-.318**
Resources for Mathematics Instruction		
Shortage of teachers specialized in mathematics	-.211**	-.240**
Shortage of library resources relevant to mathematics instruction	-.290**	-.344**
Shortage of concrete objects or materials to help students understand quantities or procedures	-.202**	-.283**
Insufficient time allocation for teaching/learning	-.154**	-0.074
Resources for Science Instruction		
Shortage of teachers specialized in science subjects	-.194**	-.279**
Shortage of library resources relevant to science instruction	-.304**	-.380**
Shortage of science equipment and materials for experiments	-.319**	-.381**
Insufficient time allocation for teaching/learning	-.216**	-.233**
Resources for Language Instruction		
Shortage of teachers specialized in English language	-.255**	-.272**
Shortage of language laboratory with audio-visual materials	-.172**	-.247**
Inadequate library resources relevant to Reading materials (e.g. magazines, novels, collections of stories, non-fiction books, etc.)	-.283**	-.456**
Insufficient time allocation for teaching/learning	-.243**	-.263**

**. Correlation is significant at the 0.01 level (2-tailed).

The regression analyses result on school resources as shown in Table 42 indicated that for all the predictor variables produced the adjusted $R^2 = 0.180$, $F(5, 581) = 26.795$, $p < .001$ in grade 10 and adjusted $R^2 = 0.329$, $F(6, 142) = 13.102$, $p < .001$ in grade 12. This result indicated that, school resource from the teachers' response as shown in the model explains 18% of grade 10 and 32.9% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 42: ANOVA, regression summary model and coefficients for the availability of school resource from teachers' response

Grade	Group	Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	6885.992	5	1377.198	26.795	.433	.187	.180	.000
	Residual	29862.118	581	51.398					
	Total	36748.110	586						
12	Regression	3590.119	6	598.353	13.102	0.597	0.356	0.329	.000
	Residual	6484.888	142	45.668					
	Total	10075.007	148						

Regression Coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	31.914	2.259		14.125	.000
	Inadequate or poor educational materials/equipment	-1.244	.330	-.177	-3.766	.000
	Lack of resources for students with disabilities	-1.028	.280	-.149	-3.668	.000
	Functioning science laboratory	2.248	.732	.138	3.073	.002
	Availability of Internet service	2.330	.961	.096	2.424	.016
	Enough classrooms	1.491	.633	.093	2.354	.019
12	(Constant)	19.600	4.768		4.111	.000
	Functioning science laboratory	4.277	1.475	.258	2.899	.004
	Enough classrooms	3.919	1.280	.225	3.061	.003
	Computers for student use	4.500	1.596	.234	2.820	.005
	Lack of electric connection	-5.582	1.553	-.258	-3.593	.000
	Availability of Internet service	4.860	1.356	.282	3.584	.000
	Inadequate or poor educational materials/equipment	-1.529	.650	-.191	-2.351	.020

4.8.4.3 Availability of school infrastructures from principals' response

Grade 10 school principals were asked for the availability of school resource facilities as shown in Figure 31. The result showed that the majority of principals like that of teachers responded that school resources like school library (79.9%), computers for student use (67.9%), separate toilet for boys and girls (76.8%), electric connection (68.4%), sport fields and materials (64.4%), and classrooms (55.4) are adequately available. Besides, 55.4% principals agreed that safe drinking water was available in their school. However, the resource facilities such as science laboratory (51.3%), internet services (71.5%) and plasma instruction (62.8%) were not available or inadequate (said 'No' response) as the response of grade 10 principals.

Figure 31: Percentage of grade 10 principals response for infrastructure availability in their School

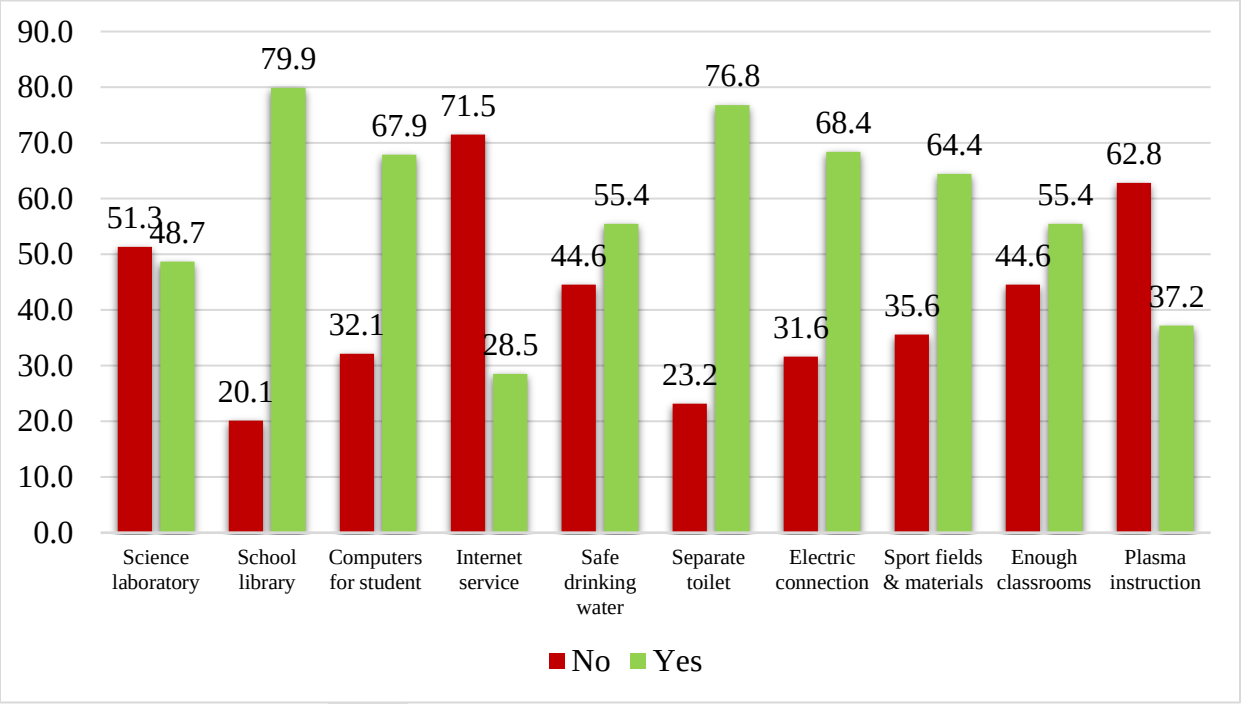
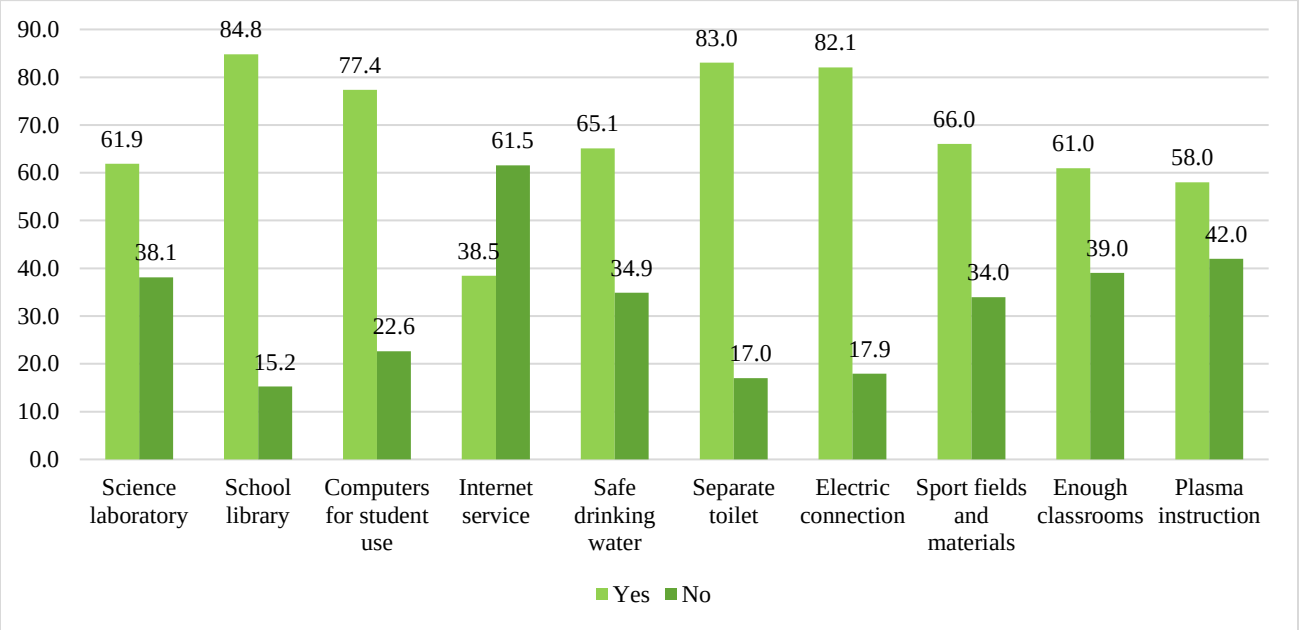


Figure 32 below also shows the response of grade 12 principals on the availability of school resources. The result shows that the majority of grade 12 principals responded that school resources like science laboratory (61.9%), school library (84.8%), computers for student use (77.4%), safe drinking water (65.1%), separate toilet for boys and girls (83%), electric connection (82.1%), sport fields and materials (66%), classrooms (61%) and plasma instruction (58%) are

adequately available. However, for internet services 61.5% of grade 12 principals responded as not available or inadequate (said 'No' response) in their school.

Figure 32: Percentage of grade 12 principals response for infrastructure availability in their School



The correlation between school resource or infrastructure and student achievement from the response of grade 10 and 12 principals were described in Table 43. As grade 10 principals response shows availability of science laboratory, school library, computers for student use, safe drinking water, and enough classrooms had statistically significant positive correlations with grade 10 students' achievement. On the other hand, electric connection, separate toilet for boys and girls, and plasma instruction are positively correlated but not statistically significant.

The result in grade 12 revealed that science laboratory, school library, computers for student use, internet services, safe drinking water, electric connection, sport fields and materials were positively correlated and the relationships were statistically significant. Although the correlations of separate toilet for boys and girls, enough classrooms and plasma instruction with achievement as grade 12 principals response revealed positive relationship, the relationships were not statistically significant.

Correlation among availability of school infrastructures and students achievement

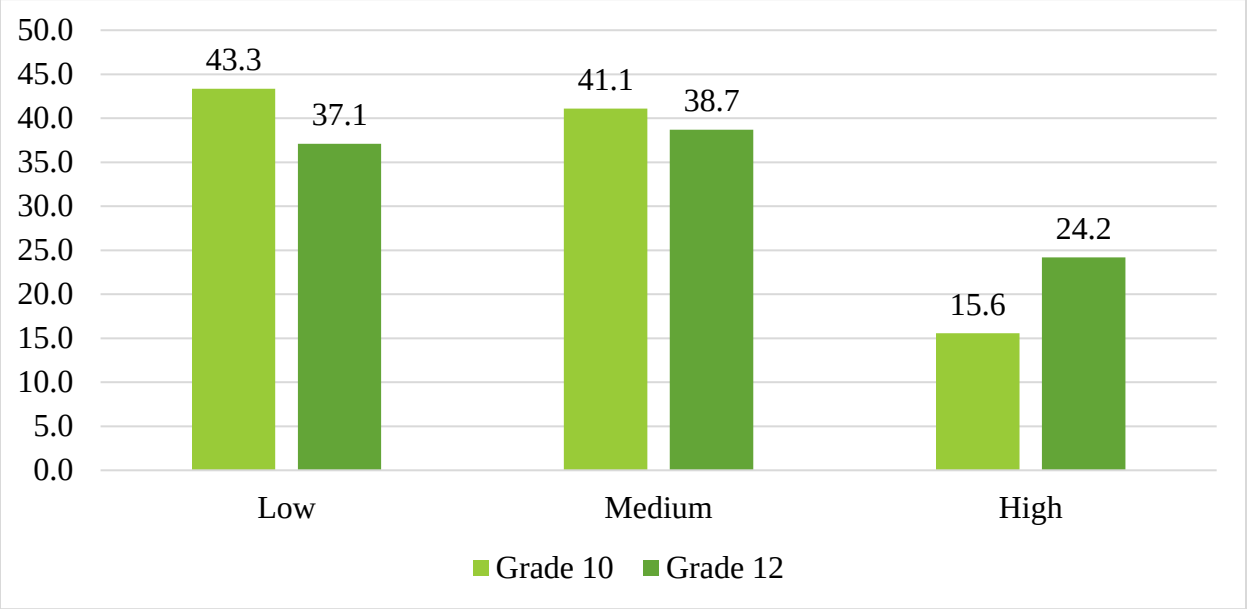
Table 43: Correlations between school resources/infrastructure and students achievement from the response of principals

	Correlation Coefficient	
	Grade 10	Grade 12
Science laboratory	.249**	.402**
School library	.327**	.283**
Computers for student use	.176*	.401**
Internet service	-.302**	.315**
Safe drinking water	.237**	.344**
Separate toilet	.128	.114
Electric connection	.024	.234*
Sport fields and materials	.051	.345**
Enough classrooms	.321**	.104
Plasma instruction	-.091	.004

**. Correlation is significant at the 0.01 level (2-tailed).

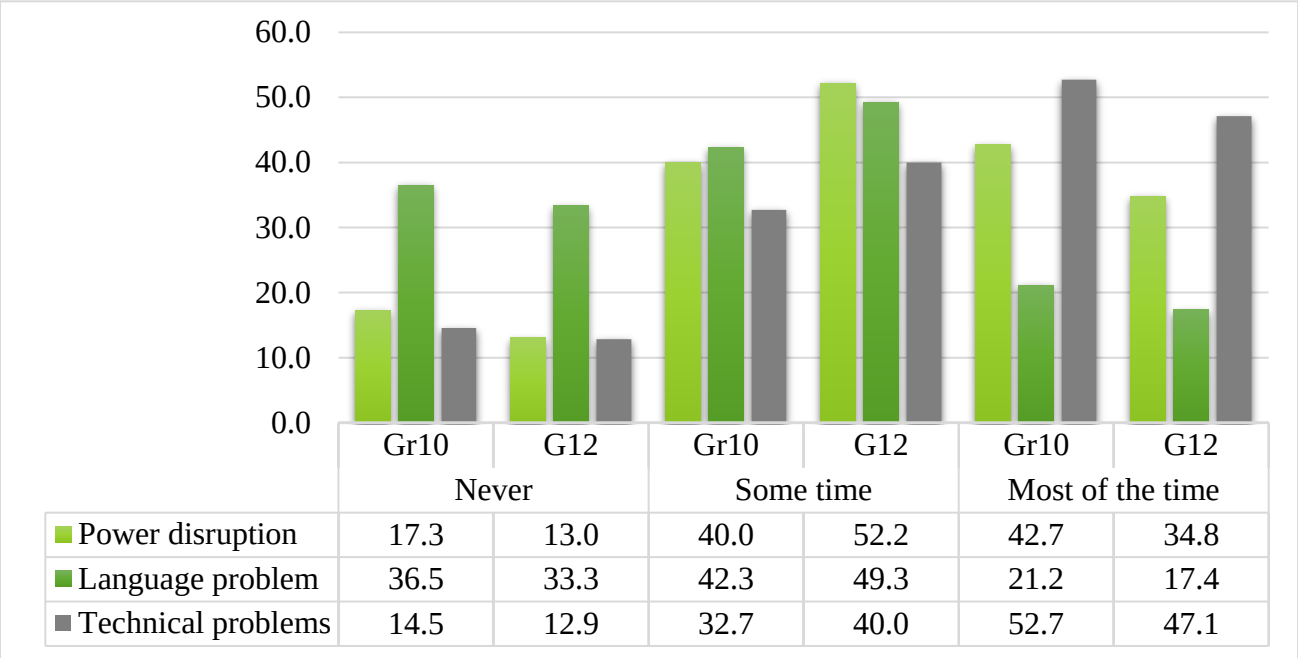
Principals were also asked to evaluate the effectiveness of the plasma instruction system as shown in Figure 33. The result shows that majority of grade 10 principals 43.3% evaluate it as low effective whereas 38.7% of grade 12 principals agree with medium level of its effectiveness. However, only 15.6% grade 10 and 24.2% grade 12 principals agreed for its effectiveness as high.

Figure 33: Principals evaluation on the effectiveness of the plasma instruction system by their subject



The problems that affect plasma instruction program as viewed by principals is shown in Figure 34. The most frequent factors in both grades as observed by principals were power disruption and technical problems. A significant number of grade 10 (52.7%) and grade 12 (47.1%) schools were suffered with technical problems of plasma instruction system.

Figure 34: Problems that affect plasma instruction from principals observation



	Never		Some time		Most of the time	
	Gr10	G12	Gr10	G12	Gr10	G12
Power disruption	17.3	13.0	40.0	52.2	42.7	34.8
Language problem	36.5	33.3	42.3	49.3	21.2	17.4
Technical problems	14.5	12.9	32.7	40.0	52.7	47.1

Principals were also asked for their opinion to what extent their school's capacity was limited by general resource and subject level instructional factor mentioned in Table 44 with a Likert scale options ranging from 'Not a problem' (1) to 'Serious problem' (4). The correlation of Principals' opinion to what extent their school's capacity limited by the following instructional factors and achievement showed that all the variables stated negatively correlated and statistically significant in both grades except lack of resources for students with disabilities and shortage of teachers specialized in English language for grade 10; and insufficient time allocation for teaching/learning in mathematics and English grade 12. The negative direction indicates that as seriousness of the problem increases achievement of students decrease and vice versa.

The school's capacity as to response of principals were limited with inadequate or poor quality of ICT for teaching and learning (11.7%) and shortage of library resources relevant to mathematics instruction (11.8%) in grade 10. Similarly, in grade 12 shortage or inadequacy of ICT for teaching

and learning (22.1%), resources for students with disabilities (17.7%), library resources relevant to mathematics (16.6%), science (11%) and language (12.6%) instruction, science equipment and materials for experiments (10.6%) had higher effects on students' achievement.(percent are not clear)

Table 44: Correlations between Principals opinion on the school's instructional factors and students achievement

Principals opinion on the instructional factors	Correlation Coefficient	
	Grade 10	Grade 12
General School Resources		
Inadequate or poor quality educational materials (e.g., textbooks, IT equipment, library or laboratory material)	-.310**	-.421**
Inadequate budget for supplies (e.g. paper, chalk, etc.)	-.179*	-.222*
Inadequate supply of school grant	-.039	-.070
Inadequate or poor quality physical infrastructure (e.g., building, grounds, electricity, etc.)	-.279**	-.287**
Inadequate or poor quality of ICT for teaching and learning (e.g., computers for student use, internet, plasma)	-.342**	-.470**
Lack of resources for students with disabilities	-.125	-.421**
Resources for Mathematics Instruction		
Shortage of teachers specialized in mathematics	-.254**	-.301**
Shortage of library resources relevant to mathematics instruction	-.343**	-.408**
Shortage of concrete objects or materials to help students understand quantities or procedures of Mathematics	-.173*	-.283**
Insufficient time allocation for teaching/learning Mathematics	-.173*	-.061
Resources for Science Instruction		
Shortage of teachers specialized in science subjects	-.160*	-.261**
Shortage of library resources relevant to science instruction	-.270**	-.332**
Shortage of science equipment and materials for experiments	-.230**	-.325**
Insufficient time allocation for teaching/learning science subjects	-.205**	-.139
Resources for Language Instruction		
Shortage of teachers specialized in English language	-.127	-.259**
Shortage of language laboratory with audio-visual materials	-.197**	-.251*
Inadequate library resources relevant to reading materials (magazines, novels, collections of stories, non-fiction books,)	-.186*	-.355**
Insufficient time allocation for teaching/learning English	-.170*	-.062

The regression analyses result on school infrastructure as shown in Table 45 indicated that for all the predictor variables produced the adjusted $R^2 = 0.260$, $F(5, 174) = 13.601$, $p < .001$ in grade 10 and adjusted $R^2 = 0.251$, $F(3, 73) = 9.490$, $p < .001$ in grade 12. This result indicated that, school resource /infrastructure from the principals' response as shown in the model explains 26% of grade

10 and 25.1% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 45: ANOVA, regression summary model and coefficients for the availability of school infrastructure from principals' response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	3847.004	5	769.401	13.601	.530	.281	.260	.000
	Residual	9842.733	174	56.567					
	Total	13689.737	179						
12	Regression	1636.125	3	545.375	9.490	.530	.281	.251	.000
	Residual	4195.203	73	57.469					
	Total	5831.328	76						
Coefficient									
Grade		Unstandardized Coefficients			Standardized Coefficients		t	Sig.	
		B		Std. Err	Beta				
10	(Constant)	17.285		3.241			5.334	.000	
	Internet service	4.524		1.320	.236		3.427	.001	
	Enough classrooms	3.954		1.185	.225		3.336	.001	
	Plasma instruction	5.203		1.221	.288		4.260	.000	
	School library	4.403		1.478	.202		2.978	.003	
	Safe drinking water	2.579		1.247	.147		2.069	.040	
12	(Constant)	30.973		5.261			5.887	.000	
	Large students-classroom ratio	-.174		.048	-.367		-3.637	.001	
	Computers for student use	5.977		2.408	.257		2.482	.015	
	Safe drinking water	4.818		1.954	.253		2.466	.016	

The regression analyses as to the response of principals for instructional materials as shown in Table 46 also revealed that for all the predictor variables produced the adjusted $R^2 = 0.112$, $F(2, 179) = 12.393$, $p < .001$ in grade 10 and adjusted $R^2 = 0.078$, $F(1, 100) = 9.568$, $p = .003$ in grade 12. This result indicated that, instructional materials from the principals' response as shown in the

model explains 11.2% of grade 10 and 7.8% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 46: ANOVA, regression summary model and coefficients for the availability of instructional from principals' response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	1707.550	2	853.775	12.393	0.349	.122	.112	0.000
	Residual	12332.037	179	68.894					
	Total	14039.587	181						
12	Regression	706.270	1	706.270	9.568	.296	.087	.078	.003
	Residual	7381.714	100	73.817					
	Total	8087.984	101						
Coefficient									
Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.			
		B	Std. Err	Beta					
10	(Constant)	22.830	2.374		9.619	.000			
	Adequate reference books in the library	3.817	1.471	.208	2.595	.010			
	Adequate teaching aids	3.500	1.417	.198	2.470	.014			
12	(Constant)	30.944	3.346		9.249	.000			
	Adequate reference books in the library	5.833	1.886	.296	3.093	.003			

The regression analyses based on the response of principals for inadequate or poor quality of ICT for teaching and learning and lack of resources for students with disabilities as shown in Table 47 was done. The result revealed that for all the predictor variables produced the adjusted $R^2 = 0.130$, $F(1, 164) = 25.603$, $p < .001$ in grade 10 and adjusted $R^2 = 0.300$, $F(2, 89) = 20.464$, $p < .001$ in grade 12. This result indicated that, instructional materials from the principals' response as shown in the model explains 13% of grade 10 and 30% grade 12 students' achievement. As can be seen

from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 47: ANOVA, regression summary model and coefficients for ICT and student with disability resources from principals' response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	1140.042	1	1140.042	25.603	.367	.135	.130	.000
	Residual	7302.396	164	44.527					
	Total	8442.438	165						
12	Regression	2347.369	2	1173.685	20.464	.561	.315	.300	.000
	Residual	5104.520	89	57.354					
	Total	7451.889	91						

Coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	40.805	1.638		24.918	.000
	Inadequate or poor quality of ICT for teaching and learning	-2.514	.497	-.367	-5.060	.000
12	(Constant)	56.816	2.725		20.849	.000
	Inadequate or poor quality of ICT for teaching and learning	-3.130	.764	-.394	-4.095	.000
	Lack of resources for students with disabilities	-2.207	.787	-.270	-2.803	.006

The focused group discussion has been conducted with students, teachers and parents including the school principals to identify the major problems related to the resources in addition to the quantitative data. According to the discussion with the students, the major problems the affect students achievement are inadequate science laboratory, lack of library with reference materials, shortage of ICT rooms with computers for student use, inadequate safe drinking water, and lack of enough classrooms, lack of electric and internet connection, inadequate separate toilet for boys and girls, shortage of lab-

technicians and lack of plasma instruction. The majority of problems are reflected in most regions of the countries except Addis Ababa, Dire Dawa and Harari. Particularly, the problems are more severe in the emerging regions. In this regard, the results from the discussion with the teachers, principals and parents were also aligned with the findings of the students (Appendix C).

4.8.5 Teaching and learning and student achievement

4.8.5.1 Instructional Time

Time on task from students' response

Table 48 below describes the students' time spent or engagement on learning tasks and its correlation to achievement. The achievement scores of the tested students were also related with the average number of days they were absent from school in that year. Absenteeism was found negatively correlated with the achievement scores in both grades. This means as students day of absenteeism increases achievement decreases. Time spent for home work and studying was positively correlated with the result achieved in both grades and the difference is statistically significant except time for studying (r=.008) in grade 12. Whereas the correlation for time spent for attending tutorial classes is negative (r=.034) for grade 10 and positive (r= .044) for grade 12. Grade 10 tutorial did not bring any effect on student achievement rather it goes in opposite direction. Meaning it was not administered on the way that make a difference on students' achievement.

In general, the result indicated that the more time spent by students attending in a learning task through study and homework and avoid school absenteeism their academic achievement improved and the difference was statistically significant.

Table 48: Correlations between student time on task engagement and their achievement

Variables	Correlation Coefficient	
	Grade 10	Grade 12
Absenteeism	-.121**	-.087**
Time for homework	.049**	.008
Time for studying	.030**	.068**
Time spend for attending tutorial classes	-.034**	.044**

**. Correlation is significant at the 0.01 level (2-tailed).

The regression analyses result on students time engagement on task as shown in Table 49 indicated that for all the predictor variables produced the adjusted $R^2 = 0.026$, $F(6, 6154) = 28.22$, $p < .001$ in grade 10 and adjusted $R^2 = 0.012$, $F(5,3425) = 9.42$, $p < .001$ in grade 12. This result indicated that, school resource from the teachers' response as shown in the model explains 2.6% of grade 10 and 1.2% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement except time spent for doing homework.

Table 49: ANOVA, regression summary model and coefficients for student time on task engagement from students' response

Grade	Groups	Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	13616.93	6	2269.49	28.22	0.164	.027	.026	0.000
	Residual	494884.51	6154	80.42					
	Total	508501.44	6160						
12	Regression	2883.63	5	576.73	9.42	.116	.014	.012	0.000
	Residual	209721.13	3425	61.23					
	Total	212604.76	3430						

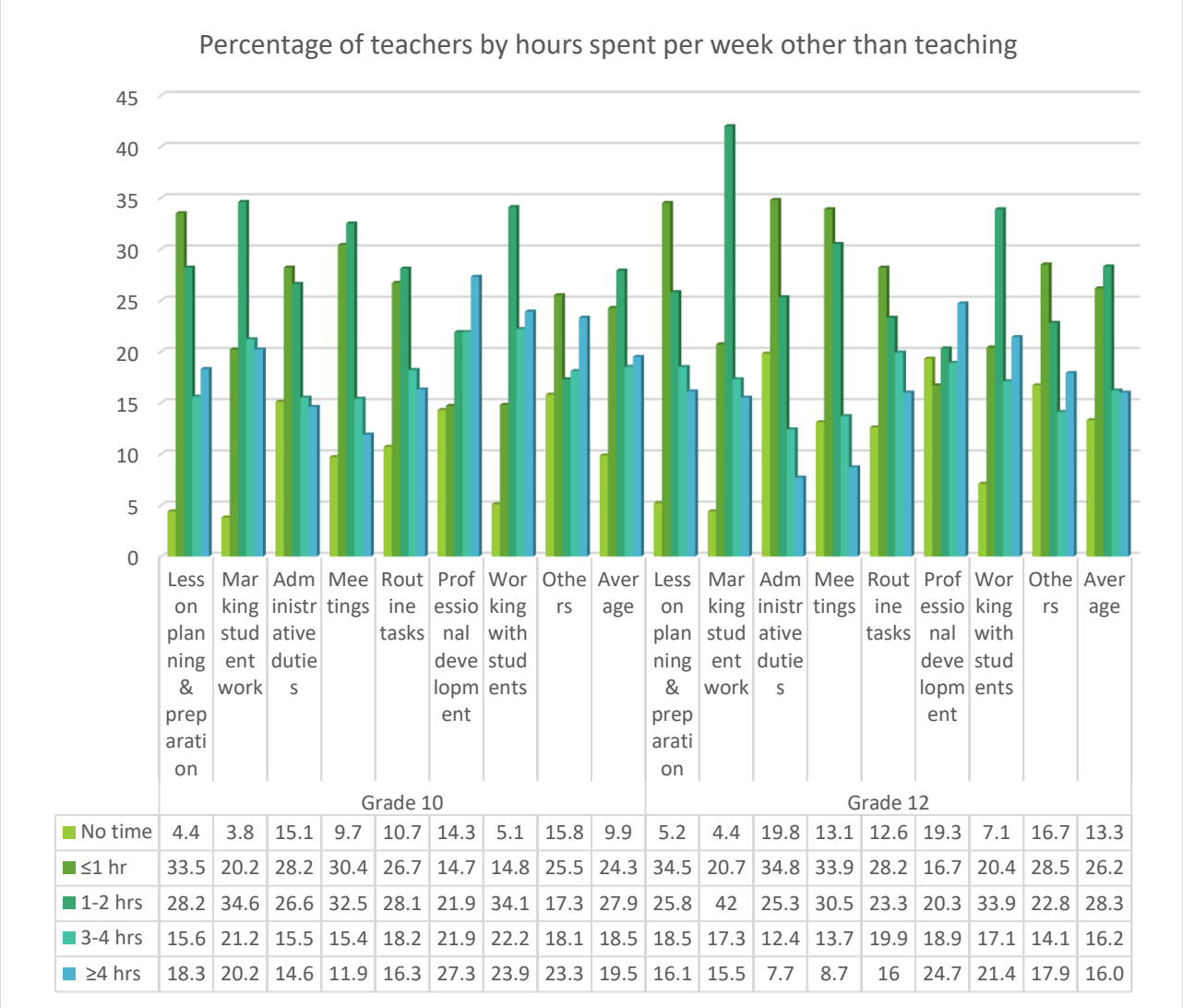
Coefficients

Grade	Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	32.87	0.61		53.96	.000
	Students' absenteeism	-0.17	0.02	-0.12	-9.22	.000
	Time spent for doing homework	0.21	0.10	0.03	2.05	.000
	Time spent in studying out of class	0.24	0.10	0.03	2.40	.000
	Time spent attending tutorial classes	-0.50	0.10	-0.07	-5.09	.000
	Frequency of providing feedback	1.10	0.18	0.10	6.26	.000
12	(Constant)	36.25	1.00		36.21	.000
	Students' absenteeism	-1.12	0.23	-0.09	-4.85	.000
	Time spent for doing homework	0.01	0.00	0.02	1.16	.246
	Time spent in studying out of class	-0.41	0.04	-0.17	-9.71	.000
	Time spent attending tutorial classes	0.43	0.15	0.05	2.92	.003
	Frequency of providing feedback	3.16	0.56	0.10	5.61	.000

Time on task from teachers' response

The teachers' time spent in different activities in addition to teaching in classroom teaching hour was described in Figure 35. Most teachers spent 1 – 2 hours of their time on working with students like marking students work and assignments in both grades. However, 62.9% of grade 10 and 64.4% of grade 12 teachers respond that they spend up to 2 hours of time with different meetings per week other than teaching. In other words, on average only 9.9% of grade 10 and 13.3% grade 12 teachers responded that they spend no time for other works during class teaching hour.

Figure 35: Hours per week teachers spend in different activities in addition to classroom teaching hours



	Grade 10									Grade 12								
	Lesson planning & preparation	Marking student work	Administrative duties	Meetings	Routine tasks	Professional development	Working with students	Others	Average	Lesson planning & preparation	Marking student work	Administrative duties	Meetings	Routine tasks	Professional development	Working with students	Others	Average
No time	4.4	3.8	15.1	9.7	10.7	14.3	5.1	15.8	9.9	5.2	4.4	19.8	13.1	12.6	19.3	7.1	16.7	13.3
≤1 hr	33.5	20.2	28.2	30.4	26.7	14.7	14.8	25.5	24.3	34.5	20.7	34.8	33.9	28.2	16.7	20.4	28.5	26.2
1-2 hrs	28.2	34.6	26.6	32.5	28.1	21.9	34.1	17.3	27.9	25.8	42	25.3	30.5	23.3	20.3	33.9	22.8	28.3
3-4 hrs	15.6	21.2	15.5	15.4	18.2	21.9	22.2	18.1	18.5	18.5	17.3	12.4	13.7	19.9	18.9	17.1	14.1	16.2
≥4 hrs	18.3	20.2	14.6	11.9	16.3	27.3	23.9	23.3	19.5	16.1	15.5	7.7	8.7	16	24.7	21.4	17.9	16.0

Teachers' response on Table 50 shows the correlation between period allotment, time lost, teacher absenteeism and achievement. The result revealed that absence of teachers due to different reasons such as meeting, sick, permission and so on has negative correlations which was statistically significant in both grades. The teaching time/periods lost due to class cancellations, school closures, or for other local reasons is also negatively correlated but it was not statistically significant. The periods allotted for teaching per week was also positively correlated in both grade and statistically significant for grade 10.

In conclusion, the instructional time wastage by either of the reasons negatively affected the achievement of students. Hence, time lost by school closure, teacher absenteeism and periods allotted per week explains the achievement of students.

Table 50: Correlation on period allotment, time lost, teacher absenteeism and achievement from teachers response

Time on task from teachers response	Correlation Coefficient	
	Grade 10	Grade 12
Periods allotted for teaching per week	.074*	.081
Number of periods/times lost because of various reasons?	-.037	-.035
Absence of Teachers due to different reasons such as meeting, sick, permission etc.	-.100**	-.133**

Moreover, teachers were asked the percentage of portion coverage by calculating the percentage of portion covered from the total periods in the five core subjects. The result as indicated in Table 51 revealed that in all subjects and both grades, there were a positive correlation with achievement and statistically significant except for chemistry grade 10.

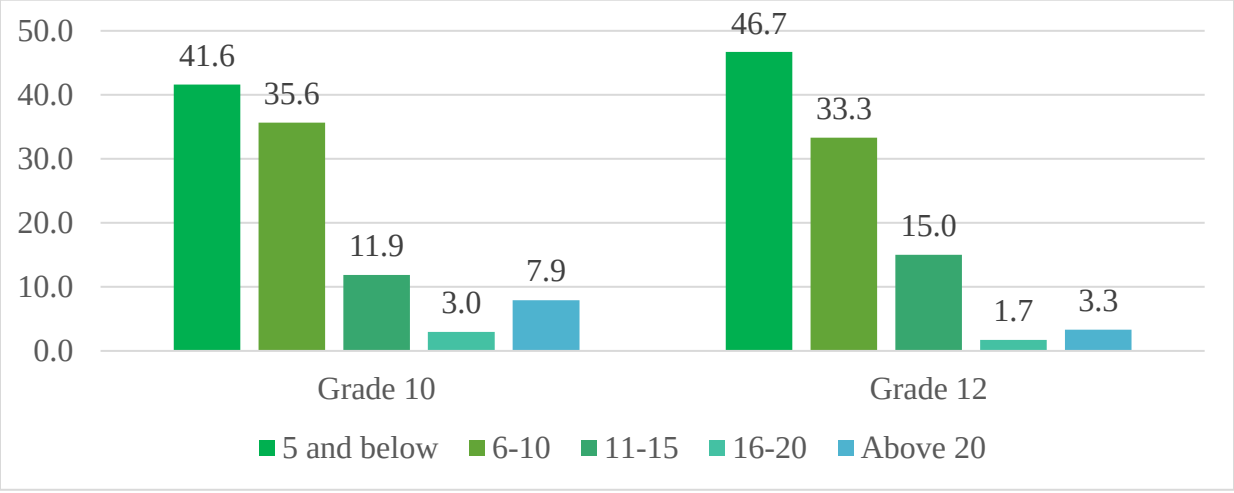
Table 51: Correlation among portion coverage and achievement for each subjects from teachers response

Grade		Correlation Coefficient				
		Biology	Chemistry	English	Mathematics	Physics
10	Biology	.153*				
	Chemistry		.109			
	English			.149*		
	Mathematics				.228**	
	Physics					.200**
12	Biology	.159*				
	Chemistry		.210*			
	English			.159*		
	Mathematics				.490**	
	Physics					.326**

Time on task from principals' response

Principals' were asked the number of days the school closed during the regular school calendar for different local reasons other than holidays including the start and early departure of the school in the academic year. Based on their response the result was summarized in Figure 36 below. The majority of principals 41.6% in grade 10 and 46.7% in grade 12 responded that five or below days their school was closed for various reasons in this academic year. 35.6% and 33.3% of grade 10 and 12 principals respectively replied their school closed for six to ten days in the academic year. The remaining indicated as their schools closed for more than 16 days.

Figure 36: Schools closure days during the regular school calendar for different local reasons other than holidays



The correlation between time on task such as period allotment, time lost, student and teacher absenteeism and achievement based on principals response was computed as shown in Table 52. The result depicted that all the variables raised had relations with student achievement. However, student and teacher absenteeism, teachers' late arrival from grade 10 and school shift in both grades were statistically significant contributors for student achievement.

Table 52: Correlation on period allotment, time lost, student and teacher absenteeism and achievement from principals response

Time on task from principals response	Correlation Coefficient	
	Grade 10	Grade 12
Average periods of periods allotted for each subject	.053	.040
Percentage of students absenteeism	-.414**	-.050
Percentage of teachers absenteeism	-.281**	-.049
Percentage of teachers are arrived late for the classes per day	-.180*	-.102
Number of days in which schools were closed	-.049	-.120
School shift (Full day=1, Half day=2)	-.298**	-.332**

4.8.5.2 Classroom assessment and feedback

Classroom assessment and feedback from students' response

Classroom assessments like giving homework and assignment tasks for the students to make them practice and has impact on their achievement. As information obtained from the students in Table 53 revealed that, the correlation about frequency of providing home work for all subjects was positive for both grades except for Biology which was negative (r=-.081) in grade 12. Not only giving assessment tasks can help students unless it is supported by timely corrective feedback. As information obtained from the sampled students indicates, correlation of all subjects in both grades were positive. On the other hand, students were also asked about the teachers encouraging interaction and group work among students in learning and it is clear that smooth interaction and encouragement of the students have impact on their achievement. Except English and Chemistry of grade 12, in all other subjects' correlations were positive in both grades.

Table 53: Correlations between classroom assessment and feedback and student achievement from students response

Variables		Correlation Coefficient	
		Grade 10	Grade 12
Frequency of providing homework	Biology	0.001	-.081**
	Chemistry	.044**	.073**
	English	.102**	0.021
	Mathematics	.073**	.132**
	Physics	0.019	.060**
Provision of helpful and timely corrective feedback for assessment tasks	Biology	.062**	.043**
	Chemistry	.039**	.040*
	English	.054**	0.020
	Mathematics	.069**	.079**
	Physics	.065**	0.023
Teachers encouraging interaction and group work among students in learning	Biology	.040**	0.080
	Chemistry	.027*	-.041*
	English	0.023	-.061**
	Mathematics	.058**	.053**
	Physics	.038**	0.012

**. Correlation is significant at the 0.01 level (2-tailed).

Similarly, from teachers' response as shown in Table 54 the frequency of classroom assessment activities and feedback are positively correlated with achievement. The frequency of using active learning method, immediate feedback on students work for grade 10 and classroom assessment in both grades were statistically significant in their contribution to achievement. However, the result in homework contradicts with students' response. The frequency of homework given by teachers of the core subjects' and achievement went in different directions as the response of teachers in both grades. To this regard, the response of students would be reliable and acceptable for the frequency of homework given by their teacher.

Table 54: Correlations between teachers teaching and classroom assessment and student achievement from teachers response

Teachers teaching & assessment	Correlation Coefficient	
	Grade 10	Grade 12
Frequency of using active learning method of teaching	.101**	.064
Frequency of using continuous classroom assessment practices to identify the gaps of each student	.109**	.088*
Frequency of giving homework	-.021	-.021
Frequency of using immediate feedback for individual student's work to improve his /her achievement level	.112**	.026

4.8.5.3 Lesson preparation and achievement

Lesson plan preparation is one of the major task of teachers that support their instructional activity. Teachers were asked how they prepare and use their lesson plan and its correlation with students' achievement as shown in Table 55. The result indicated that there was a positive correlation on the variables raised for teachers except for peer discussion in preparing their lesson plan in both grades. Teachers' use of MLC, teachers guide, textbook, reference materials and teaching aid during lesson plan preparation in grade 10 got a significant relation with their students' achievement.

Table 55: Correlation among lesson preparation in main subject areas and achievement from teachers response

Lesson plan preparation and use	Correlation Coefficient	
	Grade 10	Grade 12
I refer to and use information found in syllabus or Minimum Learning Competency (MLC) documents.	.076*	.083
I refer to and use information from the teachers' guide, student text book and other reference materials.	.082*	.071
I consider the type of teaching aids relevant to the lesson.	.069*	.023
I consider the methods of assessment during preparing the lesson.	.053	.008
I discuss with other teachers while preparing my lesson plan.	-.009	-.006

4.8.5.4 Teachers perception of their students and achievement

Teachers' perception to their student affects the teaching and learning system as well as the achievement of students. Table 56 shows the correlation between perception of teachers towards their students and achievement. The result indicated that teachers' expectation and perception to their students were positively correlated with achievement in both grades and the relationships were statistically significant except the use of different teaching method by teachers in grade 12.

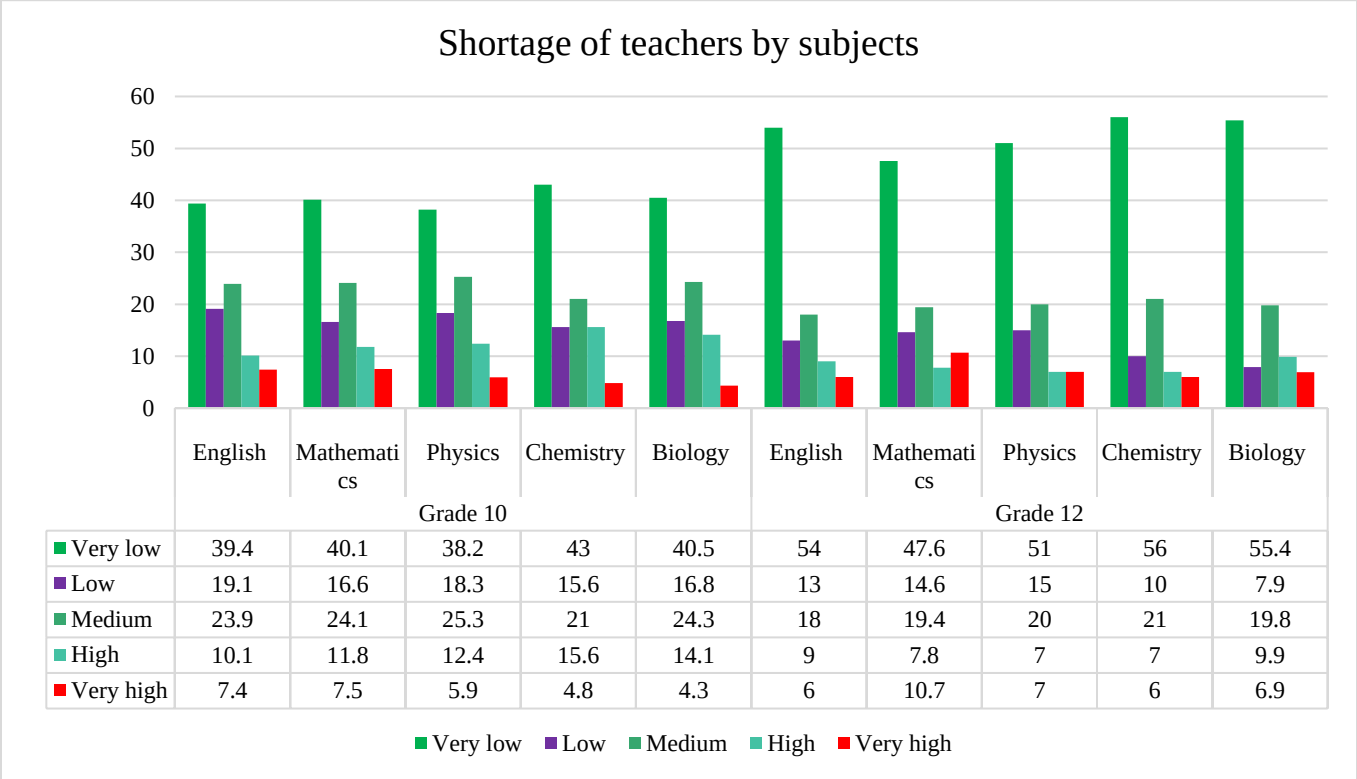
Table 56: Correlation among perception of teachers on their student and achievement

Teachers perception to their student	Correlation Coefficient	
	Grade 10	Grade 12
Most of the students in my class can do what I am supposed to teach them.	.164**	.137**
By trying different methods, I can significantly affect my students' achievement level.	.159**	.076
I feel a great deal of satisfaction when students in my class learn what I am supposed to teach them.	.151**	.211**
I expect my students to do every assignment properly	.108**	.200**

4.8.5.5 Shortage teachers and achievement

Teachers are the key actors in the provision of quality education system of a country. So, the shortage of teachers in each subject determines the performance of students. Figure 37 shows the response of school principals about the adequacy of teachers in the five core subject to their school. The result shows that the majority of schools do not have such a problem. However, a significant number of schools respond that their shortage of teachers were high and very high ranging from 13% to 20% schools in each subject.

Figure 37: Shortage of teachers by subject from principals response



	Grade 10					Grade 12				
	English	Mathematics	Physics	Chemistry	Biology	English	Mathematics	Physics	Chemistry	Biology
Very low	39.4	40.1	38.2	43	40.5	54	47.6	51	56	55.4
Low	19.1	16.6	18.3	15.6	16.8	13	14.6	15	10	7.9
Medium	23.9	24.1	25.3	21	24.3	18	19.4	20	21	19.8
High	10.1	11.8	12.4	15.6	14.1	9	7.8	7	7	9.9
Very high	7.4	7.5	5.9	4.8	4.3	6	10.7	7	6	6.9

The correlation between shortage of teachers and achievement as shown in Table 57 also indicated that there were negative correlation in all subjects and both grades. This means as the severity of shortage of teachers increases achievement decreases. More specifically, from grade 12 Biology, English, Chemistry, and Mathematics; and from grade 10 Biology and English subject teachers shortage had statistically significant contributions.

Table 57: Correlation between shortage of teachers and achievement

		Correlation Coefficient				
		Biology	Chemistry	English	Mathematics	Physics
Shortage of teachers in grade 10	Biology	-.210**				
	Chemistry		-.132			
	English			-.182*		
	Mathematics				-.145	
	Physics					-.109
Shortage of teachers in grade 12	Biology	-.277**				
	Chemistry		-.233*			
	English			-.218*		
	Mathematics				-.302**	
	Physics					-.138

4.8.5.6 School emphasis on academic success and achievement

The schools may give a different level of emphasis on academic success. They are expected to give priority on their school academic activity like understanding the curricular objectives and its implementation, teacher's expectation and team work for improving student achievement and student motivation. Table 58 presents the correlation between how principals characterize on activities that elicit for academic success in their school. The result showed that all the stated academic activities had positive correlation with achievement. For grade 10 schools all the correlations were statistically significant. Whereas for grade 12, teachers' understanding of the school's curricular objectives and teachers' ability to inspire/motivate students got statistically significant.

Table 58: Correlation among school emphasis on academic success and students achievement from principals response

School emphasis on academic success	Correlation Coefficient	
	Grade 10	Grade 12
Teachers' understanding of the school's curricular objectives	.345**	.197*
Teachers' degree of success in implementing the school's curriculum	.235**	.172
Teachers' expectations for student achievement	.217**	.146
Teachers working together to improve student achievement	.144*	.100
Teachers' ability to inspire/motivate students	.233**	.221*
Students' desire to do well in school	.307**	.186
Students' ability to reach school's achievement target	.395**	.170
Students' respect for classmates who best perform in school	.440**	.121

The regression analyses result on teaching and learning time on task as shown in Table 59 indicated that for all the predictor variables produced the adjusted $R^2 = 0.102$, $F(5, 572) = 14.2$, $p < .001$ in grade 10 and adjusted $R^2 = 0.084$, $F(5, 364) = 7.7$, $p < .001$ in grade 12. This result indicated that, teachers' time engagement on task from the teachers' response as shown in the model explains 10.2% of grade 10 and 8.4% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 59: ANOVA, regression summary model and coefficients for teachers time on task from teachers' response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	4740.5	5	948.1	14.2	.332	.110	.102	.000
	Residual	38278.5	572	66.9					
	Total	43018.9	577						
12	Regression	2817.6	5	563.5	7.7	.310	.096	.084	.000
	Residual	26459.9	364	72.7					
	Total	29277.5	369						

Coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	28.28	2.45		11.54	.000
	High Portion coverage	0.10	0.02	0.17	4.20	.000
	More time for Administrative duties	-1.28	0.32	-0.19	-3.98	.000
	Time for Marking student work	1.12	0.33	0.15	3.38	.001
	More time for Meetings	-0.87	0.34	-0.11	-2.51	.012
	Teachers absenteeism	-0.20	0.09	-0.09	-2.35	.019
12	(Constant)	31.88	2.25		14.16	.000
	Teachers expectation to students to do assignments properly	1.35	0.38	0.18	3.57	.000
	Time for Marking student work	1.35	0.43	0.16	3.15	.002
	Teachers absenteeism	-0.19	0.07	-0.13	-2.69	.007
	Referring and using information found in curriculum materials.	1.09	0.47	0.12	2.32	.021
	More time on Professional development courses	0.69	0.32	0.11	2.16	.032

Similarly, the regression analyses result on teaching and learning time as shown in Table 60 was described from the response of principals. The result revealed that for all the predictor variables produced the adjusted $R^2 = 0.369$, $F(3, 153) = 31.359$, $p < .001$ in grade 10 and adjusted $R^2 = 0.165$, $F(2, 46) = 5.740$, $p = .006$ in grade 12. This result indicated that, teaching and learning time from the principals' response explains 36.9% of grade 10 and 16.5% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 60: ANOVA, regression summary model and coefficients from Principals' response school teaching and learning time

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	4556.638	3	1518.879	31.359	.617	.381	.369	0.000
	Residual	7410.470	153	48.434					
	Total	11967.108	156						
12	Regression	902.195	2	451.097	5.740	.447	.200	.165	.006
	Residual	3614.796	46	78.583					
	Total	4516.991	48						

Coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	29.304	3.550		8.254	.000
	Students' respect for classmates who best perform in school	2.187	.721	.241	3.035	.003
	Half day school shift	-5.923	1.260	-.313	-4.700	.000
	Students' ability to reach school's achievement target	2.314	.681	.266	3.398	.001
12	(Constant)	4.361	11.717		.372	.711
	Teachers' ability to inspire/motivate students	4.874	1.707	.381	2.856	.006
	Closure of schools for different reasons	-10.492	4.681	-.299	-2.241	.030

In general, with regard to the time on task of instruction, similar to the findings from quantitative data, the results from FGD depicted that wastage of time during teaching learning process either by teachers or students. For instance, students indicated that as some teachers' do not using their

time properly and late to the class and left the class early. On the other hand, teachers and principals responded that due to a lot of unplanned meetings carried during the school days and a number of celebrating holidays frequently there were a lot of wastage in instruction time. They also added as students absenteeism become a critical issues in their school. Moreover, concerning the appropriateness of the period allotment for each subjects, all the participant members of the FGD argued that there was shortage of period allotted for geography, history, physics and mathematics while the time allocated for the rest subjects was fair.

The analysis of FGD also revealed that teachers usually provided home works and class works and use continuous classroom assessment during instruction. Nevertheless, the participant students conclude that as there were no immediate corrective feedbacks and supportive for the group or induvial student by the teachers. Even, the concept of continuous assessment was miss leaded. For instance participants from Oromia and Harari explained as most teachers do not use formative assessment instead they usually use repeated testing, using assessment only for marking purpose and continuously assessing their students at the end of each unit (summative).

Regarding the method of teaching, all the FGD participants were clarified that most of the teachers across many regions applied teacher centered teaching technique (See Appendix C).

4.8.6 Student attitude towards their school and teachers across achievement

4.8.6.1 Students Attitude towards their school

Students' were asked about their attitude towards their school that can affect their achievements as shown in Table 61. The correlation with students' achievement shows positive in all the issues raised for both grade students except on proud to go to school and safe and comfortable when they are in the school by grade 10 students' response. Whereas like being in school, feel safe and comfortable in the school from grade 10 and being proud to go to their school in both grades were not show statistically significant relation with students' performance.

Table 61: Correlation between student attitude towards their school and achievement from students response

Student attitude towards their school	Correlation Coefficient	
	Grade 10	Grade 12
I like being in this school	.017	.038*
I feel safe and comfortable when I am at this school	-.002	.047**
I like to see my classmates at this school	.069**	.123**
I am proud to go to this school	-.009	.027
I learn a lot in this school	.044**	.036*
I wish I would not go to another school	.109**	.133**

**. Correlation is significant at the 0.01 level (2-tailed).

4.8.6.2 Students attitude towards their teachers and subject matters

It is supposed that students attitude towards their teachers have impact on their academic achievement. They were asked about their English, Mathematics, Physics, Chemistry and Biology teachers as shown in Table 62. Depending on this, the correlations showed negative in receiving additional help, fairly treatment and caring of English teachers for better academic achievement in grade 12 and all positive for grade 10.

It is believed that if the relationship between teachers and students are smooth, they can ask what they want without fearing as result it has impact on their academic achievement. Concerning this, four questions were posed for students like :- teacher really listen what students have to say, when need additional help, receiving it from teacher, treat all students fairly and caring for their better academic achievement. The correlations were positive and the relationships were statistically significant for all subjects except in the case of Chemistry teachers' fair treatment in grade 10. Similarly, in grade 12 Mathematics and Chemistry correlations were positive and statistically significant in all cases.

The data from FGD participants regarding to the attitude of students towards learning indicated that, the motivation and interest of majority students to learn is declining from to time and their commitment to learn is diminishing. In this case, the participants raised various reasons. Some of them were: lack of consistent support and follow up of parents and teachers, shortage of school inputs, poor academic background of students in lower grades, rare opportunity to job after

graduation or unemployment after graduation, develop interest to have certificate of high schools and then want to engage in income producing businesses at earlier stage can be mentioned (See Appendix C).

Table 62: The correlation of students' attitude towards their teachers and achievement score by students response

Subject Teachers	Statements	Correlation Coefficient	
		Grade 10	Grade 12
English	My teacher really listen to what I have to say.	.038**	.010
	If I need additional help, I will receive it from my teacher.	.040**	-.044**
	My teacher treat me fairly.	.048**	-.007
	My teacher caring for my better academic achievement	.065**	-.010
Maths	My teacher really listen to what I have to say.	.068**	.046**
	If I need additional help, I will receive it from my teacher.	.078**	.070**
	My teacher treat me fairly.	.055**	.059**
	My teacher caring for my better academic achievement	.077**	.070**
Physics	My teacher really listen to what I have to say.	.046**	.011
	If I need additional help, I will receive it from my teacher.	.063**	.020
	My teacher treat me fairly.	.062**	.004
	My teacher caring for my better academic achievement	.068**	.029
Chemistry	My teacher really listen to what I have to say.	.024*	.067**
	If I need additional help, I will receive it from my teacher.	.031**	.058**
	My teacher treat me fairly.	.017	.066**
	My teacher caring for my better academic achievement	.037**	.114**
Biology	My teacher really listen to what I have to say.	.051**	.004
	If I need additional help, I will receive it from my teacher.	.063**	.054**
	My teacher treat me fairly.	.078**	.015
	My teacher caring for my better academic achievement	.091**	.079**

**. Correlation is significant at the 0.01 level (2-tailed).

As indicated in Table 63, students were also asked to indicate their preference for liking/disliking the subjects they were tested. Students liking the subjects are assumed to perform better in the tests. In this result the correlation showed positive in all subjects in both grades except the case of students learning interesting things in grade 12 English. The correlation of students' attitude towards their teachers and subject matters by achievement score were statistically significant in most cases for all subjects and both grade levels except for English and liking physics for grade 12.

Table 63: The correlation of students' attitude towards their teachers and achievement score from students' response

Subject	Statements	Correlation Coefficient	
		Grade 10	Grade 12
English	I like English	.052**	.023
	I learn many interesting things in English	.038**	-.029
Mathematics	I like Mathematics	.096**	.067**
	I learn many interesting things in Mathematics	.095**	.057**
Physics	I like Physics	.035**	.019
	I learn many interesting things in Physics	.054**	.062**
Chemistry	I like Chemistry	.042**	.014
	I learn many interesting things in Chemistry	.063**	.063**
Biology	I like Biology	.093**	.071**
	I learn many interesting things in Biology	.108**	.084**

**. Correlation is significant at the 0.01 level (2-tailed).

4.8.7 Student expectation and parental support across achievement

Family support and students' expectation have positive correlation with student's achievement. The high expectation of students for further education had positive correlation in both grades as shown in Table 64. While family support for students' studies at home had positive correlation in grade 10 and negative in grade 12. The family support in grade 12 didn't bring any sensible result for student achievement; this might be due to the less quality and inappropriateness of the support.

Table 64: The correlation between students' expectation and family support and achievement score

Student expectations and family support	Correlation Coefficient	
	Grade 10	Grade 12
High expectation of students for further education	.154**	.102**
Family support for studies at home	.014	-.023
Communicate what have been learned in school with someone in the family	-.041**	-.080**

4.8.8 Professional development and student achievement

4.8.8.1 Teachers professional development

Teachers' professional development participation in different activities during the last two years from the time of assessment were described in Table 65 below. In grade 10 the majority of teachers responded 'Yes' for the professional development activities except use of technology for instruction (computer, internet, plasma etc.), observation visits to other schools /sharing experience, action research and special need education. The result in grade 12 also showed that the majority of teachers said 'Yes' for in-service training (a diploma, degree or master program), classroom management and/or student discipline, method of teaching / pedagogy, continuous classroom assessment, mentoring and/or peer observation, co-curricular activities and lesson planning.

Table 65: Percentage of teachers involved in different professional development trainings

Teacher professional development activities	Grade 10			Grade 12		
	No	Yes	Total	No	Yes	Total
In-service training (a diploma or degree or master program)	43.8	56.2	100	41.0	59.0	100
Curriculum materials (text book, syllabus, Minimum Learning Competency, subject matter content)	44.2	55.8	100	55.7	44.3	100
Classroom management and/or student discipline	27.6	72.4	100	42.1	57.9	100
Method of teaching / Pedagogy	25.6	74.4	100	38.6	61.4	100
Continuous classroom assessment	21.7	78.3	100	35.8	64.2	100
Use of technology for instruction (computer, internet, plasma etc.)	65.3	34.7	100	63.0	37.0	100
Observation visits to other schools /sharing experience	66.0	34.0	100	69.0	31.0	100
Action research	60.1	39.9	100	63.7	36.3	100
Mentoring and/or peer observation	32.9	67.1	100	38.2	61.8	100
Co-curricular activities	38.0	62.0	100	47.7	52.3	100
Lesson planning	15.8	84.2	100	27.8	72.2	100
Parent involvement and/or community relations	38.2	61.8	100	54.3	45.7	100
Special need education	74.9	25.1	100	80.4	19.6	100

The correlations between teacher professional development and student achievement as shown in Table 66 indicated that all the variables stated were positively correlated in both grades except for classroom management and/or student discipline in grade 12. Among the variables, in-service training for grade 12, method of teaching/pedagogy for grade 10, action research and mentoring for grade 10, observation visits to other schools /sharing experience and lesson planning for grade 12, and use of technology for both grades were correlated positively and the associations were statistically significant.

Table 66: Correlation of teachers' professional development and achievement

Teacher professional development activities	Correlation Coefficient	
	Grade 10	Grade 12
In-service training (a diploma or degree or master program)	.048	.107*
Curriculum materials (text book, syllabus, Minimum Learning Competency, subject matter content)	.043	.049
Classroom management and/or student discipline	.015	-.027
Method of teaching / Pedagogy	.073*	.075
Continuous classroom assessment	.018	.025
Use of technology for instruction (computer, internet, plasma etc.)	.206**	.112*
Observation visits to other schools /sharing experience	.049	.186**
Action research	.077*	.027
Mentoring and/or peer observation	.076*	.046
Co-curricular activities	.062	.005
Lesson planning	.018	.103*
Parent involvement and/or community relations	.046	.023
Special need education	.044	.028

Professional development of teachers as shown in the regression analyses result on Table 67 indicated that for all the predictor variables produced the adjusted $R^2 = 0.042$, $F(4, 860) = 10.514$, $p < .001$ in grade 10 and adjusted $R^2 = 0.067$, $F(4, 424) = 8.692$, $p < .001$ in grade 12. This result indicated that, professional development from the teachers' response as shown in the model explains 4.2% of grade 10 and 6.7% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement except mentoring and/or peer observation by grade 10 students.

Table 67: ANOVA, regression summary model and coefficients for teachers professional development

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	3069.024	4	767.256	10.514	0.216	.047	.042	0.000
	Residual	62760.043	860	72.977					
	Total	65829.068	864						
12	Regression	2612.502	4	653.125	8.692	.275	.076	.067	0.000
	Residual	31861.593	424	75.145					
	Total	34474.094	428						

Regression coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	23.32	2.16		10.80	.000
	Method of teaching / Pedagogy	1.33	0.71	0.07	1.88	.040
	Use of technology for instruction (computer, internet, plasma etc.)	3.19	0.63	0.17	5.05	.000
	Action research	2.51	0.62	0.14	4.03	.000
	Mentoring and/or peer observation	0.11	0.65	0.01	0.17	.867
12	(Constant)	40.460	2.215		18.270	.000
	Visit other schools / Experience sharing	3.709	.954	.189	3.889	.000
	In-service training (diploma or degree or master program)	2.517	.865	.139	2.912	.004
	Use of technology for instruction	2.111	.910	.114	2.321	.021
	Lesson planning	2.059	.942	.106	2.185	.029

According to the findings from the focused group discussion (FGD), there were some capacity building trainings that provided at the school levels on different issues such method of teaching, assessment and CPD though it is not enough. On the other hand, the participants from the emerging regions (Ethiopian Somali, Benishangule Gumuz, Gambella and Afar) denied the access to short trainings at school level (Appendix C).

4.8.8.2 Principals professional development

Professional development of principals in different topics during the last two years from the time of assessment were described in Table 68 below. The majority of principals responded 'Yes' for most of professional development activities in both grades. However, professional development in curriculum materials (e.g. text book, syllabus, Minimum Learning Competency), majority responded 'No' in both grades. In addition, principals training on use of technology for instruction (e.g. computer, internet, plasma etc.) and safety or school climate issues is minimal as the response of grade 10 principals.

Table 68: Percentage of principals' involved in different professional development trainings

Principals professional development activities	**Grade 10**			Grade 12		
	No	Yes	Total	No	Yes	Total
In-service training (e.g. a diploma or degree or master program)	35.1	64.9	100	33.3	66.7	100
Instructional leadership	47.6	52.4	100	46.4	53.6	100
Curriculum materials (e.g. text book, syllabus, Minimum Learning Competency)	54.8	45.2	100	66.7	33.3	100
Classroom management and/or student discipline	27.4	72.6	100	30.1	69.9	100
Continuous classroom assessment	25.7	74.3	100	38.6	61.4	100
Use of technology for instruction (e.g. computer, internet, plasma etc.)	56.0	44.0	100	31.4	68.6	100
Observation visits to other schools and scaling up best practices	47.6	52.4	100	42.2	57.8	100
Action research	50.3	49.7	100	52.0	48.0	100
School supervision	33.2	66.8	100	30.1	69.9	100
Co-curricular activities	44.4	55.6	100	38.6	61.4	100
School improvement planning/setting objectives	24.0	76.0	100	31.4	68.6	100
Safety or school climate issues	51.6	48.4	100	46.5	53.5	100
Parent involvement and/or community relations	30.2	69.8	100	33.7	66.3	100
School resource management (financial and human)	35.3	64.7	100	39.6	60.4	100

The regression analyses result on principal professional development as shown in Table 69 indicated that for all the predictor variables produced the adjusted $R^2 = 0.105$, $F(2, 181) = 11.762$,

$p < .001$ in grade 10 and adjusted $R^2 = 0.036$, $F(1, 80) = 3.982$, $p = .049$ in grade 12. This result indicated that, professional development from the principals' response as shown in the model explains 10.5% of grade 10 and 3.6% grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 69: ANOVA, regression summary model and coefficients for principals professional development

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	1532.704	2	766.352	11.762	.339	.115	.105	0.000
	Residual	11793.017	181	65.155					
	Total	13325.721	183						
12	Regression	265.927	1	265.927	3.982	.218	.047	.036	.049
	Residual	5343.096	80	66.789					
	Total	5609.022	81						

Regression coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	31.604	2.736		11.551	.000
	In-service training (diploma or degree or master program)	3.046	1.250	.170	2.438	.016
	Use of technology for instruction (e.g. computer, internet, plasma etc.)	5.072	1.196	.297	4.241	.000
12	(Constant)	34.313	3.151		10.890	.000
	Experience sharing and scaling up best practices	3.714	1.861	.218	1.995	.049

4.8.9 School management and student achievement

4.8.9.1 School management from teachers' response

Teachers were asked about school management activities to estimate the percentage of time spent across the school-related leadership activities as shown in Table 70. In the activities raised, the achievement of students at both grades were positively correlated with school management and all the differences were statistically significant except for participatory decision-making and regular staff discussion about how to achieve school goals/targets from grade 10.

Table 70: Correlation among teachers' opinion regarding to school management activities and achievement

School management activities	Correlation Coefficient	
	Grade 10	Grade 12
There is effective communication between school management and teachers	.141**	.229**
Decision-making processes are participatory	.059	.116**
School meetings are worthwhile	.110**	.244**
There is mutual respect between staff and school management	.187**	.206**
Staff feel encouraged to bring forward new ideas	.120**	.193**
Teachers have a say in topics selected for the school's professional development program	.065*	.140**
There is regular staff discussion about how to achieve school goals/targets	.058	.156**
The school management openly recognizes teachers when they do things well	.115**	.176**
There is continuous classroom supervision (e.g. classroom observation)	.125**	.142**
The school improvement program provided me with many useful ideas and resources for changing my classroom practices.	.111**	.173**
There is a regular appraisal and/or feedback based on a fair assessment of teachers work.	.068*	.203**

4.8.9.2 School management from principals' response

Moreover, principals were asked about school management activities to estimate the percentage of their time spent across the school-related leadership activities as shown in Table 71. In the activities raised, the achievement of students at both grades were positively correlated with school management. Some of grade 10 principals' activities like school improvement program, supervision, motivating teachers and discussion with teachers' problems were statistically significant in the contribution to students' achievement. However, by the majority of activities the correlation with student achievement were not statistically significant.

Table 71: Correlation among Principals' opinion regarding to school management activities and achievement

School management activities	Correlation Coefficient	
	Grade 10	Grade 12
There is a detailed plan for improving instruction in my school	.134	.069
The school improvement program provided me with many useful ideas and resources for changing classroom practices.	.192**	.144
Supervising the school activities (e.g. classroom observation)	.264**	.082
Professional development activities of teachers are in accordance with the teaching and learning objectives.	.014	.069
Teachers whose students are actively participated in learning are praised.	.197**	.043
When a teacher has problems in his/her classroom, the school management takes the initiative to discuss on issues	.153*	.009
The staff has opportunities to participate in school decision-making	.085	.005
Discuss the school's plan with students, teachers and parents at school meetings	.065	.071

The regression analyses result on school management as shown in Table 72 indicated that for all the predictor variables produced the adjusted $R^2 = 0.111$, $F(3, 179) = 8.568$, $p < .001$ in grade 10. This result indicated that, school management from the principals' response as shown in the model explains 11.1% of grade 10 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining grade 10 students' achievement.

Table 72: ANOVA, regression summary model and coefficients for school management from principals response

	Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
Regression	1608.349	3	536.116	8.568	.354	.126	.111	.000
Residual	11200.899	179	62.575					
Total	12809.248	182						
Regression coefficient								
	Unstandardized Coefficients		Standardized Coefficients					
	B	Std. Err	Beta	t	Sig.			
(Constant)	25.048	3.071		8.155	.000			
Supervising the school activities. i.e. classroom observation	2.614	.730	.299	3.582	.000			
Professional development activities of teachers are in accordance with the teaching and learning objectives.	2.212	.795	.241	2.781	.006			
Teachers whose students are actively participated in learning are praised.	1.928	.816	.204	2.362	.019			

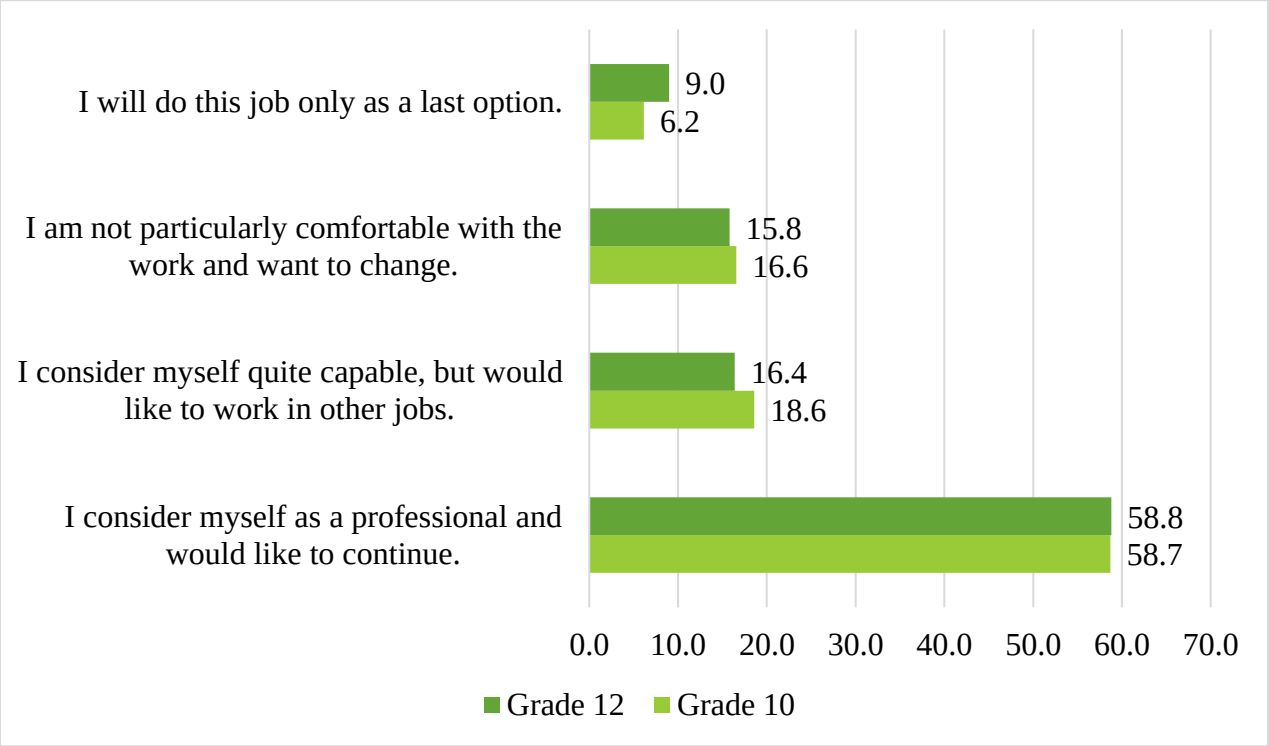
4.8.10 Teachers and principals satisfaction with working conditions and student achievement

4.8.10.1 Teachers satisfaction with working conditions

Teachers' satisfaction with their job and working condition is another important predictor for improving students' achievement. The study tries to survey the satisfaction level of teachers with their job and working condition as shown in Figure 38. The result indicated that the majority of teachers (58.7 % grade 10 and 58.8% grade 12) like their profession and would like to continue working as a teacher. However, 6.2% of grade 10 and 9% of grade 12 teachers were doing their jobs/teaching only as a last option and 15.8% and 16.6% of grade 10 and grade 12 teachers respectively responded that they want to change their profession/job.

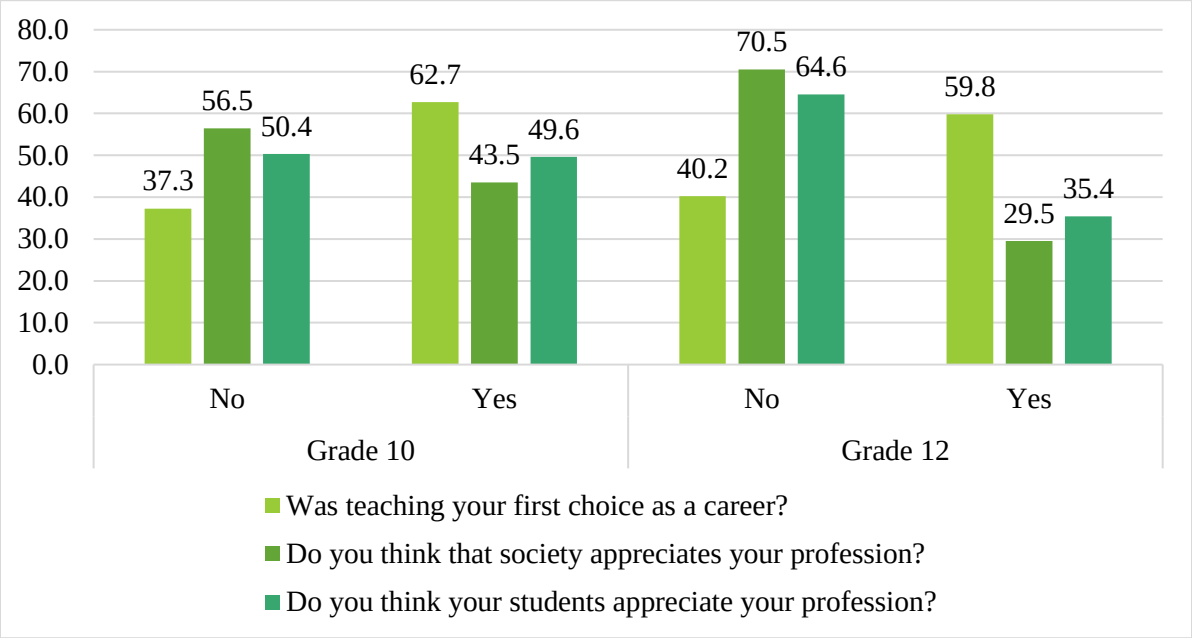
In general, above 41% of teachers in both grades were not interested to continue in teaching profession.

Figure 38: Teachers satisfaction with working conditions



Teachers were also asked whether their profession was valued by the society and their students as shown in Figure 39. The majority teachers 62.7% of grade 10 and 59.8% of grade 12 deployed were those who select teaching as a first choice of career. However, the majority of teachers in grade 10 believed that they were not valued by both society (56.5%) and their student (50.4%). Similarly, 70.5% of grade 12 teachers believed that the society do not valued and appreciated their profession.

Figure 39: Perception of teachers on their career

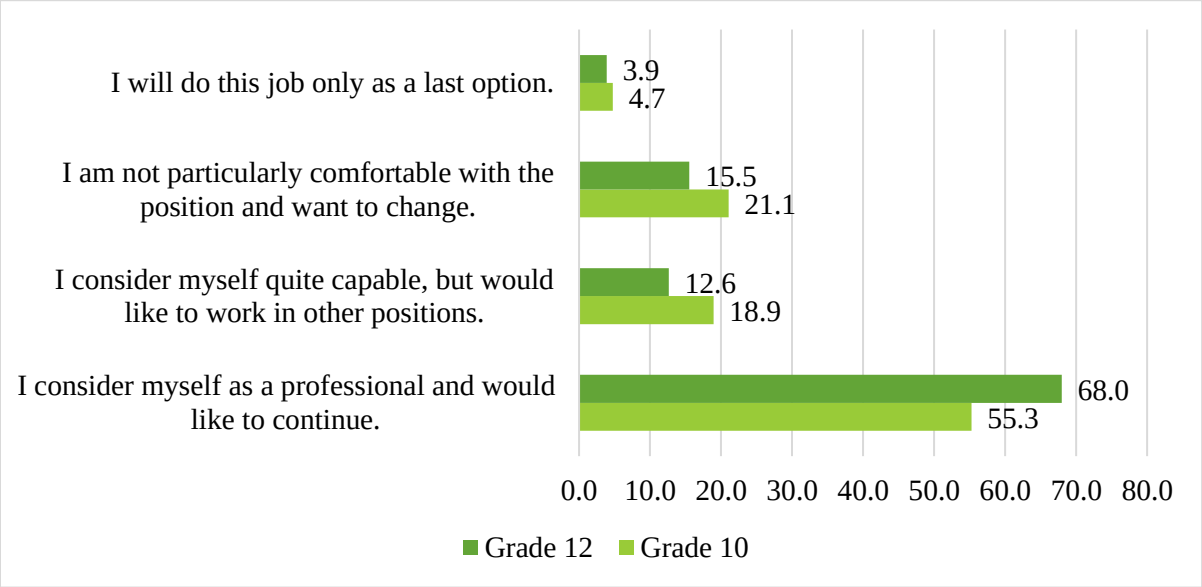


In general, regarding teachers' satisfaction with their teaching profession, the results of the FGD from the participants depicted that most of the teachers from Addis Ababa, Harari, Gambella, SNNP and Tigray regions had lack of interest and motivation in teaching profession. Similarly, some of the teachers from Afar, Oromia, Dire Dawa and Benishangul Gumuz were also do not like their profession and want to leave the profession. Thus, they are attending distance education in other fields of studies in order to change their profession. The main reasons for dissatisfaction with the profession was low values provide to teaching by the society and less payment. This finding is consistent with the findings from the quantitative data analysis shown above (Appendix C).

4.8.10.2 Principals satisfaction with working conditions

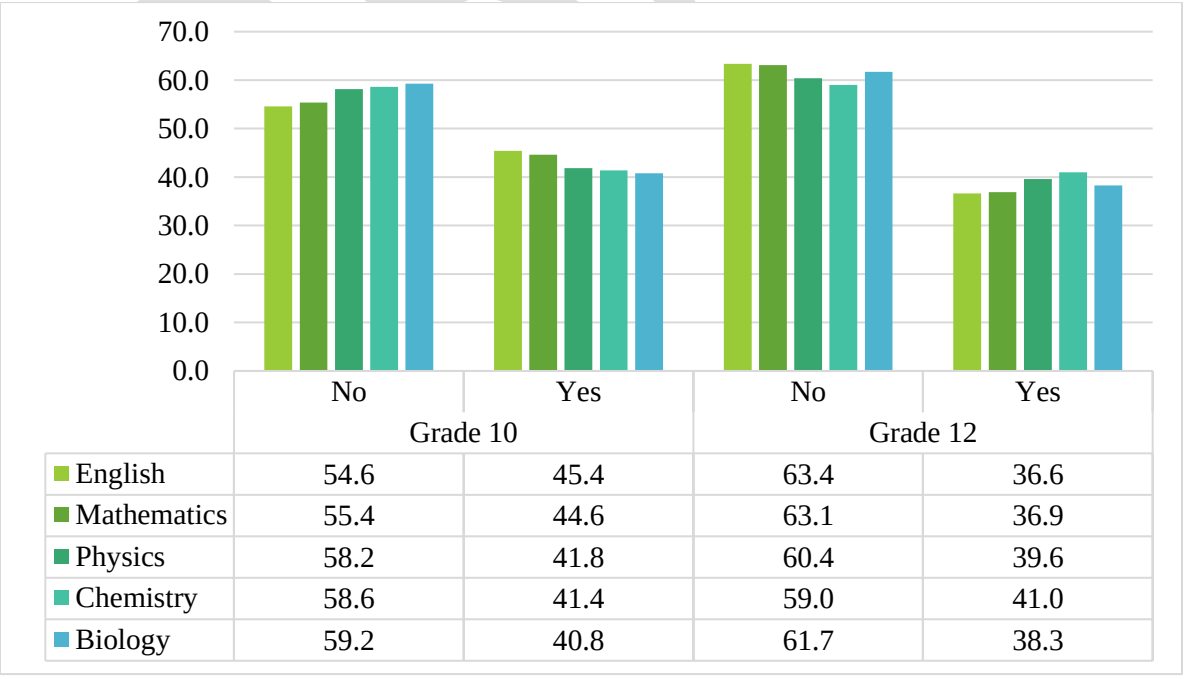
Principals' satisfaction with their job and working condition was indicated in Figure 40 below. The result was same as that of teachers, the majority of principals (55.3 % grade 10 and 68% grade 12) responded as they like their profession and would like to continue working as a principal. However, a significant number of principals (44.7% from grade 10 and 32% from grade 12) also responded that they want to change their profession/job.

Figure 40: Principals satisfaction with working conditions



School principals were also asked whether there is an incentive/incentive mechanism for the teachers in their school as shown in Figure 41. The majority of principals responded 'No' in both grades. This indicates teachers' motivation mechanism at school level is not present. So this could be one of the problems that made teachers not to satisfy with their teaching profession.

Figure 41: Principals response on the presence of any incentive /motivation mechanisms for teachers in their school



	Grade 10		Grade 12	
	No	Yes	No	Yes
English	54.6	45.4	63.4	36.6
Mathematics	55.4	44.6	63.1	36.9
Physics	58.2	41.8	60.4	39.6
Chemistry	58.6	41.4	59.0	41.0
Biology	59.2	40.8	61.7	38.3

4.8.11 Relationship with school community and student achievement

4.8.11.1 Relationship with school community by teachers' response

School community relationship is one important task of school administrators and teachers. It is a two-way mutual arrangement through which the school and the community co-operate with each other for the realization of goals of the community and vice versa. The community and/or parents will have a direct and unreplaceable contribution for students learning. They will guide and support teachers, can supervise and assist their children at home with homework assignment and other school related activities. To this regard, this study tries to investigate the relationship between teachers in the school with the community and students achievement from the response of teachers as shown in Table 73. The result indicated that the correlation between school community relationship and student achievement was positively correlated and the correlation was statistically significant in both grade levels. Thus, as the frequency and percentage of parents and teacher contact increases the achievement of students also increased.

Table 73: Relationship with school community by teachers' response

School community relationship	Correlation Coefficient	
	Grade 10	Grade 12
High frequency of teachers contact with parents to discuss regarding their children	.091**	.172**
Large percentage of parents that teachers contact in the academic year	.114**	.129**

4.8.11.2 Principals relationship with school community

School relationship with community from principals' response was described in Table 74. The result indicated that all the parents' and community related activities of principals were positively correlated with achievement. The correlations with achievement of students and the degree of parents involvement as volunteers or committees in monitoring student behavior, interacting with staff on matters affecting their own children and supporting students to ensure that they are ready to learn for successful achievement were statistically significant in grade 10. Similarly, the correlations between students' achievement and the degree of parents' involvement in interacting

with staff on matters affecting their own children and helping the school in fund raising activities were statistically significant for grade 12.

Table 74: Relationship with school community by Principals' response

Degree of parents' involvement in various school activities and achievement	Correlation Coefficient	
	Grade 10	Grade 12
Number of parents principals' met per month in the academic year on average	.018	.042
Parents acting as volunteers or committees in monitoring student behavior	.179*	036
Serving on committees on matters of school instruction	.078	.093
Serving on committees on matters of finance or administration	.028	.088
Interacting with staff on matters affecting their own children	.350**	.258**
Helping the school in fund raising activities	.120	.210*
Supporting students to ensure that they are ready to learn for successful achievement	.343**	.173

The regression analyses result on relationship with school community as shown in Table 75 indicated that with all the predictor variables together produced the adjusted $R^2 = 0.078$, $F(1, 152) = 13.916$, $p < .001$ for grade 10 and adjusted $R^2 = 0.056$, $F(1, 97) = 6.764$, $p = .011$ for grade 12. This result indicated that, parents supporting students for successful achievement 7.8% of grade 10 and interacting with staff on matters affecting their own children 5.6% for grade 12 from the principals' response as shown in the model explains students' achievement. As can be seen from regression coefficients these two variables entered in the model had significant weights in explaining achievement.

Table 75: ANOVA, regression summary model and coefficients for relationship with school community from principals response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	749.163	1	749.163	13.916	.290	.084	.078	0.000
	Residual	8183.100	152	53.836					
	Total	8932.263	153						
12	Regression	507.987	1	507.987	6.764	.255	.065	.056	.011
	Residual	7284.469	97	75.098					
	Total	7792.455	98						

Regression coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	27.27	1.79		15.16	.000
	Parents supporting students for successful achievement	2.29	.61	.290	3.73	.000
12	(Constant)	34.84	2.49		13.95	.000
	Interacting with staff on matters affecting their own children	2.48	.95	.255	2.60	.011

The relationship among school and the community around is very vital to improve the students' achievement. In this regard, the findings from FGD depicted that there was a strong relationship between school and school community in Addis Ababa, Harari and Dire Dawa regions which were performed better. On top of that, the relationship between school and school community is encouraging according to the participants from Ethiopian Somali, SNNP and Benishangul Gumuz. On the contrary, the participants from Amhara, Oromia, Tigray, Afar and Gembella regions revealed that relationship between school and school community was weak (Appendix C).

4.8.12 School climate and student achievement

The school environment that are friendly, inviting and supportive are assumed to be the predictor for improving students' achievement. Though the school climate includes all the practices and physical environment, in this study the school climate is delimited to attitudes and behaviors elicited by the student and teachers and its contribution to student achievement.

4.8.12.1 School climate from teachers' response

The response of teachers as indicated in Table 76 describes the students attitude and behavior and its correlation with achievement. The student misbehaviors as to the opinion and perception of teachers revealed that in all cases, students' misbehaviors were negatively correlated with students' achievement and the correlations were also statistically significant for both grades except physical injury to other students in grade 12. In other words, when the extent of students' misbehavior like absenteeism, arriving late, classroom disturbance and so on increases, student achievement decreases.

Table 76: Correlation among Teachers opinion about problems related to students behavior and their achievement

Student behavior	Correlation Coefficient	
	Grade 10	Grade 12
Arriving late at school	-.226**	-.278**
Absenteeism (i.e., unjustified absences)	-.302**	-.316**
Classroom disturbance	-.122**	-.215**
Exam cheating	-.071*	-.140**
Destruction	-.179**	-.127**
Theft	-.141**	-.177**
Drug abuse (e.g. chat, cigarette, heroin, cocaine, alcohol /excessive drinking)	-.198**	-.159**
Bullying or verbal abuse among students	-.158**	-.160**
Physical injury to other students	-.120**	-.031

Table 77 also describes teachers' opinion on teachers' behavior. The result showed that in all the issues raised the direction of correlations were negative. This means as the extent of teachers misbehavior increases students' achievement decreases. The correlations between teacher absenteeism and low expectations to their students and achievement were statistically significant in both grades. And also the correlations of teachers being too strict with their students and late arrival were statistically significant with grade 10 students' achievement.

Table 77: Correlation among teachers opinion about problems related to teachers behavior and achievement score

Teachers behavior	Correlation Coefficient	
	Grade 10	Grade 12
Arriving late or leaving early	-.145**	-.062
Absenteeism	-.096**	-.099*
Teachers low expectation of students	-.082*	-.109*
Teachers being too strict with students	-.073*	-.067
Teachers not meeting individual students' needs	-.027	-.052

The regression analyses result on teachers behavior as shown in Table 78 indicated that with all the predictor variables produced the adjusted $R^2 = 0.049$, $F(2, 904) = 24.568$, $p < .001$ for grade 10 and adjusted $R^2 = 0.023$, $F(2, 476) = 6.505$, $p < .001$ for grade 12. This result indicated that, teachers' behaviors from the teachers' response as shown in the model explains 4.9% of grade 10 and 2.3% of grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant rates in explaining achievement.

Table 78: ANOVA, regression summary model and coefficients for teachers behavior from teachers response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	3439.897	2	1719.949	24.568	.227	.052	.049	.000
	Residual	63287.597	904	70.008					
	Total	66727.495	906						
12	Regression	1035.198	2	517.599	6.505	.163	.027	.023	.002
	Residual	37872.833	476	79.565					
	Total	38908.031	478						

Regression coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	41.547	1.130		36.75	.000
	Not choosing teaching as first choice while joined higher education	-2.916	.572	-.165	-5.09	.000
	Arriving late or leaving early the class	-1.636	.342	-.155	-4.79	.000
12	(Constant)	46.014	1.472		31.256	.000
	Teachers low expectation of students	-1.162	.431	-.122	-2.696	.007
	Teachers' opinion about society do not appreciate teaching profession	-2.172	.900	-.109	-2.413	.016

The regression analyses result on students behavior as shown in Table 79 indicated that with all the predictor variables produced the adjusted $R^2 = 0.128$, $F(2, 810) = 60.64$, $p < .001$ for grade 10 and adjusted $R^2 = 0.119$, $F(2, 462) = 32.484$, $p < .001$ for grade 12. This result indicated that, student behaviors from the teachers' response as shown in the model explains 12.8% of grade 10 and 11.9% of grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 79: ANOVA, regression summary model and coefficients for student behaviors from teachers response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	8277.25	2	4138.62	60.64	.361	.130	.128	.000
	Residual	55281.73	810	68.25					
	Total	63558.98	812						
12	Regression	4697.238	2	2348.619	32.484	.351	.123	.119	.000
	Residual	33402.955	462	72.301					
	Total	38100.193	464						

Regression coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	43.281	.883		49.002	.000
	Student absenteeism	-2.884	.301	-.330	-9.571	.000
	Drug abuse (chat, cigarette, heroin, cocaine, excessive alcohol drinking)	-.715	.332	-.074	-2.154	.032
12	(Constant)	49.793	1.158		43.015	.000
	Student absenteeism	-2.004	.521	-.237	-3.844	.000
	Students arriving late at school	-1.207	.531	-.140	-2.275	.023

4.8.12.2 School climate from principals' response

Principals were also asked on their students' behavior and its correlation to achievement as shown in Table 80. The result indicated that all the stated variables were negatively correlated in both grades. Of the misbehaviors of students as viewed by principals absenteeism in both grades and arriving late and classroom disturbance for grade 10 were negatively correlated and the relationships are statistically significant.

Table 80: The correlation among the problems of students' behavior and achievement by principals response

Student behavior	Correlation Coefficient	
	Grade 10	Grade 12
Arriving late at school	-.187*	-.156
Absenteeism (i.e., unjustified absences)	-.323**	-.231*
Classroom disturbance	-.154*	-.053
Exam cheating	.024	-.091
Destruction	-.043	-.188
Theft	-.011	-.014
Drug abuse (e.g. chat, cigarette, heroin, cocaine, alcohol drinking)	-.138	-.159
Bullying or verbal abuse among students	-.048	-.099
Physical injury to other students	.028	-.060
Bullying or verbal abuse of teachers or staff	-.052	-.062
Physical injury to teachers or staff	-.135	-.110

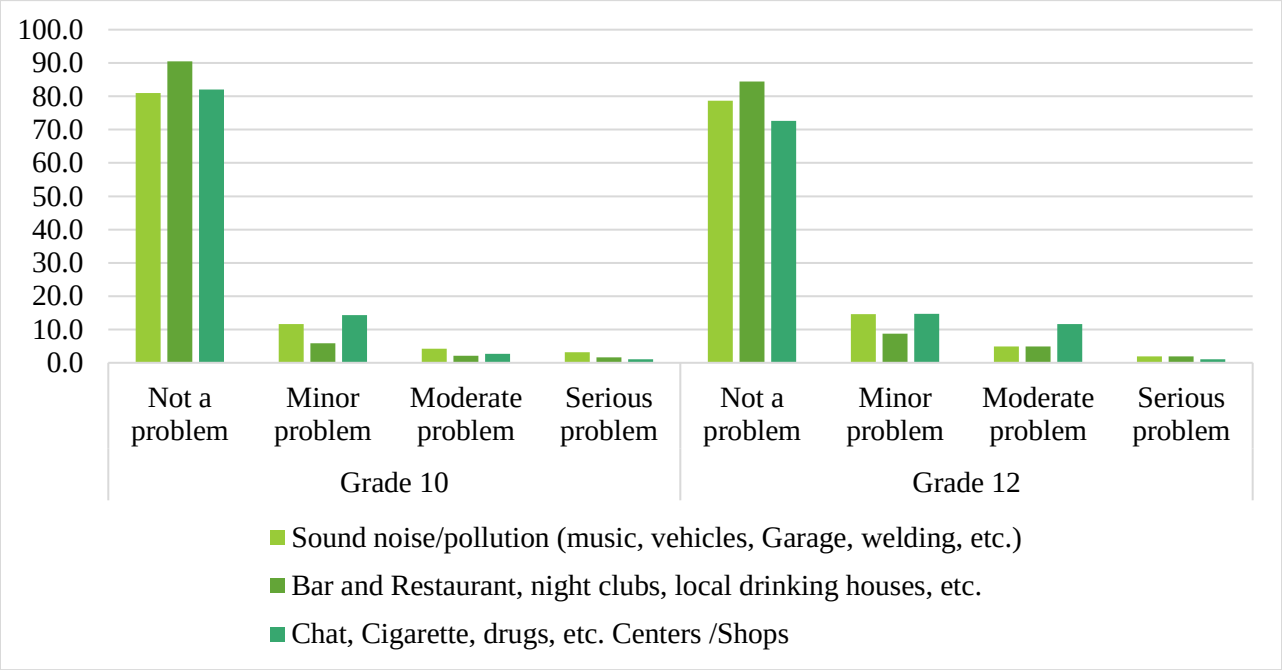
Principals' opinion on teachers' behavior was presented in Table 81. The result showed that in all the issues raised, the direction of correlations were negative. This means as the extent of teachers misbehavior increases students' achievement decreases. The correlations between teacher absenteeism in both grades and low expectations to their students, and teachers not meeting individual students' needs from grade 10 and achievement are statistically significant.

Table 81: The correlation among the problems of teachers' behavior and achievement from principals response

Teachers behavior	Correlation Coefficient	
	Grade 10	Grade 12
Arriving late or leaving early	-.096	-.130
Absenteeism	-.195**	-.166*
Teachers low expectation of students	-.170*	-.120
Teachers being too strict with students	-.117	-.133
Teachers not meeting individual students' needs	-.175*	-.058

With regard to the school environment the majority (about 80%) of principals of both grade levels responded that the school environment problems that disturb the teaching and learning process were not their problem as shown in figure 42.

Figure 42: School environment Problems that disturb the teaching and learning process



The regression analyses result on student behavior as shown in Table 82 indicated that with all the predictor variables produced the adjusted $R^2 = 0.160$, $F(2, 158) = 16.209$, $p < .001$ for grade 10 and adjusted $R^2 = 0.059$, $F(1, 101) = 7.354$, $p < .001$ for grade 12. This result indicated that, school resource from the students' response as shown in the model explains 16% of grade 10 and 5.9% of grade 12 students' achievement. As can be seen from regression coefficients all the variables entered in the model had significant weights in explaining achievement.

Table 82: ANOVA, regression summary model and coefficients for student absenteeism from principals response

Grade		Sum of Squares	df	Mean Square	F	R	R^2	Adj. R^2	Sig.
10	Regression	2268.029	2	1134.014	16.209	.413	.170	.160	.000
	Residual	11053.694	158	69.960					
	Total	13321.723	160						
12	Regression	576.329	1	576.329	7.354	.261	.068	.059	.008
	Residual	7915.639	101	78.373					
	Total	8491.969	102						

Regression Coefficient

Grade		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Err	Beta		
10	(Constant)	40.331	2.302		17.520	.000
	Student absenteeism	-3.970	.741	-.392	-5.354	.000
	Bar and Restaurant, night clubs, local drinking houses, etc.	-3.612	1.341	-.197	-2.693	.008
12	(Constant)	48.475	2.817		17.210	.000
	Student absenteeism	-3.224	1.189	-.261	-2.712	.008

The same as the findings from quantitative data, the results from FGD also revealed that presence of problems in schools with regard to the school climate. The main problems raised by the participants during the discussion were: drug addiction, illegal films, local drinking houses, sound pollution, students' misbehaver etc. (Appendix C). These problems were mainly indicated in city administrations of Addis Ababa and Dire Dawa.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

This chapter presents the conclusions of the research works undertaken and the recommendations made as an outcome of this study.

5.1 Conclusions

The purpose of ETNLA is to inform the education system on what students know and can do on upon completion of General Secondary Education (Grade 10) and the Preparatory Program (Grade 12) in core curriculum areas. It also helps the Ministry to know the contributing factors that affect the quality of education.

The findings of this study indicated that the composite percent mean score was found to be 33.3 and 41.7 for grade 10 and grade 12 respectively. The result is below the minimum policy target of 50% achievement in all the five core subjects at both grades except grade 12 Biology (50.01%). The mean score result of physics was the least whereas Biology was relatively higher in both grades.

The achievement of students as disaggregated by content domain revealed that students grade 10 children faces relatively more challenges on the areas such as writing in English, trigonometry in Mathematics; temperature and heat, geometrical optics in Physics; chemical reaction and structure of the atom in Chemistry; and microorganisms and classification from Biology. Similarly, the result in grade 12 showed that students faces more difficulties in areas of writing and reading in English; statistics in Mathematics; atomic physics, electricity and magnetism, temperature and heat in Physics; carboxylic acids, chemical reaction, and structure of substance in Chemistry and genetics in Biology. On the other hand, students achievement in most of the subjects across cognitive domains revealed that their performance decreases as we go from lower level (knowledge) to higher level (application and above) skills in both grades.

Regarding to students achievement by proficiency level, majority of students' (more than 50%) in all subjects of grade 10 were found to be Below Basic performance level. Whereas in grade 12, the majority of students (ranging from 45.9% to 73.1%) in all subjects except mathematics were found at Basic level. However, 53.2% of students were at Below Basic in mathematics.

The result was found far below the expectation of the national performance level target stated in ESDP V that 50% and 70% of students' in grade 10 and 12 respectively achieve composite mean score of at least 50%. Only 9.1% and 26.6% of grade 10 and 12 students respectively achieved 50% and above by the composite mean score.

The achievement of grade 10 and 12 students as compared by gender, location and school type revealed that males outperform than females, urban students better than rural students, and nongovernment schools outperformed than government schools and all the differences were statistically significant. The result with school rank also indicated that schools with rank A were relatively higher than B, and B higher than C in both grades.

The achievement by regions showed that there were a significant difference between them in both grades. Among the regions as we have seen in the homogeneity subset groupings by the composite mean score, Addis Ababa, Harari and Dire Dawa were relatively the higher achievers where as Benshangul Gumuz, Gambella, Tigray and Afar were from the lower achievers in grade 10. And also in grade 12 Harari, Addis Ababa and Dire Dawa were relatively high performers and Ethiopia Somali and Afar were from the lower achievers.

The students' achievement across time to compare the trend indicated that, in all subjects the achievement of 2013 students higher than 2017 in both grades. This implies that children's performance is decreasing as compared to the previous cycle.

The findings of the background variables as data obtained from students, teachers, principals and parents through the questionnaires and focused group discussion indicated that the following major factors were influencing the achievement of grade 10 and 12 students.

1. Student background:
    - Gender – the gender of students had a significant correlation with students' achievement.
    - Students' age – students' age was found negatively correlated with achievement and it was statistically significant in both grades. That means as the age of students increases achievement decreases.

- Pre-primary education – as observed in both correlation and regression analysis those who attend in pre-primary education significantly performed better in grade 10 and 12 students.
- Parents' education – as the education level of students' father / male guardian and mother /female guardian increases students achievement increased and the differences were statistically significant.
- In general, as observed in regression analysis result, all the above student background variables together accounted for the students' achievement by 16.4% and 9.6% for grade 10 and 12 respectively.

2. Teachers background:
   - The majority of teachers were males and experience between 6-10 years in both grades. The ages of most teachers were between 21 – 30 years for grade 10 and 31 – 40 years for grade 12. In terms of qualification, majority of them were first degree holders who attended their degree by the regular program. The correlation and regression analysis revealed that age of teachers, teaching experience, and level of education had significant positive contribution for students' achievement in both grades. In this case, the teachers' background variables such as age, experience, sex, level of education and the program they attended their education together explain achievement by 9.1% for grade 10 and 2.8% for grade 12.
3. Principals Background:
   - The majority of principals were males (95.4%) for grade 10 and 99.1% for grade 12 with their age range 31 -40 in both grade and qualification first degree (68%) in grade 10 and second degree (49.5%) in grade 12. And more than half of the principals in both grades were trained or qualified by educational leadership /administration. Most of the principals' experience in both grades were between 6 – 10 years as a school principal or deputy principal. All the correlations between principals' background variables and students' achievement were positive. While, the correlations were statistically significant for age and experience in grade 10, and qualification and training on leadership in grade 12.

4. Socio economic status
    - The student socio economic related variables such as economic status of parents, frequency of meal per day, distance travel (grade 10), family size, reference books at home and the presence of house hold properties such as study place, radio, mobile, etc. were significantly contributed to the achievement of students in both grades. All these variables together also influence achievement of grade 10 by 9.6% and grade 12 by 6.6%. This implies, socio economic disparities between families with schools have significant differences in students' achievement.
5. Instructional Materials:
    - As to the response of students and principals, the majority of students have text books in one to one ratio in the assessed core subjects in both grades. However, 4 - 5.5% of grade 10 and 2.8 - 4.4% grade 12 students had no textbooks according to the students' response. Majority of them also do not come always to school with their textbooks (66% grade 10 and 68% grade 12) in the assessed core subjects. This implies that in addition to textbook shortage, proper usage is a problem from student side. The correlation between student achievement and textbook ratio was statistically significant for both grade students.
    - As to the response of teachers, instructional materials such as reference books, syllabus and teachers guide in their subject had statistically significant correlations with students' achievement in both grade levels. The majority of principals were also responded as these materials were available except resource for students with disabilities. The regression analysis result from principals indicated that instructional materials like adequate reference books in the library and teaching aids explains student achievement by 11.2% and 7.8% for grade 10 and 12 respectively.
6. Availability of school resources/infrastructure:
    - The availability of school resources /infrastructures like school library, computers for student use, safe drinking water, separate toilet for male and female, sport fields and materials, classrooms and electric connections were adequately available as to the response of the majority of students, teachers and principals. However, the majority of schools were facing the shortage of science laboratory, internet services

and plasma instructions. In general, all the correlations on resources availability were statistically significant as most of the respondent groups. Similarly, the regression analysis indicated that the school infrastructure together influence grade 10 students achievement by 10.6%, 18% and 26% as to the response of students, teachers and principals respectively. Likewise, for grade 12 school infrastructure together explains by 20.1%, 32.9% and 25.1% as to the response of students, teachers and principals respectively.

- Students' usage of school library revealed that only 18.5% of grade 10 and 24.2% of grade 12 uses library always. But majority responded as they use library some times. Hence, students' awareness and proper use of library requires improvement.
- On the other hand, the effectiveness of plasma instruction as evaluated by teachers and principals was found medium level and the most frequent problems that affect plasma instructions were power disruption and technical problem.

7. Instructional time:
    - Concerning factors related to instructional time, the result revealed that student and teacher absenteeism, time on task (time on homework, study and tutorial), school shift, and portion coverage had statistically significant correlations to the students' achievement. The regression analysis results from the teachers' response revealed that teachers' time engagement on tasks explains achievement by 10.2% for grade 10 and 8.4% for grade 12. Similarly, from principals' response the regression result revealed that teaching and learning time (school shift and school closure) explains students' achievements by 36.9% for grade 10 and 16.5% for grade 12.
8. Classroom assessment and feedback:
    - Classroom assessments such as homework, assignment, and interaction and group work that make students to practice with timely corrective feedback had significant correlations with student achievement.
9. Teachers perception of their students:
    - The result indicated that teachers' expectation and perception to their students were positively correlated with achievement in both grades and the differences are statistically significant.

10. Shortage of teachers:

- The shortage of teachers in the five core subjects shown in the study found that the majority of schools do not have shortage of teachers as to the response of principals. However, a significant number of schools responded that their shortage of teachers as "high" and "very high" ranging from 13% to 20% in each subject. The correlation with achievement also shows that as the severity of shortage of teachers increases achievement decreases.

11. School emphasis on academic success:

- The schools level of emphasis and priority on academic success like understanding the curricular objectives and its implementation, teacher's expectation and team work for improving student achievement and student motivation had positive correlations with achievement. More specifically, for grade 10 schools all the correlations were statistically significant whereas for grade 12, only teachers' understanding of the school's curricular objectives and teachers' ability to inspire/motivate students showed statistically significant.

12. Student attitudes:

- Student attitudes towards their school and their teachers and subject matter is an important variable that affect the achievement of students.
  - The students' attitude towards their school showed positive correlations with achievement for both grade students except on their being proud to go to school, safe and comfortable when they were in the school as grade 10 students' response.
  - Students' attitude towards their subject teachers' showed that the correlations were positive for all subjects of both grades except English grade 12.
  - Students liking the subjects were also showed positive correlations in all subjects for both grades.

13. Student expectation and parental support:

- The high expectation of students for further education has significant positive correlations with student achievement for both grades. While family support for student studies at home has weak positive correlations in grade 10 and negative in

grade 12. The family support in grade 12 doesn't bring any sensible result for student achievement it might be due to the less quality and inappropriateness of the support.

14. Professional development:

- The majority of teachers in both grades responded 'Yes' for existence of professional development activities except use of technology for instruction (computer, internet, plasma etc.), observation visits to other schools /sharing experience, action research and special need education. The correlations between teacher professional development and student achievement were positive in both grades except at classroom management and/or student discipline in grade 12. The regression analysis result indicated that teachers' professional development activities like method of teaching / pedagogy, use of technology for instruction (computer, internet, plasma etc.), action research, mentoring and/or peer observation together explains 4.2% for grade 10. For grade 12, visiting other schools / experience sharing, in-service training (diploma or degree or master program), use of technology for instruction and lesson planning together contributes 6.7% of students' achievement.
- The majority of principals responded 'Yes' for most of professional development activities in both grades. However, professional development in curriculum materials (e.g. text book, syllabus, Minimum Learning Competency), majority responded 'No' in both grades. The regression analysis result indicated that among grade 10 principals' professional development activities in-service training (diploma or degree or master program) and use of technology for instruction (e.g. computer, internet, plasma etc.) together influence achievement by 10.5%. In grade 12, experience sharing and scaling up best practices also explains students' achievement by 3.6%.

15. School management:

- As to the response of teachers and principals, school management activities were positively correlated with students' achievement in both grades. As to the teachers response all the differences were statistically significant in both grades except participatory decision-making and regular staff discussion about how to achieve

school goals/targets from grade 10. However, from the principals perspective for most of the management activities the correlation with student achievement were not statistically significant in both grades except school improvement program, supervision, motivating teachers and discussion with teachers' problems in grade 10.

16. Teachers and principals satisfaction with the working conditions:
    - Teachers' satisfaction with their job and working condition in this study indicated that the majority of teachers (58.7 % grade 10 and 58.8% grade 12) likes their profession and would like to continue working as a teacher. However, 6.2% of grade 10 and 9% of grade 12 teachers were doing their jobs/teaching only as a last option and 15.8% and 16.6% of grade 10 and grade 12 teachers respectively responded that they want to change their profession/job. That means, about 41% of teachers in both grades were not interested to continue working as teachers. The majority of teachers 50.4% from grade 10 and 70.5% of grade 12 teachers believed that they were not valued by both society and their student. The result from majority of principals' response also showed that there was no incentive mechanism for best performing teachers in their school.
    - Principals' satisfaction with their job and working condition also indicated the majority of principals (55.3 % grade 10 and 68% grade 12) likes their profession and would like to continue working as a principal. However, a significant number of principals (44.7% from grade 10 and 32% from grade 12) were responded that they want to change their profession/job.
17. Relationship with parents:
    - As the response of teachers, there were a statistically significant correlation between teachers' – parents' relationship and students' achievement in both grade levels. That means as the frequency and percentage of parents and teacher contact increases the achievement of students also increased. School relationship with parents from principals' response also indicated that all the parents' and community related activities of principals were positively correlated with achievement.
18. School climate with respect to students and teachers behavior:

- According to the opinion and perception of teachers and principals, students' misbehaviors were negatively associated with students' achievement. Particularly as the response of teachers, students' misbehaviors were statistically significant for both grades except physical injury to other students in grade 12. In other words, when the extent of students' misbehavior like absenteeism, arriving late, classroom disturbance and so on increases, student achievement decreases. The regression analysis also showed that student behaviors from the teachers' response explains 12.8% of grade 10 and 11.9% grade 12 students' achievement.
- There were also negative correlation between teachers' misbehaviors and students' achievement as to the opinion and perception of teachers and principals. Specifically, the correlations between teacher absenteeism in both grades, low expectations to their students, and teachers not meeting individual students' need from grade 10 and achievement were statistically significant.
- On the other hand, as to the majority of principals' response, in their school environment there were no problems that disturb the teaching and learning process.

5.2 Recommendation

The results of this study are essential for policy makers, teachers, educators, researchers, parents and learners.

Therefore, the following recommendations stemming from this study may contribute to the increase of learners' success in secondary and preparatory schools:

- Teachers and school administrators are the key actors to provide quality education for citizens'. To this regard, the government tries to improve teachers' qualification by different mechanisms and programs of study. The teachers' quality assurance system using licensure program was in place. Teachers' motivation mechanisms like salary increments, providing residential houses are good efforts to improve teachers' motivation and capacity. However, this study found that a significant number of teachers (41%) and principals (44.7%) were not satisfied on their job and working conditions and most of teachers perceive that teaching profession as undervalued by the society and their students. So, policy makers and regional authorities should consider whether sufficient, motivated and

qualified teachers are available in every school. Differentiated and competitive type of reward and benefit package should be devised as motivation system for teachers and principals based on their performance.

- The study found that there were still a greater diversity in students' performance across gender, location, school type and regions. Policy makers should focus their attention on how basic skills performance varies between different groups of students and different schools within each region. Differentiated support mechanism seems important for those that are lagging behind groups for instance in resource supply and capacity building.
- The study found that pre-primary education was positively related to later academic success. Hence, policy makers and educationalists should consider the expansion of pre-schooling. Attention should be paid to different forms of pre-schooling that may strengthen the academic performance of students in the long run without affecting negatively the overall personal development of small children. The existing O-class approaches of pre-schooling which could help children from less advantaged socioeconomic backgrounds in the education system should be strengthen.
- In this study, student and teacher related behaviors like absenteeism, misbehavior, perception and attitude significantly contributed for students' achievement. So, policy makers, teachers and principals should work to build a conducive school climate.
- The availability of school infrastructure and educational resources significantly contributed to students' achievement. As to the majority of research participants' response, most of the resources were available in their school. However, science laboratory and ICT (internet service and plasma instruction) were poorly available. Therefore, policy makers and regional education bureaus should consider whether schools and teachers are adequately equipped to cope with the challenges of teaching and learning posed by the growing use of ICT for instructional purposes.
- There is a positive relationship between expectation, interest in and enjoyment of a subject, and the achievement scores of students. Thus, policy makers, parents, and teachers should consider initiatives for increasing the awareness and motivation/interest among students in learning and studying.
- Family education and support were also found as a significant contributor for students' achievement. As the fathers' and mothers' education level increases, students' achievement

also increased. Thus, policy makers and regional authorities should work on parents' education like strengthening adult education program.

- Instructional time was found a critical factor both by students, teachers and principals. The school calendars set by the ministry of education was affected by different reasons like teacher and student absenteeism and school closure. The portions were not covered by such a related reasons. Hence, policy makers, educational experts, principals and teachers should monitor and address this problem. Specially a strategy both on teacher and principal lateness and absenteeism, and lately start and early closure of schools should be devised.
- Students' achievement in successive rounds of NLA indicated that it was far below the policy target and ESDP V. The trend indicates declining. Students' achievement in problem solving and higher order thinking skills is very low. And also the percentage of students who are achieving at proficient and advanced level are almost insignificant. This might be due to the gap that our students were not engaged with the appropriate curriculum or content area or it might be too difficult against their age level or there would be a teaching gap. Hence, following additional and detailed investigation curriculum reforms aimed to change the form and content of teaching and learning appear important.
- Researchers are encouraged to conduct their own studies on students learning secondary schools at different levels such as classroom, school, sub city, zone, woreda, and region level to address the issue more widely and provide intervention according to the gap existed in each level.

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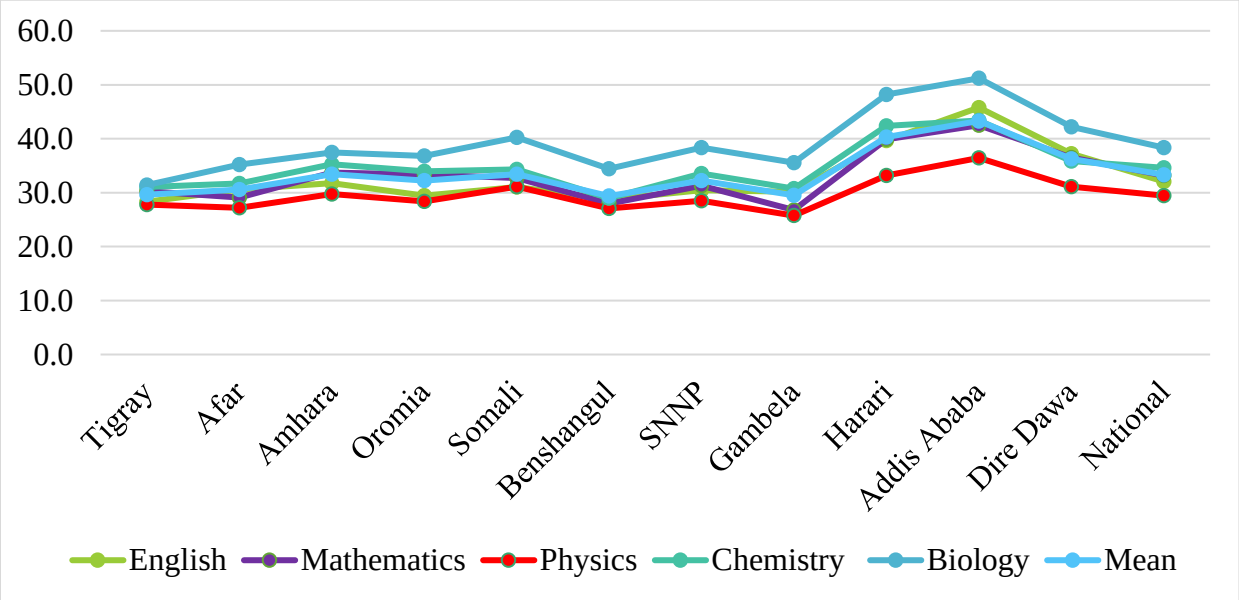
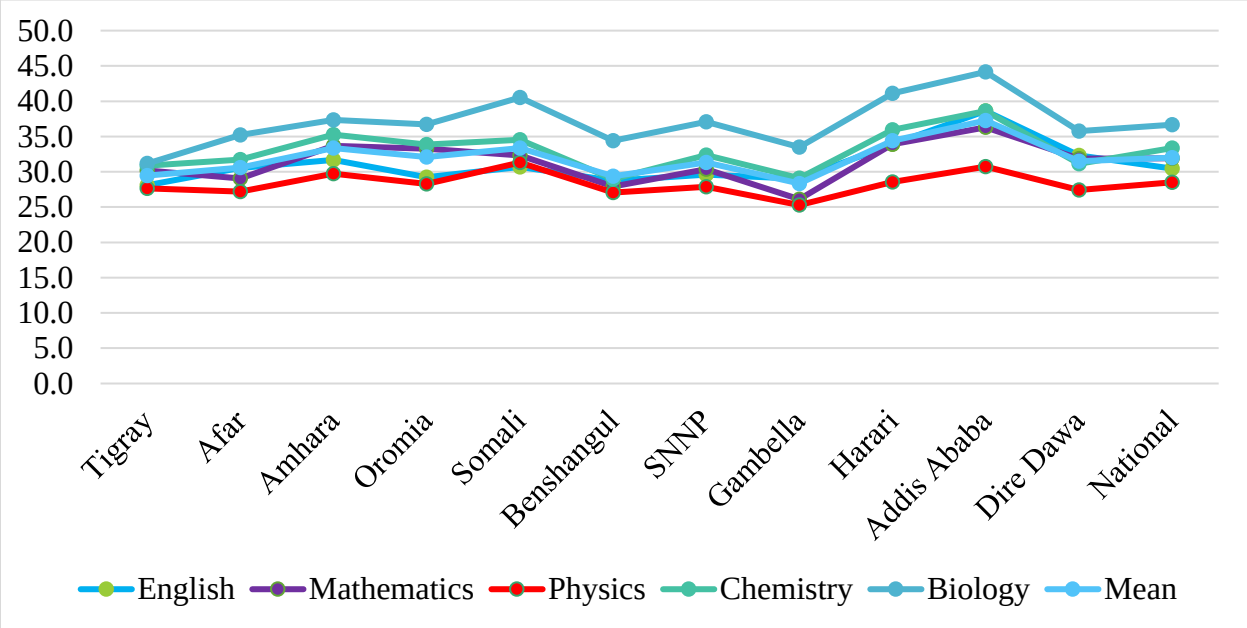
APPENDICES

Appendix-A: Regional Achievements by School Types

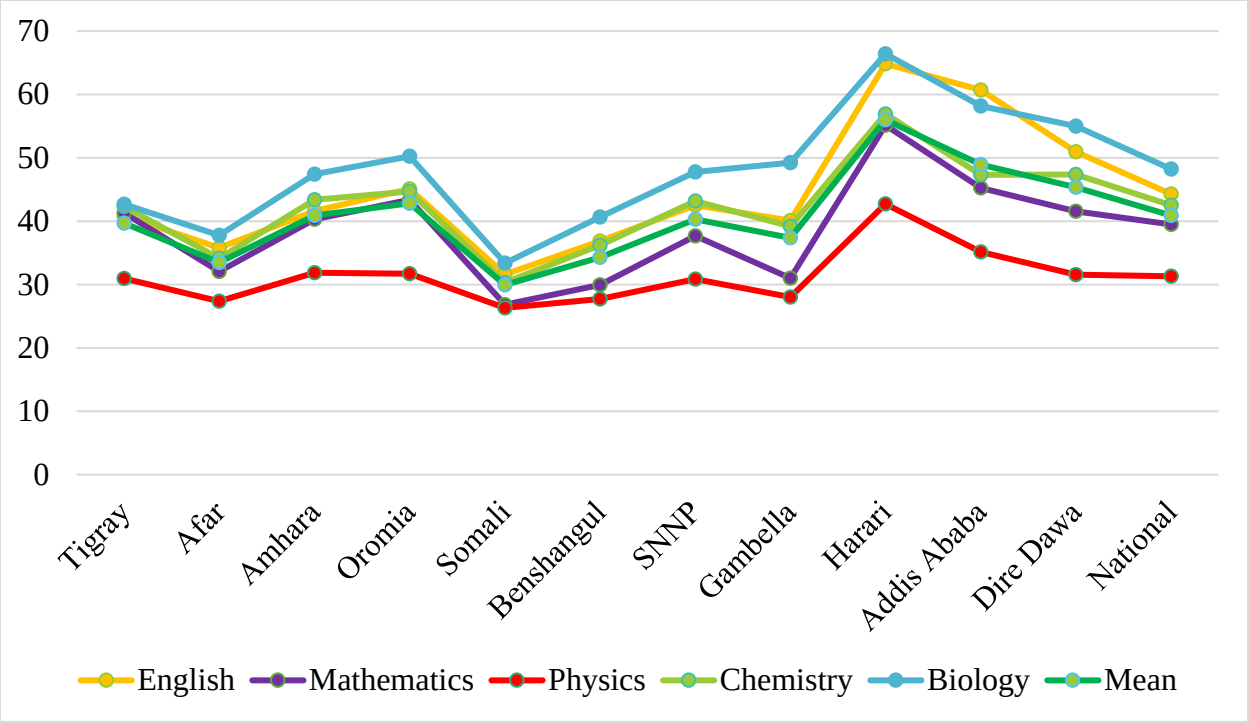
Grade 10 Achievement by Region in all sample Schools



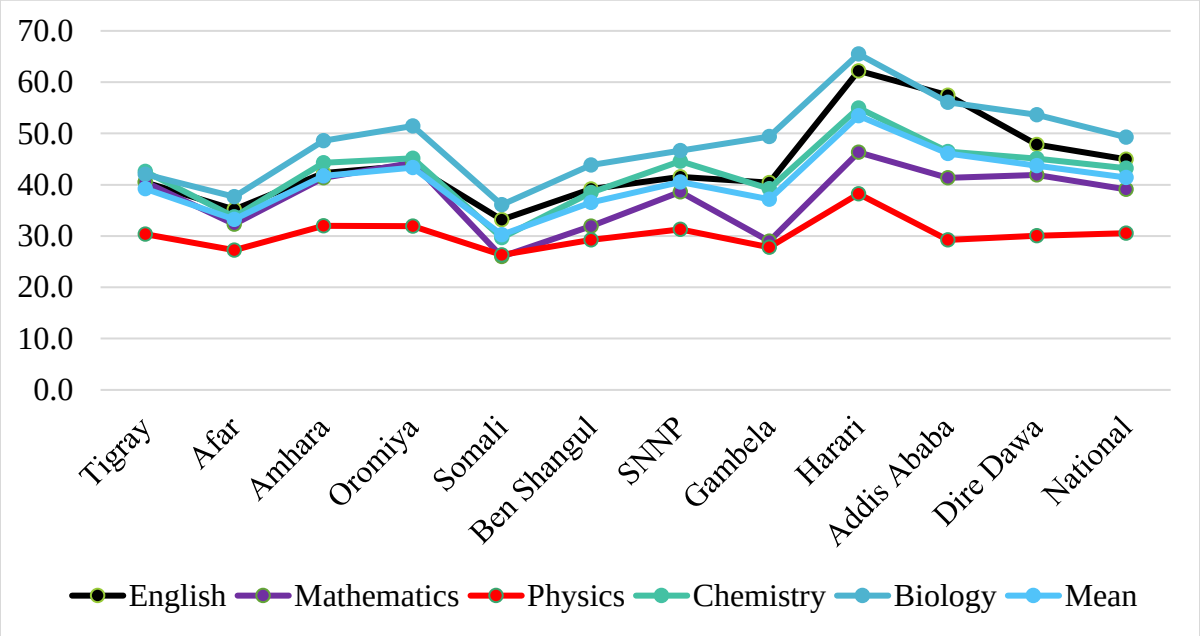
Grade 10 Achievement of Regions by Government schools



Grade 12Achievement by Region in all sample Schools



Grade 12 Achievement of Regions by Government Schools



Appendix-B: Regional Achievements in Homogeneous Subsets for each Subjects

G10 Homogeneous Subsets of regions in English

Region	N	Subset for alpha = 0.05				
		1	2	3	4	5
Tigray	724	28.32				
Benshangul	213	28.74	28.74			
Oromia	1814	29.46	29.46	29.46		
Gambella	438	30.17	30.17	30.17		
SNNP	1271	30.46	30.46	30.46		
Afar	208	30.57	30.57	30.57		
Eth. Somali	423		31.05	31.05		
Amhara	1525			31.79		
Dire Dawa	313				37.25	
Harari	254				39.63	
Addis Ababa	614					45.78
Sig.		.199	.167	.158	.134	1.00

G10 Homogeneous Subsets of regions in Mathematics

Region	N	Subset for alpha = 0.05						
		1	2	3	4	5	6	7
Gambella	407	26.79						
Benshangul	214	27.94	27.94					
Afar	206	29.07	29.07	29.07				
Tigray	726		30.29	30.29	30.29			
SNNP	1259			31.29	31.29	31.29		
Eth. Somali	412				32.74	32.74		
Oromia	1792					33.34		
Amhara	1564					33.73	33.73	
Dire Dawa	310						36.50	
Harari	246							39.88
Addis Ababa	579							42.50
Sig.		.297	.249	.336	.202	.206	.081	.126

G10 Homogeneous Subsets of regions in Physics

Region code	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
Gambella	422	25.75					
Benshangul	212	27.07	27.07				
Afar	210	27.19	27.19				
Tigray	708	27.78	27.78	27.78			
Oromia	1816		28.36	28.36			
SNNP	1250		28.50	28.50			
Amhara	1570			29.74	29.74		
Dire Dawa	304				31.10	31.10	
Eth. Somali	416				31.13	31.13	
Harari	250					33.17	
Addis Ababa	591						36.44
Sig.		.145	.651	.180	.679	.126	1.000

G10 Homogeneous Subsets of regions in Chemistry

Region code	N	Subset for alpha = 0.05				
		1	2	3	4	5
Benshangul	214	28.97				
Gambella	410	30.74	30.74			
Tigray	712	31.04	31.04	31.04		
Afar	205	31.73	31.73	31.73		
SNNP	1243		33.54	33.54	33.54	
Oromia	1774		33.95	33.95	33.95	
Eth. Somali	419			34.34	34.34	
Amhara	1577				35.27	
Dire Dawa	315				35.86	
Harari	242					42.41
Addis Ababa	574					43.38
Sig.		.208	.067	.052	.466	.997

G10 Homogeneous Subsets of regions in Biology

Region code	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
Tigray	749	31.41					
Benshangul	208	34.41	34.41				
Afar	210		35.23	35.23			
Gambella	395		35.56	35.56			
Oromia	1775		36.79	36.79	36.79		
Amhara	1557		37.47	37.47	37.47		
SNNP	1237			38.33	38.33		
Eth. Somali	412				40.26	40.26	
Dire Dawa	299					42.21	
Harari	241						48.21
Addis Ababa	584						51.20
Sig.		.261	.236	.219	.100	.850	.267

G12 Homogeneous Subsets of Regions in English

Region	N	Subset for alpha = 0.05						
		1	2	3	4	5	6	7
Eth. Somali	308	31.60						
Afar	208	35.80	35.80					
Benshangul	227		36.88	36.88				
Gambela	228		40.10	40.10	40.10			
Tigray	362			40.82	40.82	40.82		
Amhara	578				41.62	41.62		
SNNP	550				42.52	42.52		
Oromia	850					45.09		
Dire Dawa	173						50.93	
Addis Ababa	412							60.69
Harari	174							64.83
Sig.		.101	.083	.163	.829	.090	1.000	.114

G12 Homogeneous Subsets of regions in Mathematics

Region	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
Eth. Somali	271	26.83					
Benshangul	220	29.96	29.96				
Gambela	208	31.01	31.01				
Afar	205		32.08				
SNNP	542			37.68			
Amhara	569			40.28	40.28		
Tigray	353			41.31	41.31	41.31	
Dire Dawa	166			41.55	41.55	41.55	
Oromia	825				43.40	43.40	
Addis Ababa	397					45.23	
Harari	179						55.14
Sig.		.180	.951	.281	.615	.265	1.000

G12 Homogeneous Subsets of regions in Physics

Region code	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
Eth. Somali	303	26.32					
Afar	202	27.35					
Benshangul	225	27.73	27.73				
Gambela	207	28.01	28.01	28.01			
SNNP	538		30.83	30.83	30.83		
Tigray	338			30.95	30.95		
Dire Dawa	160				31.57		
Oromia	859				31.73		
Amhara	555				31.86		
Addis Ababa	400					35.16	
Harari	177						42.71
Sig.		.832	.064	.104	.994	1.000	1.000

G12 Homogeneous Subsets of regions in Chemistry

Region code	N	Subset for alpha = 0.05						
		1	2	3	4	5	6	7
Eth. Somali	330	30.31						
Afar	206	34.12	34.12					
Benshangul	221		36.23	36.23				
Gambela	215			39.18	39.18			
Tigray	346				42.34	42.34		
SNNP	544				43.17	43.17	43.17	
Amhara	562				43.39	43.39	43.39	
Oromia	864					44.69	44.69	
Addis Ababa	399						47.34	
Dire Dawa	168						47.39	
Harari	174							56.93
Sig.		.176	.909	.552	.082	.834	.081	1.000

G12 Homogeneous Subsets of regions in Biology

Region	N	Subset for alpha = 0.05						
		1	2	3	4	5	6	7
Eth. Somali	266	33.38						
Afar	195	37.77	37.77					
Benshangul	215		40.64					
Tigray	342		42.67	42.67				
Amhara	562			47.43	47.43			
SNNP	530			47.79	47.79			
Gambela	212				49.22			
Oromia	857				50.22	50.22		
Dire Dawa	168					54.99	54.99	
Addis Ababa	412						58.16	
Harari	163							66.40
Sig.		.203	.092	.062	.831	.114	.682	1.000

Appendix- C. Qualitative data analysis from FGD

The availability of Text books and Reference books

REGION	PARTICIPANTS VIEWS	
	Students	Teachers, Principals and Parents
AMHARA	• There is no scarcity in English and science subjects of text book. One book for each subjects are available. • Students do not bring the text book to class. Rather they bring turn by team • The contents of the book are good. But it is difficult for to understand. • Some of the students have reference books and use it. But majority of the students do not have.	• With the exception of English and Amharic, Text books is ratio 1:1. • The major problem is that students do not come with their books. The reason they say is there is large distance from home to school and it is difficult to carry all the text books. • With regard to content, Physics is difficult to students
OROMIA	• Students bring the text book to school turn by turn • There is one to one text books but they are copy (not original) it is difficult to identify different figures in the book so it is not attractive. • Only few students bring text books to the school. Since the size of the book is too large it is difficult to carry. • Mathematics and physics content is difficult and other subjects are medium. • There is no enough reference books in the library and most of the students have no reference books at home.	• Text book to student ratio is 1:1 except English Afan Oromo and and Amharic • With regard to difficulty, Physics in difficult in all grades.
TIGRAY	• All students have one book for each subjects. • They don't bring the textbook to the class. Because the text books are too huge to carry • Some subjects' content are good but physics is too complex • Students have no reference books in our home	• In most subjects text book to student ratio is 1:1 with the exception of Amharic, Tigrigna, and physical education. • The contents of some subjects is difficult for students. Eg in English and Chemistry. • In general, textbooks favor urban students with better access.
SNNP	• Students have one to one science text books. • Students don't bring text book to class because as it is heavy to carry. • Most students have no reference books in their home	• Text book to student ratio is 1:1 except History, economics, geography, Amharic and Physical education
DIREDAWA	• All students have one to one science text book. • All most all students do not bring textbook to class because the size of the books are large to carry. • Physics subject is difficult in content and others are relatively good. • Many students do not have reference books in their home.	• Text books are distributed in a 1:1 ratio in almost all subjects. • But the problem is students do not bring texts to school and teachers do not follow up and control their students.
ETHIOPIAN SOMALIE	• In all subjects there is one to one text books. • Not all students bring the text books to class. • The contents of the book are good. • There is no reference books.	• Text books are 1:1 and no problems of text books in the region. • Majority of students come to schools with their text books.

		• Regarding to content areas all the subjects have medium difficulty levels except Mathematics
AFAR	• There is one to one text books in all subjects. • The school administrator and teachers do not control students to bring text books to class. Thus, students bring the text book turn by turn. • The text books content is medium. But physics subject is somewhat difficult. • Few students have reference books at their home.	• Ratio of textbooks to students is 1:1. • Student do not bring text books to school. • Contents of some subjects are difficult Eg. Chemistry contents are complex for students to understand.
BENISHANGUL GUMUZ	• Except in Amharic there is a one to one text books for all subjects. • There is no enough reference books in other school and students do not have reference books • Since students comes from far they bring text books turn by turn as it is difficult to come with all books every day. • Physics and chemistry book contents are difficult.	• Except Amharic and HPE the rest subjects are in 1: 1 textbook to student ratio. • Most texts have medium difficulty. However, since science subjects are not supported by laboratory and they are slightly difficult to understand.
HARARI	• There is one to one textbook ratio. But the students don't bring text book to class. • In the school there is reference books. • Some textbook content are not brief. For example chemistry and physics.	• Except for History and Harari, text books are allocated 1:1. • Regarding to content, Biology and Physics are not precise and attractive in its preparation. Maths Grade 11 Chapter 5 is very vast it needs improvement.
GAMBELLA	• There is no one to one text book. • Students do not bring text book to class. There is no control of teachers. • Except physics the content of other subjects are medium. • Only few students use reference books	• Text books for most subjects is not in 1:1 ratio. • The other problem is students do not come with their text books. The reason they forward is that they come from very distant
ADDIS ABABA	• There is one to one text book textbook ration. • Not all of the students bring text book to class. Because the size of the book to carry. • The content of the book is medium in difficulty but physics and mathematics subjects are difficult. • Only few students have reference books at their home. Because majority cannot buy reference books.	• Text book to student ratio is 1:1. • Many students do not bring text books to class. As bring all text books is very difficult. • Most subjects can be grouped under medium difficulty but Physics and Maths are difficult subjects.

Views of participants on Teaching Learning Process

REGION	PARTICIPANTS VIEW	
	Students	Teachers, principals and Parents
AMHARA	The teaching learning process in the school is not such attractive. • Because, almost all teachers use lecture method of teaching. • The teaching learning process is not supported in practical work. • Some teachers are incapable to teach and they don't know subject matter properly. • Most teachers give homework and class work but they don't check and give feed back • The period allotment given for each subject is appropriate.	• Most teachers are competent in the subject they teach and are willing to help students equally • Teachers use student center method of teaching. • Some teachers are less competent with insufficient knowledge of the subject matter and pedagogy. Specially, teachers graduated in applied science and do not attended PGDT • Most of the students have no interest to learn. Some of them their reasons are: shortage of school inputs, poor academic background of students in lower grades, rare opportunity to job after graduation etc. • The time allotment for some subjects is not sufficient enough (Physics, Geography, history, English). • Schools starting date is usually late and there are also loss of instructional period. These have an impact on content coverages.
OROMIA	• Most teachers use lecture method and participate all students. • Most students' interest to learn is low • Teaching learning process does not start on time as it stated on calendar • Most of the teachers have subject matter knowledge. However, some of them do not have the required knowledge for the class assigned. • Most teachers give homework or assignment, but they don't check and give feedback. • Teachers used continuous assessment only for marking and some of them don't like their profession • Many teachers try to help students in group and individually and no special support for female students. • The period allotment for some subjects like English, Maths, physics and Geography is not sufficient	• Most teachers have good knowledge of their subject matter. But there are teachers that do not teach to their best and do not seem to have the required knowledge of their subject. • Most teachers do not use formative assessment instead they usually use repeated testing. • Teachers do not have motivation to teach as a result, performance of students became lower • Most students do not have interest to learn. • The period allotment for many subjects is not proportional to the contents. Eg. English, Physics, Chemistry, Geography
TIGRAY	• The teaching learning process is good but students' attitude towards learning is very low. • Teachers are teaching in a proper way. They have enough knowledge of subject matters. • Most teachers use active learning methods. • Some teachers are not committed to teach and don't like their profession • The period allotment through all subjects are fair. But for physics it is not enough to cover the portion on time.	• Most teachers try to address their knowledge • Majority of teachers have good knowledge and pedagogical skills. However many of the teachers lack interest and motivation in teaching. Thus, they are continuing their distance education in other fields of studies in order to change their profession. • Most students are not interested to learning and not fully attended the school attendance • Reasons for lack of interest are: unemployment after graduation, interested to have certificate of high schools and then want to engage in income producing businesses at earlier.

		• Period allotments are not enough for many subjects. Specially, for Physics, Chemistry, and Biology in all grades because there are laboratory activities to be done on each subject.
SNNP	• The teaching learning process is almost good. Most students don't like to learn. • Most teachers use lecture method. • There are teachers who give assignment, homework and class work and check. But some of them give activities for students but don't check and provide feedback • Period allotment for each subjects is fair.	• Education quality is a serious issue and no improvement from time to time. • Majority of teachers have good knowledge and skill. However many of the teachers have no interest and motivation in teaching. As their salary is not proportional to their responsibility. • Many students have no interest to learn. They do not regularly attend class • There is optimum allocation of periods for many subject. But, in most of the preparatory subjects the given period was not enough to cover the portion.
DIRE DAWA	• The teaching learning process is good but, students' interest to learn is low. • Teachers use student centered teaching method. • Only some teachers use continuous assessment properly and give feedback for students • Some teachers do not respect their profession. • The time given for each subject is fair except physics. • No support for special need students is p.	• Few teachers have the problem of motivation in teaching and less enthusiastic in their profession. This is due to less emphasis given to teachers and teaching and lack of incentives • Motivation of students to learn is decreasing from to time. Many students have not commitment to learn. The main reason for this is that parents and teachers do not consistently give support and follow up for their children. • There are a lot of unplanned meetings carried during the school days and a number of celebration holidays frequently practiced which wastes a lot of periods. • Portions of science subjects most of the times are not covered by the allotted period.
ETHIOPIAN SOMALIE	• The teaching Learning process is going on in a proper way. • Teachers are using various teaching methods such as group work, giving homework, questions and answers and. use continuous assessment • They give special support for female students. • The period allotment for each subjects are enough.	• Education quality is increasing from time to time • Majority of teachers are trained in the subject they teach and methodology of teaching. Hence they are competent in their subject matter and are good in classroom management and assessment. • They usually help female students in a separate programs. • Few students have no interest and motivation to learn, but, since the last few years, students' interest is increasing and their performances improved. • Period allotments are not sufficient for social science subjects to cover the portion.
AFAR	• Teaching learning is smoothly going on and students interest to learn is also good • Most teachers use lecture method. • Most teachers use their time properly, however, some of them do not enter the class even while they are in the school. • Some teachers are not interested to teach. • Female students have special support from their teacher. • Except English and Chemistry all subjects' period allotment is good.	• There are a problems for teachers in mastery of the subject content. • Active method of teaching is not common. • Some teachers are not interested end motivated to teach. • Most students have no interest to learn. • Students who did not attend the class most of the time scorer high in exam which created a negative feeling on good students. • Period allotments are not enough for many subjects (Physics, Mathematics, History, Chemistry and Biology) and portions are not covered properly.

BENISHANGUL GUMUZ	• The teaching learning methods is not participatory. • Teachers use continuous assessment but the feedback is not on time. • Some teachers do not like teaching profession. • Female students are supported, but there is no support or tutorial given for special need students. • The students' interest to learn is too low. • The period allotment for other subjects are good except social science subjects.	• Majority of teachers are teaching the subject of qualification and have no problem of subject matter knowledge • Teachers apply continuous assessment method and frequently give feedbacks to their students. • Majority of students have no interest to learn and not attended the classes regularly and even they do not show motivation to do class works and home works. • For most subjects, it is not possible to cover the portion of textbooks in the given time as the contents of most of the text books in high school are vast.
HARARI	• Teachers' encouragement to improve students' achievement is good. • Most of the time, teachers highly use lecture method • Most teachers don't respect their profession and want to leave it • While students feedbacks for the teachers regarding teaching, they don't obey to accept.	• Majority of teachers are competent that they have good knowledge and skills of their subject matter. • Teachers use student center method of teaching and continuously assess their children at least at the end of each chapter and give feedback. • Most teachers are not satisfied with their profession. • Majority of the students have no interest to learn and do not attend classes regularly. • The contents for Physics and Maths are vast and do not covered in the allotted periods.
GAMBELLA	• The teaching learning process is not attractive as teachers use lecture method • Most teachers use continuous assessment but only few of them give feedback • Teachers are not supporting students in group or individually • Students' interest to learn is low. • The period allotment for all subject is not enough.	There is shortage of teachers in many subjects and diploma holders are assigned mostly in high school. • This leads to incompetency of teachers on the subject. • Many teachers use teacher centered method. • Majority of teaches have no good motivation to teach. Consequently they have no initiation to help students out of class hours. • Students' motivation is very low because they were not well prepared in lower grades and they cannot properly read and write and their interest to stay at school is very low. • Period allotted to most subjects is not sufficient
ADDIS ABABA	• The number of experienced teachers are low. This can directly affect the teaching learning process. • The students' interest to learn is low due to economic factors. • Most of the time they use lecture method. • Most of them don't like the profession, have less motivation, and don't make enough preparation for the class • Some teachers do not use time properly and they enter late and leave early. • Teachers are no support students in group or individually. • No special support for female students. • The period allotment for some subjects like History and Geography are not enough to complete on time.	• There are teachers who have very good knowledge of subject matter and effectively teach students. On the contrary some teachers have problems of mastery of subject matter and face difficulty in teaching students. • Majority of teachers do not follow active method of teaching. • Students motivation and interest to learn is low and they do not regularly attend the class • However students with close follow up and support from their parents are committed to learn and their performance is good. • Periods allotted for History and Geography are very small and difficult to cover the portion. Similarly Physics grade 10 is too.

Participants Views with Regard to the School Facilities

REGION	PARTICIPANTS	
	Students	Teachers, principals and Parents
AMHARA	• There is no organized library. Even the library has no enough reference hooks. • In most schools have no laboratory rooms • No equipped ICT rooms and ICT teachers. • There is no plasma education because of the of lack of electric power	• No Sufficient laboratory equipment, • No enough reference books in library, • No enough computers for students and • Inadequate separate toilet for girls and boys. • Shortage of classrooms for teaching.
OROMIA	• No enough classrooms and desks for students. • The school is not organized in facilities (no pure water, inadequate separated toilet for male and female students, no any laboratory materials and Lab technician. • There is no functioning library with enough reference books. • There is pedagogics center but does not give service • There is ICT room in the school but has no enough computer and cannot provide internet service. • The students are not learning by plasma TV due to class starts lately.	• Majority of schools have problems in school resources. • There is shortage of classrooms, and laboratory • Pedagogical centers are not properly equipped. • No ICT rooms. • Plasma TV is not functional. • Shortage of drinking water and electricity • Thus Schools are not conducive for teaching learning process
TIGRAY	• Classrooms are comfortable for teaching learning process. • There is no pure water and sport fields. • There is laboratory but not equipped by necessary materials. • There is ICT room which has few computers and no connected to internet	• Many schools are not conducive for teaching and learning process. • In most cases there are no adequate resources. (electricity, no sustainable drinking water, shortage of reference books in library, inadequate laboratory and lack of lab technician)
SNNP	• The school has library but it has no necessary materials. • There is no enough laboratory with technician. • There is ICT room. The number of computers are not enough for students and not connected to internet. • No plasma TV instruction.	• Some schools have organized facilities for different services. • But apart from the arrangements of classes: they have no adequate materials like lab equipment, computers, books for reference etc.
DIREDAWA	• Most schools have sport field and separated toilet for male and females. • There is no pure water. • There is organized library in the schools. • There is laboratory room. But it is not equipped by necessary materials • There is ICT room it has computer one to two. But no internet service. • There is plasma TV teaching.	• Inadequate school compound which does not allow free play ground for students, • Reference books are not available as required, • There are separate toilets for boys and girls but they are not far apart because of insufficient area.
ETHIOPIAN SOMALI	• The school environment is not conducive for teaching learning process. • Because most schools have no, library, laboratory and ICT rooms	• Majority are challenged with shortage of school resources like reference books, laboratory materials, computers for

	• There is plasma TV but it is not functioning.	students and appropriate classrooms for teaching learning • No separate toilets for male and female students as well as plasma lesson throughout.
AFAR	• Most schools have no enough facilities • No suitable with the air condition. • No sport field and pure water • No separated toilet for male and females. • There is no organized library giving service and laboratory rooms. • There ICT room but it does not give service and has internet connection. • There is plasma TV but does not functioning.	• Schools are not conducive for learning. • There is shortage of drinking water in the schools Shortage of reference books, laboratory materials, computers for students and very few classrooms for teaching learning • No plasma lesson throughout because of electricity.
B/ GUMUZ	• The school is not attractive for teaching learning process. • There is no sport field and pure water, • Shortage of classrooms and absence of separate toilet • There is no organized library and laboratory • ICT rooms have no enough computers and internet service and no plasma TV instruction.	• Majority of the schools are not conducive for teaching and learning process. • No Sufficient laboratory equipment, no enough reference books in library, no enough computers for students and no separate toilet for girls and boys. • The other basic problem is shortage of classrooms.
HARARI	• There is sport field, pure water, separated toilet for male and females. • There are also enough computers, there is plasma TV but, it has no program. • There is pedagogics center. Teachers and students are using it. • There is ICT room in the class, but no enough computers	• Most of school facilities are adequate and enough like class rooms are appropriate, • Libraries were well equipped with reference books, • There is shortage of chemicals in the laboratory • Plasma instruction is sometimes interrupted.
GAMBELLA	• The school is no good environment for teaching learning process. • No libraries, laboratories and pure water • There is ICT room but it has no enough computer. • There is no plasma TV instruction.	• There is no conducive environment for teaching learning process. • Schools are free to the external environment with no fence. • Many school resources are not fulfilled (reference books, laboratory equipment and computers)
ADDIS ABABA	• Most schools have standardized classrooms, pure water, separated toilet for male and females. But no sport fields. • There are the noises disturb the class from the outside • There is library but not organized and fulfilled by necessary books. • There is laboratory room. But has no lab technicians. • There is ICT room with computers and internet but does not work. • There is Plasma TV. But teachers do not open it and not learning through it.	• There is no problem in main school resources. • However, schools are exposed to external disturbance. Sounds from cars and music • There are drug shops and Khat chewing shops which disturbs the teaching learning process.

Opinion of Teachers, Principals and Parents on teachers Professional Development

REGION	Participants views
AMHARA	There are efforts to give school based trainings on different topics like CPD, test development and class room management and teaching methodology. However, there are no capacity building trainings initiated by woreda and the regions.
OROMIA	School based trainings are frequently given on different topics like CPD, continuous assessment, method of teaching and on classroom management and creation of students' motivation in learning. Some teachers also have got to upgrade their career on summer programs. However, there are no short term on job trainings offered by woreda education offices or regional education bureau.
TIGRAY	School based trainings are given frequently at school levels. This is done by identifying the training gaps. For example in this year, many trainings were given on continuous assessment, classroom management, pedagogies, CPD, and project development. Mekele university also sometimes provides support on trainings.
SNNP	There is no much trainings given in the school. However, teachers are given the opportunity of summer training for upgrading.
DIRE DAWA	Previously, trainings were provided on prioritized topics at school level. But, now school level trainings are officially prohibited for unknown reason, this became an obstacle for school improvement.
ETHIOPIAN SOMALI	There are no in-service trainings for teachers. There is a large gap in providing integrated capacity building for teachers. Teachers are working by the potential they already got from colleges and universities.
AFAR	Sometimes, few teachers participate in trainings like method of teaching, assessment and they try to share to the other staff. CPD is frequently given in school level. But this is not sufficient.
BENISHANGUL GUMUZ	Sufficient training were no provided at school level.
HARARI	Some trainings were given on different topics. Example, Active learning, continuous assessment, drug abuse etc.
GAMBELLA	There are no capacity building trainings provided.
ADDIS ABABA	Trainings are frequently given for teachers on different issues in this year as refreshments. Example, Continuous assessment, CPD, action research, induction, professional licensing, gender etc.

School Community Relationships as teachers, principals and parents view

REGION	PARTICIPANTS VIEWS
AMHARA	School community relationship is poor. Parents and the society around are not participate in the school development and students learning. Those parents with better income send their children to other better school instead of supporting the nearby school.
OROMIA	Community and school relationship is low. School leaders try to involve the society by their representatives. So school issues are discussed with PSTA. However the involvement of the large community is not as required.
TIGRAY	School and community relationships is very weak. Often teachers and school management try to participate the community by calling through their children. However, most of parents and the whole society are not willing to come to school. They prioritized their individual home issues. If they are few parents to participate in school issues, they come only during the final parents' day during the school closing.
SNNP	There are encouraging efforts in community participation and mobilization. The society participates in many school issues like buildings, and financial contributions. However, it is not sufficient compared to the gaps of schools.
DIREDAWA	Currently school community relationships is good. Many parents try to communicate with the school about their children. Today, the concern of community about school issues is somewhat improved.
ETHIOPIAN SOMALI	Currently, school community relationships is good. Society around started to look and support schools around.
AFAR	There are efforts to communicate the community around, but parents and the community are not willing to participate on school issues. However, the attitude of the society towards supporting school is not yet improved. So there is no strong school community relationships.
BENISHANGUL GUMUZ	School and community relationships is good and the society around tried to cover the payment for school facilities.
HARARI	There is strong establishment of school community relations. Each class has parent representative and students performance evaluated at the end of every three months. There are also volunteer individuals that give support to low income students.
GAMBELLA	School community relationships is very low. Parents do not give any support to their children and do not communicate with the teachers and school administration.
ADDIS ABABA	School community relationships is very strong. Parents support schools to manage students' behavior, finance and other issues.