

Second National Learning Assessment on Grades 10 and 12 Students



**National Educational Assessment and Examinations Agency
Educational Assessment Directorate**

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Acronyms and Abbreviations

AAEB Addis Ababa Education Bureau

AIR American Institutes for Research

ANOVA Analysis of Variance

CTT Classical Test Theory

ESDP Education Sector Development Program

ESNLA Ethiopia Second National Learning Assessment

ETP Education and Training Policy

ETS Educational testing Services

GEQIP General Education Quality Improvement Program

IATA Item and Test Analysis

IRT Item Response Theory

MLC Minimum Learning Competency

MoE Ministry of Education

NEAEA National Educational Assessment and Examinations Agency

NLA National Learning Assessment

PLD performance level descriptors

READ Russian Education Aid for Development

SNNPR Southern Nations, Nationalities and Peoples Region

SPSS Statistical Package for Social Sciences

TAP Test Analysis Package

TVET Technical and Vocational Education and Training

EXECUTIVE SUMMARY

1. Introduction

1. 1. Background

National learning assessments in different countries are involved in assessing what and how much students are taught, and how much they learn and the variables that best facilitate effective learning outcomes. Conducting learning assessment and giving feedback to all stakeholders is becoming the best way to monitor quality of education system 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 become able to compare the achievement among regions, locations, gender, socio-economic status, and other attributing variables to achievement, and determine where to target their energy and resources for the greatest improvement of learning outcomes in the education system. Besides, the assessment can be used to evaluate the effectiveness of teachers, curricula, and the educational systems or programs as a whole, and identify trends in educational achievement for tracing the attainment of curriculum goals and diagnosing learning difficulties.

Regarding this, the Ethiopian government has also shown a great concern for the provision of quality education at all levels of the system. There is increasingly recognizing the key role that assessment of student learning outcomes plays critically important for monitoring and guiding the country's education quality improvement strategies. As stated in the ESDP IV document, Ethiopia is strengthening the national learning assessments being carried out every three years at each exit sub cycle of primary (grades 4 and 8) and secondary (grades 10 and 12). Moreover, the document recommends joining regional/international learning assessment organizations to determine the status of quality of education as compared to other countries to ensure international competitiveness.

The National Educational Assessment and Examinations Agency (NEAEA) is an authorized institution to conduct such learning assessments at all exit levels. Moreover, it had conducted the baseline national learning assessment on grades 10 and 12 in 2010 and this is the second of its kind.

1.2. Purposes of the Study

The main purposes of the study were to measure learning achievements of the students upon completion of General Secondary Education (Grade 10) and the Preparatory Program (Grade 12) in light of the learning outcomes of the curriculum and identify the major variables that could determine their test performances. Besides, the results of the study help to monitor the implementation of the GTP and ESDP-IV.

1.3. Objectives

The specific objectives of the Ethiopian Second National Learning Assessments of grades 10 and 12 are to:

- describe the students' achievement scores in key subjects;
- compare variations of student achievement scores across subgroups: gender, region, school types and the proficiency levels and the target set in ESDP IV;
- examine trends of students' achievement since the baseline study in 2009;
- identify possible factors that explain the variations in the achievement; and
- foreword some recommendations.

1.4. Significance of the Study

This study is significant since it provides information for policy makers and practitioners in the field of education. Having the empirical evidence from the study, they understand well about the improvement of curriculum goals attainment and ensure the quality of education provision and students learning achievement. In order to accomplish this, they have to rely on reliable information on how well education systems prepare students for life.

The country is striving to improve the quality of education provision. Thus, this second national learning assessment of grades 10 and 12 contributes in receiving feedback on the extent students achieve the curriculum goals in key subjects as compared to the national curriculum and ESDP IV targets.

Since national learning assessments base on the nations curriculum, follow a carefully designed research procedure, and test administration, students and their teachers know the extent to which learning and teaching process is effective. Moreover, they will help to identify obstacles to the successful operation of the system. In addition, results from national learning assessments are helpful to the various stakeholders in evaluating their accomplishments in comparison to planned intentions; organize their efforts; and direct resources to improve their performance in the future.

On the other hand, the findings of the study may serve as a stepping stone for researchers in the area to further investigate on some issues raised in detail.

2. Design and Methods of the Study

2.1. Design

In order to obtain the required information both descriptive survey research design was used. It mainly involved a collection of cross-sectional data on similar issues addressed by the quantitative study.

2.2. Sampling

The study followed a two-stage cluster sampling procedure with a fixed number of schools proportional to the number of schools from each region at the first stage and a cluster of 40 students from each school as the second stage were selected using simple random sampling. The minimum number of schools per region was set to 8 and 4 schools for grade 10 and 12 respectively for the purpose of optimization. With this procedure, a total of 7040 sample students from 176 schools and 3640 students from 91 schools of grades 10 and 12 respectively in all regions were intended to include in the study. From these two stages sampling, 97.5% of the students and 98.9% of the schools for grade 10 and 91.6% of the students and 94.7% of the schools for grade 12 were achieved. For the purpose of generating data on factors which determine the academic achievement, 875 teachers and 176 Principals from grade 10 and 455 teachers and 91 Principals from grade 12 were included in the study.

2.3. Instrumentations

2.3.1. Tests

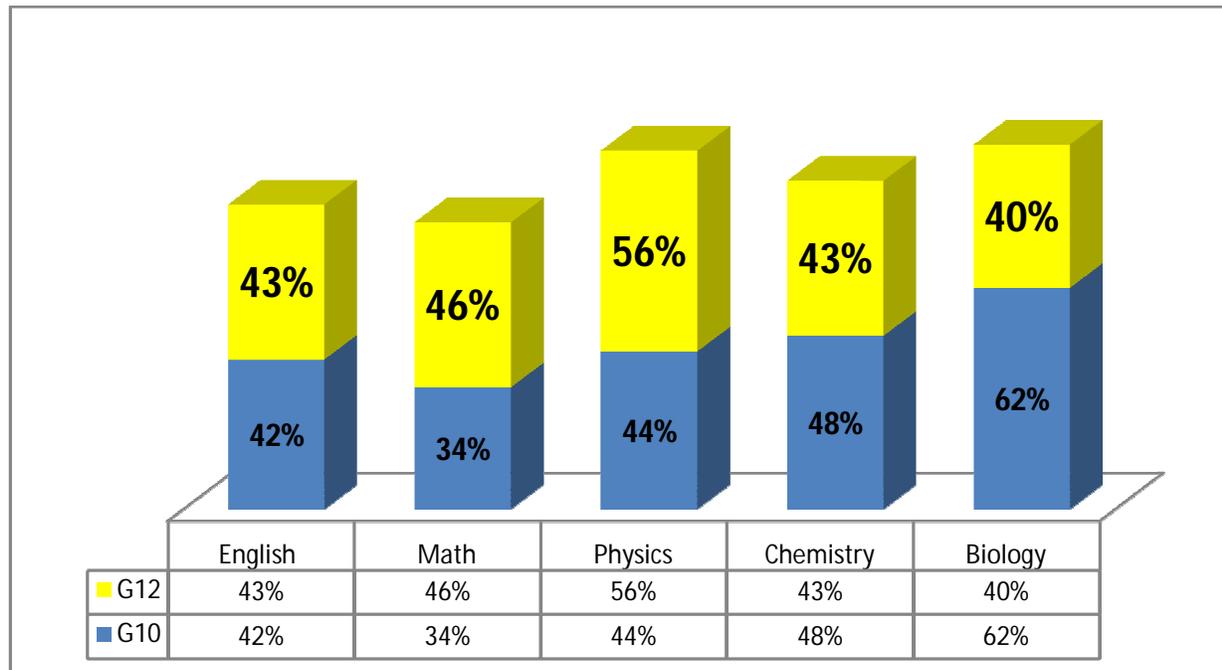
Piloting

The achievement tests used in both grades were English, Mathematics, Biology, Chemistry, and Physics. The NEAEA developed the achievement tests based on the Minimum Learning Competencies (MLC) set in the National Curriculum. These instruments were pilot tested in April 2012 in 36 selected schools. After the item and test analyses were carried out, some items were further improved and final versions were produced.

Linking Common Items for Comparability

To link and make sound comparison with the base line study, about 34% to 62 % (grade10 mathematics and Biology Grade 12 respectively) better common items were reused as anchor items in the current study as shown in the figure below.

Figure1: Percentage of Common Items in 2010 and 2014 Tests



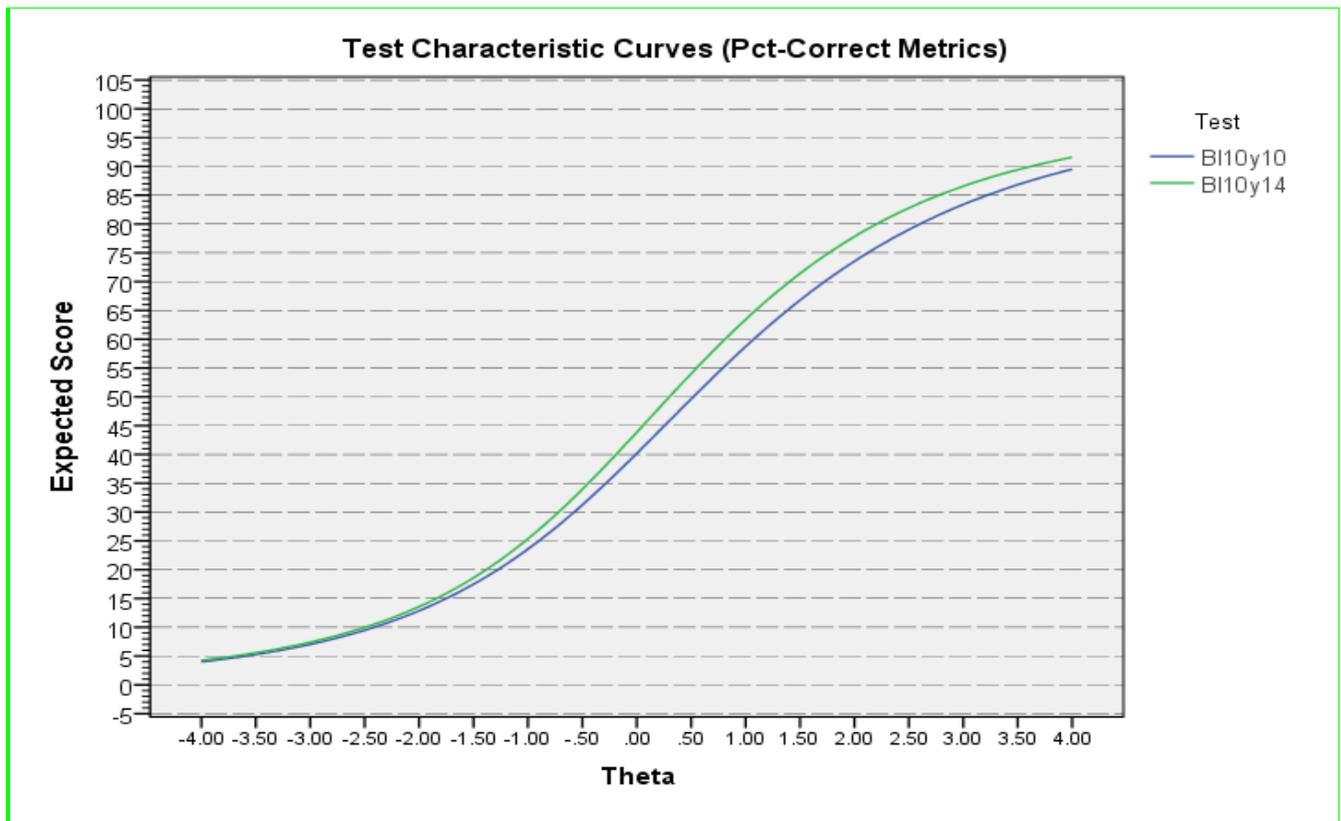
Equating and Scaling of Tests

Equating could be considered a more specific form of linking, or the strongest type of linking relationship. When test forms are created to be similar in content and difficulty, equating adjusts for differences in difficulty.

Student's percent scores or raw scores were transforming in to a different score scale using 250 as mean score and 50 standard deviation multiplied by zscores of the specific subject to facilitate and provide an easy way of interpretation and understanding of the 2010 and 2014 test scores. Once scales have been created and test users become familiar with the scale, test users can know how well an examinee did with only the information given in the scale score.

Test score equating technique is the most common way practitioners ensure comparability of standards. Post-equating – design or common items design was used since the two test takers were non-equivalent groups. A set of common items were included in the two tests administered in 2010 and 2014 with the assumption that common items are representative to the test in content and statistical characteristics and those items were not changed nor revealed to the second group. As shown in the Biology G10 prototype figure 2 below, almost all of the rest of the 2010 and 2014 subject tests were found well equivalent and sound comparisons could be made when we put on the same ability scale (theta).

Figure 2: Test Equating Prototype (Biology G10)



2.3.2. School based test results and Questionnaires

For both grades, students' first semester school based achievement results were collected from the school roster and analyzed to correlate with the NLA tests.

For triangulation and substantiation reasons, three kinds of questionnaires were used to collect relevant information from students, their teachers, and the school principals. The questionnaires contained closed and open questions in order to identify the association of various personal, school, and teaching-learning variables with student achievement.

2.4. Data Collection and Organization

Experts from NEAEA, MoE, TVET Agency and AAEB served as route coordinators. The regional coordinators recruited data collectors from each participating region. They attended a training program on how to administer the tests and questionnaires and had to stay for four days in each school to administer the tests and questionnaires. After the collection, data from tests and questionnaires were captured using MS Access, and for the purpose of data cleaning and checking consistency, Micro Soft Excel 2007 and SPSS v20 were used.

2.5. Data Analysis

Descriptive summary statistics to summarize central tendencies and dispersion for each subject and the composite average score were computed to each grade. Correlation and statistical tests of significance were also computed between a number of independent variables (gender, region, in-school and out of school factors, etc) and the dependent variable (Students' achievement scores) in order to detect relationships and differences. One-way analysis of variance (ANOVA) followed by Post Hoc test was also computed to identify homogenous subset groups. Statistical analyses, including multiple regressions, were also carried out using SPSS v20 to find out the variation of students' achievement due to different variables.

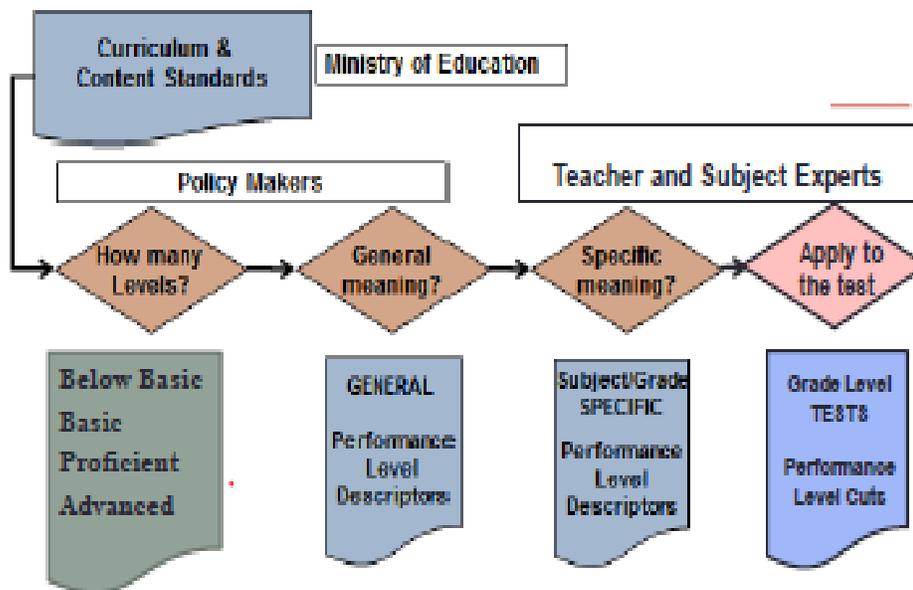
2.6. Standard Setting Procedures

The operational standard setting was the continuation of the two prerequisite capacity building workshops, training on Test Equating & Scaling for Nonequivalent Groups by Dr.

Zarko Vukmirovic (Principal psychometrician /statistician (American Institutions for Research-AIR), March 10- 22/2014) and the theoretical and practical applications of standard setting process and methods by Dr. Mary Pitoniak, Strategic Advisor and Director of Special Projects (Educational Testing Service- ETS, April 12–14/2014). In the operational standard setting procedures, Dr. Abdulah Ferdous, a Principal psychometrician and researcher (American Institutions for Research-AIR), September 22- October 03/2014) mentored and advised technically the assessment experts of the agency.

As recommended by Modified Angoff standard setting method, the panelists were trained and asked to conceptualize the general policy definitions and develop the performance level descriptors (PLDs) using the general policy definitions as a guide. The method and its procedure helps the panelists internalize how the levels are defined more meaningfully during their subsequent and used as a common frame of reference. The PLDs and threshold descriptions are also used as basis for the classification of students into the various achievement levels. Moreover, it allows the teachers to maximize what they know about the interaction between content requirements and student performances of the grade levels. The following visual presentation of the process is followed in the two rounds of the standard setting workshops.

Figure 3: Visual Presentation of the process



To establish achievement levels for ESNLA of grades 10 and 12 students, a total of 156 panelists were participated for the standard setting workshop in two rounds from September 22 to October 03, 2014. These panelists selected from curriculum development and implementation directorate of MOE, assessment and examinations directorates of the NEAEA, and subject teachers (10 teachers from each region) from high, medium and low performing schools based on the second NLA of grades 10 and 12 students' achievement which was conducted in May 2013. The participants were being trained well on the method and procedures of standard setting. Their judgments were based on a clear understanding of what is expected of students, what the assessment measures, and how well students are expected to perform in relation to the MLCs of the grade levels.

The generic performance standards policy definitions were adapted from the Ethiopian English EGRA since they do not contain any subject specific directly related to the curriculum or specific grade level MLCs. These definitions were used as the benchmark for developing detailed performance-level descriptors (PLDs) by panelists (teachers and content experts).

Table 1: Descriptions of the Generic Performance Standards Policy Definitions

Performance-level category	Descriptions
Below Basic	Students at this level demonstrate a minimal understanding of subject specific minimum learning competencies and do not have skills to solve simple problems appropriate at the grade level
Basic	Students at this level demonstrate a partial understanding of subject specific minimum learning competencies and have skills to solve some simple problems appropriate at the grade level.
Proficient	Students at this level demonstrate a solid understanding of subject specific minimum learning competencies and have skills to solve a wide variety of problems appropriate at the grade level.
Advanced	Students at this level demonstrate a comprehensive and in-depth understanding of subject specific minimum learning competencies and have skills to provide sophisticated solutions to complex

Before the participants started making the yes/no decision for each item, they were given intensive training on this standard-setting methodology. After developing detailed PLDs for each MLC of the grade level, the participants were first asked to conceptualize typical below basic, basic, proficient, and advanced students from their classroom, then they made an individual and independent yes/no decision (ratings) for each item on the test by asking him/herself which student (below basic/basic/proficient/advanced) from his/her classroom would be able to answer

the item “pretty sure”? They were given two rounds for making their individual yes/no decisions about the items, and feedback data was provided based on their round 1 yes/no decisions. The round 2 decisions’ were taken as consistent and reliable than round 1 and were used for determining the recommended cut scores. The following table, which was extracted from the detail of Chemistry Grade 10 PLDs report, was used as a sample of how detailed and deep the

Area of competency	Minimum Learning Competencies (MLCs) Grade 10	Below Basic Students at this level to:	Basic Students at this level may demonstrate partial ability to:	Proficient Students at this level will usually be able to:	Advanced Students at this level will consistently be able to:
Chemical Reactions	Explain what an Electro chemistry is	Explain poorly what an Electro chemistry is	Explain what an Electro chemistry is using few examples	Explain an Electro chemistry using some examples	Explain an Electro chemistry in depth
	Define electrical conductivity and differentiate electrolytic conductivity from metallic conductivity	Define only electrical conductivity	Define electrical conductivity but do not differentiate electrolytic conductivity from metallic conductivity	Define electrical conductivity and differentiate electrolytic conductivity from metallic conductivity with some details	Define electrical conductivity and differentiate electrolytic conductivity from metallic conductivity in depth
	Define terms like Electrolysis, Electrode, Cathode, anode, Anion, Cation, Electrolyte, non-electrolyte, strong electrolyte and weak electrolyte, half reaction and cell reaction	Define few simple terms like anion, cation, Electrolyte, and non-electrolyte	Define some simple terms like Anion, Cation, Electrolyte, non-electrolyte, Cathode, anode, Electrolysis, Electrode and electrolyte	Define many terms like Electrolysis, Electrode, Cathode, anode, Anion, Cation, Electrolyte, non-electrolyte, strong electrolyte and weak electrolyte, half reaction and cell reaction	Define all terms like Electrolysis, Electrode, Cathode, anode, Anion, Cation, Electrolyte, non-electrolyte, strong electrolyte and weak electrolyte, half reaction and cell reaction in detail.
	Confirm by performing simple experiments on metallic and electrolytic conductivity	Do not confirm by performing experiment on metallic conductivity	Confirm partially by performing experiment on metallic and electrolytic conductivity	Confirm by performing experiment on metallic and electrolytic conductivity successfully	Confirm by performing experiment on metallic and electrolytic conductivity more successfully

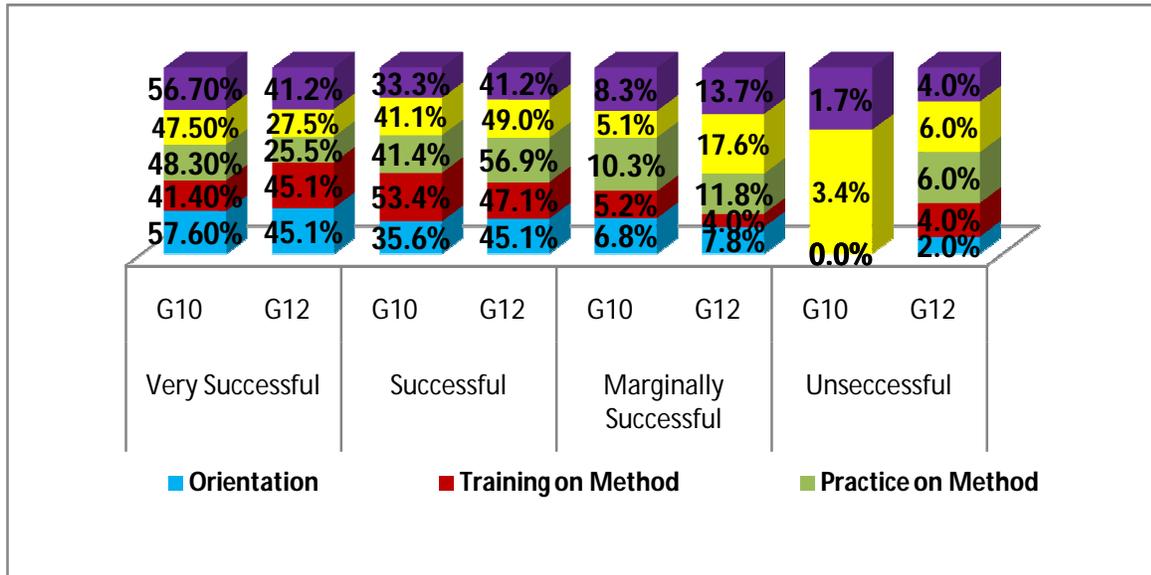
standard setting participants went through each MLC.

Table 2 Sample PLDs developed by Chemistry G10 Panelists

Participants’ evaluation of the standard setting

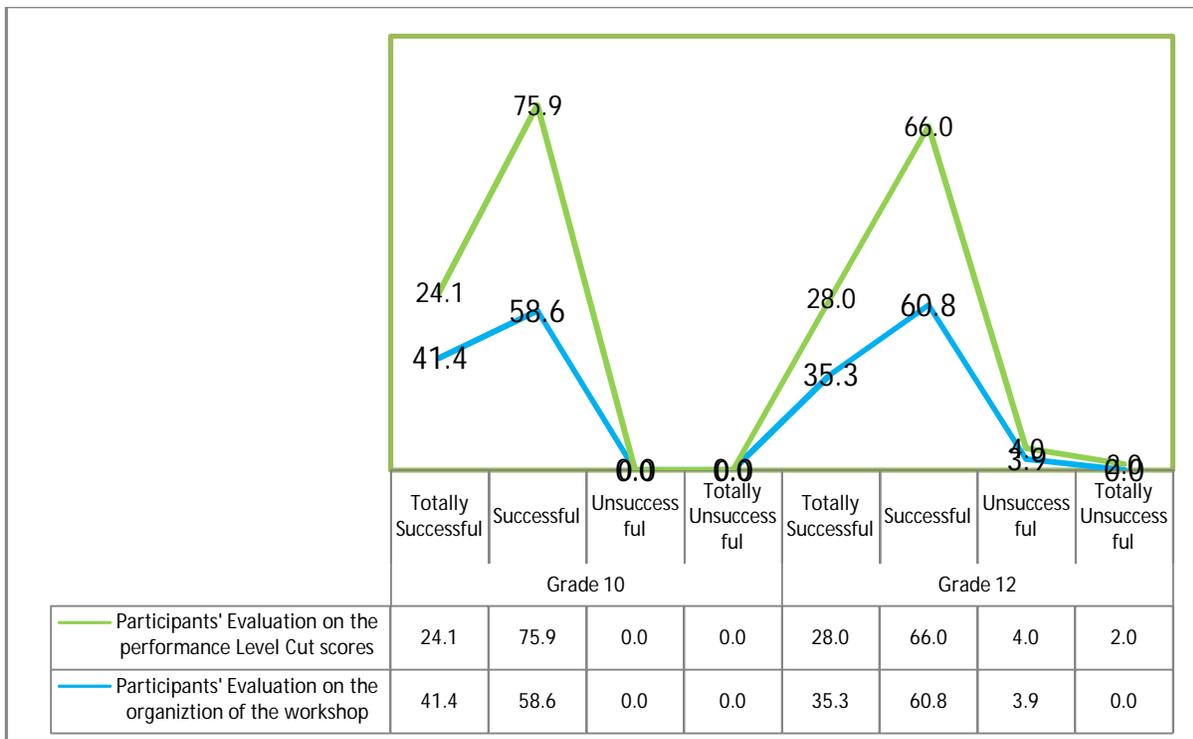
Finally, the participants filled out an evaluation form as part of gathering validity evidence for the standard-setting procedure and the results displayed in figure 4 and 5 below were found.

Figure 4: Panelists response on the Successfulness of the Standard setting training



As depicted vividly in figure 4 above, most of the panelists of both grades found orientation, training and practice on methods, interpretation of feedback and the overall standard setting training (very) successful. This implies the standard setting method and procedure were sound and defensible.

Figure 5: Overall Participants' Evaluation on Cut scores & organization of the Workshop



As shown in Figure 5 above, almost all participants of both grades rated the performance level cut scores they made as well as organization of the workshop as (totally) successful. From this, one can deduce that participants of both grades believed they did their best and were confident enough in their judgment of the cutting scores.

3. Overall Achievement Scores of Grades 10 and 12

3.1. Grade 10 Achievement Scores

This part deals with the result obtained from grade 10 students' academic achievement in the five subject tests (English, Mathematics, Biology, Chemistry and Physics). Each test was composed of multiple choice items from grades 9 and 10 contents based on the Minimum Learning Competency (MLC).

3.1.1. Summary of Descriptive Statistics

The academic achievement of the students as measured by the mean score of the five subjects was found less than the 50% achievement level set by the Education and Training Policy. The details are displayed in the table below.

Table 3: Mean scores by subject in percent

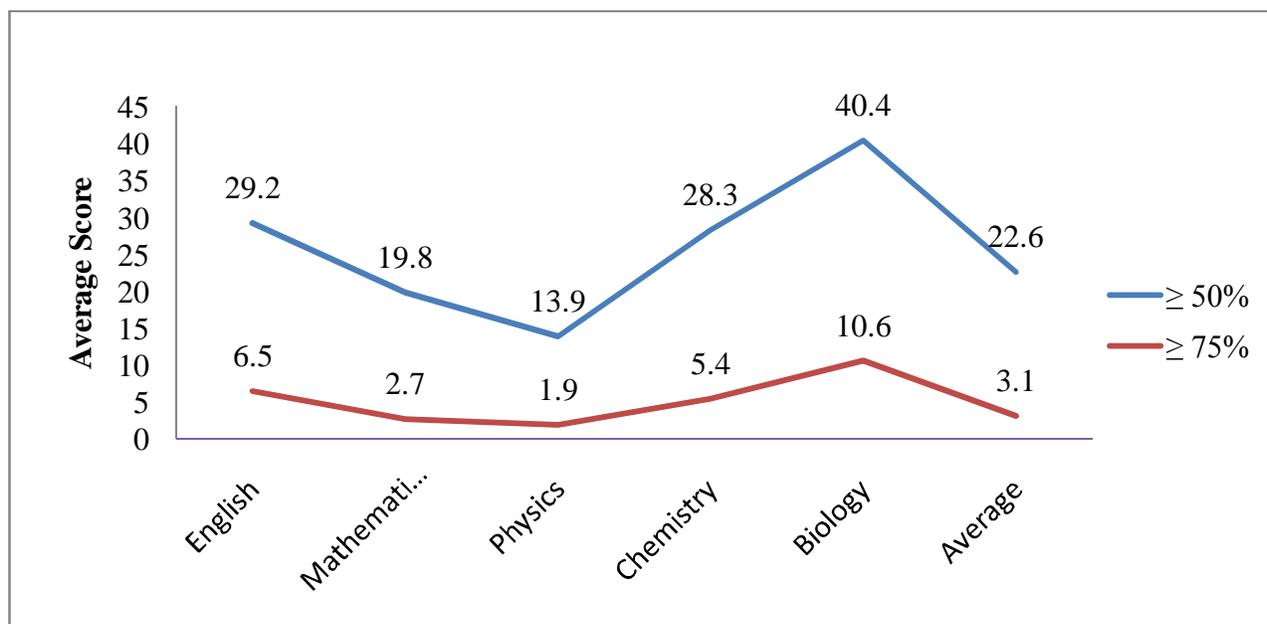
Subjects	N	Mean	Std. Dev	Median	Sig. (2-tailed)	Skewness
English	6968	42.58	16.94	38.33	0.000	0.89
Mathematics	6894	37.01	15.36	34.00	0.000	1.01
Physics	6862	35.45	13.48	32.00	0.000	1.28
Chemistry	6875	41.41	17.10	36.67	0.000	0.82
Biology	6863	46.94	18.71	43.33	0.000	0.53
Ave Score	7006	40.64	14.15	37.07	0.000	1.04

The national mean score (the average of what the students scored in the five subjects) was 40.64%. The median score which is less than the mean score (40.64%) has shown that 50% of the students in the average score obtained about less than 37.07%. The mean score for Biology subject (46.94%) is the highest whereas the mean score for physics (35.45%) and mathematics (37.01) were found the least. The distribution in all subjects was positively skewed indicating that only very few students achieved the highest scores. Looking at the standard deviation, the highest variation in the achievement scores among the students was in biology score which is 18.71. The distribution in all subjects was positively skewed indicating that only very few students achieved the highest scores.

Students who scored 50% and 75% and above

As shown in Figure 6 below, the percentage of students who scored of 50% and above as well as 75% and above in five subjects. In Physics and Mathematics subjects only 13.9% and 19.8% of the students were able to score 50% and above respectively. Similarly, only 1.9% and 2.7% of the students achieved 75% and above in the same subjects. In the average score, 22.6% of students scored 50% and above and only 3.1% achieved 75% and above.

Figure 6: Percentage of Students who scored 50% and above as well as 75% and above



Achievement scores at seven marker points

Table 4 below indicated the range of achievement in the five subjects and the average scores at seven marker points: 10th, 25th, 30th, 50th, 70th, 75th and 90th percentiles. Achievement at the 10th percentile is an indicative of the low achievers, while achievement at the 90th percentile can be taken as indicative of high achievers.

Table 4: Range of achievement scores (%) at seven marker points

Percentiles	English	Mathematics	Physics	Chemistry	Biology	Average Score
10 th	25.00	22.00	22.00	23.33	25.00	25.89
25 th	30.00	26.00	26.00	28.33	31.67	29.73
30 th	31.67	28.00	28.00	30.00	33.33	31.00
50 th	38.33	34.00	32.00	36.67	43.33	37.07
70 th	48.33	42.00	38.00	48.33	56.67	45.67
75 th	51.67	44.00	42.00	51.67	60.00	48.67
90 th	68.33	60.00	54.00	66.67	75.00	60.86

Students at 10th percentile scored only 25.89% and this means about 10% of the students scored at or below the chance level in all subjects. On the other hand students at 90th percentile achieved 60.86% in the average scores. This means only 10% of them were able to achieve a score of 60.86% and above. The difference between 90th and 10th percentiles is 34.97% in the average score, which indicated the wide spread variation between high achievers and low achievers. Moreover, regarding the median (50th percentile) score, 50% of the students scored at or below 37.07% in the average and in the range of 32% to 43.33% in five subjects.

3.1.2. Achievement by Gender

The study showed that there was statistically significant difference at $p < .001$ between male and female achievement in favor of the former. In all subjects males (42.68%) outperformed females (38.35%) as depicted in the following Table 5 below. The table also showed that the achievements mean score of males was higher than that of females by 4.33% in the average score and the mean differences ranged from 2.82% in physics to 6.06% in Biology.

Table 5: Independent Sample t-test for Mean Scores between Males and Females

Subject	Gender	N	Mean	Std. Dev	T	df	MD	Sig.
English	Female	3288	40.38	16.42	-10.30	6966	-4.15	0.000
	Male	3680	44.54	17.15				
Mathematics	Female	3261	35.31	14.08	-8.74	6892	-3.22	0.000
	Male	3633	38.53	16.27				
Physics	Female	3242	33.96	12.41	-8.72	6860	-2.82	0.000
	Male	3620	36.79	14.24				
Chemistry	Female	3254	38.62	15.66	-12.98	6873	-5.30	0.000
	Male	3621	43.91	17.93				
Biology	Female	3235	43.73	17.65	-13.58	6861	-6.06	0.000
	Male	3628	49.80	19.17				
Ave Score	Female	3306	38.35	12.96	-12.93	7004	-4.33	0.000
	Male	3700	42.68	14.83				

3.1.3. Students Achievement by School Type

School type comprises government and nongovernment schools. The mean score of students from the non-government schools was higher than that of government by 18.42% and the mean differences ranged from 15.11% in physics to 24.88% in English.

Table 6: Independent Sample t-test for Mean Scores between government and non-government school students

Subject	School Type	N	Mean	Std. Dev	T	Df	MD	Sig
English	Government	6300	40.19	15.03	-40.03	6966	-24.88	0.000
	Non Government	668	65.07	17.43				
Mathematics	Government	6238	35.47	14.24	-26.85	6892	-16.11	0.000
	Non Government	656	51.58	17.79				
Physics	Government	6201	34.00	12.09	-29.04	6860	-15.11	0.000
	Non Government	661	49.11	17.54				
Chemistry	Government	6208	39.78	16.09	-25.21	6873	-16.81	0.000
	Non Government	667	56.58	18.75				
Biology	Government	6202	45.10	17.66	-26.12	6861	-19.07	0.000
	Non Government	661	64.17	19.48				
Average Score	Government	6337	38.88	12.74	-34.67	7004	-18.42	0.000
	Non Government	669	57.30	15.88				

The average achievement score for the government school students was 57.30% whereas, the average means score of the government school students was found to be 38.9% which was closer to the national average (40.64%). In all subjects as well as in the mean score, the difference between government and non-government school students were statistically significant at $p < .001$.

3.1.4. Students' Achievement by Region

The analysis of variance (ANOVA) was computed to identify the existence of statistically significant mean differences among the regions by taking the region as independent and all subjects including average scores as the dependent variables and the following was found.

Table 7: Average score achievement by Region

Region		English	Mathematics	Physics	Chemistry	Biology	Average
Tigray	N	589	596	599	603	599	604
	Mean	42.27	39.92	38.82	45.09	52.21	43.61
Afar	N	358	349	349	351	312	359
	Mean	35.92	30.01	30.13	32.87	38.33	33.18
Amhara	N	952	929	894	908	935	952
	Mean	42.38	41.08	38.66	45.02	49.82	43.31
Oromia	N	1503	1484	1496	1505	1494	1509
	Mean	40.56	38.05	35.63	42.02	46.69	40.56
Somali	N	479	478	457	456	472	479
	Mean	47.85	36.51	32.69	43.20	48.62	41.76
BenishangulGumuz	N	398	396	397	398	398	399
	Mean	34.57	29.46	30.37	33.17	36.21	32.75
SNNP	N	955	946	952	957	930	960
	Mean	40.36	36.62	35.55	41.75	47.19	40.26
Gambella	N	314	316	313	318	314	319
	Mean	33.49	25.60	26.59	30.73	37.15	30.74
Harari	N	351	347	347	311	348	352
	Mean	52.44	41.64	37.73	46.39	52.37	45.87
Addis Ababa	N	713	701	703	712	706	714
	Mean	50.68	37.28	38.14	41.56	49.17	43.43
Dire Dawa	N	356	352	355	356	355	359
	Mean	48.70	39.21	35.47	42.63	47.12	42.69
National Average	N	6968	6894	6862	6875	6863	7006
	Mean	42.58	37.01	35.45	41.41	46.94	40.64

As shown in Table 7 above, Harari (45.87%) scored highest with a mean difference of 15.13% from Gambella which achieved the least score (30.74%). The mean scores of Harari, Addis Ababa, Dire Dawa, Amhara, Tigray, and Somali were higher than the national mean score. All the rest regions achieved mean scores less than the national mean (40.64%).

Government School Achievement by Region

Since the distribution of non government schools restricted in only five regions, comparisons were made among the government schools across all regions. Following are the details of these comparisons in all five subjects and average score among regions.

Average score Achievement by Region

Table 8: Government school Average score by Region

Region	N	Subset for alpha = 0.05						
		1	2	3	4	5	6	7
Gambella	319	30.74						
BenishangulGumuz	399	32.75	32.75					
Afar	359	33.18	33.18					
Dire Dawa	239		35.27	35.27				
Addis Ababa	517			37.09	37.09			
Oromia	1349				38.83	38.83		
Somali	439				39.21	39.21		
SNNP	960					40.26		
Harari	200					40.80	40.80	
Amhara	952						43.31	43.31
Tigray	604							43.61
Sig.		0.12	0.10	0.53	0.30	0.41	0.10	1.00

Table 8 above portrayed that the regions were classified in to seven categories of homogeneity subset groupings. Students from Tigray (43.61%) and Amhara (43.31%) performed the highest mean score. Students from the three emerging

regions Afar (33/18%), BenishangulGumuz (32.75%) and Gambella (30.74%) performed the least mean score as compared to the others.

Non Government School Achievement by Region

Non government sample schools were taken from five regions namely: Oromia, Somali, Harari, Addis Ababa and Dire Dawa. As shown in Table 9 below, there existed statistically significant differences among them at $p < 0.005$ in average score.

Table 9: Homogeneous subset groupings for Average score by Region

Region	N	Subset for alpha = 0.05		
		1	2	3
Harari	152	52.54		
Oromia	160	55.18	55.18	
Dire Dawa	120	57.46	57.46	
Addis Ababa	197		60.06	
Somali	40			69.78
Sig.		0.17	0.17	1.00

Among the five regions, students' mean score from Somali were found to be an exceptional with the highest mean score of 69.9% whereas Harari performed less (52.5%).

3.1.5. Achievement by Gender in each Region

This part looks the five achievement scores across the regions by taking gender as a disaggregating variable. Looking at the average score in all the regions males performed better than females and the differences were statistically significant in most cases as displayed in Table 10 below. The gender achievement disparity seemed very big between males and females in Amhara, Oromia, Somali, and SNNP regions.

Table 10: Achievement by Gender across Region

Region	Gender	Mean Score					
		English	Mathematics	Physics	Chemistry	Biology	Average score
Tigray	Females	41.39	39.57	37.92	43.88	50.87	42.67
	Males	43.25	40.31	39.82	46.42	53.67	44.64
Afar	Females	34.42	30.13	29.93	30.6	36.88	32.15
	Males	37.09	29.93	30.29	34.62	39.43	34
Amhara	Females	38.38	36.92	35.44	39.74	43.72	38.73
	Males	45.94	44.76	41.44	49.68	55.23	47.4
Oromia	Females	38.03	35.5	33.56	38.41	42.69	37.61
	Males	42.9	40.43	37.52	45.37	50.37	43.29
Somali	Females	42.14	34.26	30.77	39.76	44.77	38.31
	Males	51.54	37.97	33.99	45.55	51.09	44
BenishangulGumuz	Females	32.56	28.25	29.22	31.26	33.51	30.96
	Males	36.07	30.37	31.24	34.6	38.24	34.1
SNNP	Females	37.45	34.14	33.87	38.31	43.69	37.49
	Males	42.79	38.68	36.97	44.65	50.13	42.58
Gambella	Females	30.88	25.17	25.67	27.37	33.14	28.46
	Males	35.9	26	27.47	33.85	40.85	32.88
Harari	Females	56.1	42.51	38.03	48.18	52.68	47.13
	Males	49.45	40.92	37.49	44.92	52.12	44.84
Addis Ababa	Females	49.02	36.84	36.95	40.04	47.01	42.01
	Males	52.52	37.76	39.49	43.25	51.6	45.01
Dire Dawa	Females	47.36	37.41	33.94	40.12	43.7	40.62
	Males	49.96	40.95	36.89	44.99	50.29	44.63
National Average	Females	40.38	35.31	33.96	38.62	43.73	38.35
	Males	44.54	38.53	36.79	43.91	49.80	42.68

The above table also showed that Harari was the only region that significant means score difference was observed in favor of female students. They outperformed than male ones in average score, English, and chemistry.

Non Government school achievement by Gender and Region

Comparisons were made between males and females among non government schools across in five regions from which sample schools were taken. The gender disparity, like government

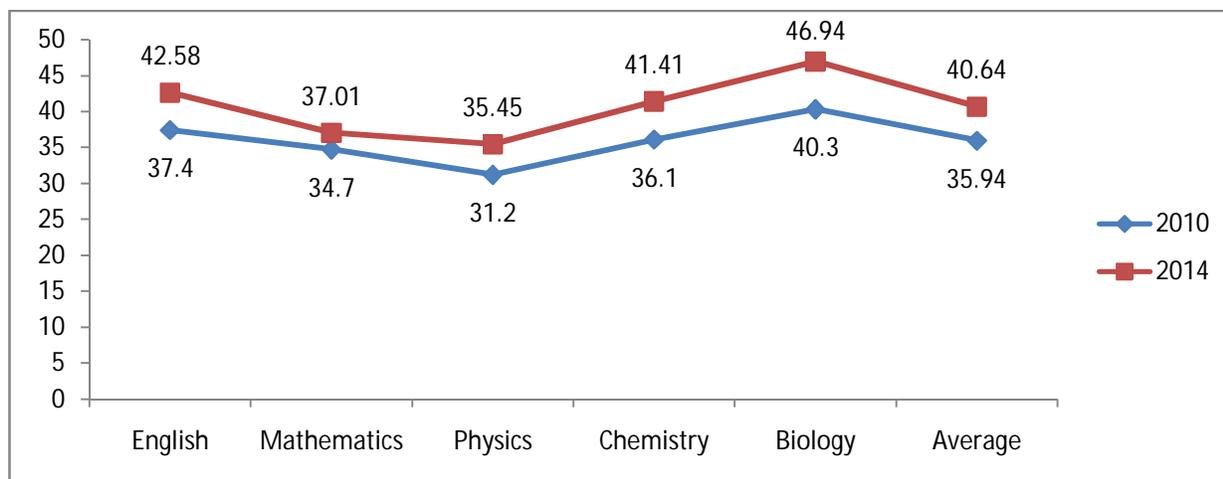
schools, was observed between males and females in the average score in favor of former in all regions except Harari. The gender achievement disparity is almost zero in Hararinon government school students as shown in Table 11 below. However, female (66.40%) students in this same region outperformed than males (61.67%) in English mean score.

Table 11: Non Government school Achievement by Gender in five Regions

Region	Gender	N	Mean Score					
			English	Mathematics	Physics	Chemistry	Biology	Average
Oromia	Female	82	58.06	47.15	47.54	50.84	64.49	53.45
	Male	78	61.04	50.43	50.51	56.20	66.84	57.00
Somali	Female	14	70.60	53.86	48.66	71.52	74.88	63.90
	Male	26	74.81	69.31	65.31	74.53	80.77	72.95
Harari	Female	80	66.40	48.58	42.63	52.49	54.12	52.57
	Male	72	61.67	49.46	43.10	51.67	56.35	52.51
Addis Ababa	Female	98	68.21	54.60	53.01	57.73	66.21	59.90
	Male	99	70.64	49.03	52.82	58.04	69.03	60.22
Dire Dawa	Female	174	47.36	37.41	33.94	40.12	43.7	40.62
	Male	185	49.96	40.95	36.89	44.99	50.29	44.63
Ave Score	Female	448	47.36	37.41	33.94	40.12	43.70	54.09
	Male	460	63.62	51.83	49.73	57.09	64.66	57.46

3.1.6. Comparison of Grade 10 Students' Academic Achievement with the baseline study

Figure 7: Achievement comparison by Subject



As shown in Figure 7 above, even though the overall mean score of the two cohorts of the 2010 and the 2014 below the minimum requirement 50%, the current cohort exceeded the previous one by 4.7% mean score difference. The highest mean difference was observed in Biology (6.64%) followed by Chemistry (5.31%) and English (5.18%) in favor of the 2014.

3.1.7 Achievement comparison with the target set in ESDP IV

As indicated in the ESDP IV document, the target set for grade 10 students who assumed to score 50% and 75% and above was 70% and 25% respectively. As indicated in Table 12 below, comparing students who scored 50% and with the baseline achievement (13.8%), the 2014 achievement (22.6%) could be said as great stride achievement for the grade level. The number of students who scored 75 % and above was greater than the baseline ones by 1.8% mean score difference. However, the achievement was found by far below the ambitious expectation of the ESDP IV target.

Table 12: Number of Students who scored at least 50% & 75% in core subjects

Score	Baseline 2009/10	2013/2014	ESDP IV Target2014/15
≥ 50%	13.8%	22.6%	70%
≥ 75%	1.3%	3.10%	25%

Region Level Achievement compared with the target set in ESDP IV

Table 13 below displayed the region level comparison of students who scored 50% and 75% and with the target set in ESDP IV. Though no region reached the target, relatively large number of students from Harari scored 50% and above followed by students from Dire Dawa, Tigray, and Amhara scored above the national average while, students from the three emerging regions namely, Gambella, Afar, BenishangulGumuz, scored by far below the national average. Looking number of students who scored 75% and above, students from Addis Ababa scored 3 fold greater than the national average. Students from Tigray, Amhara, and Harari scored above the national average. On the other hand, students from Afar, Gambella, BenishangulGumuz and SNNP scored very far below the national average.

Table 13: Number of Students who scored at least 50% & 75% in core subjects

Region	Achieved		ESDP IV Target of 2014/15	
	≥ 50%	≥ 75%	≥ 50%	≥ 75%
Tigray	29.1	5	70	25
Afar	6.1	0		
Amhara	28	4		
Oromia	23.7	2		
Somali	24.8	2.3		
BenishangulGumuz	7.3	1.3		
SNNP	20.1	1.2		
Gambella	3.8	0.3		
Harari	34.4	3.4		
Addis Ababa	25.5	10.8		
Dire Dawa	29.5	5		
National Average	22.60	3.10		

3.2. Overall Grade 12 Achievement scores

The academic achievement of the students was measured by the mean score of the five subjects' English, Mathematics, Physics, Chemistry and Biology. Each achievement test was composed of multiple choice items from grades 11 and 12 contents based on the Minimum Learning Competency (MLC).

3.2.1. Summary of Descriptive Statistics

The national mean score was 45.52% and Biology was the only subject in which students scored above the minimum expected while all the rest were scored less than the 50% achievement level set by the Policy.

Table 14: Summary of Descriptive Statistics

Subjects	N	Mean	Std. Dev	Median	Sig	Skewness
English	3446	45.21	15.80	43.33	0.000	0.56
Mathematics	3334	45.28	19.35	42.00	0.000	0.61
Physics	3403	33.05	12.57	30.00	0.000	1.25
Chemistry	3417	47.70	18.55	45.00	0.000	0.50
Biology	3407	56.78	18.76	56.67	0.000	0.08
Ave Score	3472	45.52	14.46	43.33	0.000	0.69

Looking at the mean score of each subject, except biology (56.78%), in all the other subjects the mean scores were below the minimum requirement (50%). The average median score was less than the mean score (45.52%) means that 50% of the students obtained 43.33% and below. The mean score for physics (33.05%) was the least and much lower than the national composite score. The median scores were found less than the mean scores in all subjects except for Biology, which mean the distribution of the scores were positively skewed indicating that

only very few students achieved the highest scores varying by subjects. The standard deviations of the five subjects' mean scores range from 12.57% in Physics to 19.35% in Mathematics. This shows the existence of very wide variation among the mean score of students' achievement in each subject.

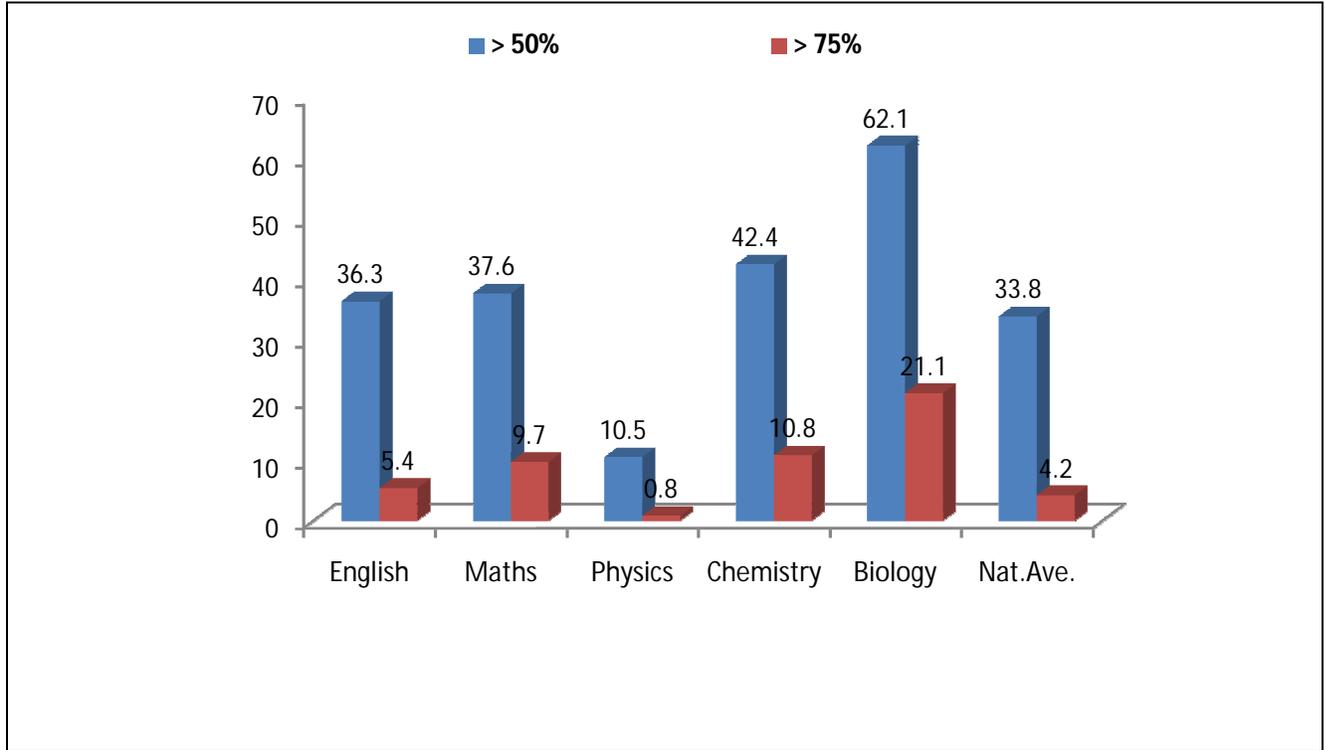
Table 15: Percentile scores at seven marker points

Percentiles	English	Mathematics	Physics	Chemistry	Biology	Average score
10 th	26.67	24.00	20.00	25.00	31.67	28.55
25 th	33.33	30.00	24.00	33.33	41.67	34.17
30 th	35.00	32.00	26.00	35.00	45.00	35.73
50 th	43.33	42.00	30.00	45.00	56.67	43.33
70 th	51.67	54.00	36.00	56.67	68.33	51.74
75 th	55.00	58.00	38.00	60.00	71.67	54.07
90 th	68.33	74.00	50.00	75.00	83.33	66.56

Students who scored 50% and 75% and above

As depicted vividly in Figure 8 below, the percentages of students who achieved 50% and above were found 62.1% in Biology, 42.4% in Chemistry, 37.6% in mathematics, and 36.3% in English. On the other hand, the percentage of students who scored 75% and above was relatively higher in Biology (21.1%), Chemistry (10.8%) and Mathematics (9.7%) than other subjects.

Figure 8: Students who scored 50% and above (G-12)



3.2.2. Achievement by Gender across Subjects

As was done for grade 10, the gender achievement disparity was computed for grade 12 and the results described in Table 16 below were found.

Table 16: Achievement by gender

Subject	Gender	N	Mean	SD	T	df	MD	Sig.
English	Females	1447	41.39	15.38	-12.37	3444	-6.60	0.000
	Males	1999	47.99	15.51				
Mathematics	Females	1394	39.61	16.61	-14.80	3332	-9.74	0.000
	Males	1940	49.35	20.14				
Physics	Females	1424	30.31	10.83	-10.95	3401	-4.70	0.000
	Males	1979	35.01	13.34				
Chemistry	Females	1435	41.11	15.92	-18.54	3415	-11.37	0.000
	Males	1982	52.48	18.86				
Biology	Females	1423	50.40	17.78	-17.56	3405	-10.96	0.000
	Males	1984	61.36	18.11				
Ave Score	Females	1456	40.53	12.58	-18.09	3470	-8.60	0.000
	Males	2016	49.13	14.66				

In Grade 12, in all subjects males performed better than females did and the differences were statistically significant in all cases. Males scored an average of 49.13% whereas females had an average of 40.53%. The mean achievement differences between males and females were found relatively high in chemistry, biology, and mathematics in favor of males.

3.2.3. Students' Achievement by School Type

Table 17: Independent Sample t-test for Mean Scores between government and non-government school students

Subject	School type	N	Mean	Std. Dev	T	Df	MD	Sig
English	Government	3248	43.96	14.91	-20.01	3444	-21.9	0.000
	Non Government	198	65.86	15.63				
Mathematics	Government	3140	44.61	18.99	-8.14	3332	-11.55	0.000
	Non Government	194	56.15	21.77				
Physics	Government	3208	32.48	12.11	-10.83	3401	-9.87	0.000
	Non Government	195	42.35	15.94				
Chemistry	Government	3219	47.22	18.30	-6.13	3415	-8.28	0.000
	Non Government	198	55.51	20.78				
Biology	Government	3212	56.04	18.52	-9.41	3405	-12.86	0.000
	Non Government	195	68.91	18.58				
Average score	Government	3274	44.78	14.02	-12.51	3470	-12.95	0.000
	Non Government	198	57.73	16.17				

The above table depicts vividly those students who were from Non Government schools (57.73%) significantly outperformed than their counterparts from government schools (44.78%) in all subjects. The highest mean difference was observed in English achievement (MD= 21.9). Both school types were best in biology. Students from non government schools achieved 68.91%) and students

from government also scored the 56.04% which was the highest for them. Similarly, Physics seemed difficult for the groups since students from non government scored 42.35 % and students from government scored 32.48% which were found the lowest for both school type students.

3.2.4. Students' Achievement by Region

The analysis of variance (ANOVA) was computed to identify the existence of statistically significant mean differences among the regions by taking the region as independent and subjects including average scores as the dependent variables and the following results were found.

Table 18: Average score achievement by Region

Region	Mean Score					Ave Score
	English	Mathematics	Physics	Chemistry	Biology	
Tigray	43.85	49.87	35.48	49.51	56.08	46.99
Afar	40.40	40.25	28.78	38.96	49.64	39.02
Amhara	43.30	48.45	35.21	49.79	59.88	47.32
Oromia	45.87	49.02	34.57	52.40	60.03	48.38
Somali	42.82	35.82	27.22	42.81	50.97	40.01
BenishangulGumuz	42.08	35.81	28.52	41.74	50.88	39.76
SNNP	42.95	46.21	32.88	49.23	57.27	45.68
Gambella	41.64	30.11	27.50	38.80	50.22	38.33
Harari	56.31	50.88	39.43	53.40	63.52	52.71
Addis Ababa	50.87	43.00	33.01	43.33	55.09	45.05
Dire Dawa	52.52	48.57	34.65	48.76	60.07	48.40
Nat. Average	45.21	45.28	33.05	47.70	56.78	45.52

Disaggregating the average of the five subjects and mean score of each subject across regions, there existed disparities in academic achievement among regions. Contrasting with the minimum requirement in the national standard, except Harari region with the composite mean score of 52.71%, all the rest regions exhibited below 50%. The average mean scores in Gambella (38.33%), Afar (39.02%), BenishangulGumuz (39.76%) and Somali (40.01%) were found much lower when compared to the highest achieving regions and the national average.

Government schools Students' Achievement by Region

Since the distribution of grade 12 non government schools limited in only three regions, comparisons were made among the government schools across all regions. Following are the details of these comparisons in all five subjects and average score among regions.

Average score Achievement by Region

Table 19: Homogeneity subset groupings in average score by Government schools across Regions

Region	N	Subset for alpha = 0.05		
		1	2	3
Gambella	122	38.33		
Afar	155	39.02		
BenishangulGumuz	200	39.76		
Somali	278	40.01		
Addis Ababa	316	41.72	41.72	
Dire Dawa	118	41.95	41.95	
SNNP	452		45.68	45.68
Tigray	312			46.99
Amhara	542			47.32
Oromia	739			48.38
Harari	40			49.41
Sig.		0.37	0.24	0.33

The Grade 12 homogenous subset groupings in terms of composite mean scores, as shown in Table 19 above, there were three groups. All the emerging regions: Gambela, Afar, Benishangul-Gumuz and Somali, were categorized in Group 1 and distinctly differed from the high achieving regions. Students from Harari, Oromia, Amhara, Tigray , and SNNP were found the highest achievers in the other groups (category3) . It is easy to observe from the table that the mean scores of all these high achieving regions, attained greater than the national mean (45.52%).

Non Government Achievement by Region

Based on the proportion of grade 12 non government school from the total population, only five schools from three regions (Harari , Addis Ababa, and Dire Dawa) were included in the national sample and the results showed in Table 20 below were found.

Table 20: Homogeneity subset groupings for average score by region

Region	N	Subset for alpha = 0.05
		1
Harari	40	56.01
Dire Dawa	78	58.15
Addis Ababa	80	58.19
Sig.		0.75

The homogeneity subset grouping result in Table 20 above depicted that there is no statistically significant difference within the group in grade 12 non government schools in Harari, Dire Dawa, and Addis Ababa regions.

3.2.5. Achievement by Gender in each Region

Taking gender as a disaggregating variable in the five subjects mean scores, males performed better than females with statistically significant differences in almost all regions as indicated in Table 21 below. The gender achievement disparity seemed very big in Amhara(13%), Oromia (12%), SNNP (12%), and BenishangulGumuz regions and the mean differences between males and females in mean score exceeded 10 % in favor of the former. In Harari, the gender disparity seemed almost zero; while in Somali, females' average score was found higher than the male ones at face value level in English achievement mean score.

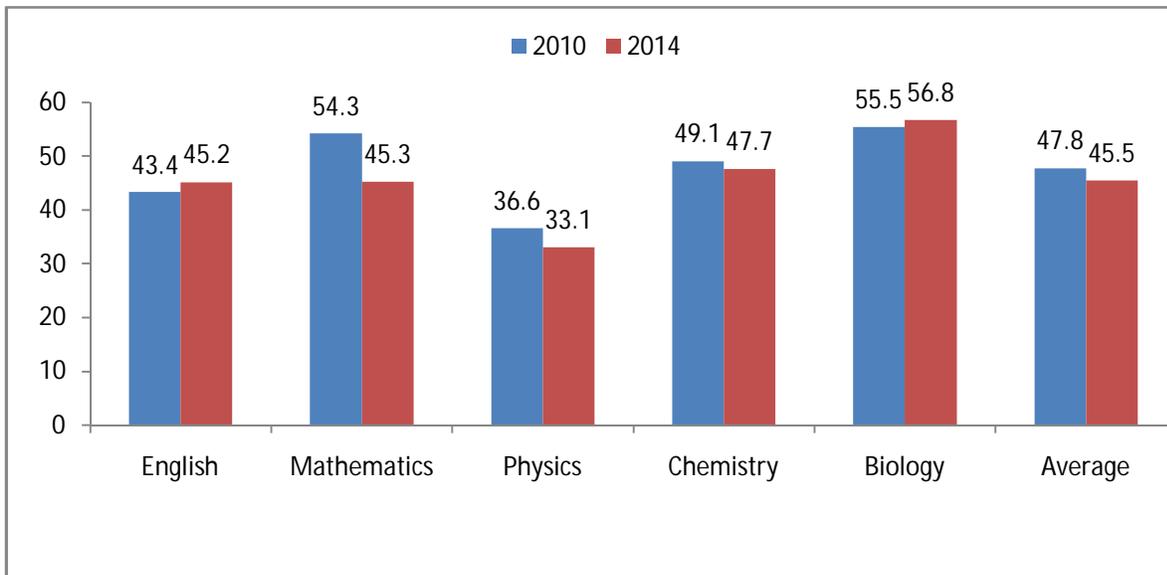
Table 21: Achievement by Gender and region

Region	Gender	Mean Score					
		English	Mathematics	Physics	Chemistry	Biology	Average score
Tigray	Females	39.56	45.10	32.94	43.51	49.49	42.15
	Males	47.97	54.22	37.84	55.25	62.20	51.54
	Average	43.85	49.87	35.48	49.51	56.08	46.99
Afar	Females	39.97	38.16	28.26	36.38	47.78	37.8
	Males	40.66	41.53	29.08	40.53	50.76	39.81
	Average	40.4	40.25	28.78	38.96	49.64	39.02
Amhara	Females	36.54	40.85	31.13	40.9	52.34	40.3
	Males	49	54.78	38.67	57.32	66.18	53.24
	Average	43.3	48.45	35.21	49.79	59.88	47.32
Oromia	Females	39.76	38.96	30.33	42.58	51.09	40.59
	Males	49.39	54.79	36.98	58.05	65.12	52.87
	Average	45.87	49.02	34.57	52.4	60.03	48.38
Somali	Females	45.92	38.08	29.25	42.75	51.02	41.41
	Males	41.71	35.02	26.48	42.84	50.96	39.51
	Average	42.82	35.82	27.22	42.81	50.97	40.01
BenishangulGumuz	Females	35.43	30.87	25.35	35.06	40.63	33.45
	Males	47.73	40.01	31.22	47.32	59.69	45.14
	Average	42.08	35.81	28.52	41.74	50.88	39.76
SNNP	Females	37.69	38.55	28.19	39.92	48.07	38.53
	Males	46.37	51.11	35.9	55.28	63.18	50.33
	Average	42.95	46.21	32.88	49.23	57.27	45.68
Gambella	Females	38.25	29	26.16	31.65	41.26	33.9
	Males	43.25	30.42	28.1	42.11	54.27	40.4
	Average	41.64	30.11	27.5	38.8	50.22	38.33
Harari	Females	55.99	49.97	39.89	51.91	63.79	52.31
	Males	56.77	52.18	38.79	55.51	63.13	53.29
	Average	56.31	50.88	39.43	53.4	63.52	52.71
Addis Ababa	Females	48.63	38.02	30.18	40.32	50.99	41.60
	Males	53.31	48.55	36.10	46.59	59.58	48.70
	Average	50.87	43	33.01	43.33	55.09	45.05
Dire Dawa	Females	50.85	42.43	31.95	43.25	55.61	44.68
	Males	54.03	54.85	37.10	54.02	64.03	51.76
	Average	52.52	48.57	34.65	48.76	60.07	48.4
National Average	Females	41.39	39.61	30.31	41.11	50.4	40.53
	Males	47.99	49.35	35.01	52.48	61.36	49.13
	Average	45.21	45.28	33.05	47.7	56.78	45.52

3.2.6. Comparison of Grade 12 Students' Academic Achievement with the Baseline Study

The trend analysis in terms of the national averages of each subject and their composite mean score was computed as shown in figure 9 below. There was found a significant decline of achievement in Mathematics achievement score from 54.3% in baseline to 45.3% in the current study. Similarly, though the gap seemed small, there was a declining trend in Physics, Chemistry and the national average scores. However, the current study achievement score seemed better than in English and Biology achievement scores than the baseline.

Figure 9: Grade 12 Achievement comparison with baseline



3.2.7. Achievement comparison with the target set in ESDP IV

As described in Table 22 below, it was anticipated to achieve the target in the ESDP IV that 70% and 25% of students of grade 12 will be able to score 50% and 75% and above respectively. However, let alone achieving the target set, it could not sustain the baseline achievement score. Comparing with the baseline, the current achievement score was declined by 8.20% in percentages of students who scored 75% and above.

Table 22: Students who scored at least 50% & 75% at national level

Score	2010 Baseline	2014	ESDP IV Target of 2014/15
≥ 50%	34.9%	33.8%	70%
≥ 75%	12.40%	4.20%	25%

Students' Achievement Comparison with ESDP IV Target by Regions

As shown in Table 23 below, regions themselves were compared by the percentages of students who could score greater or equal to 50% and 75%. Comparing percentages of students who scored 50% and above among the regions, students from Harari (52.5%), Oromia (43.4%), Dire Dawa (41.3%) and Tigray (40.7%) scored much higher than the national average (33.8%). On the other hand, the number of students who scored 50% and above from the four emerging regions Gambella, Somali, Afar, and Benishangul Gumuz were found below 20% which was by far below the national average. Looking at the percentage of students who scored 75% and above across regions, students from Harari (10%), Dire Dawa (7.7%) and Amhara (7.6%) were found much better than the national average (4.2%) even though by far below the anticipation of ESDP IV target (25%).

Table 23: Students who Scored $\geq 50\%$ and 75% by Regions

No	Region	$\geq 50\%$	$\geq 75\%$	ESDP IV Target of 2014/15	
				$\geq 50\%$	$\geq 75\%$
1	Tigray	40.7	2.6	70%	25%
2	Afar	17.4	0		
3	Amhara	35.2	7.6		
4	Oromia	43.4	4.7		
5	Somali	17.3	0		
6	BenishanguGumuz	19.0	0.5		
7	SNNP	34.7	3.1		
8	Gambella	11.5	0.8		
9	Harari	52.5	10		
10	Addis Ababa	31.8	5.8		
11	Dire Dawa	41.3	7.7		
12	National Average	33.8	4.2		

3.3. Student Performances at Varying Levels of Standards

As discussed so far, the student performance comes from placing the students into their performance-level categories based on their scores from both grade levels. A four -category set of performance standards definitions was adopted to assist in utilizing student performance data. The categories are the same as those used in the 2010 (baseline) NLA study, but in the current performance levels and cut scores were set by subject experts and teacherpanelists who were coming from high, medium and low performing schools in the test which was administered in May 2013. For this reason, the cut scores of the two NLAs and performance levels were not directly comparable. In this regard, this current study can be used as benchmark for the coming NLA studies. Students' achievement ranged of below basic to advanced level continuum is presented under subsections of 3.3.1 and 3.3.2 below.

3.3.1. Grade 10 Student Performances at Varying Levels of Standards

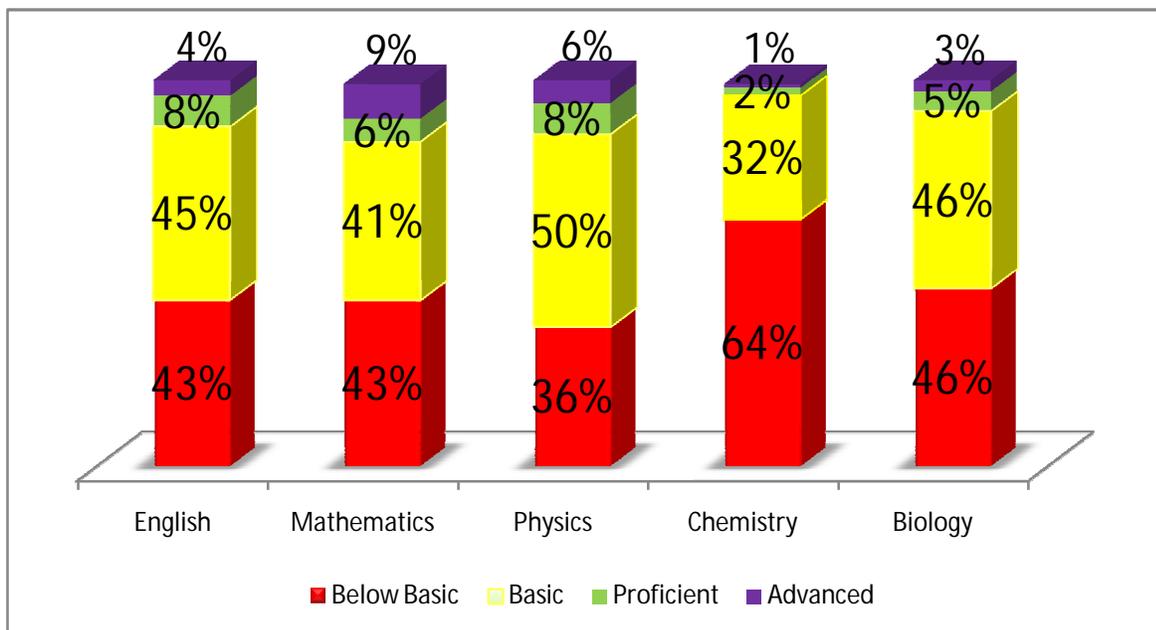
As indicated in table 24 below, the cut scores for basic category ranged from scaled score 227.6 to 255.5 in English and Chemistry tests respectively. The cut score for proficient category ranged from 296.5 to 329.4 and 353.1 in Physics, Biology, and chemistry in their respective order. For a proficient category, all scaled scores were found to be 324.8 and above in all subject tests.

Table 24: Grade 10 cutting Scaled score and percentage of students in each category

Subjects	Below Basic		Basic		Proficient		Advanced	
	ScScor	% stu	Scaled score	% stu	Scaled score	% stu	Scaled score	% students
English	≤227.5	43	227.6-311.2	45	311.3- 355.5	8	355.6 & above	4
Math	≤229.1	43	229.2-298.7	41	298.8- 324.7	6	324.8 & above	9
Physics	≤230.7	36	230.8-296.4	50	296.5- 341.0	8	341.1 & above	6
Chemistry	≤255.5	64	255.6-353.0	32	353.1- 377.4	2	377.5 & above	1
Biology	≤231.4	46	231.5- 329.3	46	329.4- 351.6	5	351.7 & above	3

The following figure depicted the percentage of students in each category.

Figure 10: Grade 10 Percentage of students in each performance level



As displayed in table 24 above, this figure 10 above depicted visually, classification based on the scaled scores were ‘Advanced’ is 9% for Mathematics, 6% for Physics, 4 % for English, 3% for Biology, and 1%for Chemistry. Students at the proficient levels ranged from 2% for Chemistry to 8% for English and Physics. In general, the number of students at the proficient and advanced level were found the 15%, 14% and 12% for mathematics, Physics and English respectively whereas Chemistry is placed at lowest side the continuum. Percentage of students under **Basic** categorized was highest for Physics (50) and least for Chemistry (32%). On the other hand, percentage of students under Below Basic was relatively highest for Chemistry (64%) and least for Physics (36%). In general, 84% to 94% of students were under basic and below basic levels in each subject.

3.3.2. Grade 12 Student Performances at Varying Levels of Standards

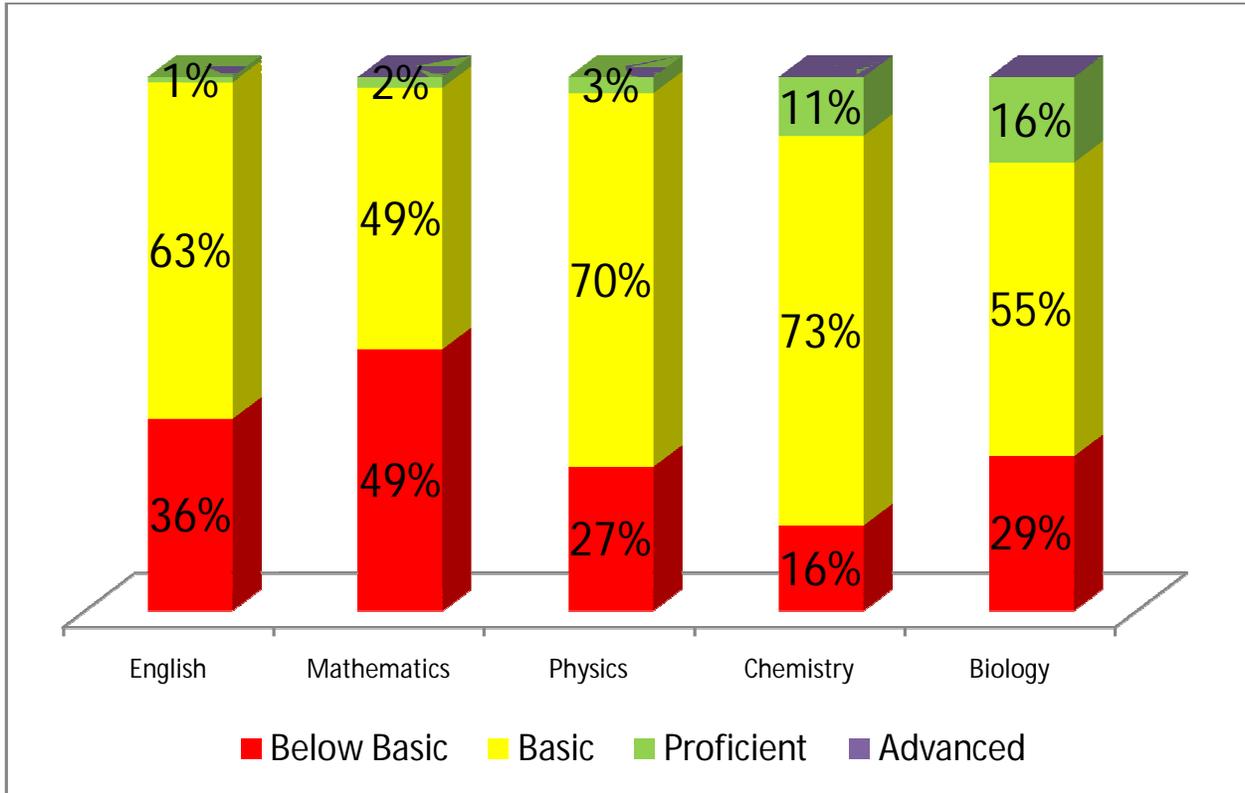
As shown in table 25 below, the cut scores for **Basic** category ranged from scaled score 191.2 and 236.4 to 248.4 for English, Mathematics and Physics tests respectively. The cut score for **Proficient** category ranged from 303 to 436.7 for Biology and Physics respectively.

Table 25: Grade 12 cutting Scaled score and percentage of students in each category

Subjects	Below Basic		Basic		Proficient		Advanced	
	Scaled Score	% stu	Scaled Score	% stu	Scaled Score	% stu	Scaled Score	% stu
English	≤ 191.2	36	191.3-333.6	63	333.7-412.8	1	412.9 and above	0
Math	≤ 236.3	49	236.4-360.3	49	360.4-391.3	2	391.4 and above	0
Physics	≤ 248.3	27	248.4-436.7	70	436.7-	3	436.8 and up	0
Chemistry	≤ 218.5	16	218.6-319.0	73	319.1-386.5	11	386.6 and above	0
Biology	≤ 214.1	29	214.2-302.9	55	303.0-360.70	16	360.8 and above	0

For better visual representation, the figure below was used to depict the percentage of students in each category.

Figure 11: Grade 12 Percentage of students in each performance level



In Grade 12, as visually depicted in Figure 11 above, none of the students were categorized as Advanced for all the five subjects. The students who were categorized as proficient were found 16% and 11% of for Biology and chemistry respectively, but they were below 4% for the rest subjects. Majority of the students categorized under basic level which was ranged from 49% for Mathematics to 73% for Chemistry. On the other hand, percentage of students in Below Basic category was highest for Mathematics (49%) and least Chemistry (16%).

3.4. Factors associated with students' academic achievement

3.4.1. Grade 10 Students' Background related Factors

Among several variables related to students' home and school variables, only some of them were found statistically significant in predicting the students' achievements. About 19% of the total variation in grade 10 student test scores was accounted by the school type, gender, students' absenteeism, frequency of reading additional materials and availability of reference books at their home, family support in learning, distance from home to school, mother and father educational status and frequency of having meals per day .

3.4.2. Grade 12 Students' Background related Factors

Grade 12 students' test performances were also significantly predicted by the following background variables: students' gender, number of meals in a day, number of pages that students read per day for studying, parental support for study, mothers educational status, distance travel from home to school, absenteeism and having reference books for studying at home. These background factors were able to explain 18% ($R^2=0.18$) for the variation observed in the average scores. Moreover, students' feeling towards their teachers and schools related factors explained 8% and 5% respectively of the total variations of students achievement score.

3.4.3. Grade 10 Teachers and School Related Factors

About 14% of the total variation of Grade 10 students' achievement scores was accounted for by the wastage of time in meetings, students' lack of respect for their teachers and the technical problems of plasma TV during instruction. Moreover, the frequency of contacting with students' parent, teachers qualification, lack of

students interest in learning, teachers usage and share of experiences of about curriculum materials were accounted for about 25% of variation in average score. About 7% of the total variation in students' achievement scores was accounted for by the usage of teaching media and students' absenteeism and 3% was accounted for by the school improvement program. On the other hand, 20% of the variance in students' achievement was explained by parental support for the school, plasma power disruption, experiences of school principal as school leadership and students absenteeism.

3.4.4. Grade 12 Teachers and School Related Factors

Among the English language teacher variables that significantly predicted test performance of the students were: clarifying standards of the Syllabus and MLC for student learning through in-depth discussion and analysis of students, class work, professional development (e.g., courses and professional reading), the kinds of changes called for by the school improvement program are helping the students reach higher levels of achievement, an instructional leader studied students work and commented on ways the English teacher could improve their learning of subject matter. These English language subject specific variables explained 29% ($R^2=0.29$) of the total students English achievement scores.

Concerning mathematics teacher variables, clarifying standards in the Syllabus and MLC for student learning through in-depth discussion and analysis of students class work, participation of in-service, professional development, or other courses related to mathematics teaching showed significant correlation and prediction with the students' test performance. These variables were able to predict 23% ($R^2=0.23$) of the total variations of students mathematics achievement scores.

With respect to the total test performance of students' chemistry, only very few variables namely: Disruption of classes by students and use of technology for Chemistry instruction significantly predicted 13% ($R^2=0.13$) of the total variation of students' chemistry achievement scores.

Similarly, from Physics Teacher questionnaire, only the following variables: Use of Technology for Physics Instruction, Student Absenteeism, Power disruption during plasma instruction, and Planning and preparation of teachers explained 26% ($R^2= 0.26$) the total variations of students Physics achievement scores. However, from the Biology Teacher questionnaire only one variable that is the "Comfort level of Biology teacher in teaching the subject" was found the only significant predictor of students' Biology achievement scores. This variable which is related to teachers job satisfaction was able to predict 7% ($R^2=0.07$) of the variation of students Biology achievement scores.

On the other hand, among the principal variables collected from principals' questionnaire, very few were found significant predictors of students overall average achievement score. These predictor variables were "examining the coverage of specific curricular topics, textbook student ratio of Grade 12 Physics, developing thematic units or other approaches for integrating instruction across curricular areas." These principal related variables as independent group explained 23% ($R^2 =0.23$) of the total average of students achievement scores.

3.5. School Level Effects

The variance partitioning based on general linear model result, that took student mean score as dependent variable and school level data as random factor showed that 15.3% and 11% of the observed variations in academic achievement for grade 10 and 12 respectively came from differences among schools.

The same model that took region level data as random factor showed that in grade 10 was 12.4% and in 12 was 10% of the observed variations in academic achievement were due to differences among the regions.

Synopsis of the Most Influential Factors based on their Weight

The result of the study indicated that the most dominant variables which accounts for variance of students' achievement were:

1. Factors related to effort and efficiency of student in learning
 - Students absenteeism
 - Number of pages students read per a day
 - Students lack of respect and misbehavior for their teachers

2. Factors related to student back ground variables
 - School Type
 - Gender
 - Distance student travel from school to home
 - Lack of parents support for the students study
 - Mother and father educational status
 - Insufficient discussion between parents/guardians and students about educational affaires
 - Daily regular opportunity for meal
 - Availability of reference materials at home

3. Factors related to school variables
 - **Teachers**
 - Encouragement/support made by teacher
 - Provision of feedback by teachers
 - Teachers usage of instructional materials and aids/media
 - Qualification of teachers
 - Sharing experience among teacher about syllabus MLC and text books

- **Principals**
 - Experience of school principals as leadership
 - Creating discussion/support within parents
- **Usage of technological medias**
 - Power disruption during plasma instruction
 - technical and language problem
- **School activities**
 - School effort in students decision making
 - Time spent Co-curriculum/related activities
 - Wise usage of learning/school times
 - School readiness for students achievement
 - Enabling school environment
 - School improvement program
 - School communication with and involvement of parents

4. Conclusions and Recommendations

4.1. Conclusions

The mean achievement scores in the subjects tested were found low and most students in both grades were unable to score at least 50%.

Despite the fact that the minimum expected score in each subject is 50%, only 13.9% in Grade 10 and 10.5% in Grade 12 were able to score 50% and above in physics.

Physics is a major requirement of further education in the field of science and technology which is the focus of the government at present. However, the achievement scores in this subject were found the least at both grades. It is to be recalled that similar results were found in the baseline study.

There exist wide variations across subgroups too. Males were performing better than females in both grades in each subject. Students from non government schools performed better than their counter parts from government schools. Emerging regions are mostly performing less when compared with the others.

The trend analysis made in terms of grade 10 national averages of each subject and their composite mean scores showed that there was a significant increase of achievements in all subjects except in biology. Particularly, the increase in physics subject is relatively good.

In grade 12, the current students' achievement became decline as compared to the baseline achievement data. The decline in mathematics score was found relatively huge.

The number of students who scored at least 50 and 75 and above percentages for both grades were found by far lower than when comparing with the target set in ESDP IV.

Multiple regression analysis based on the students' questionnaires resulted in a model which was able to explain 19% for background variables for the variations observed in the average scores at student level.

In Regard to the teachers' questionnaires, 14% of the total variation in students' achievement scores was accounted for by frequency of meeting, students' misbehavior and plasma TV disruption and 3% explained by school improvement program. Moreover, 25% of score variation was explained by number of contact with parents, teachers' usage and share of

experience of about curriculum materials, qualification of teachers, low interest of students in learning and 7% accounted for by the usage of teaching media and students' absenteeism.

4.2. Recommendations

1. The observed low achievement scores in all the subjects tested calls for immediate intervention and continued effort to raise the achievement levels. Schools and teachers should be facilitated and supported through professional development trainings in extending the use of all available resources and sharing experiences with one another. In addition, teachers need to have a comprehensive pre- and in-service training on how to use classroom assessment strategies and techniques which is compatible with the newly reframed competency based education curriculum for better students' academic achievement.
2. A tailor made learning support program should be introduced at national and regional levels. The primary beneficiaries of this scheme should be disadvantaged areas such as the emerging regions. The Ministry of Education and/or the Regional Education Bureaus can track disparities through regular analysis of standards and can take preventive measures which can correct any disparities identified.
3. The existence of wide variations in achievement scores not only between groups but also within group calls for individualized approaches of teaching. Teachers should be trained and become familiar to techniques that help to diagnose and intervene at individual student level.
4. Teachers need to incorporate greater differentiation of teaching practices into their classroom. Such differentiations should address the needs of both low and high achieving students.
5. All concerned bodies should address provision of additional supports to female students. There should be a concerted effort to raise the achievement levels of females to narrow the gap. The source of the problem goes beyond the Education Sector hence there is a need to carry out detailed investigations to come up with specific recommendations.
6. In all the subjects in general, and in physics in particular, there is a felt need to revisit the curriculum materials and the mode of delivery and intervene immediately. Simplifying the materials and relating the concepts with day to day life are suggested. Besides, regular

orientation should be given to the students on how to have and maintain good habit learning physics and mathematics as well by enlightening them that nobody was born with what they have in their brain, that they learn everything as they are growing up. By doing this, the orientation that the students have will change and they may be able to have positive attitude to their studies of the subject.

7. In order to identify subject specific implications and maximize the benefit of the available data, further exploration using rigorous standard setting and item analysis procedures should be carried out. Production of separate report for each subject will help to maximize the benefits of the assessment.
8. Classroom teachers should use the PLDs to inform the development of classroom-based formative assessment tools, including the creation of rubrics to gauge student learning against the expectations of the MLCs of the grade level. For quick reference and better understanding of the level of instructional supports students who performance fits, the detailed PLDs should be included in the students' textbooks as well as in teacher's guide. Therefore, the curriculum development and implementation directorate of MOE and the REBs should include the PLDs when they print the students' textbook and the teacher's guides.
9. NEAEA and REBs should use PLDs to determine the threshold expectations for students to demonstrate the knowledge and skills necessary to attain just barely a Basic, Proficient, or Advanced on the assessment. PLDs should also be used during item development, as each test needs questions that distinguish performance all along the continuum.

5. Annex: Recommended Cut Scores for each subject of both grades

Grade 12 English Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	16.3	2.1	18	14	20	12
P	42.4	2.6	45	40	48	37
A	59.1	0.5	60	59	60	58

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	12%		19%	6%	27%	2%
P	92%		95%	90%	97%	84%
A	100%		100%	100%	100%	100%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	12%		19%	6%	27%	2%
B	80%		76%	84%	70%	82%
P	8%		5%	10%	3%	16%
A	0%		0%	0%	0%	0%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	27.1		30.0	23.3	33.3	20.0
P	70.6		75.0	66.7	80.0	61.7
A	98.5		100.0	98.3	100.0	96.7

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-1.50	0	-1.30	-1.80	-1.05	-2.10
P	1.45	0	1.85	1.15	2.40	0.80
A	4.00	0	4.00	4.00	4.00	4.00

Grade 12 Mathematics Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	14.2	2.7	17	11	20	9
P	37.7	3.1	41	35	44	31
A	48.7	0.5	49	48	50	48

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	23%		38%	9%	49%	3%
P	90%		95%	88%	98%	81%
A	100%		100%	100%	100%	100%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	23%		38%	9%	49%	3%
B	67%		57%	78%	49%	77%
P	10%		5%	12%	2%	19%
A	0%		0%	0%	0%	0%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	28.4		34.0	22.0	40.0	18.0
P	75.5		82.0	70.0	88.0	62.0
A	97.5		98.0	96.0	100.0	96.0

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-1.25		-1.00	-1.60	-0.70	-1.90
P	1.05		1.60	0.70	2.30	0.30
A	4.00		4.00	4.00	4.00	4.00

Grade 12 Physics Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	10.8	2.0	13	9	15	7
P	33.3	2.7	36	31	39	28
A	47.5	1.1	49	46	50	45

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	13%		36%	7%	52%	2%
P	98%		99%	96%	99%	94%
A	100%		100%	100%	100%	100%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	13%		36%	7%	52%	2%
B	85%		63%	89%	48%	92%
P	2%		1%	3%	1%	6%
A	0%		0%	0%	0%	0%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	21.6		26.0	18.0	30.0	14.0
P	66.5		72.0	62.0	78.0	56.0
A	95.1		98.0	92.0	100.0	90.0

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-1.15	0	-0.75	-1.55	-0.40	-2.05
P	2.30	0	2.90	1.90	3.70	1.45
A	4.00	0	4.00	4.00	4.00	4.00

Grade 12 Chemistry Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	15.7	1.3	17	14	18	13
P	42.1	1.8	44	40	46	39
A	58.3	0.7	59	58	60	57

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	10%	0%	16%	7%	21%	5%
P	86%	0%	89%	83%	92%	81%
A	100%	0%	100%	100%	100%	100%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	10%	0%	16%	7%	21%	5%
B	76%	0%	73%	75%	72%	76%
P	14%	0%	11%	17%	8%	19%
A	0%	0%	0%	0%	0%	0%

Percent Raw Score Cuts

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	26.2%		28.3%	23.3%	30.0%	21.7%
P	70.2%		73.3%	66.7%	76.7%	65.0%
A	97.2%		98.3%	96.7%	100.0%	95.0%

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-1.10	0	-1.00	-1.30	-0.9	-1.4
P	1.10	0	1.30	0.90	1.5	0.8
A	4.00	0	4.00	4.00	4	4

Grade 12 Biology Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	20.5	2.7	23	18	26	15
P	40.4	2.8	43	38	46	35
A	56.8	1.0	58	56	59	55

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	13%		20%	9%	29%	4%
P	69%		76%	63%	84%	55%
A	99%		100%	99%	100%	98%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	13%		20%	9%	29%	4%
B	55%		56%	55%	55%	51%
P	31%		24%	36%	16%	43%
A	1%		0%	1%	0%	2%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	34.2		38.3	30.0	43.3	25.0
P	67.3		71.7	63.3	76.7	58.3
A	94.7		96.7	93.3	98.3	91.7

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
0	-1.25		-1.10	-1.45	-0.90	-1.70
0	0.15		0.40	-0.05	0.70	-0.25
0	2.95		3.70	2.60	4.00	2.25

Grade 10 English Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	17.1	3.7	21	13	24	10
P	31.6	6.4	38	25	44	19
A	39.0	7.7	47	31	54	24

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	23%		43%	6%	55%	1%
P	75%		87%	59%	94%	33%
A	89%		96%	75%	99%	55%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	23%		43%	6%	55%	1%
B	52%		45%	52%	38%	32%
P	13%		8%	17%	6%	22%
A	11%		4%	25%	1%	45%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	28.6		35.0	21.7	40.0	16.7
P	52.7		63.3	41.7	73.3	31.7
A	65.0		78.3	51.7	90.0	40.0

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
0	-1.05		-0.55	-1.70	-0.20	-2.35
0	0.65		1.50	-0.10	2.55	-0.80
0	1.65		3.30	0.60	4.00	-0.20

Grade 10 Mathematics Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	18.2	3.2	21	15	25	12
P	31.9	5.4	37	26	43	21
A	36.1	6.0	42	30	48	24

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	61%		72%	43%	82%	22%
P	92%		97%	84%	100%	72%
A	97%		99%	91%	100%	80%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	61%		72%	43%	82%	22%
B	31%		25%	41%	17%	50%
P	5%		2%	6%	0%	8%
A	3%		1%	9%	0%	20%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	36.4		42.0	30.0	50.0	24.0
P	63.7		74.0	52.0	86.0	42.0
A	72.1		84.0	60.0	96.0	48.0

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	0.10		0.45	-0.35	0.95	-0.80
P	1.90		2.90	1.10	4.00	0.45
A	2.70		4.00	1.65	4.00	0.80

Grade 10 Physics Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	17.47	3.259001	21.00	14.00	24	11
P	29.13	4.976339	34.00	24.00	39	19
A	35.47	5.934908	41.00	30.00	47	24

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	59%		79%	36%	86%	100%
P	93%		97%	86%	99%	100%
A	97%		99%	94%	100%	100%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	59%		79%	36%	86%	100%
B	34%		18%	50%	13%	0%
P	4%		3%	8%	1%	0%
A	3%		1%	6%	0%	0%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	34.9		42.0	28.0	48.0	22.0
P	58.3		68.0	48.0	78.0	38.0
A	70.9		82.0	60.0	94.0	48.0

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-0.05		0.40	-0.60	0.80	-1.15
P	1.50		2.30	0.80	3.45	0.15
A	2.60		4.00	1.65	4.00	0.80

Grade 10 Chemistry Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	22.2	4.2	26	18	31	14
P	39.4	6.7	46	33	53	26
A	43.8	7.3	51	36	58	29

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	51%		64%	33%	76%	14%
P	89%		96%	79%	99%	64%
A	94%		99%	85%	100%	72%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	51%		64%	33%	76%	14%
B	38%		32%	47%	24%	50%
P	4%		2%	5%	1%	8%
A	6%		1%	15%	0%	28%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	37.0		43.3	30.0	51.7	23.3
P	65.7		76.7	55.0	88.3	43.3
A	73.0		85.0	60.0	96.7	48.3

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-0.20		0.15	-0.55	0.60	-1.00
P	1.45		2.40	0.80	4.00	0.15
A	2.05		3.50	1.10	4.00	0.40

Grade 10 Biology Round 2 Standard Setting Result

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	20.1	3.9	24	16	28	12
P	39.6	6.7	46	33	53	26
A	43.8	7.3	51	36	58	29

Cumulative Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	31%		46%	15%	57%	3%
P	81%		92%	69%	99%	52%
A	88%		97%	75%	100%	60%

Percent of Students in Performance Level Categories

Category	Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
BB	31%		46%	15%	57%	3%
B	50%		46%	55%	42%	48%
P	7%		5%	6%	1%	8%
A	12%		3%	25%	0%	40%

Percent Raw Score Cuts

Category	% Raw Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	33.4		40.0	26.7	46.7	20.0
P	66.0		76.7	55.0	88.3	43.3
A	73.0		85.0	60.0	96.7	48.3

Theta Cuts Corresponding to Percent Raw Cuts

Category	Theta Cut	SE	Cut + 1SE	Cut - 1SE	Cut+2SE	Cut -2SE
B	-0.55		-0.20	-0.95	0.10	-1.40
P	1.15		1.90	0.50	3.25	-0.05
A	1.60		2.75	0.80	4.00	0.20