National Report

National Assessment of Achievement of Students Completing Grade 8 in Year 2016 in Sri Lanka

Ministry of Education
National Education Research and Evaluation Centre (NEREC)

May 2017

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Acknowledgements

Message from the Secretary, Ministry of Education

I consider it is a privilege for me to write this message to the report on 'National Assessment of Achievements of Grade 8 students in 2016 in Sri Lanka'. Conducting periodical national assessments has been one of the major activities of the Education Sector Development Framework and Programme (ESDFP) (2012-2016). This is an important national action which is exercised with a view to reveal in the achievement levels of students in various grades. Findings of these assessments help teachers to understand the levels of achievement of students and policy-makers and planners to determine the performance of the education system by means of learning outcomes, to what extent the educational development programmes and investments have been successful and what further steps should be taken in order further to upgrade the performance of the system considering the importance of this exercise, the Ministry of Education has planned to continue these assessments regularly and effectively.

In this context the Ministry of Education, with the financial assistance of the World Bank, has commissioned the National Education Research and Evaluation Center (NEREC) of the Faculty of Education, University of Colombo the task of conducting national assessments to determine the levels of achievements of students in grades 4 and 8, during last several years. Its latest national assessment report reveals factors that are particularly significant in order to enhance teaching and learning, analysed by various aspects such as types of schools, gender, medium of instruction, location, and competency levels of students who completed grade 8 in the year 2016.

I wish to extend my sincere gratitude to Hon. Akila Viraj Kariyawasam, Minister of Education for providing guidance to implement this activity which has a national importance. Further, I also wish to thank Dr. Harsha Aturupane, Lead Education Specialist, Education Global Practice of the World Bank for providing technical guidance to carry out this assessment and appreciate the financial assistance extended by the World Bank through the 'Transforming School Education Project (TSEP)' for this purpose. I also appreciate the Dean, Faculty of Education University of Colombo, and Director NEREC, Professor Marie Perera and NEREC research team

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Abbreviations

EFA	Education for All
ESDFP	Education Sector Development Framework and Programme
ESS	Effective Sample Size
IEA	International Association for the Evaluation of Educational Achievement
NEREC	National Education Research and Evaluation Centre
PPS	Probability Proportional to Size
roh	Rate of homogeneity
SD	Standard deviation
TIMSS	Trends in International Mathematics and Science Study

Executive Summary

Assessment of student learning has become a major tool of governments to collect high-quality data on education in order to inform effective policies and practices. In keeping with this trend in Sri Lanka the Ministry of Education has entrusted the National Education Research and Evaluation Centre (NEREC) of the Faculty of Education, University of Colombo to conduct these assessments.

NEREC has conducted National Assessment of Learning Outcomes both at primary as well as at secondary level. At secondary level National Assessment of learning outcomes were conducted at Grade 8 in 2005, 2008, 2012 and 2014. This report presents the findings of a National assessment conducted in grade 8 for English, mathematics and science in the year 2016.

The national assessment of learning outcomes of 2016 used instruments designed in 2012 to test cognitive skills in English, mathematics and science in keeping with the new competency based curriculum which was introduced in 2009 in grade 8. Same instruments were used in the 2014 national assessments. The findings of the 2016 assessment were compared with the findings of 2014.

The national assessment covered the entire country and the sample was drawn to enable analysis by province, type of schools, gender and medium of instruction. The sample consisted of 12,971 students drawn from 442 schools.

Patterns in learning achievement was discussed using measures of central tendency mean and median, skewness values of the distribution, cumulative percentages and percentile ranks. In addition, graphs – frequency polygon and box plots were also used

Data gathered through the achievement tests were analyzed on a national and provincial basis in relation to medium of instruction, school type, and gender.

The findings revealed that national averages of achievement for the three subjects mathematics, science and English in 2016 were 51.11, 41.76 and 35.81

respectively. Compared with the findings of 2014 it was found that in 2016, there is a slight increase in performance in all three subjects.

There is disparity in achievement in all three subjects in relation to provincial performance, school type, gender and medium of instruction. However, the comparison between the achievements in 2014 -2016 revealed that in science and English achievement male performance, in rural area and Tamil medium schools and 1C and Type 2 schools has increased. These findings implies that bridging the gap is possible, Therefore, is necessary to identify best practices that contributed to these increases and disseminate them to other schools.

It was also revealed that the competency based curriculum needs to be revisited. Achievement of majority of the competency levels in all three subjects is not satisfactory. However, when compared to 2014 in 2016 there is an improvement. Yet, the areas that were very weak continues to be weak and in some competency levels the achievement has decreased. Achievement of writing skills in English continues to be weak.

The National Institute of Education should examine whether these findings have been incorporated to the curriculum revisions in 2015. If not measures need to be taken to address these issues.

Dissemination of these findings at provincial and zonal level is recommended. It is necessary for the findings to be feed into future developmental plans. Therefore, it is necessary to carry out further small scale research, conduct workshops as to identify how best the findings could be utilized at grass root levels.

Introduction to the Study

1.1   Background

There is a greater need today to uphold the fundamental principles of equality of educational opportunity and universal access to education. The World Declaration on Education for All, adopted in Jomtien, Thailand (1990) and the Dakar Framework for Action (2000) set out an overall vision: universalizing access to education for all children, youth and adults, and promoting equity. Evaluating the progress made towards the EFA goals since 2000 and the education related Millennium Development Goals (MDGs) as well as the lessons learned, a new education agenda and the Framework for Action, Incheon Declaration, 2030 has been proposed. This declaration having examined the remaining challenges has identified on future priorities and strategies for its achievement hoping to "leave no one behind". This new vision is embodied in the proposed Sustainable Development Goal 4 (SDG 4) "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".

The global norm for educational governance has been established by adopting evidence-based policymaking in education (Wiseman, 2010). A world wide emphasize, on the need for timely and credible data on student learning, that may inform the design of effective mechanisms to improve educational outcomes, rather than only on education inputs could be seen. Consequently there is a dramatic and global growth in the use of learning assessments (Kamens & McNeely, 2010). Assessment of student learning have become a major tool of governments to collect high-quality data on education in order to inform effective policies and practices (Masters, 2017).

This shift from an emphasis on education inputs to assessment of quality was influenced by the Jomtien Declaration (*World Declaration on Education for All* 1990). Article 4 of the Jomtien Declaration 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,p. 5). Another reason for this shift in focus was the Dakar Framework for Action (UNESCO 2000), which also highlighted the importance of learning outcomes. One of its goals was, by 2015, to improve "all aspects of the quality of education . . .especially in literacy, numeracy, and essential life skills" (UNESCO 2000, iv, 7). Over 130 Education Ministers and more than 1500 participants have now adopted the Incheon Declaration "Education 2030: Towards inclusive and equitable quality education and lifelong learning for all ". The Incheon Declaration was signed at the end of the World Education Forum (WEF) held in Incheon, Republic of Korea, during the third week of May 2015. As explained in the opening paragraphs of the document, the Declaration marks and important step in the development of international education policy, continuing the Education for All (EFA) movement, started in Jomtien Thailand in 1990 and formalised by the Dakar Framework for Action (2000).

As a member country agreed on the World Declaration on Education for All, Sri Lanka strived to enhance the quality of education by implementing procedures that will provide information on students' learning. One such measure adopted was monitoring student achievement through national assessments at different Grade levels conducted by the National Education Research and Evaluation Centre (NEREC). A national assessment "is designed to describe the achievement of students in a curriculum area aggregated to provide an estimate of the achievement level in the education system as a whole at a particular age or grade level" (Kellaghan, Greaney and Murray. 2009, p.xi).

The purpose of a national assessment is not only to provide information on the state of education, but also that information should lead to improvement in student achievement by systematically feeding into decision making. Sui-chu Ho, E (2015) identifies three main purposes of National Assessment. First, is to evaluate the overall learning achievement levels of students at certain grade levels and to monitor the overall quality of basic education. Secondly, to provide feedback to the curriculum and teaching and learning practices in order to achieve better outcomes for students. Thirdly, to inform policy.

Promoting "Equity" and "excellence" and reducing disparities in the education system is one of the main focuses of the Government of Sri Lanka. In this regard a comprehensive medium term Education Sector Development Framework and Programme (ESDFP) from 2006–2010 was developed. This "framework incorporates a blend of bottom - up and top – down supportive planning process for the development of the primary and secondary education system" (Pg.2) One of the Major areas identified in this framework is "improving the quality of basic and secondary education" and "increasing equitable access to basic and secondary education" (p.2) This Framework further emphasizes that equitable access means that "each child can access an education appropriate to his /her individual learning potential and needs" (Pg.4). The plan for the second stage of the ESDFP for the period 2012 -2017 is an extension of the policy framework which comprises three policy themes as follows.

> Theme 1: Increase equitable access to primary and secondary education
> Theme 2: Improve the quality of primary and secondary education
> Theme 3: Strengthen governance and service delivery of education

In addition it provides a foundation theme and a crosscutting activity to ensure the achievement of policy themes related results and outcomes.

The foundation : Overarching education sector development rolling plan : and
Crosscutting activity : Results – based monitoring and evaluation. (p.1)

Under theme 2 – Improving Quality of primary and secondary education, National Assessment of Learning Outcomes are expected to be utilized for program development.

1.2   National Assessment studies conducted in Sri Lanka

National Assessment of Learning Outcomes has become an important component of education policy analysis and programme monitoring in Sri Lanka. The National Education Research and Evaluation Centre (NEREC) of the Faculty of Education, University of Colombo has been the forerunner in conducting these assessments.

NEREC has conducted National Assessment of Learning Outcomes both at primary as well as at secondary level. At primary level, assessments were conducted at Grade 4 in 2003, 2007, 2009, 2013 and 2015 respectively. At secondary level National Assessment of Learning Outcomes were conducted at Grade 8 in 2005 , 2008, 2012 and 2014. The results from these studies, it is claimed provide "useful information for analysis of policy and the monitoring of the progress of the education system" (Aturupane, 2009, p.31).

1.3   Rationale for the present study

This report presents the findings of a National Assessment conducted in grade 8 in 2016 for English, Mathematics and Science.

The national assessments conducted in grade 8 in 2005 and 2008 reveal that on average there is an improvement in achievement levels of Grade 8 students in Science and Mathematics. The achievement of the English language, which is the second language of the students was not assessed. While there was an improvement in the achievement of learning outcomes it was also revealed that there are inequalities in provision of education in relation to provinces, gender, medium of instruction and locality (NEREC, 2008).

Although there is a substantial increase in achievement over the period, the need "for these findings to be supported by further national assessments in the future, in order to reach a reliable and robust conclusion about the magnitude of improvement" (Aturupane, 2009, p.33) has been stressed.

On the other hand, in 2007, a new competency based curriculum was introduced at grade 6 and in 2009 in grade 8. Therefore, there was a need to find out whether the introduction of the new curriculum had an impact on the learning outcomes.

1.4   National Assessment of Learning Outcomes- 2014 and 2016

The National Assessment of Learning Outcomes of 2012 used new instruments to test cognitive skills in English, Mathematics and Science in keeping with the new curriculum. Therefore, it was not possible to compare with the previous assessments. Instead, the 2012 National Assessment served as the baseline for monitoring the level and distribution of learning outcomes over time. The same instruments were used in the National Assessment of learning outcomes in 2014 and 2016.

According to Kellaghan and Greaney 2009), all national assessments seek answers to six questions. The present Assessment seeks to find answers to four of them as follows:

- How well are students learning in the education system (with reference to general expectations, aims of the curriculum, preparation for further learning, or preparation for life)?

- Does evidence indicate particular strengths and weaknesses in students' knowledge and skills?

- Do particular subgroups in the population perform poorly? Do disparities exist, for example, between the achievements of (a) boys and girls, (b) students in urban and rural locations, (c) students from different language or ethnic groups, or (d) students in different regions of the country?

- Do the achievements of students change over time? This question may be of particular interest if reforms of the education system are being undertaken. Answering the question requires carrying out assessments that yield comparable data at different points in time
  (Kellaghan and Greaney, 2008, p.9).

Chapter 2 of this report will discuss the methodology of the study. Chapters 3-5 will present the findings pertaining to the achievement of cognitive skills in Mathematics, Science and English respectively. The final chapter will discuss the lessons to be learnt and the way forward.

1.5   Summary

A worldwide concern regarding the need to achieve "Education for All" is evident. The challenge before all nations is to ensure that increased access to education is delivered in association with improvements in the conditions of schooling and student achievement levels.

Sri Lanka being a member country that has agreed to the World Declaration on Education for All, has conducted national assessments of achievement of learning outcomes of students with the aim of monitoring and evaluating the quality of its education systems.

A new competency based curriculum had been introduced at the secondary level in 2009. Therefore, it was necessary to assess student achievement in order to find out the impact of the new curriculum reforms as well as to provide a baseline for future studies. The first national assessment of learning outcomes of grade 8 students after the introduction of the new curriculum was held in 2012. Subsequent national assessments were held in 2014 and 2016. This report presents the findings of student achievement over the period 2014 -2016.

Methodology

2.1 Introduction

In chapter 1, the background and significance of National Assessments with particular relevance to Sri Lanka were discussed. This chapter elaborates the methodology used to conduct the present study in 2016.

2.2 Objectives of the study

In accordance with the Education Sector Development Framework Programme (ESDFP 2012-2016) and the education sector development plan through sector-wide approach, the main objective of the study was to determine the achievement of the learning outcomes of students completing grade 08 in 2016.

2.2.1 Specific objectives of the study

I.   Assess the extent to which the expected learning outcomes have been achieved by students
II. Identify the areas of strengths and weaknesses of student achievement in relation to subject content and related skills
III. Examine whether there are disparities in achievement in relation to school type, medium of instruction, school location, and gender
IV. Compare the achievement level of students in 2016 with that of 2014.

2.3 Sampling methodology

The sampling methodology used for this study was the same as the one used in national assessments of 2012 and 2014. It was based on an instructional manual designed by the Statistical Consultation Group, Statistics Canada in Ottawa. This has been recommended by the World Bank in its series, Assessment of Educational Achievement in Developing Countries and has been used for evaluation purposes since 2007 in international studies

such as the IEA Study of Reading Literacy, the IEA Progress in International Reading Study (PIRLS), and Trends in International Mathematics and Science Study (TIMSS).

Selection of the sample of schools and the sample of students are given below.

2.3.1 Target population

The target population of the study has grade-based definition. Therefore, students who have completed eighth grade in the year 2016 in the education system of Sri Lanka were considered as the desired target population for this study.

2.3.2 Sampling frame and elements of the sampling frame

Sampling frame is the list of ultimate sampling entities. Latest updated school database available at the Ministry of Education, Sri Lanka (the school database for the year 2015 June) was the sampling frame used for the study.

Private schools also provide primary and secondary education. However, they are not regulated by the Ministry of Education in Sri Lanka. Some private schools follow the local curriculum while some of them teach both local and international curricular. International schools, another variety of private schools in Sri Lanka, follow only international curricular. The medium of instruction of these private schools is either Sinhala or Tamil or English. These private schools were not included in the sampling frame. Accordingly, as Table 2.1 indicates the desired target population of the study was 336,593 pupils who completed grade eight in 2016 from 6,176 government schools.

Table 2.1: Target population

Province	Number of Schools	Number of classes	Number of Students
1. Western	896	2,229	78,861
2. Central	913	1,580	45,400
3. Southern	688	1,359	41,566
4. Northern	525	842	19,288
5. Eastern	643	1,159	32,259
6. North Western	781	1,380	40,696
7. North Central	423	765	22,752
8. Uva	564	899	23,794
9. Sabaragamuwa	743	1,176	31,977
Total	6,176	11,389	336,593

2.3.3 Sample design – Procedure

The sample procedure of this study has a multi-stage approach, a strategy used to select the final sample through a series of stages.

In the first stage, schools were selected for the sample. Schools were selected within strata with Probability Proportional to Size, without replacements. *Probability Proportional to Size Sampling* (PPS) is a sampling technique, commonly used in multistage cluster sampling, in which the probability that a particular sampling unit is selected in the sample is proportional to some known variable (Ross, K., 2005). In the second stage, a group of students was selected from the sampled schools using cluster sampling approach thereby an entire grade 08 class from each sampled school was selected.

In selection of the sample, in the present study, as in the two previous studies, 'province' was taken as the main stratum (explicit stratum) because in the Sri Lankan context, education being a devolved subject, Provincial Ministries of Education have a key role in planning, implementing and monitoring educational plans. Medium of instruction (Sinhala and Tamil) and type of school have been considered as implicit strata, because

in Sri Lanka it is used to report students' achievement by medium of instruction and type of school. Accordingly results will be reported for provinces.

Table 2.2 illustrates student sample and school sample per province with other important values which decide the size of sampling error, such as roh, ESS and design effect. Design Effect is the ratio of the variance of the sample mean for a complex sample design to the variance of a simple random sample.

Table 2.2: Calculated student sample and school sample per province

Province	Data	Total	MOE (average class size)	roh	Design effect	ESS=178 Student sample calculated	School sample
Western	students	78,861	35	0.25	9.594885599	1,708	48
	classes	2,229					
Central	students	45,400	29	0.25	7.933544304	1,412	49
	classes	1,580					
Southern	students	41,566	31	0.25	8.396431199	1,495	49
	classes	1,359					
Northern	students	19,288	23	0.25	6.476840855	1,153	50
	classes	842					
Eastern	students	32,259	28	0.25	7.708369284	1,372	49
	classes	1,159					
North Western	students	40,696	29	0.25	8.122463768	1,446	49
	classes	1,380					
North Central	students	22,752	30	0.25	8.185294118	1,457	49
	classes	765					
Uva	students	23,794	26	0.25	7.36679644	1,311	50
	classes	899					
Sabaragamuwa	students	31,977	27	0.25	7.547831633	1,343	49
	classes	1,176					
Total					**8.138554746**	12,697	442

Table 2.3 illustrates calculated student sample, allocated student sample and achieved student sample by provinces.

Table 2.3: Calculated, allocated and achieved student sample per each province

Province	Calculated Student Sample	Allocated Student Sample as MOE School Census Database	Achieved Student Sample		
			Science	Mathematics	English
Western	1,708	1,885	1,415	1,465	1,466
Central	1,412	1,718	1,460	1,472	1,473
Southern	1,495	1,753	1,435	1,499	1,503
Northern	1,153	1,363	1,287	1,302	1,301
Eastern	1,372	1,494	1,329	1,339	1,345
North Western	1,446	1,690	1,489	1,497	1,496
North Central	1,453	1,588	1,376	1,384	1,379
Uva	1,311	1,655	1,478	1,500	1,499
Sabaragamuwa	1,344	1,707	1,454	1,512	1,509
Total	**12,694**	**14,853**	**12,723**	**12,970**	**12,971**

The sampling frame was explicitly stratified by province. With stratification, sample student size can be calculated in advance of sampling procedure so that it will meet the desired level of precision, by each stratum. This ensures that the target population is represented adequately in the sample. Study team was satisfied with 178 as Effective Sample Size (ESS). This would be an accuracy of plus or minus 7.5% at the error limit at the province level. Rate of homogeneity, (roh) 0.25 was calculated from the previous grade 8 assessment study data. Maximum value of roh at the province level was taken for the calculation of the student sample for each province. Assigning a weight to each sampled unit was calculated within the explicit strata.

2.4   Framework for the National Assessment

In assessing the achievement of students, three achievement tests which, were constructed and validated for the previous grade 8 study in 2012, were used in this study as well. These achievement tests were developed to determine the achievement level of learning outcomes of grade 8 students in 2012. The learning outcomes were the competency levels of each subject expected to be achieved by the students. Therefore, to assure the content validity of test papers, a table of specifications similar to the one given below was used.

Example of a skeleton table of specification:

Competency	Competency Level	Content domain	Cognitive domain	Question numbers

2.5   Achievement tests

The tests in mathematics, science and English Language were designed based on the above framework for each subject. Mathematics paper consisted only selective type questions, while the English Language and science papers consisted of both selective and supply type items.

Mathematics test consisted of 40 multiple choice questions with four options. Science paper consisted of 20 multiple choice questions carrying 40 marks and questions requiring short answers carrying 60 marks. The English Language paper consisted of 37 items of different types such as multiple choice, matching activities, completion of sentences and writing simple sentences.

2.6   Procedures in administration of the National Assessment 2016

National Assessment of Grade 08 students were conducted island-wide on the 29th and 30th of November, 2016. It was possible to conduct the test in all 442 schools on the same stipulated dates.

2.6.1 Test coordinators

Coordinators to administer the test from the sample schools were appointed from among Lecturers of the Faculty of Education, University of Colombo and students who follow Master of Philosophy, Master of Education and Post Graduate Diploma in Education courses. Furthermore, lecturers from National Colleges of Education and teachers were also selected for this task. Senior teachers from the schools, where the tests were administered, were appointed to assist the coordinators with the consent of principals.

2.6.2   Training workshop for coordinators

Training workshops for coordinators were organized in two phases. During the first phase, a team representing NEREC visited North Central, Northern, Eastern, Southern and Uva Provinces and conducted workshops at Anuradhapura, Polonnaruwa, Vavuniya, Killinochchi, Jaffna, Trincomalee, Batticaloa, Ampara, Monaragala, Bandarawela, Galle and Hambathota from 21st to 25th of November 2016. Test papers and other relevant documents were handed over to all coordinators with necessary instructions in the above centers during the workshops.

The second phase of the training workshops was organized at the NEREC on the 24th and 25th of November, 2016.

Coordinators from Central, Western, North Western, and Subragamuwa Provinces participated in these sessions. Test papers and other relevant documents with necessary instructions were handed over to them during these workshops. All coordinators were advised to meet the principals and the school coordinators of sample schools on 28th of November 2016 to make prior arrangements concerning the test.

Given below are some of the measures that were adopted in the 2016 study which were expected to increase the reliability of the assessment.

- The tests were administered on weekdays (29th and 30th of November 2016)
- In order to better monitor the administering of the tests, in the 2016 study 442 independent coordinators were appointed to the 442 examination centers.
- The coordinators were expected to complete a journal in which they had to provide information regarding the conduct of the examination.

2.6.3   Return of answer scripts and other documents

Coordinators from Central, Western, North Western, and Sabragamuwa Provinces handed over the answer scripts and other documents to the NEREC office from 3rd to 6th December 2016. A team from NEREC visited the North Central, Northern, Eastern, Southern and Uva Provinces to collect answer scripts and other documents from 8th to 17th December 2016.

2.7   Analysis of data

Data gathered through the achievement tests were analyzed on a national and provincial basis. Since samples were selected on provincial basis, data were weighted.

Patterns in learning achievement were presented using mean, standard deviation, standard error of mean, skewness, cumulative percentages and percentile ranks. In addition to these, graphs such as frequency polygons, box plots, whisker plots and bar graphs were also used to present the data visually.

2.8   Summary

This chapter presented the specific objectives of the study, sampling procedures and the framework of the national assessment of achievement of Grade 8 students in 2016. As mentioned earlier, the National Assessment of Achievement of Grade 8 Students of Sri Lanka in the year 2016 was conducted with the main objective of examining how far the expected learning outcomes have been achieved by such students. The findings are expected to provide important insights into areas that contribute to the achievement of learning outcomes. The next three chapters will present the data pertaining to student achievement in relation to the three subjects, mathematics, science and English language.

Introduction to Chapters 3 – 5

In chapters 3-5 data pertaining to achievement of learning outcomes in relation to mathematics, science and English would be presented. Each chapter is divided into two parts. The main objective of part I would be to identify patterns in achievement in relation to providing equal opportunities in Education. In part II patterns of achievement of 2016 would be compared with the patterns identified in 2014 to identify trends in achievement.

The patterns in achievement will first be presented at all island level to get an overview of the students' achievement in the relevant subject. As discussed in chapter 2, the explicit strata in the 2016 study is the province. Thus, student achievement will next be presented in relation to province. The implicit stratum are the gender, school type, medium of instruction and location. Therefore, provincial analysis would be followed by achievement in relation to gender, school type, medium of instruction and location.

In order to discuss the distribution of achievement, four indicators are used. They are:
- Measures of central tendency - mean and median
- Skewness values of the distribution
- Measures of relative position - cumulative percentages and percentile ranks
- Measures of variability – range and standard deviation, graphs, frequency polygons, box plots and whisker chart

In the final section of part I of each chapter, student achievement would be presented in relation to the skills identified for the particular subject. In part II, patterns identified in 2016 would be compared with patterns identified in 2014 to identify the trends in achievement over the period 2014-2016.

Patterns and Trends in Achievement: Mathematics 2016

3.1 Introduction

This chapter presents the patterns and trends in achievement of the students in mathematics.

The patterns of achievement in 2016 will be presented in part I and the trends will be presented in part II.

Part I – Patterns in achievement in mathematics

First, national level student achievement would be discussed in relation to student performance pertaining to mathematics.

3.2 Patterns of achievement at national level
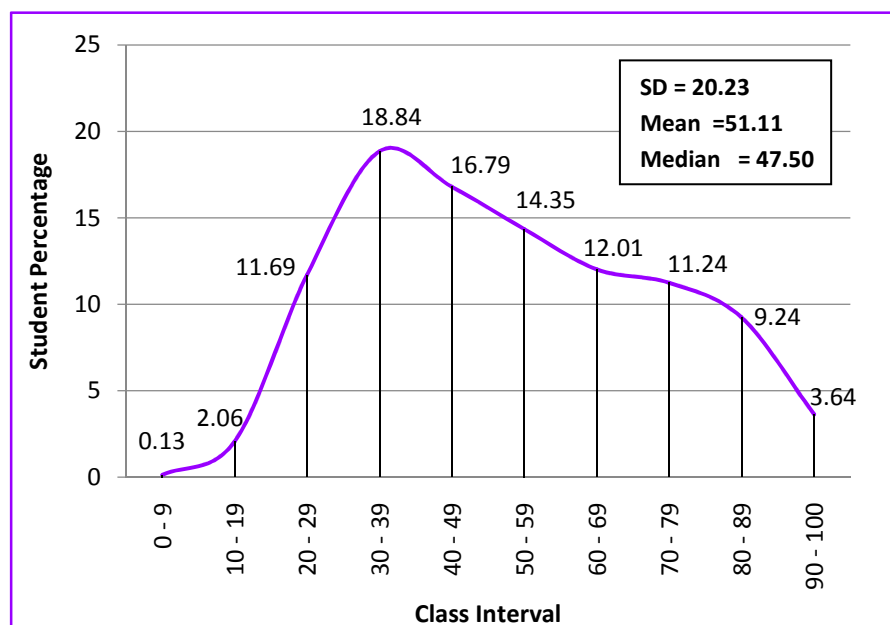
Fig. 3.1: All island achievement in mathematics 2016 – dispersion of marks

The frequency polygon shown in Fig. 3.1 outlines the total picture of the distribution of marks of grade 08 students in mathematics.

Fig. 3.1 depicts a positively skewed distribution of marks displaying that majority of the students has scored low marks in mathematics. The distribution of marks is further clarified in Table 3.1.

Table 3.1: All island achievement in mathematics 2016– cumulative percentages

Class Interval	Student %	Cumulative %
0 - 9	0.13	0.13
10 - 19	2.06	2.19
20 - 29	11.69	13.88
30 - 39	**18.84**	**32.72**
40 - 49	16.79	49.51
50 - 59	14.35	63.86
60 - 69	12.02	75.88
70 - 79	11.24	87.12
80 - 89	9.24	96.36
90 - 100	3.64	100.00
Total	100.00	

According to this table the highest percent of students (19%) has scored between 30-39 marks. Further, 32.72% of students has scored below 40 marks. On the other hand, approximately 25% of students has scored above 70. This shows the disparity in achievement in mathematics. Even though, the mean value is 51.11 the median is 47.50 indicating that 50% of the students has scored above 47.50.

Fig. 3.2 illustrates student achievement patterns further.

As Fig. 3.2, the box plot displays average marks (mean) is 51.11. On the other hand the median of the achievement is 47.50. As the average value is above the median, 50% of the students has scored above the average marks.

While 25% of the students (25th percentile) has scored below the 35 marks, another 25% of the students has scored above the 67.50 marks. Therefore, students' marks range between 35 and 67.50.
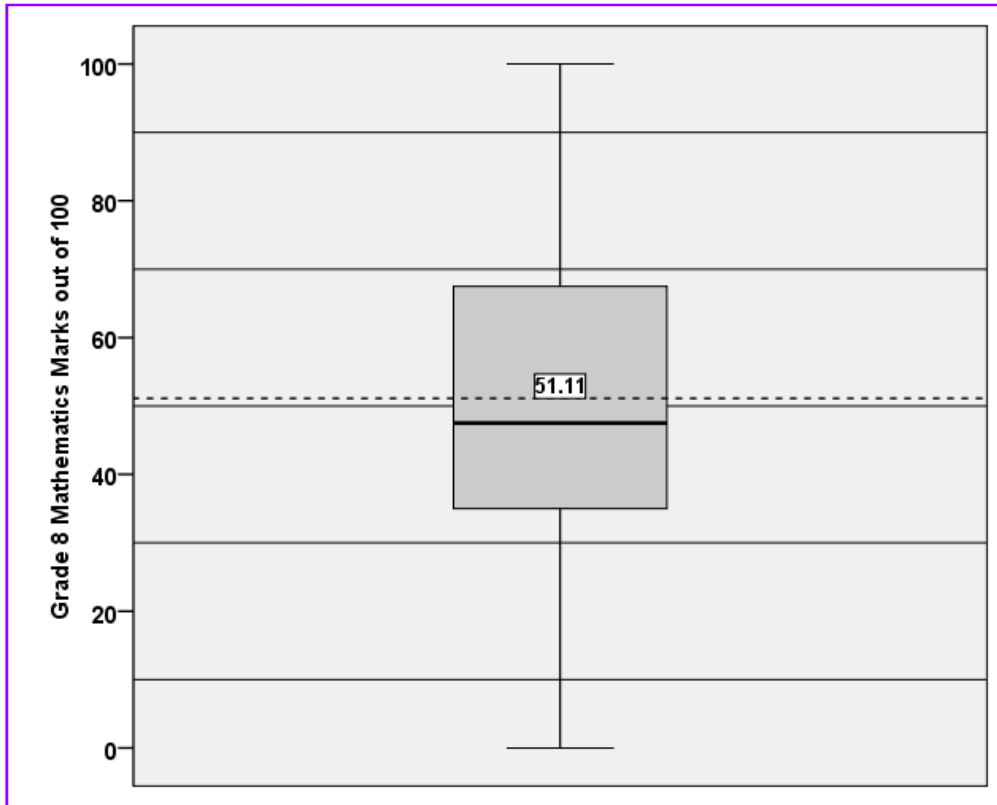
Fig. 3.2: Box plot and whisker chart representing all island mathematics achievement

Summary of national level achievement

- National level mean is 51.11, while the median is 47.50.
- Disparity in achievement prevails with approximately 32.72% of students scoring below 40 and 25% of students scoring above 70. However, the highest number of students falls within the marks range of 30-39.

Provincial wise student achievement will be discussed next.

3.3   Provincial wise student achievement

The nature of the distribution of scores provincial wise reveals certain patterns. These patterns are discussed based on Table 3.2.

Table 3.2: Provincial achievement in mathematics 2016 – Summary statistics

Province	Mean	Rank	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75
Southern	55.63	1	0.10	21.31	0.03	37.50	55.00	75.00
Western	54.80	2	0.07	20.30	0.11	37.50	52.50	72.50
Sabaragamuwa	51.91	3	0.12	20.49	0.29	35.00	50.00	67.50
North Central	50.90	4	0.13	18.99	0.30	35.00	47.50	65.00
North Western	50.11	5	0.10	19.98	0.29	32.50	47.50	65.00
Central	48.89	6	0.09	19.20	0.44	35.00	45.00	62.50
Northern	47.02	7	0.14	20.24	0.54	30.00	42.50	62.50
Eastern	46.23	8	0.11	19.18	0.56	32.50	42.50	60.00
Uva	46.18	9	0.12	18.48	0.54	32.50	42.50	60.00
All Island	51.11		0.03	20.23	0.30	35.00	47.50	67.50

As Table 3.2 indicates based on provincial wise mean achievement Southern Province ranks first. However, Western Province is ranked second with only a slightly lower mean value.

Achievement wise the provinces fall into three categories. Southern, Western and Sabaragamuwa, with mean scores above the national mean, fall into the higher category. Central, North Central and North Western Provinces cluster in the middle while the rest of the provinces fall into the lowest category. Between the Southern and Eastern Provinces there is almost nine point difference in mean values indicating the disparity in achievement among the provinces.

These disparities are further highlighted in Fig. 3.3.
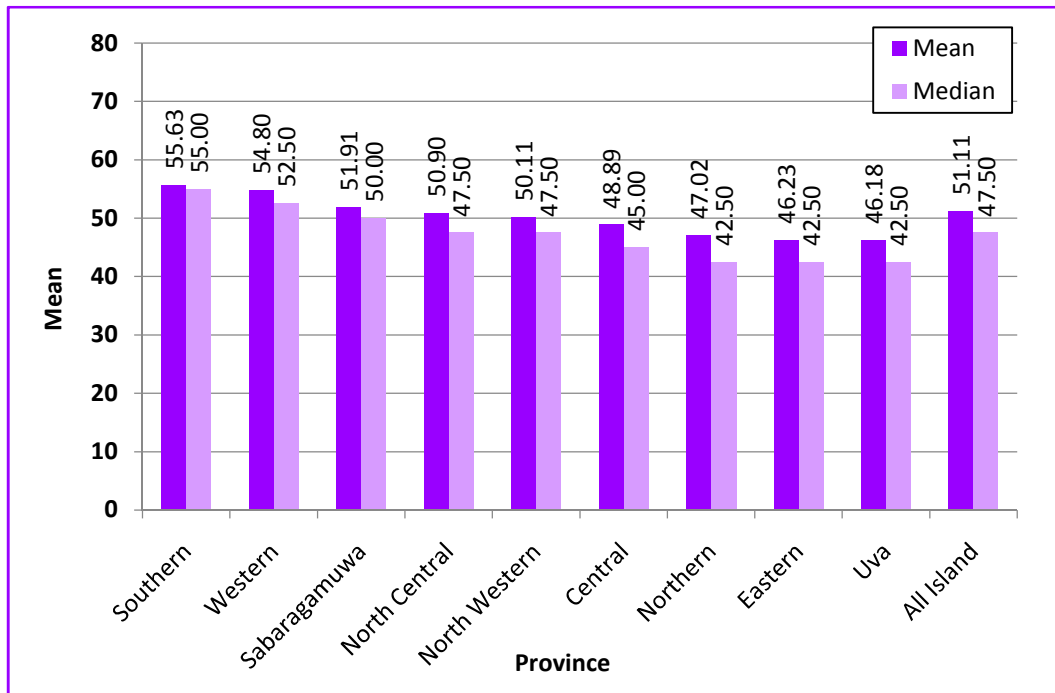
Fig. 3.3: Bar chart to represent mean and median among the provinces - Mathematics

As Fig. 3.3 displays the median values in all provinces are below the mean values. Since the median value represent 50% it could be concluded that in all provinces 50% of students has reached the average (mean) mark.

Disparity in achievement among provinces

According to Table 3.2, Southern Province has the highest mean value but its SD is higher than Western Province which has the next highest mean value. This means that student performance is more homogeneous in the Western Province. Southern Province has the highest SD value indicating that the variation of students' marks is the highest in this province. The SD values of Southern, Western, Sabaragamuwa and the Northern Provinces are higher than the all island SD value indicating that there is variation in achievement in these provinces. There are five provinces that have SD values lower than the all island SD. All the provinces have obtained positive skewed values. This indicates that student performance is low.

These disparities are further highlighted through the line curves for each province given in Fig. 3.4. Only Southern and Western indicate low skewness values and their curves are bimodal compared to other provinces. The two curves being bimodal suggest that there are both high achievers and low achievers in these provinces.

Central Province

0.14, 2.38, 11.41, 19.29, 20.72, 15.22, 10.87, 8.90, 7.95, 3.13

Class Interval

Eastern Province

0.07, 3.36, 15.76, 21.58, 18.67, 12.47, 9.86, 9.56, 6.72, 1.94

Class Interval

North Central Province

0.07, 1.30, 9.75, 17.92, 18.57, 15.17, 15.10, 10.84, 8.60, 2.67

Class Interval

North Western Province

0.13, 2.20, 12.36, 17.77, 15.97, 15.10, 12.22, 11.96, 9.29, 3.01

Class Interval

Northern Province

0.15, 2.61, 15.67, 23.73, 15.05, 12.29, 9.98, 8.76, 8.14, 3.61

Class Interval

Sabaragamuwa Province

0.13, 1.72, 10.25, 17.20, 15.01, 16.14, 11.38, 12.50, 10.98, 4.70

Class Interval

Southern Province

0.13, 1.47, 8.74, 14.28, 13.08, 13.54, 13.68, 14.48, 14.21, 6.40

Class Interval

Uva Province

0.33, 2.13, 14.13, 23.53, 18.13, 13.33, 11.60, 9.07, 5.67, 2.07

Class Interval

Western Province

0.00, 1.50, 7.85, 15.09, 16.11, 15.49, 13.17, 14.61, 11.19, 4.98

Class Interval

Fig. 3.4: Provincial wise distribution of marks -mathematics

Patterns of achievement in the different provinces are further elaborated through the box plot chart.
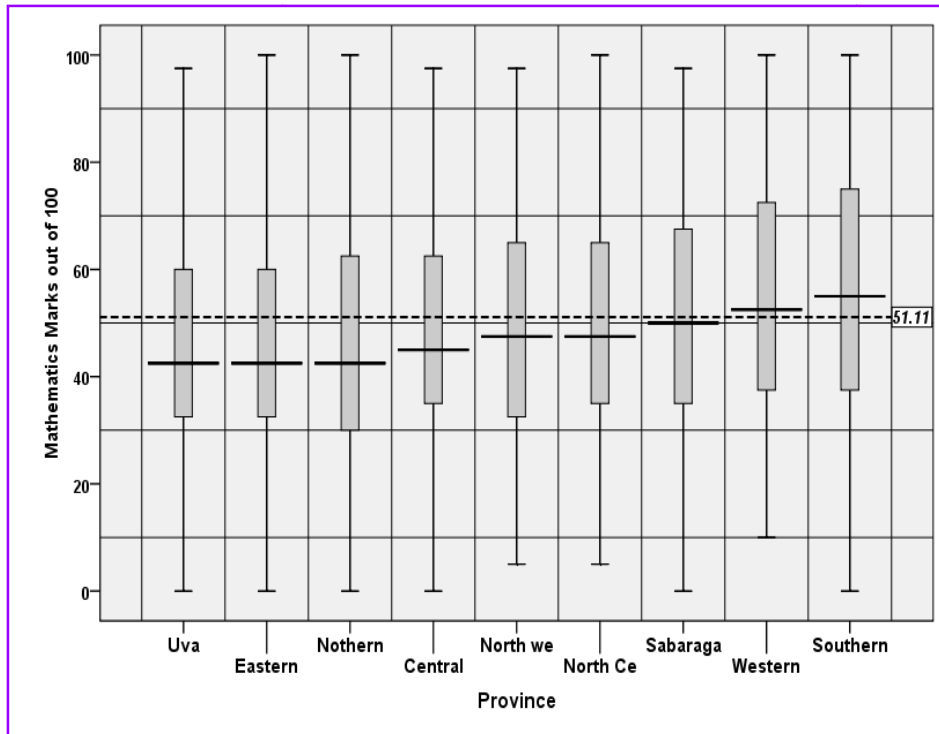
Fig. 3.5:   Box plot and whisker chart representing provincial wise mathematics achievement

According to the above chart there are two provinces (Uva and Eastern) which show similar characteristics. Similarly, even though Western Province and Southern Provinces performance are very similar the 75th percentile is higher in the Southern Province. Therefore there is greater disparity of marks in the Southern Province. However, there are no outliers in any of the provinces.

Table 3.3: Percentage of student scoring 50 or above, and below 50 – Mathematics

Province	Greater than or Equal to50	Less than 50
Central	46.06	53.94
Eastern	40.55	59.45
North Central	52.38	47.62
North western	51.57	48.43
Northern	42.78	57.22
Sabaragamuwa	55.69	44.31
Southern	62.31	37.69
Uva	41.73	58.27
Western	59.45	40.55
All Island	50.49	49.51

Summary of provincial level analysis

- Achievement wise the provinces fall into three categories.

  Category 1 – Southern, Western and Sabaragamuwa, with mean scores above the national mean (51.11).

  Category 2 –North Central and North Western Provinces cluster in the middle.

  Category 3 –Uva, Eastern, Central and Northern Provinces

3.4   Achievement levels by type of school

Table 3.4: Mathematics achievement according to school type

School Type	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
1AB	58.14	0.05	20.55	-0.07	40.00	57.50	75.00		
1C	44.97	0.05	17.45	0.52	32.50	42.50	55.00	23756.83	0.000
Type 2	42.32	0.07	16.65	0.67	30.00	40.00	52.50		
All Island	51.11	0.03	20.23	0.30	35.00	47.50	67.50		

As Table 3.4 indicates there is a considerable gap between the mean scores of different school types. However, 1AB schools' mean score is above that of the other types and also above the national mean. On the other hand, the mean scores of Type 2 and 1C schools, are below the national mean. Therefore, the gap between school types exists.

The difference in mean and median scores is graphically shown in Fig. 3.6
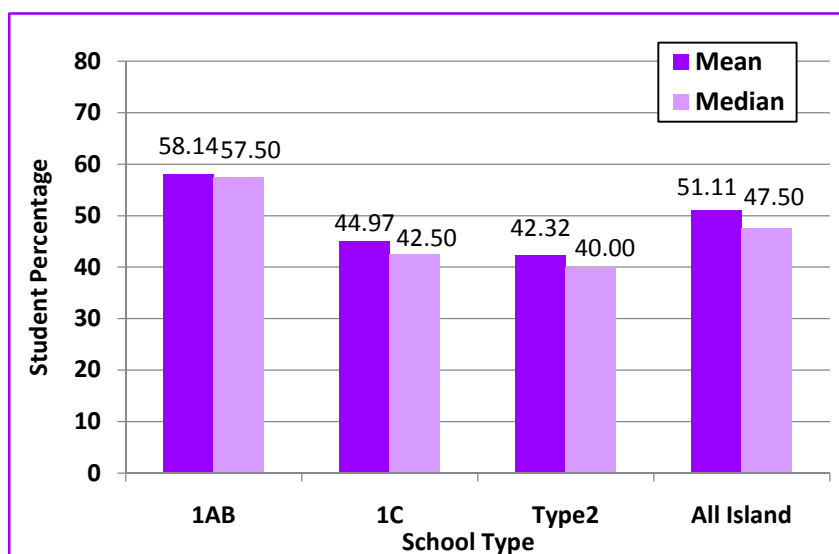
Fig. 3.6: Bar chart representing the mean and median among the school types- Mathematics

The performance of the school types is further highlighted when the median scores are considered in Table 3.4 and Fig. 3.6. All school types have achieved median values below the mean value for the mathematics achievement. This means that fifty percent of students in all school types have obtained scores above the mean value.

Variation among students

Variation in student achievement in 1C and Type 2 schools is low. Lower standard deviation values are shown by 1C schools and Type 2 schools. Those values are lower than the all island SD value as well. It reveals that higher number of student achievement lies closer to the mean value. The dispersion from the mean value is very low. 1AB schools standard deviation value is the highest among the school types. This indicates that student achievement deviation from the mean is very high.

Disparity in achievement

Both 1C and Type 2 schools have obtained positive skewed values. It reveals that in these types higher number of students has achieved low marks while higher marks are obtained by a lower number of students. Highest skewed value has been obtained by Type 2 schools. Next higher value has been obtained by 1C schools. Both values are above the all island skewness value. On the other hand 1AB schools skewness value is lower than the all island value, indicating that there is lesser variation in achievement in these schools. Further, it is negative indicating that there are more high achievers.

The variation in student performance in different types of schools is further highlighted through the frequency distribution graphs.
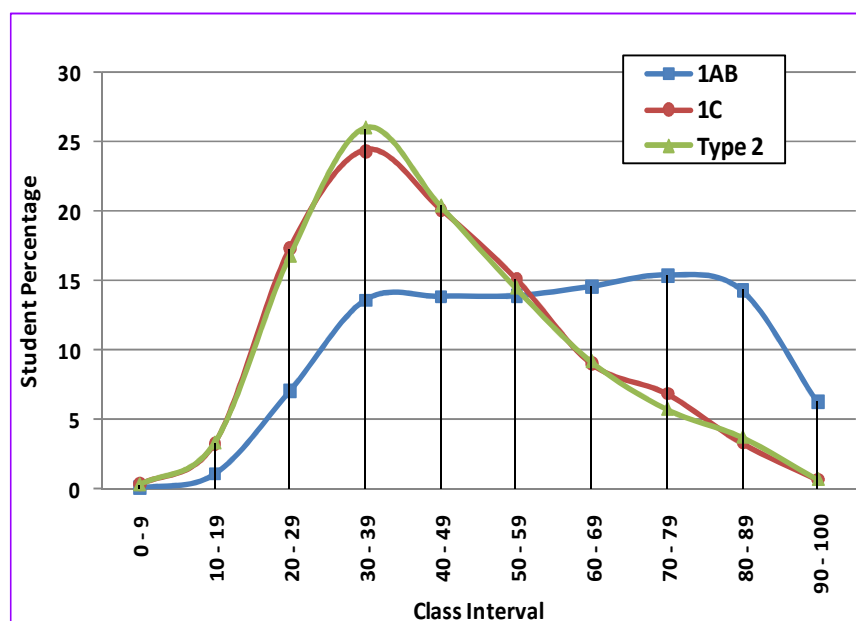
Fig. 3.7:   Dispersion of marks by school type–Mathematics

Fig. 3.7 displays that 1C and Type 2 school curves peaked at the 30-39 class interval. While in 1AB schools the peak spreads over different class intervals. It is a bimodal curve with both high and low achiever groups. However, the high achiever group is more.

The spread of marks at different class intervals is further illustrated in the cumulative percentage Table 3.5.

Table 3.5: Cumulative student percentages according to school type- Mathematics

Class Interval	1AB		1C		Type 2	
	Student %	Cumulative %	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.03	0.03	0.26	0.26	0.23	0.23
10 – 19	1.05	1.08	3.23	3.48	3.25	3.48
20 – 29	7.03	8.11	17.29	20.77	16.72	20.20
30 – 39	13.59	21.71	24.36	45.14	25.97	46.17
40 - 49	13.87	35.57	20.10	65.24	20.34	66.51
50 - 59	13.91	49.48	15.10	80.34	14.42	80.93
60 - 69	14.59	64.07	8.98	89.32	9.11	90.04
70 - 79	15.40	79.47	6.81	96.13	5.69	95.73
80 - 89	14.29	93.76	3.25	99.38	3.66	99.39
90 - 100	6.24	100.00	0.62	100.00	0.61	100.00
Total	100.00		100.00		100.00	

In the 1AB school type high percentage of students has scored between 70-79. On the other hand in both Type 2 and 1C schools the highest percentage of students falls between the class interval 30-39.

The analysis of data pertaining to the school types indicates disparity in achievement.

This is further illustrated through the box plot.
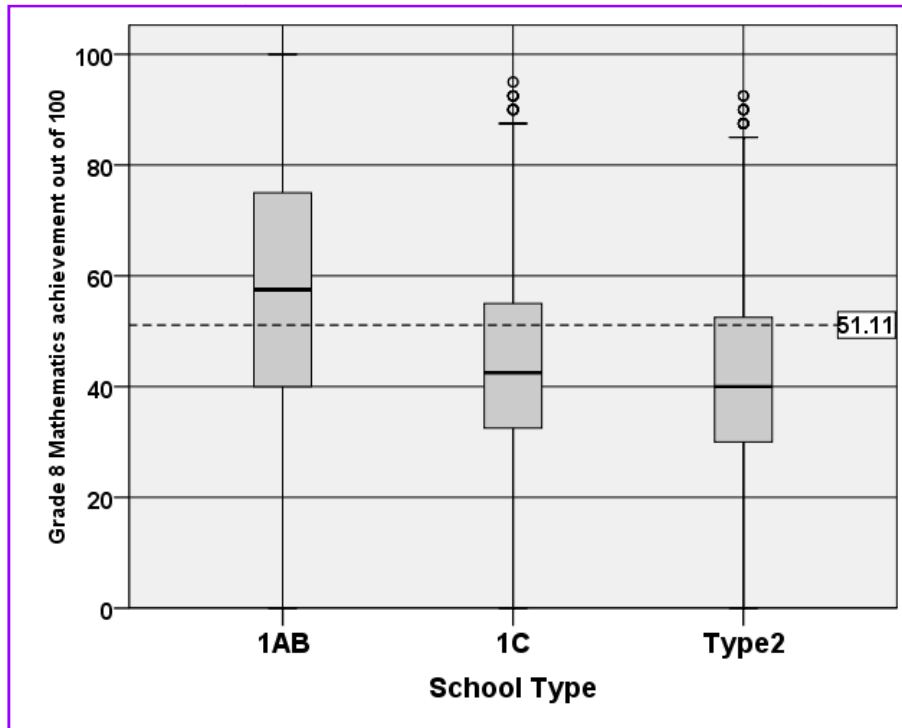
Fig. 3.8: Mathematics marks according to school types using box plot and whisker plot

The box plots of the 1C and Type 2 schools are quite similar. This indicates that their performances are similar. In both school types there are also outliers who's performance is higher than the other students. On the other hand, the 1AB schools performance is different. Their 25th as well as the 75th percentiles are higher than that of the Type 2 and 1C schools. It also indicates that their performance is high.

Summary

- The achievement in mathematics in 1C and Type 2 schools are relatively similar.
- 1AB schools' performance is quite different and higher than the other two school types.
- The gap in achievement between school types continues.

3.5   Achievement levels by gender

Table 3.6: Mathematics achievement according to gender

Gender	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Male	49.40	0.05	20.61	0.39	32.50	45.00	65.00		
Female	52.70	0.05	19.74	0.22	37.50	50.00	67.50	2251.12	0.000
All Island	51.11	0.03	20.23	0.30	35.00	47.50	67.50		

There is a difference in the achievement of females over males. As Table 3.6 indicates, male performance is also lower than the all island mean score, while female performance is above the all island mean.

These differences could also be seen in Fig. 3.9
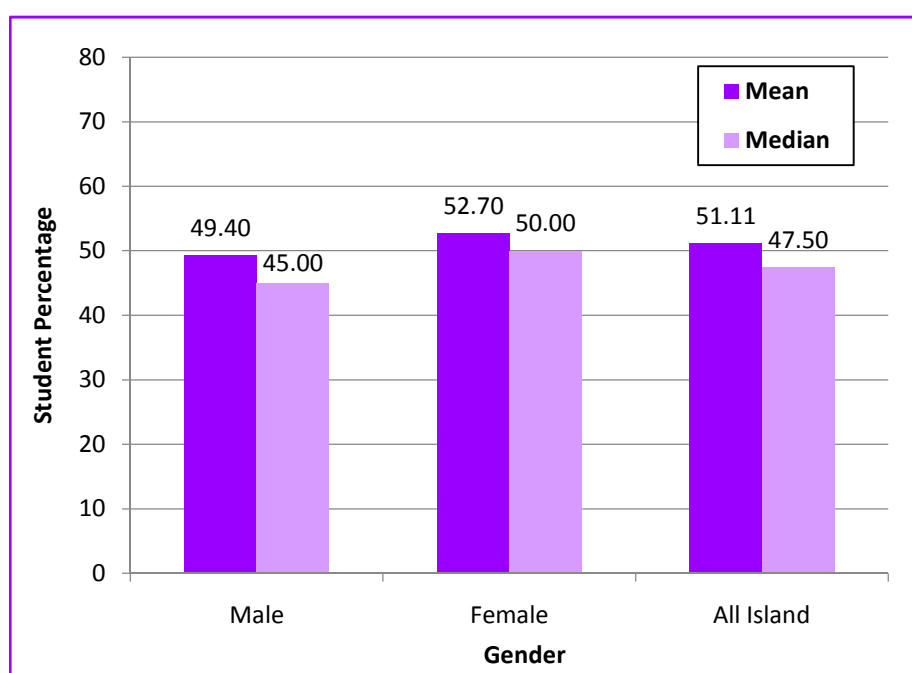
Fig. 3.9: Bar chart representing mean and median values according to gender –Mathematics

Variation among students

Variation in achievement among male students is higher than that of the female students. This is indicated by the male students obtaining a higher SD value than the female students as well as the all island SD (Table 3.5). On the other hand, the female students SD is below the all island SD. Further, the female skewness value is higher than the all island as well as the male value. This indicates that there are more high achievers

among the females. Fig. 3.9 also indicates that both among males and females the median value is below the mean. This indicates that more than 50% of the students have scored above the average mark.

Fig. 3.10 graphically illustrates the dispersion of marks according to gender.
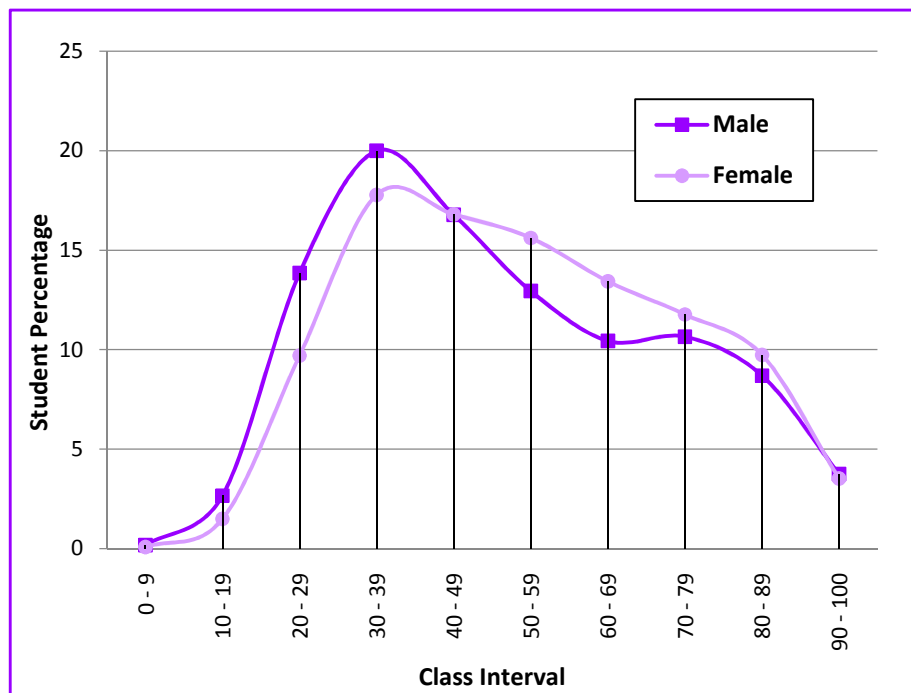
Fig. 3.10: Dispersion of marks by gender – Mathematics

Fig. 3.10 displays two curves which are both positively skewed. As can be seen there are more low achievers than high achievers among both males and females. However the pattern of the two curves are slightly different. At the beginning the curves are similar, then the curves become different and at the 40-49 class interval they cut across. But the female curve then rises above the male curve and finally, both curves become similar again.

The disparity in the male students' achievement can be elaborated better through the cumulative percentages.

Table 3.7: Cumulative student percentages according to gender –Mathematics

Class Interval	Male		Female	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.14	0.14	0.08	0.08
10 – 19	2.83	2.97	1.48	1.56
20 – 29	14.28	17.25	9.70	11.26
30 – 39	20.26	37.51	17.78	29.04
40 - 49	17.36	54.87	17.43	46.47
50 - 59	13.23	68.10	15.83	62.30
60 - 69	10.05	78.15	13.30	75.60
70 - 79	10.21	88.36	11.74	87.34
80 - 89	8.19	96.55	9.32	96.66
90 - 100	3.45	100.00	3.34	100.00
Total	100.00		100.00	

According to Table 3.7 and Fig. 3.10 it could be concluded that among both females and males, there are low performing students. The highest percentage (17.78%) of female students' marks fall into the class interval 30-39. The highest percentage of male students' marks, even a higher percentage (20.25%) falls into the same class interval. This indicates that the low performing boys achievement is higher than that of the low performing girls.

At the 40-49 class interval percentage of male and female students is almost similar (17.36% and 17.43%).

Even though there are only 29.04 cumulative percent of female students who has scored below 40 marks, there are 37.51% of male students who has scored less than 40 marks. Therefore, the heterogeneity in achievement in mathematics of the boys is greater than the girls.

Box plot and whisker for gender wise mathematics achievement shows similarities that has been discussed already.
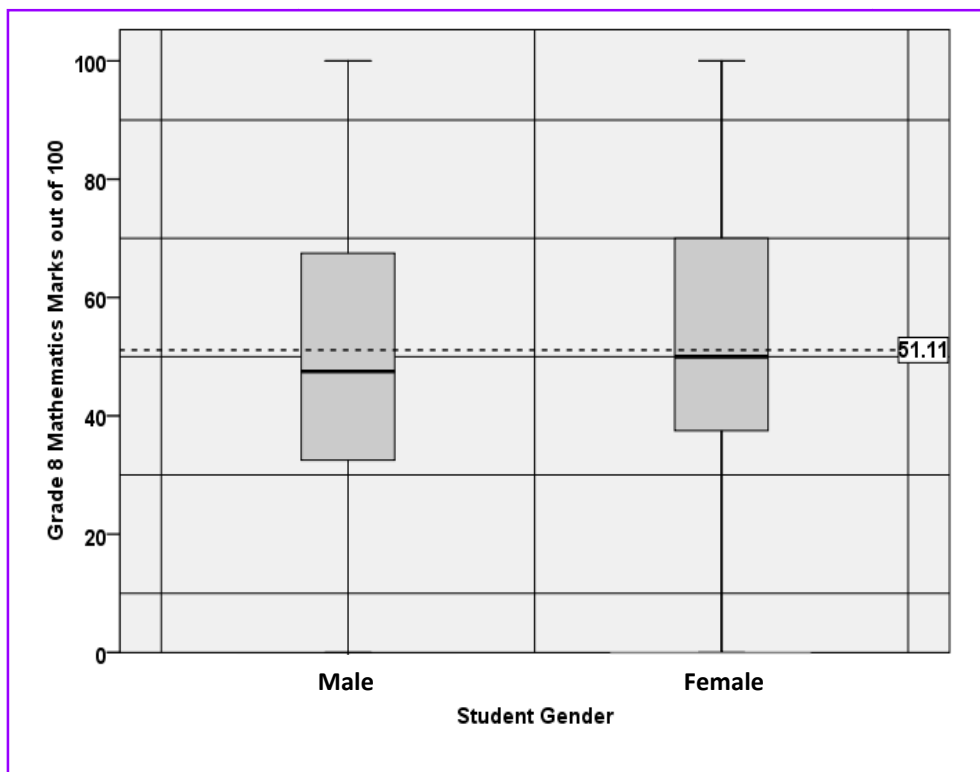
Fig. 3.11: Box plot and whisker plot representing gender wise mathematics marks

Box plot and whisker chart shows that male students' 25th and 50th percentiles are lower than the female mark range as well as the all island range. Therefore, fifty percent of male students' achievement lie below the female students' achievement.

Summary

- Female performance is better than all island and male performance.
- While 29.04% of girls has scored below 40, the male percentage is 37.51.
- Highest percentage of females, 17.78% as well as 20.26% of males fall into the mark range 30-39.

3.6   Achievement levels by medium of instruction

Table 3.8: Mathematics achievement according to medium of instruction

Medium of Instruction	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Sinhala	53.28	0.04	20.33	0.19	37.50	52.50	70.00	11234.80	0.000
Tamil	45.01	0.06	18.66	0.60	30.00	40.00	57.50		
All Island	51.11	0.03	20.23	0.30	35.00	47.50	67.50		

There is disparity between the students belonging to the different medium of instruction. While the Sinhala medium students' mean achievement is above the all island mean value, the Tamil medium students' mean achievement is below the national mean average.

These disparities are further highlighted through the bar chart given in Fig. 3.12.
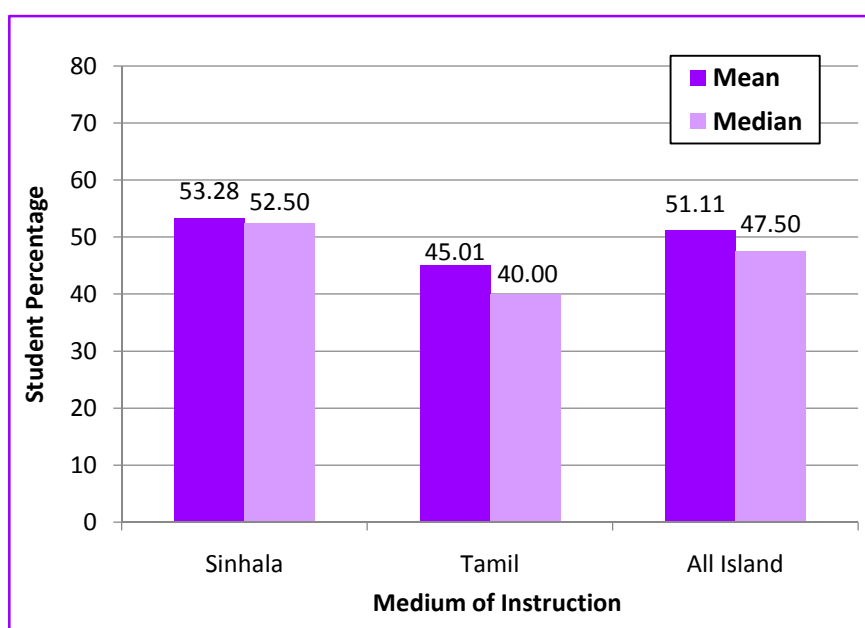
Fig. 3.12: Bar chart representing mean and median values according to medium of instruction - Mathematics

As Table 3.8 indicates Tamil medium students SD is lower than the Sinhala medium students and is lower than the national SD. Thus there is less variation in their performance.

The diversity in achievement among the students taught through the different medium of instruction, is further highlighted through the frequency distribution graphs.
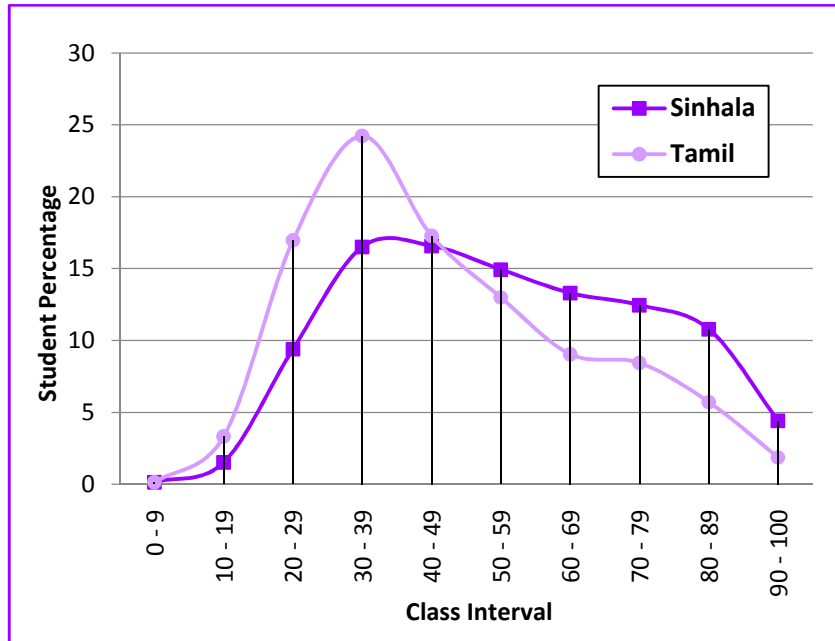
Fig. 3.13: Dispersion of marks by medium of instruction – Mathematics

The two curves on Fig. 3.13 show two different patterns. While both curves are positively skewed with more students scoring low marks the Sinhala medium students marks are spread. There are low achievers as well as high achievers. However, the low achievers are slightly more. This pattern can be explained thorugh Table 3.9.

Table 3.9: Cumulative student percentages according to medium of instruction –Mathematics

Class Interval	Sinhala		Tamil	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.13	0.13	0.13	0.13
10 – 19	1.52	1.65	3.31	3.44
20 – 29	9.40	11.05	16.98	20.42
30 – 39	16.50	27.55	24.24	44.66
40 - 49	16.58	44.13	17.28	61.94
50 - 59	14.93	59.06	13.00	74.94
60 - 69	13.30	72.36	9.05	83.99
70 - 79	12.46	84.81	8.44	92.43
80 - 89	10.78	95.59	5.71	98.14
90 - 100	4.40	100.00	1.86	100.00
Total	100.00		100.00	

As Table 3.9 indicates the highest percentage of the Sinhala medium students' marks is in the range of 40-49. This amounts to more than 44%. On the other hand, the highest percentage of Tamil medium students marks are between 30-39.

Considering the pass mark as 40, only 27.55% of Sinhala medium students has scored below the pass mark. On the other hand 44.66% of Tamil medium students has scored below the pass mark.

Box plot for medium wise achievement graphically shows the differences that have been discussed already.
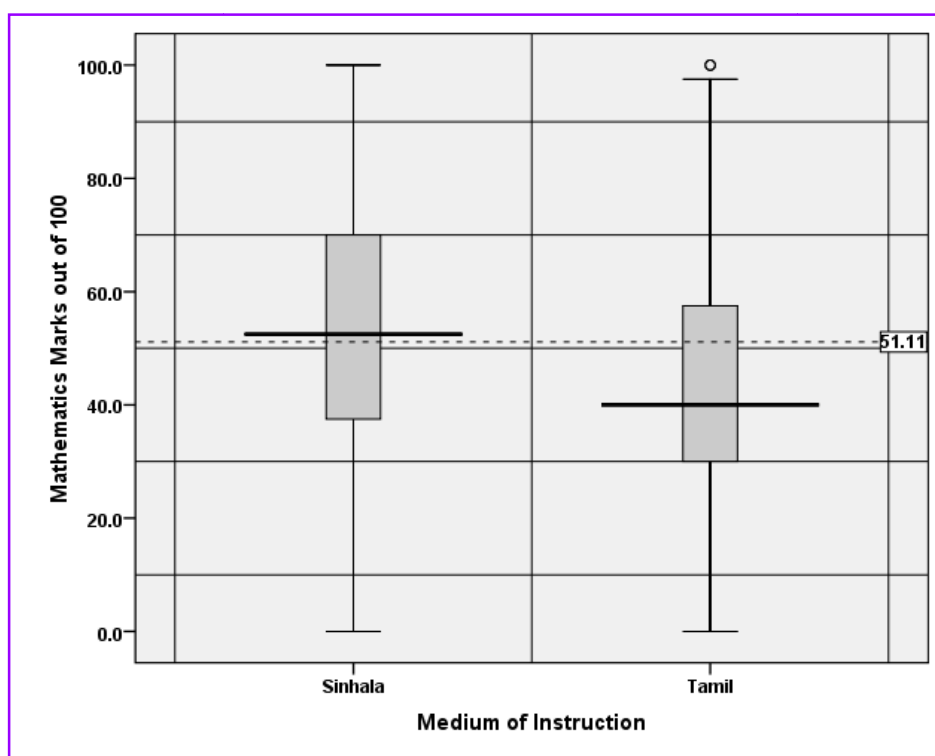
Fig. 3.14: *Mathematics marks according to medium of instruction using box plot and whisker plot*

Box plot and whisker plot chart shows differences among both media. However, Sinhala medium dispersion of marks in the box plot is less than the Tamil medium students' dispersion of marks. There are no outliers among both media.

Sinhala medium student's 25th, 50thand 75th percentile values are higher than that of the Tamil medium students. Therefore, this confirms that there is disparity between the performance in mathematics of Tamil and Sinhala medium students.

Summary

- There is wide disparity among students belonging to different medium of instruction.
- The Sinhala medium students' mean score is above the national mean while the Tamil medium students' mean is lower.

Students' achievement in relation to the location of the school would be discussed next.

3.7   Achievement levels by location

Table 3.10:   Mathematics achievement according to location

Location	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Rural	48.75	0.04	19.27	0.38	32.50	45.00	62.50	12610.73	0.000
Urban	57.38	0.07	21.36	-0.01	40.00	57.50	77.50		
All Island	51.11	0.03	20.23	0.30	35.00	47.50	67.50		

As Table 3.10 indicates, there is variation in achievement among the schools in the different localities. The urban area schools have performed better than the rural area schools. Rural area schools have performed below the national mean while the urban schools have performed above the national mean.

According to Table 3.10 the SD also differs in the two localities even though not to a great extent. However, while the SD of the rural schools is closer to the all island SD, the urban schools SD is higher than the all island SD denoting more variation among the student achievement.

The difference in mean and median values is graphically shown in Fig. 3.15.

As Fig. 3.15 indicates the median value in the rural area schools is lower than mean value.
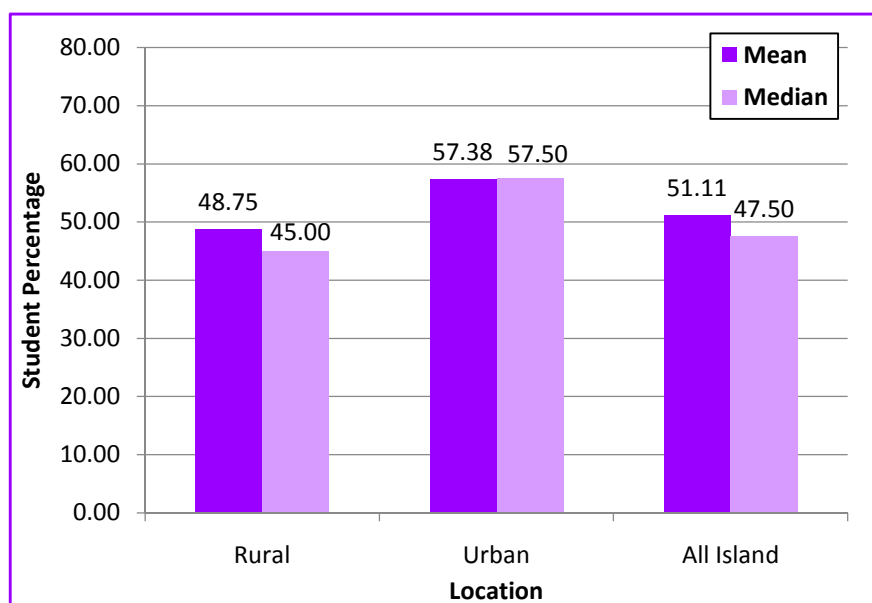
Fig. 3.15: Bar chart representing mean and median values according to location– Mathematics

Students' achievement is further elaborated through the frequency distribution graphs in Fig. 3.16.
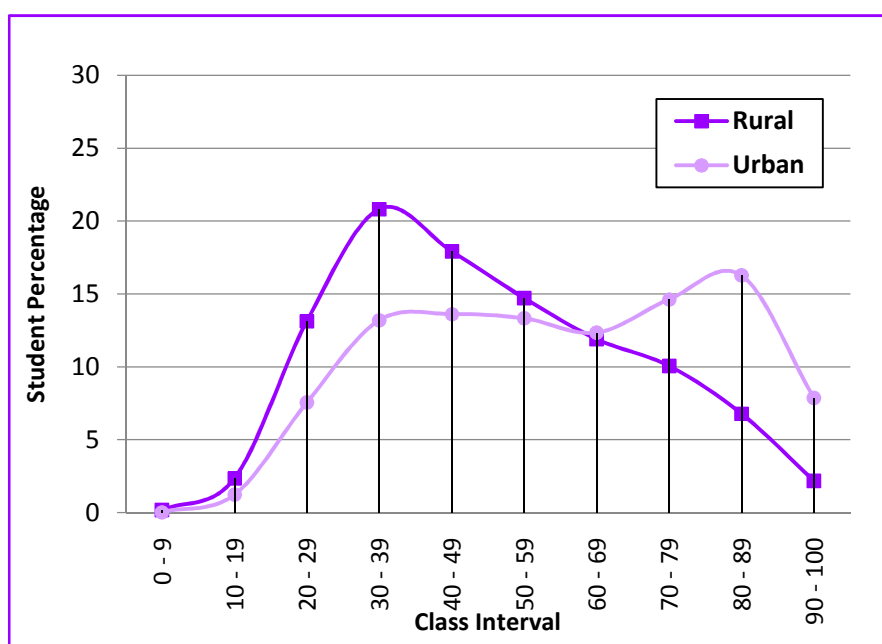
Fig. 3.16: Dispersion of marks by location – Mathematics

Fig. 3.16 displays two differently skewed graphs. While the curve representing the rural areas is positive the shape of the curve representing the performance of urban schools is negative. This difference can be explained using the cumulative percentage Table 3.11.

Table 3.11: Cumulative student percentages according to the location –Mathematics

Class Interval	Rural		Urban	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.17	0.17	0.03	0.03
10 – 19	2.35	2.52	1.22	1.25
20 – 29	13.14	15.66	7.55	8.80
30 – 39	20.82	36.48	13.20	22.00
40 - 49	17.90	54.38	13.61	35.61
50 - 59	14.71	69.09	13.32	48.93
60 - 69	11.90	80.99	12.34	61.27
70 - 79	10.06	91.05	14.62	75.89
80 - 89	6.78	97.83	16.26	92.15
90 - 100	2.17	100.00	7.85	100.00
Total	100.00		100.00	

According to Table 3.11 the highest percentage of students in urban area schools (16.26%) fall into the class interval 80-89. This is the peak of the urban area school curve. On the other hand, in the rural area schools the highest percentage of students falls in to the class interval 30-39 and the percentage is 20.82. Thus while the urban area curve is negatively skewed the rural area curve is positively skewed.

The spread of marks is further illustrated through the box plot graph.
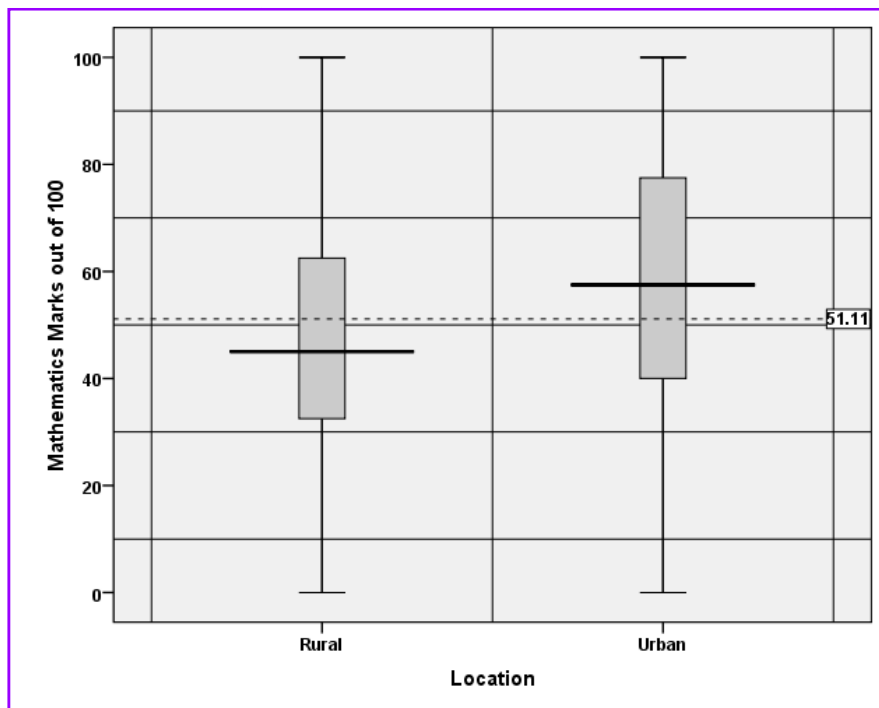
Fig. 3.17: Box plot and whisker plot representing location wise mathematics marks

According to the box plot the urban area schools' performance differ from the rural area schools at the 25th, 50th and 75th percentile. Further their performance is above the all island performance. The box plot confirms the variation that exists between the performance of the two localities.

Summary

- The performance of the students in the urban areas is better than in the rural areas.
- The deviation of marks is less in the rural area schools.

Patterns observed in relation to the achievement in mathematics, revealed that there are variations among provinces, school type, gender and medium wise.

Students' achievement in relation to subject content will be discussed next.

3.8   Analysis of achievement by sub skills

In constructing the achievement tests, the test items were designed in relation to the competencies and competency levels identified for grade eight. As discussed in chapter 2, the construct assessed in these studies were the competency levels. Based on the competencies and competency levels, table of specification was prepared.

The mathematics paper was based on five main process standards– knowledge and skills, communications, relationships, reasoning and problem solving.

Achievement of competencies related to knowledge and skills

The percentage of students who has answered correctly the questions related to each competency level under knowledge and skills is given in Table 3.12.

Table 3.12: Achievement of competency levels related to knowledge and skills

Competency Level	Question numbers	Percentage
1.1 Inquires into the relationships between the whole numbers.	2	55.70
1.2 Manipulates directed numbers under the basic mathematical operations	1	37.90
2.1 Builds relationships between the terms of number patterns by investigating various properties	7	43.50
3.1 Manipulates units and parts under multiplication	3	66.10
5.1 Develops the relationship between fractions, ratios and percentages	8	35.60
7.1 Satisfies various requirements by investigating the perimeter of rectilinear plane figures	20	42.30
9.1 Facilitates daily work by investigating large masses	18	54.10
10.1 Determines for daily needs, the space that is taken up by various solids	15	61.00
11.1 Facilitates daily work by investigating the capacity of liquid containers	21	26.00
12.1 Investigates the rotation of earth and inquires into its results	19	58.30
12.2 Investigates the difference in time between countries and finds their relative positions	23	39.80
13.1 Indicates the direction of a location using angles	24	34.30
15.1 Factorizes algebraic expressions	26	38.80
20.2 Illustrates the behavior of a variable pictorially	31	35.00
20.3 Represents location on a Cartesian Plane	30	46.90
21.1 Examines the angles made by various straight lines	35	45.20
21.2 Performs calculations using the relationships between various angles	36	40.40
22.1 Created solids and confirms the relationships between properties related circles	34	66.60
23.1 Inquires into the relationships between the various angles of rectilinear plane figure	33	36.70
24.1 Inquiries into the special properties related to circles	32	71.90
25.1 Inquires into the results of a rotation that are based on symmetry	37	55.30
27.1 Compares varies movements with the basic foci	11	69.90
29.1 Inquires into numerical representative values of a group of data	12	71.70
31.1 Determines the likelihood of an event occurring by investigating the various methods of finding a suitable value	13	69.50

According to Table 3.12 the competency levels 24.1 and 29.1 have been achieved by more than 70% of students. On the other hand, competency level 11.1 (Facilitates daily work by investigating the capacity of liquid containers) has been achieved only by 26.00%. Out of the 24 competency levels tested only 11 have been achieved by more than 50% of students.

Percentage of students who achieved the competency levels related to knowledge and skills is graphically illustrated in Fig. 3.18.
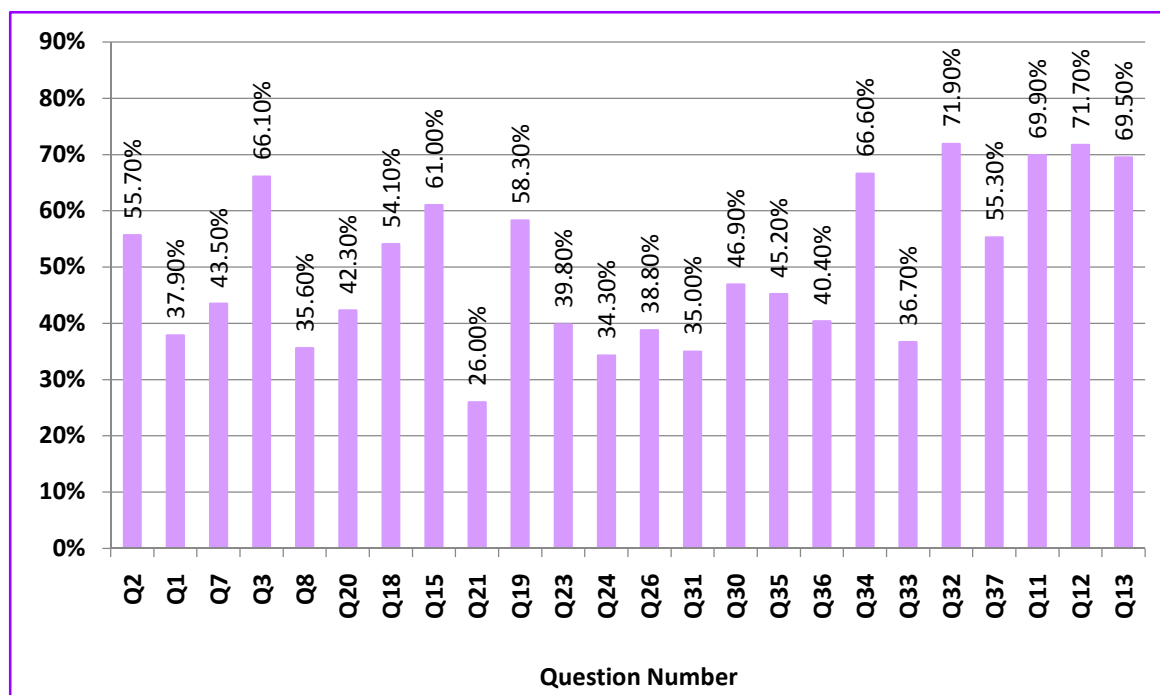
Fig. 3.18: Achievement of competency levels related to knowledge and skills

Achievement of competency levels related to communication will be assessed next.

Achievement of competency levels related to communication

Table 3.13: Achievement of competency levels related to communication

Competency level	Question No.	Percentage
3.2 Manipulates units and parts of units under division	9	27.90
3.3 Manipulates decimal numbers under the mathematical operations of multiplication and division.	4	73.10
6.2 Expands a power of a negative integer and finds the value	5	63.80
8.2 Fulfils daily needs by investigating the surface area of various solids	16	19.80
13.2 Describes various locations in the environment using scale drawings	22	66.80
14.1 Simplifies algebraic expressions by removing brackets and finds the value by substitution.	25	47.90
18.1 Uses the relationships between two quantities that can be used to enhance beauty.	28	53.60
20.1 Uses a number line to represent fractions and decimal numbers	29	40.20
26.1 Studies shapes by creating various patterns that can be used to enhance beauty.	39	62.20
30.1 Analyze the various relationships related to sets.	40	65.60

The competency level achieved by the highest percentage of students in relation to the competency communication is 3.3. That is "Manipulates decimal numbers under the mathematical operations of multiplication and division". On the other hand the least achieved competency level is 8.2. That is "Fulfils daily needs by investigating the surface area of various solids". Out of the ten competency levels tested only six have been achieved by more than 50% of the students in the sample.

The percentage of students who has achieved the competency levels related to communication is graphically shown in Fig. 3.19.
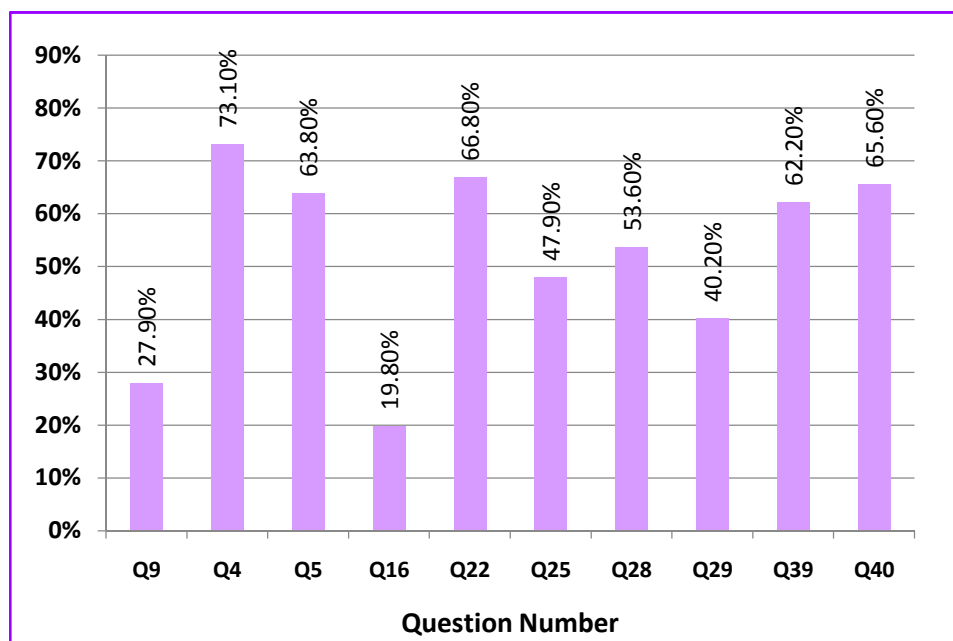
Fig. 3.19: Achievement of competency levels related to communication

Achievement of competency levels related to relationship, reasoning and problem solving will be discussed next.

Achievement of competency levels related to relationship, reasoning and problem-solving

Table 3.14: Achievement of competency levels related to relationships, reasoning and problem solving

Standard	Competency Level	Question No.	Percentage
Relationships	4.1 Uses ratios in day to day activities	6	59.50
	4.2 Solves problems constructing relationships between two ratios	10	52.20
Problem solving	8.1 Finds the area of a compound plane figure in the environment and has an awareness of the space allocated for them.	17	58.50
	17.1 Uses linear equations to solve problems	27	41.00
Reasoning	27.2 Constructs triangles	38	62.00
	28.1 Represents data such that comparison is facilitated	14	67.50

According to Table 3.14 more than 50% of the students has achieved the competency levels related to reasoning and relationships. However, the achievement of competency level 17.1 that is 'uses linear equations to solve problems' related to problem solving is less than 50%.

The percentage of students who has achieved the competency levels related to relationships, reasoning and problem solving is graphically shown in Fig. 3.20.
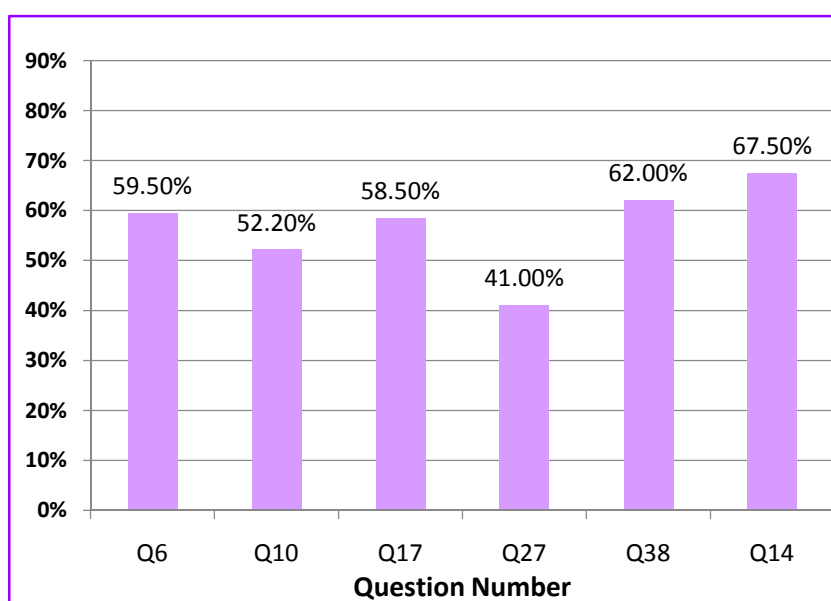
Fig. 3.20: Achievement of competency levels related to relationships, reasoning and problem solving

Part II - Comparison of achievement level of students in 2014 with that of 2016

Trends in achievement over the period 2014-2016 will first be discussed at national level.

3.9   Trends in achievement at national level
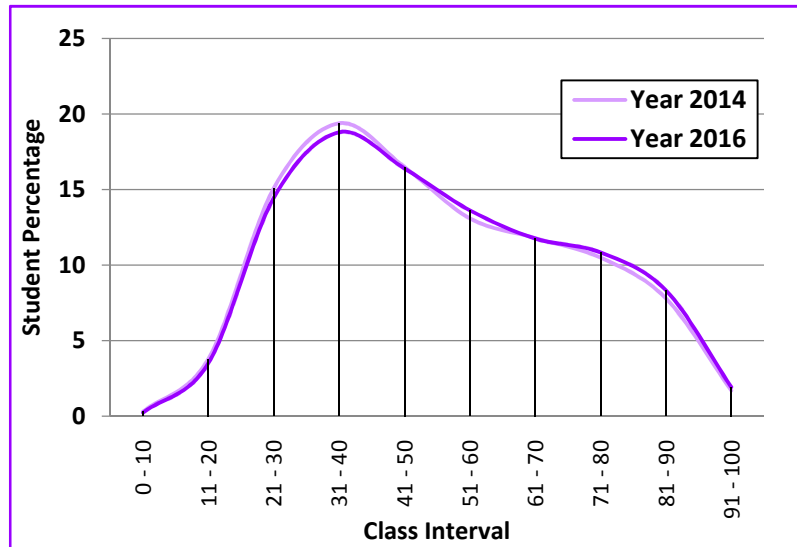
Fig. 3.21: All island achievement in mathematics comparison 2014 -2016– dispersion of marks

As Fig 3.21 indicates there is a slight improvement in students' achievement in the year 2016. The line curve for 2016 shows that the percentage of low achievers has decreased slightly and the percentage of high achievers has slightly increased. This has resulted in an increase in the mean value from 50.87 – 51.11.

This change is further elaborated through the cumulative percentage table.

Table 3.15: Comparison of all island achievement in mathematics - cumulative percentages

Class Interval	Year 2014		Year 2016	
	Student %	Cumulative %	Student %	Cumulative %
0-10	0.30	0.30	0.25	0.25
11-20	3.80	4.10	3.53	3.78
21 - 30	15.10	19.20	14.47	18.25
31 - 40	19.40	38.60	18.80	37.05
41 - 50	16.50	55.10	16.40	53.45
51 - 60	13.10	68.20	13.64	67.09
61 - 70	11.80	80.00	11.77	78.86
71 - 80	10.50	90.50	10.85	89.71
81 - 90	7.80	98.30	8.34	98.05
91-100	1.70	100.00	1.94	100.00
Total	1 00		100	

The percentage of low achievers, those who have scored below 40% has decreased from 38.60 % to 37.05%. On the other hand the percentage of students who has scored between 50-100 has risen from 44.9 to 46.54.

Provincial level performance has contributed to the national level achievement. The trend in provincial level achievement will be discussed next.

3.10 Provincial wise comparison of student achievement

As Fig 3.22 displays while some provinces have contributed positively to the increase in all island mean value some have contributed negatively.
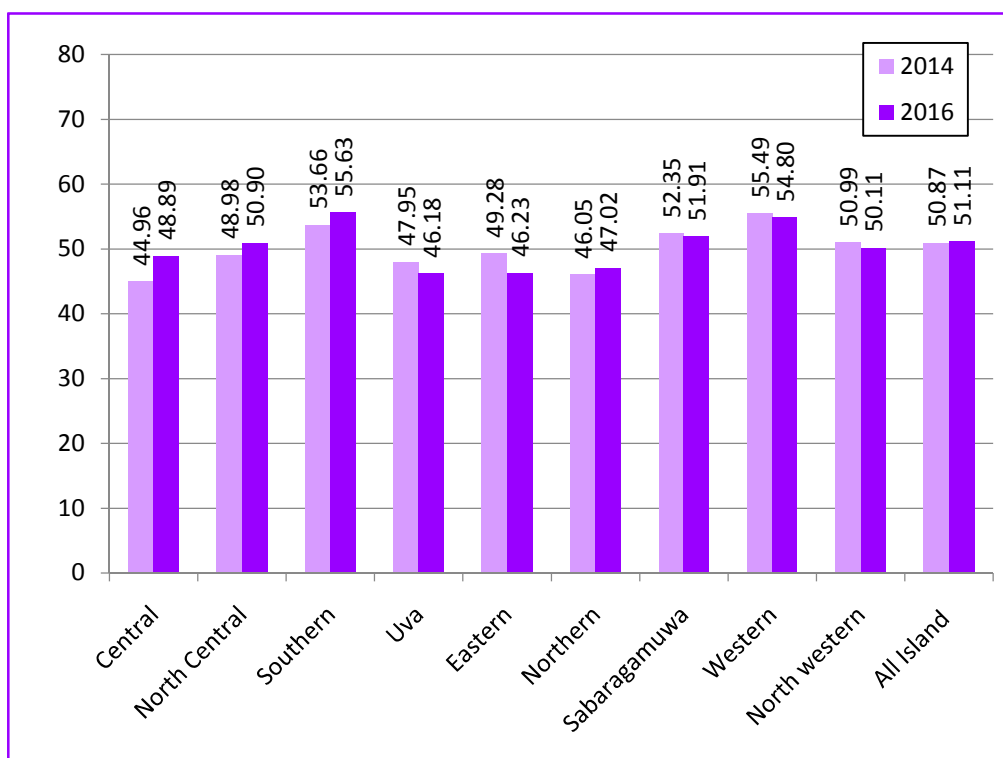
Fig. 3.22: Provincial wise comparison of student achievement - 2014 -2016

The contribution of the changes in the provincial mean values are further clarified in Table 3.16.

Table 3.16: Provincial wise comparison of student achievement – 2014 & 2016

Province	Year 2014		Year 2016		Z
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
Central	44.96	18.77	48.89	19.20	6.06**
North Central	48.98	19.17	50.90	18.99	2.87**
Southern	53.66	21.44	55.63	21.31	2.76**
Uva	47.95	18.80	46.18	18.48	-2.73**
Eastern	49.28	20.28	46.23	19.18	-4.25**
Northern	46.05	19.55	47.02	20.24	1.27
Sabaragamuwa	52.35	19.46	51.91	20.49	-0.65
Western	55.49	20.73	54.80	20.30	-1.02
North western	50.99	19.58	50.11	19.98	-1.29
All Island Mean	50.87	20.29	51.11	20.23	1.02

* Values are significant at 95%   ** Values are significant at 99%

According to Table 3.16 mean values of Central, North Central and Southern have increased in 2016 and these increases are significant. On the other hand, the mean values of Uva and Eastern Provinces have decreased and these decreases are also significant. Even though, the mean value in the Northern Province has increased it is not significant. At the same time, Sabaragamuwa, Western and North Western records declines in mean values. Yet, they are also not significant.

Fig: 3.23 depicts the line curves denoting the performance of each province.

As the line curve for the Central Province illustrates the percentage of high achievers in the range of 50-90 has increased.

Similarly, the North Central and Southern Provinces curves also show an increase in high performances. These increases have positively impacted on the mean values of these provinces. As Table 3.16 indicates these changes are significant.

Central Province — 2014, 2016

Eastern Province — 2014, 2016

North Central Province — 2014, 2016

North Western Province — 2014, 2016

Northern Province — 2014, 2016

Sabaragamuwa Province — 2014, 2016

Southern Province — 2014, 2016

Uva Province — 2014, 2016

Western Province — 2014, 2016
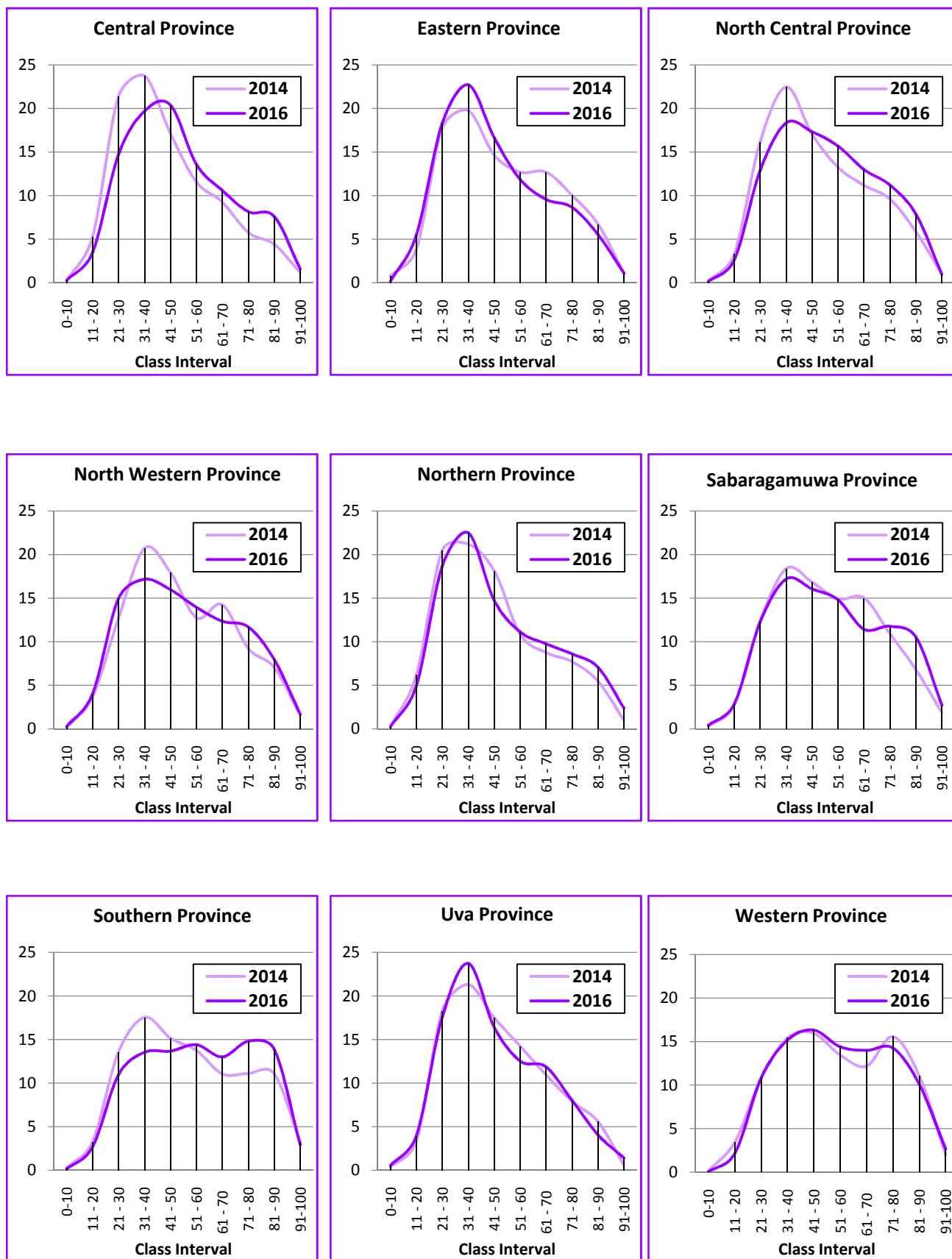
Fig. 3.23: Comparison of provincial wise distribution of marks – Mathematics

3.11   Comparison of marks according to school type
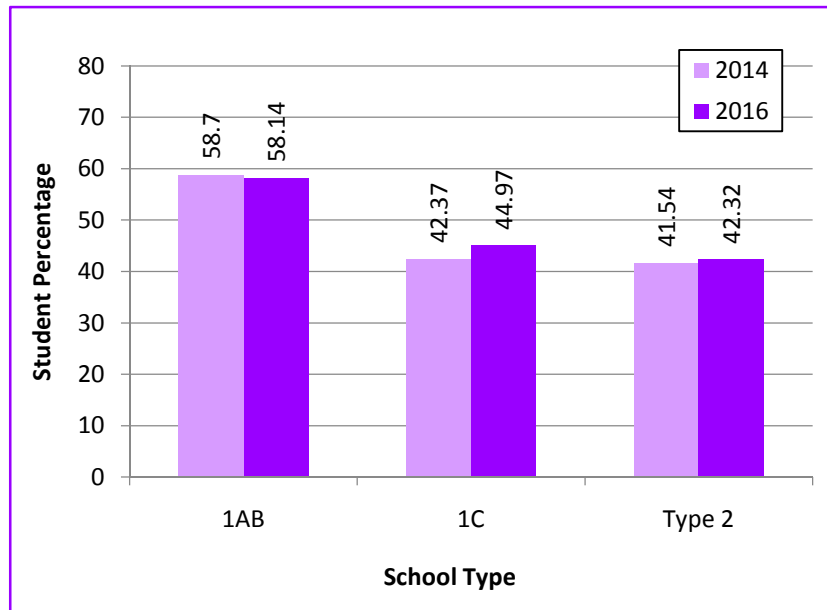
Fig. 3.24: All island comparison of mean values according to school type

As the bar graphs indicate there is a slight decrease in achievement in 1AB schools while there is a slight increase in 1C and Type 2 schools. This increase in 1C and Type 2 schools is a positive sign.

Table 3.17: Comparison of mathematics achievement according to school type

School Type	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
1AB	58.70	20.01	58.14	20.55	-1.75*
1C	42.37	16.42	44.97	17.45	7.21**
Type 2	41.54	17.08	42.32	16.65	1.65*
All Island	50.87	20.29	51.11	20.23	1.02

* Values are significant at 95%   ** Values are significant at 99%

According to Table 3.17 the decrease in the 1AB schools mean value is significant. At the same time the increase in 1C and Type 2 schools is also significant.

The trend in achievement gender wise will be discussed next.

3.12   Comparison of marks according to gender
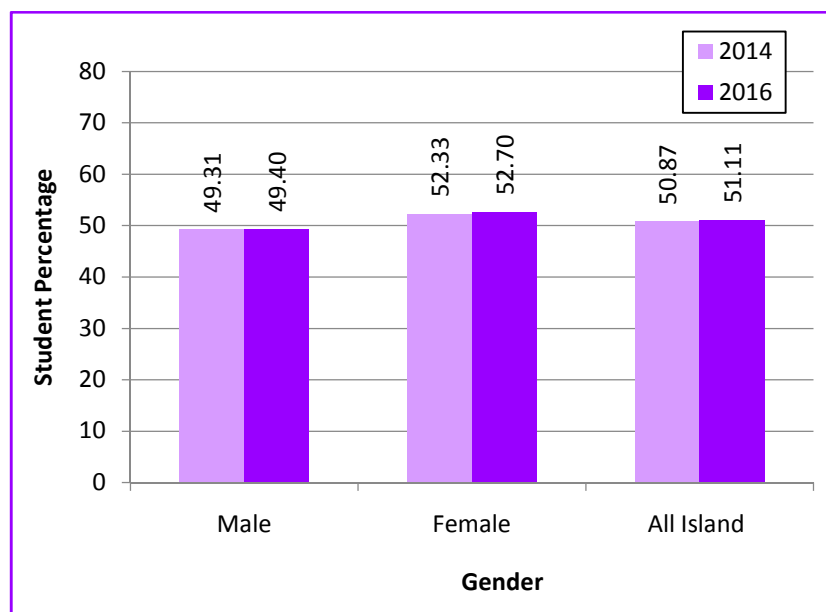
Fig. 3.25: All island comparison of mean values according to gender

As Fig. 3.25 indicates there are slight increases in both male and female performances.

However, according to Table 3.18 these changes are not significant.

Table 3.18: Comparison of mathematics achievement according to gender

Student Gender	Year 2014		Year 2016		Z
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
Male	49.31	20.30	49.40	20.61	0.27
Female	52.33	20.17	52.70	19.74	1.15
All Island	50.87	20.29	51.11	20.23	1.02

3.13   Comparison of marks according to medium of instruction
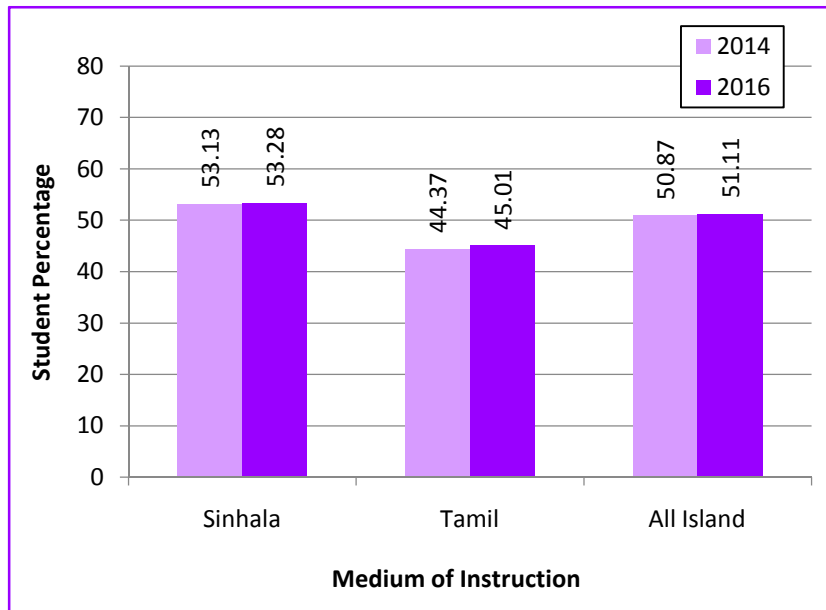
Fig. 3.26: All island comparison of mean values according medium of instruction

There is a very slight improvement in the performance of both Sinhala medium as well as Tamil medium students' performance (Fig. 3.26). However, as Table 3.19 indicates these changes are insignificant.

Table 3.19: Comparison of mathematics achievement according to medium of instruction

Medium of Instruction	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Sinhala	53.13	20.34	53.28	20.33	0.54
Tamil	44.37	18.69	45.01	18.66	1.59
All Island	50.87	20.29	51.11	20.23	1.02

3.14 Comparison of marks according to location
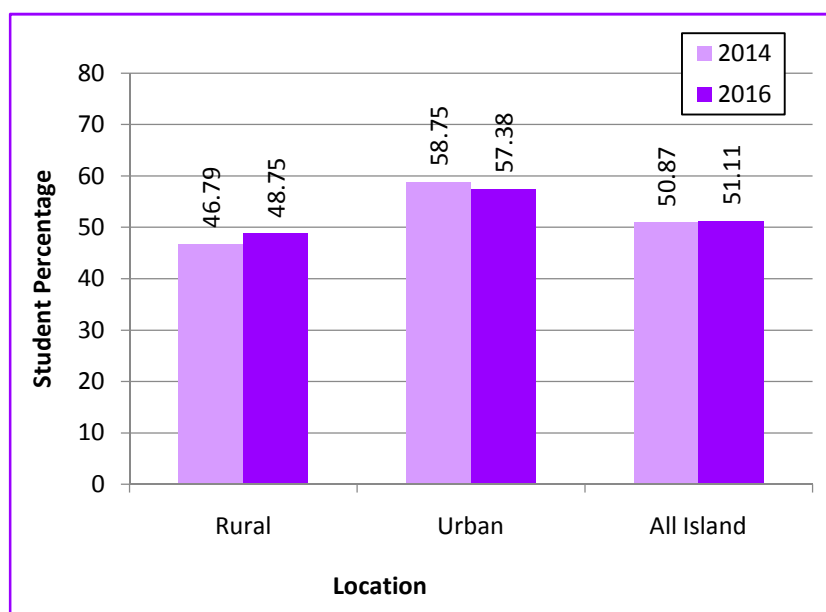
Fig. 3.27: All island comparison of mean values according to location

The urban students' performance has decreased by one point. On the other hand, the rural students' performance has increased by 2 points. According to Table 3.20 this change is significant.

Table 3.20: Comparison of mathematics achievement according to location

Location	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Rural	46.79	18.65	48.75	19.27	7.67**
Urban	58.75	21.01	57.38	21.36	-2.87*
All Island	50.87	20.29	51.11	20.23	1.02

Increase in rural students' performance is a positive feature even though the urban rural gap in achievement continues.

Trends in performance according to the sub skills in mathematics will be discussed next.

3.15 Comparison of students' achievement in relation to ELCs

Table 3.21: Comparison of achievement of competency levels related to knowledge and skills

Competency Level	Question Numbers	Percentage		Change
		2014	**2016**	
1.1 Inquires into the relationships between the whole numbers.	Q2	56.50	55.70	-0.80
1.2 Manipulates directed numbers under the basic mathematical operations	Q1	38.80	37.90	-0.90
2.1 Builds relationships between the terms of number patterns by investigating various properties	Q7	44.30	43.50	-0.80
3.1 Manipulates units and parts under multiplication	Q3	66.70	66.10	-0.60
5.1 Develops the relationship between fractions, ratios and percentages	Q8	34.90	35.60	+0.70
7.1 Satisfies various requirements by investigating the perimeter of rectilinear plane figures	Q20	38.80	42.30	+3.50
9.1 Facilitates daily work by investigating large masses	Q18	51.30	54.10	+2.80
10.1 Determines for daily needs, the space that is taken up by various solids	Q15	59.90	61.00	+1.10
11.1 Facilitates daily work by investigating the capacity of liquid containers	Q21	25.40	26.00	+0.60
12.1 Investigates the rotation of earth and inquires into its results	Q19	58.30	58.30	+0.00
12.2 Investigates the difference in time between countries and finds their relative positions	Q23	39.00	39.80	+0.80
13.1 Indicates the direction of a location using angles	Q24	34.10	34.30	+0.20
15.1 Factorizes algebraic expressions	Q26	38.00	38.80	+0.80
20.2 Illustrates the behavior of a variable pictorially	Q31	35.10	35.00	-0.10
20.3 Represents location on a Cartesian Plane	Q30	46.50	46.90	+0.40
21.1 Examines the angles made by various straight lines	Q35	45.10	45.20	+0.10
21.2 Performs calculations using the relationships between various angles	Q36	40.00	40.40	+0.40
22.1 Created solids and confirms the relationships between properties related circles	Q34	63.70	66.60	+2.90

Competency Level	Question Numbers	Percentage 2014	Percentage 2016	Change
23.1 Inquires into the relationships between the various angles of rectilinear plane figure	Q33	35.50	36.70	+1.20
24.1 Inquiries into the special properties related to circles	Q32	72.00	71.90	-0.10
25.1 Inquires into the results of a rotation that are based on symmetry	Q37	52.90	55.30	+2.40
27.1 Compares varies movements with the basic foci	Q11	69.00	69.90	+0.90
29.1 Inquires into numerical representative values of a group of data	Q12	72.30	71.70	-0.60
31.1 Determines the likelihood of an event occurring by investigating the various methods of finding a suitable value	Q13	67.60	69.50	+1.90

Considering the Table 3.21 there is not much change in the achievement of skills between 2014 -2016. In 2014 only 11 competencies have been achieved by more than 50% of students. In 2016 also the same 11 competencies have been achieved by more than 50% of students.

Table 3.22: Comparison of achievement of competency levels related communication

Competency Level	Question Numbers	Percentage 2014	Percentage 2016	Change
3.2 Manipulates units and parts of units under division	Q9	27.90	27.90	No Change
3.3 Manipulates decimal numbers under the mathematical operations of multiplication and division.	Q4	72.50	73.10	+0.60
6.2 Expands a power of a negative integer and finds the value	Q5	65.60	63.80	-1.80
8.2 Fulfils daily needs by investigating the surface area of various solids	Q16	18.50	19.80	+1.30
13.2 Describes various locations in the environment using scale drawings	Q22	65.60	66.80	+1.20
14.1 Simplifies algebraic expressions by removing brackets and finds the value by substitution.	Q25	48.30	47.90	-0.40
18.1 Uses the relationships between two quantities that can be used to enhance beauty.	Q28	52.50	53.60	+1.10

Competency Level	Question Numbers	Percentage		Change
		2014	2016	
20.1 Uses a number line to represent fractions and decimal numbers	Q29	36.80	40.20	+3.40
26.1 Studies shapes by creating various patterns that can be used to enhance beauty.	Q39	59.40	62.20	+2.80
30.1 Analyze the various relationships related to sets.	Q40	64.60	65.60	+1.00

In relation to the competency communication, in 2014 only six competencies have been achieved by more than 50% of students. In 2016 also only the same six competencies have been achieved by more than 50% of students.

Table 3.23: Comparison of achievement of competency levels related relationships, reasoning and problem solving

Standard	Competency Level	Question Numbers	Percentage		Change
			2014	2016	
Relationships	4.1 Uses ratios in day to day activities	Q6	59.20	59.50	+0.30
	4.2 Solves problems constructing relationships between two ratios	Q10	50.00	52.20	+2.20
Problem solving	8.1 Finds the area of a compound plane figure in the environment and has an awareness of the space allocated for them.	Q17	57.30	58.50	+1.20
	17.1 Uses linear equations to solve problems	Q27	39.60	41.00	+1.40
Reasoning	27.2 Constructs triangles	Q38	63.20	62.00	-1.20
	28.1 Represents data such that comparison is facilitated	Q14	68.30	67.50	-0.80

According to Table 3.23 in 2014 students have achieved more than 50% in all competencies except competency 17.1. In 2016 there has been a slight improvement in the achievement of the sub skill.

3.16 Summary

Part I of this chapter described student performance in relation to the achievement of learning outcomes in the mathematics. The discussion pertained to both national and provincial level. Further, achievement was analyzed according to school type, gender, medium of instruction and location.

Test items used to assess students' performance were analyzed to assess how far they have been successful in achieving sub skills of the language expected to be achieved by grade 8 pupils.

Part II described the trends in achievement between 2014-2016.

It could be concluded that even though overall the achievement of learning outcomes in the mathematics is satisfactory there is still disparity in achievement provincial wise as well as location and gender wise.

Although there is a slight improvement in achievement between 2014-2016 overall achievement of competencies is not satisfactory. The achievement of competency levels that were unsatisfactory in 2014 has not improved in 2016.

Patterns and Trends in Achievement: Science 2016

4.1   Introduction

This chapter presents the patterns and trends in achievement of the students in science.

The patterns of achievement in 2016 will be presented in part I and the trends will be presented in part II.

Part I – Patterns in achievement in science

First, national level student achievement would be discussed in relation to student performance pertaining to science.

4.2   Patterns of achievement at national level
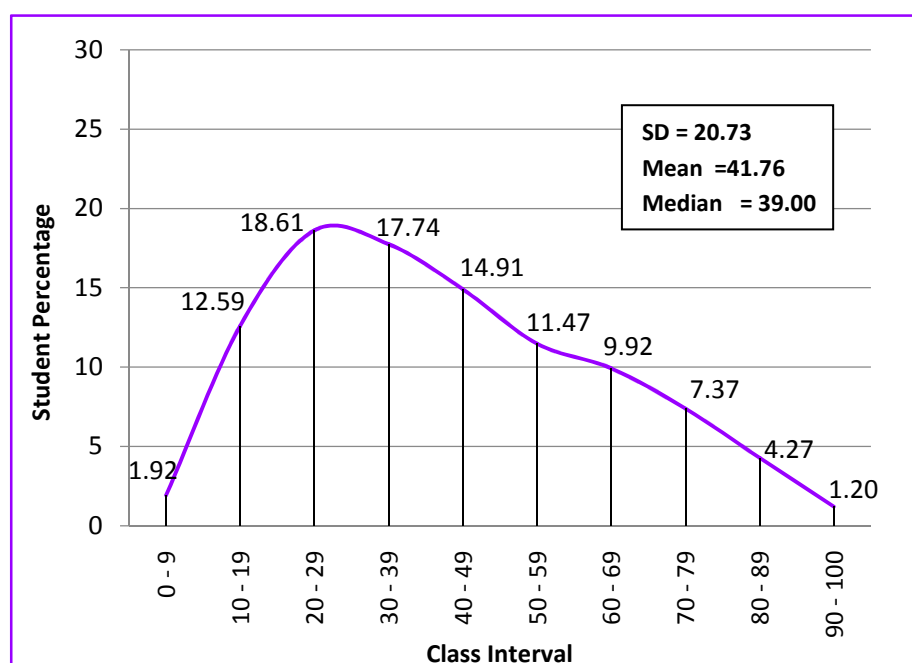
Fig. 4.1: All island achievement in science 2016 – dispersion of marks

The frequency polygon shown in Fig. 4.1 outlines the total picture of the distribution of marks of grade 8 students in science.

Fig. 4.1 depicts a positively skewed distribution of marks displaying that majority of the students has scored low marks in science. The distribution of marks is further clarified in Table 4.1.

Table 4.1: All island achievement in science 2016– cumulative percentages

Class Interval	Student %	Cumulative %
0 - 9	1.92	1.92
10 - 19	12.59	14.51
20 - 29	18.61	33.12
30 - 39	17.74	50.86
40 - 49	14.91	65.77
50 - 59	11.47	77.24
60 - 69	9.92	87.16
70 - 79	7.37	94.53
80 - 89	4.27	98.80
90 - 100	1.20	100.00
Total	100.00	

According to Table 4.1 the highest percent of students (18.61%) has scored between 20-29 marks. Further, 50.86% of students has scored below 40 marks. Fig. 4.2 illustrates student achievement patterns further.

As Fig. 4.2, the box plot displays average marks (mean) is 41.76. On the other hand the median of the achievement is 39. As the average value is above the median, more than 50% of the students has achieved values above the average value.
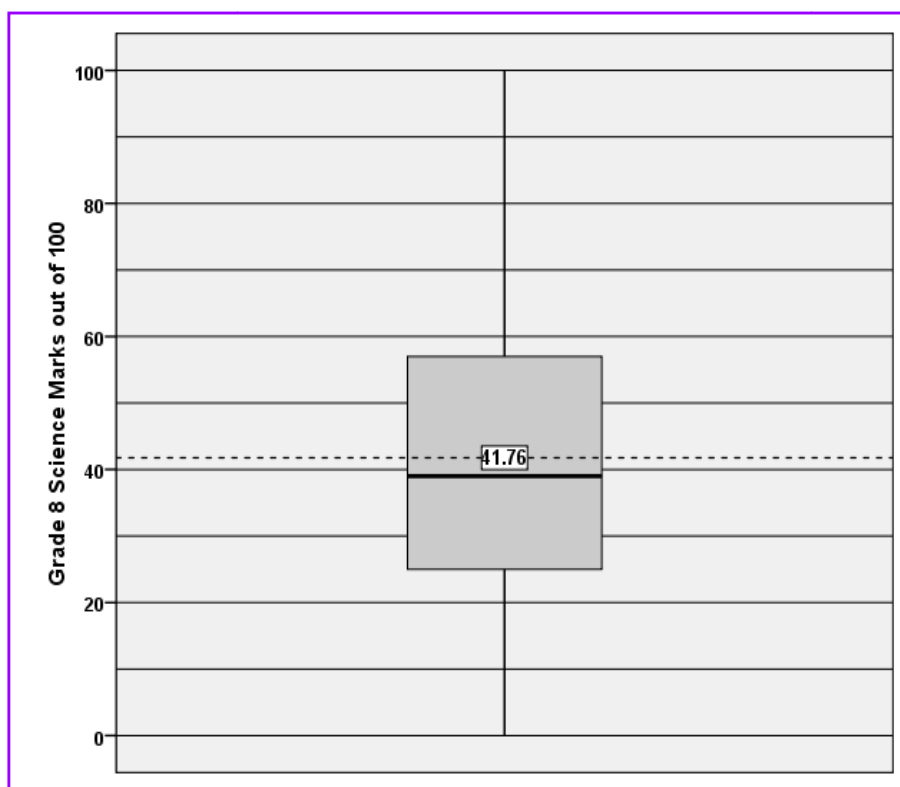
Fig. 4.2: Box plot and whisker chart representing all island science achievement

Summary of national level achievement

- National level mean is 41.76, while the median is 39.00.
- Disparity in achievement prevails with approximately 50.86% of students scoring below 40. However, the highest number of students (18.61%) has scored between the marks range of 20-29.

Provincial wise student achievement will be discussed next.

4.3   Provincial wise student achievement

The nature of the distribution of scores provincial wise reveals certain patterns. These patterns are discussed based on Table 4.2.

Table 4.2: Provincial achievement in science 2016 – Summary statistics

Province	Mean	Rank	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75
Southern	46.51	1	0.11	22.45	0.22	27.00	45.00	64.00
Western	45.42	2	0.08	21.03	0.25	28.00	43.00	62.00
Sabaragamuwa	43.38	3	0.11	19.96	0.37	28.00	41.00	57.00
North Western	42.89	4	0.11	21.28	0.40	25.00	40.00	60.00
North Central	40.97	5	0.13	19.16	0.49	26.00	38.00	54.00
Central	39.21	6	0.09	18.88	0.70	24.00	36.00	50.00
Uva	37.57	7	0.12	18.85	0.64	23.00	34.00	50.00
Eastern	35.57	8	0.11	19.63	0.70	20.00	31.00	48.00
Northern	34.34	9	0.13	19.05	0.83	20.00	30.00	45.00
All Island	41.76		0.04	20.73	0.46	25.00	39.00	56.00

As Table 4.2 indicates based on provincial wise mean achievement Southern Province ranks first. Western Province is ranked second with only a slightly lower mean value.

Achievement wise the provinces fall into three categories. Southern, Western, Sabaragamuwa and North Western with mean scores above the national mean, fall into the higher category. North Central and Central Provinces cluster in the middle while the rest of the provinces fall into the lowest category. Between the Southern and Northern Provinces there is almost twelve point difference in mean values indicating the disparity in achievement among the provinces.

As can be seen in Fig. 4.3 the median values of all the provinces are below that of their mean values. Therefore, 50% of the students has achieved above the mean value in each province.
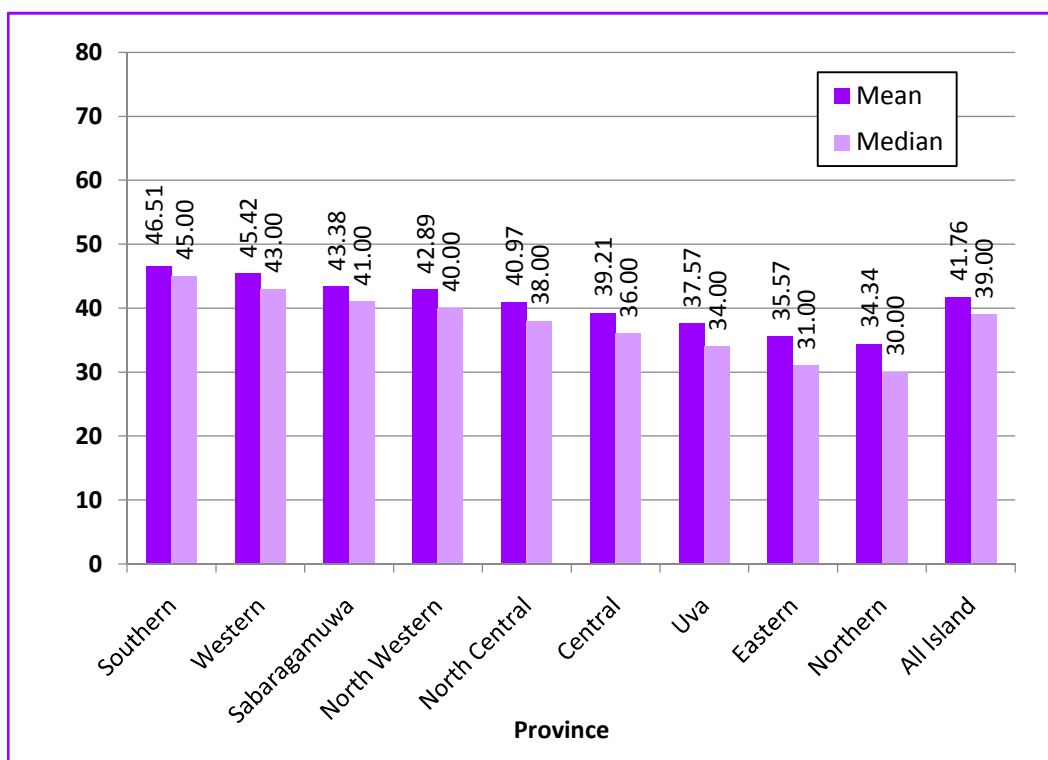
Fig. 4.3: Bar chart to represent mean and median among the provinces - Science

Disparity in achievement among provinces

According to Table 4.2, Southern Province has the highest mean value but its SD is higher than Western Province which has the next highest mean value. This means that student performance is more homogeneous in the Western Province. Southern Province has the highest SD value indicating that the variation of students' marks is the highest in this province. The SD values of both Southern and Western Provinces are higher than the all island SD value indicating that there is variation in achievement in these provinces. All the other provinces have SD values lower than the all island SD.

All the provinces have obtained positive skewed values. This indicates that student performance is low. Only Southern and Western indicate low skewness values and their curves are bimodal compared to other provinces. The two curves being bimodal suggest that there are both high achievers and low achievers in these provinces.

These disparities are further highlighted through the line curves for each province given in Fig. 4.4.
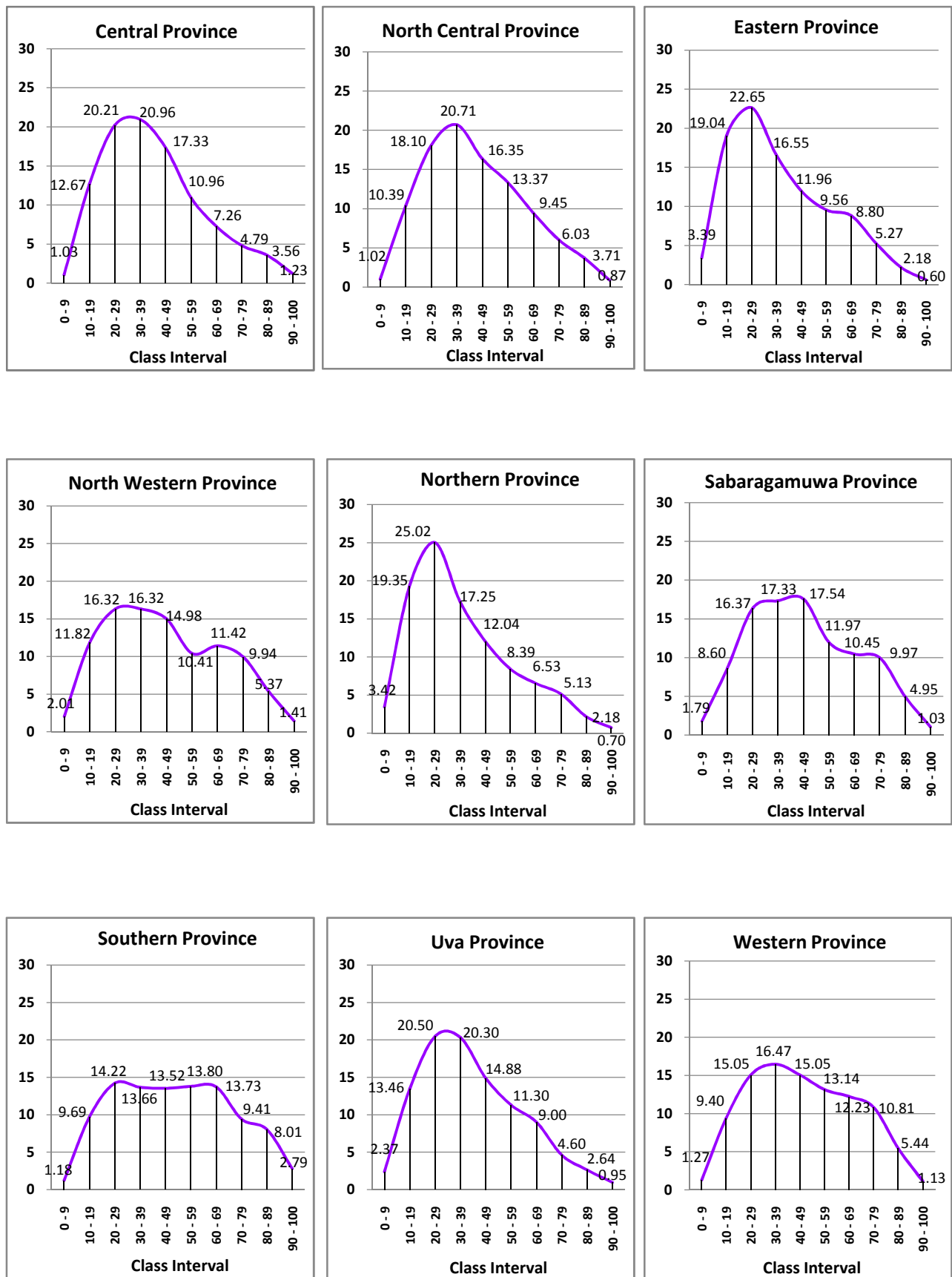
Fig. 4.4: Provincial wise distribution of marks -science

Patterns of achievement in the different provinces are further elaborated through the box plot chart.
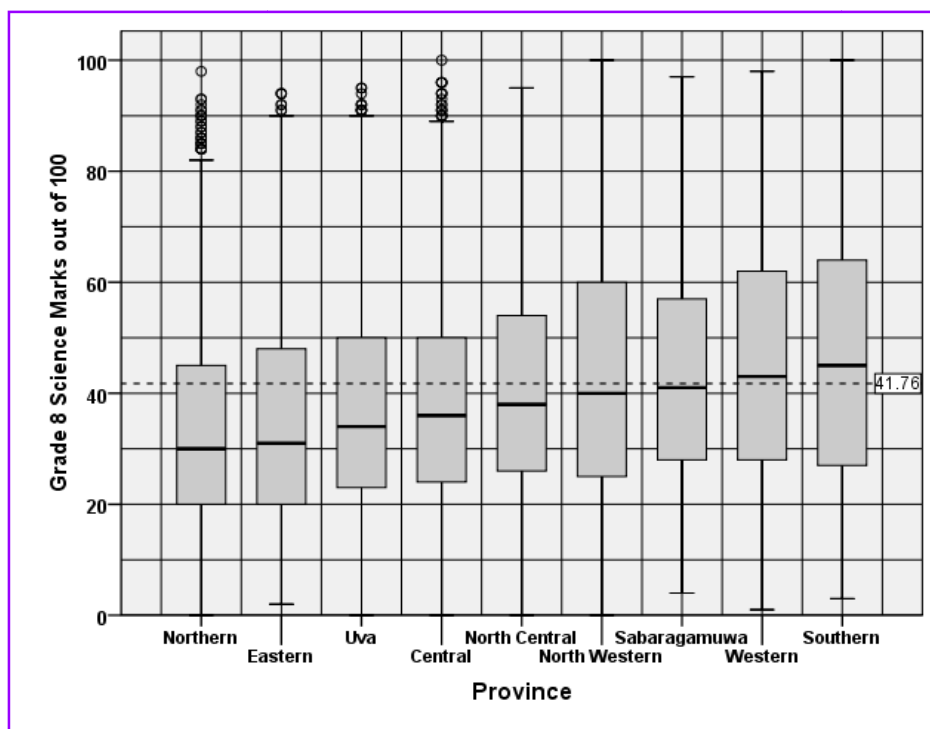
Fig. 4.5:   Box plot and whisker chart representing provincial wise science achievement

According to the above chart there are two provinces (Uva and Central) which show similar characteristics. Similarly, even though Western Province and Southern Provinces performance are very similar the 75th percentile is higher in the Southern Province. Therefore there is greater disparity of marks in the Southern Province. An interesting feature in the achievement of the provinces is that there are outliers in all the low performing provinces.

Table 4.3: Percentage of student scoring 50 or above, and below 50 – Science

Province	Greater than or Equal to50	Less than 50
Central	27.81	72.19
Eastern	26.41	73.59
North Central	33.43	66.57
North Western	38.55	61.45
Northern	22.92	77.08
Sabaragamuwa	38.38	61.62
Southern	47.74	52.26
Uva	28.48	71.52
Western	42.76	57.24
All Island	34.23	65.77

Summary of provincial level analysis

- Achievement wise the provinces fall into three categories.

  Category 1 - Southern, Western, Sabaragamuwa and North Western with mean scores above the national mean (41.76)

  Category 2 – North Central and Central Provinces cluster in the middle

  Category 3 – Uva, Eastern and Northern Provinces

4.4   Achievement levels by type of school

Table 4.4: Science achievement according to school type

School Type	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
1AB	48.63	0.05	21.62	0.12	31.00	48.00	66.00		
1C	36.00	0.05	17.51	0.60	22.00	33.00	47.00	20741.49	0.000
Type 2	33.33	0.07	16.94	0.78	20.00	30.00	43.00		
All Island	41.76	0.04	20.73	0.46	25.00	39.00	56.00		

As Table 4.4 indicates there is a considerable gap between the mean scores of different school types. However, 1AB schools' mean score is above that of the other types and also above the national mean. On the other hand, the mean scores of Type 2 and 1C schools are below the national mean. Therefore, the gap between school types exists.

The difference in mean and median scores is graphically shown in Fig. 4.6
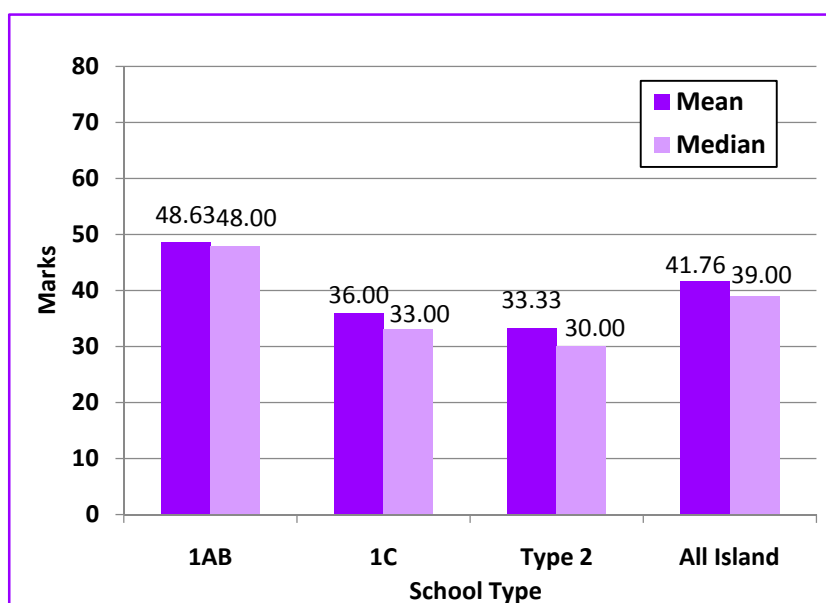
Fig. 4.6: Bar chart representing the mean and median values according to school types- Science

The performance of the school types is further highlighted when the median scores are considered in Table 4.4 and Fig. 4.6. All school types have achieved median values below the mean value for the science achievement. This means that fifty percent of students in all school types have obtained scores above their respective mean value.

Disparity in achievement

As Table 4.4 indicates the SD in 1AB schools is high. It is higher than the all island SD. Thus the deviation of marks in these schools is high. On the other hand, in Type 2 and 1C schools SD is below the all island mean.

All school types have obtained positive skewed values. It reveals that in these types there are higher number of students who has achieved low marks while higher marks are obtained by a lower number of students. Highest skewed value has been obtained by Type 2 schools. Next higher value has been obtained by 1C schools. Both values are above the all island skewness value. On the other hand 1AB schools skewness value is lower than the all island value, indicating that there is greater variation in achievement in these schools.

The variation in student performance in different types of schools is further highlighted through the frequency distribution graphs.
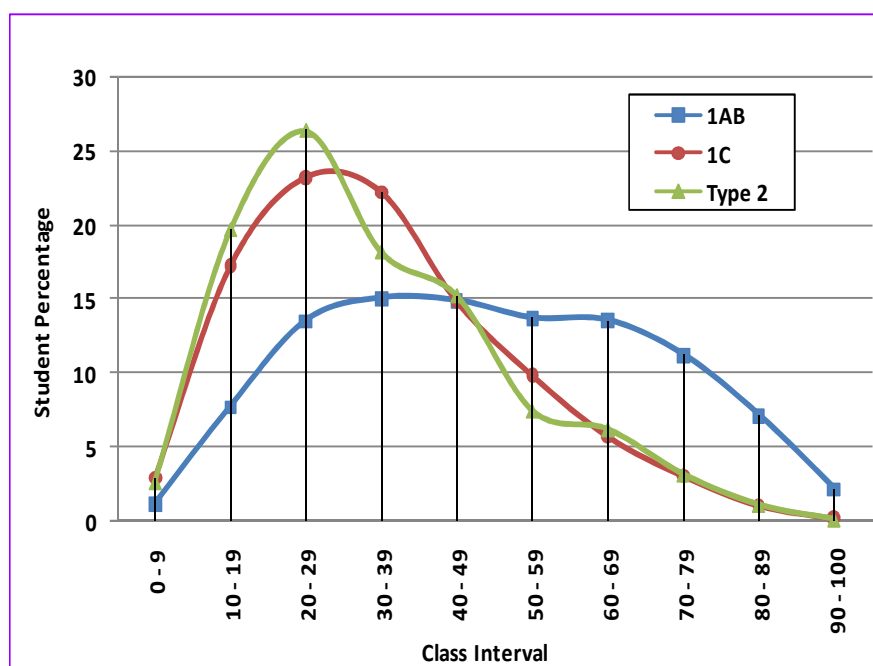
Fig. 4.7: Dispersion of marks by school type–Science

Fig. 4.7 displays that 1C and Type 2 school curves are quite similar. They are positively skewed and the majority of the students' marks fall between the class intervals 30-39 and 20-29. On the other hand in 1AB schools the peak spreads over different class intervals. It shows both high and low achiever groups. However, the low achiever group is slightly higher.

The spread of marks at different class intervals is further illustrated in the cumulative percentage Table 4.5.

Table 4.5: Cumulative student percentages according to school type- science

Class Interval	1AB		1C		Type 2	
	Student %	Cumulative %	Student %	Cumulative %	Student %	Cumulative %
0 – 9	1.14	1.14	2.88	2.88	2.62	2.62
10 – 19	7.71	8.85	17.21	20.09	19.67	22.30
20 – 29	13.51	22.36	23.23	43.32	26.37	48.67
30 – 39	15.04	37.40	22.22	65.53	18.17	66.84
40 - 49	14.86	52.26	14.82	80.35	15.22	82.06
50 - 59	13.69	65.95	9.81	90.16	7.45	89.51
60 - 69	13.53	79.48	5.68	95.85	6.18	95.69
70 - 79	11.21	90.69	3.01	98.86	3.14	98.83
80 - 89	7.14	97.83	1.01	99.87	1.08	99.91
90 - 100	2.17	100.00	0.13	100.00	0.09	100.00
Total	100.00		100.00		100.00	

In the 1AB school type high percentage of students has scored between 20-79. On the other hand in both Type 2 and 1C schools the highest percentage of students fall between the class intervals 10-49.

The analysis of data pertaining to the school types indicates disparity in achievement.

This is further illustrated through the box plot.
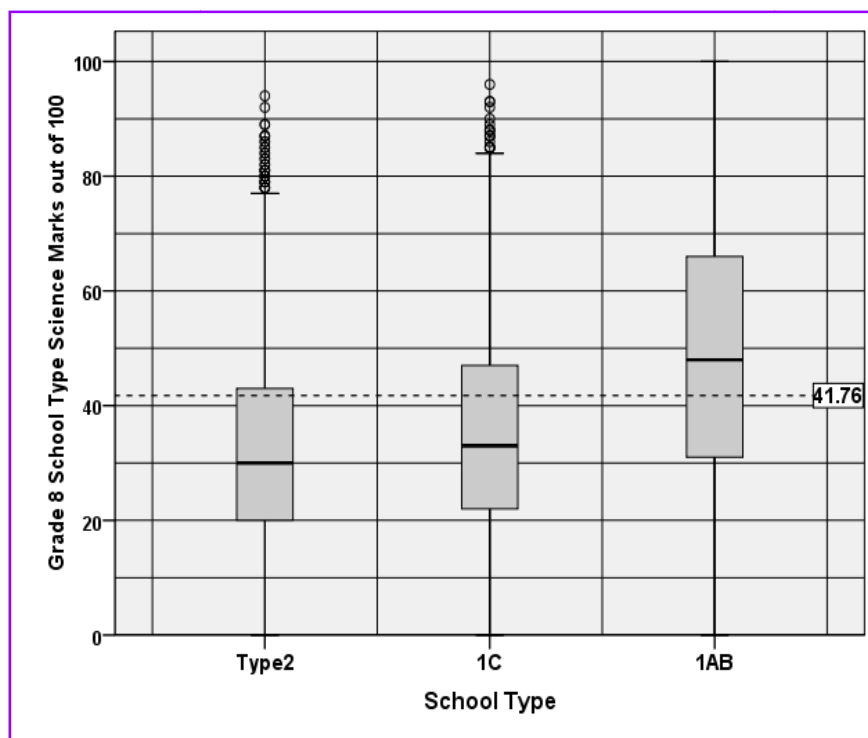
Fig. 4.8: Science marks according to school types using box plot and whisker plot

The box plots of the 1C and Type 2 schools are quite similar. This indicates that their performances are similar. However, in 1C type 25th and 75th percentiles are higher than in Type 2 schools indicating their performance is higher than that of Type 2. In both school types there are also outliers who's performance is higher than the other students. On the other hand, the 1AB schools performance is different. Their 25th as well as the 75th percentiles are higher than that of the Type 2 and 1C schools. It also indicates that their performance is high.

Summary

- The achievement in science in 1C and Type 2 schools are relatively similar.
- 1AB schools' performance is quite different and higher than the other two school types.
- The gap in achievement between school types continues.

4.5   Achievement levels by gender

Table 4.6: Science achievement according to gender

Gender	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Male	39.48	0.05	21.22	0.58	23.00	36.00	54.00		
Female	43.86	0.05	20.03	0.38	28.00	41.00	59.00	3793.34	0.000
All Island	41.76	0.04	20.73	0.46	25.00	39.00	56.00		

There is a difference in the achievement of females over males. As Table 4.6 indicates, male performance is also lower than the all island mean score, while female performance is above the all island mean.

These differences could also be seen in Fig. 4.9.
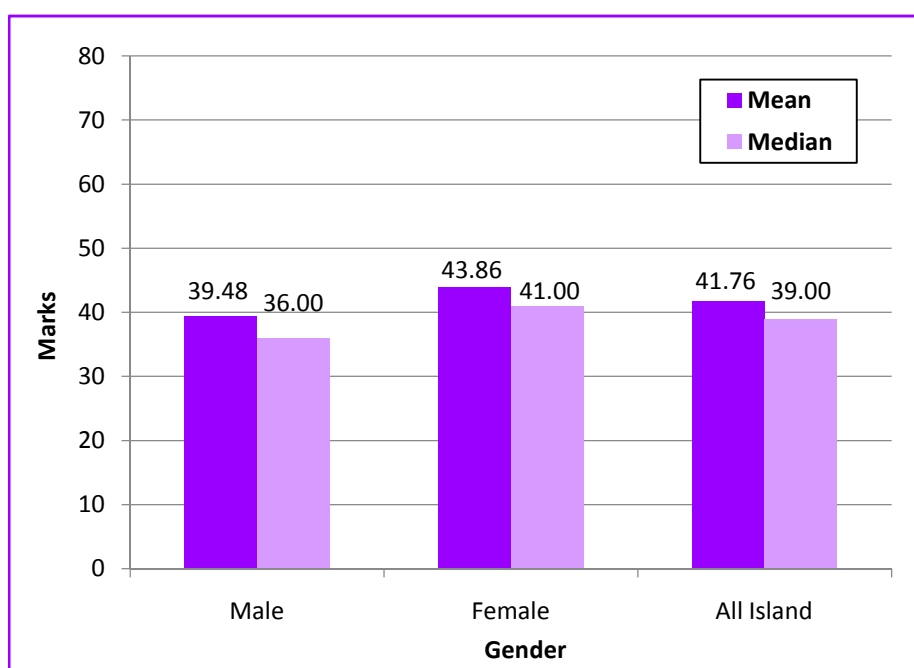
Fig. 4.9: Bar chart representing mean and median values according to gender –Science

Variation among students

Variation in achievement among males is higher than that of the female students. This is indicated by the male students obtaining a higher SD value than the female students as well as the all island SD (Table 4.6). On the other hand, the female SD value is closer to the all island value. Fig. 4.9 also indicates that both among males and females the

median value is below the mean. This indicates that more than 50% of the students has scored above the average mark.

Fig. 4.10 graphically illustrates the dispersion of marks according to gender.
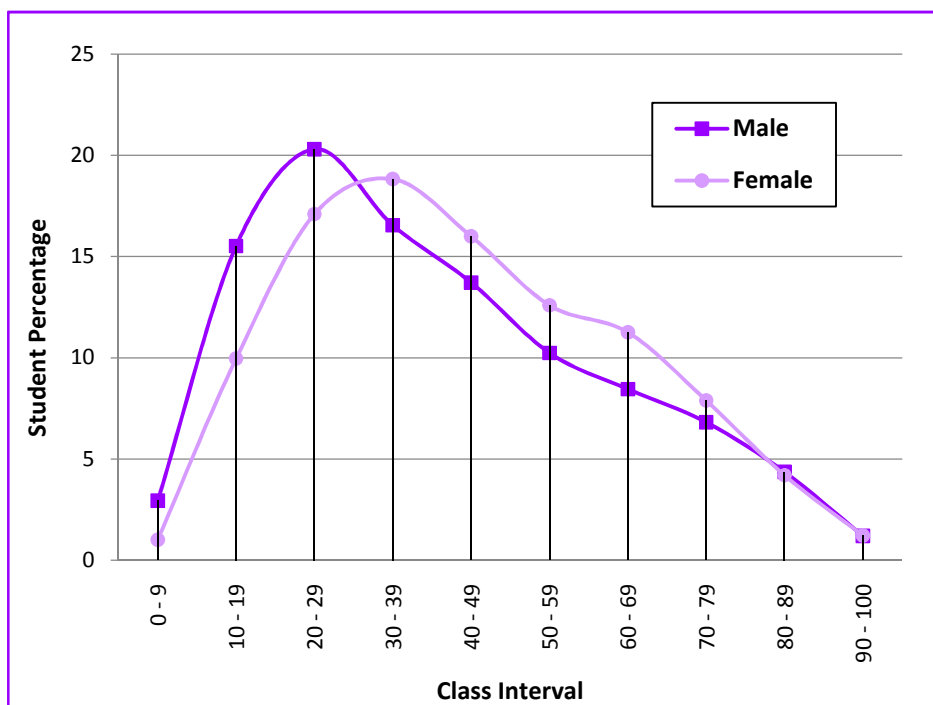
Fig. 4.10: Dispersion of marks by gender – Science

Fig. 4.10 displays two curves which are both positively skewed. As can be seen there are more low achievers than high achievers among both males and females. However the pattern of the two curves are slightly different. At the beginning the curves are similar, then the curves become different. While the peak of the male curve is at 20-29 class interval, the female curve then rises above the male curve and its peak is at 30-39 class interval. Finally, both curves become similar again.

The disparity in the students' achievement can be elaborated better through the cumulative percentages Table 4.7.

Table 4.7: Cumulative student percentages according to the gender –Science

Class Interval	Male		Female	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	2.93	2.93	1.00	1.00
10 – 19	15.51	18.44	9.95	10.95
20 – 29	20.29	38.74	17.09	28.05
30 – 39	16.54	55.27	18.83	46.87
40 - 49	13.71	68.98	16.00	62.87
50 - 59	10.23	79.21	12.59	75.46
60 - 69	8.44	87.65	11.25	86.71
70 - 79	6.80	94.45	7.89	94.60
80 - 89	4.35	98.81	4.19	98.79
90 - 100	1.19	100.00	1.21	100.00
Total	100.00		100.00	

According to Table 4.7 and Fig. 4.10 it could be concluded that among both females and males, there are low performing students. The highest percentage (18.83%)of female students' marks fall into the class interval 30-39. The highest percentage of male students' marks, even a higher percentage (20.29%) falls into the class interval 20-29. This indicates that the low performing boys' percentage is higher than that of the low performing girls.

While there are 46.87 cumulative percent of female students who has scored below 40 marks, there are 55.27cumulative percent of male students who has scored less than 40 marks. Therefore, the heterogeneity in achievement in science of the boys is greater than the girls.

Box plot and whisker for gender wise science achievement shows similarities that has been discussed already.
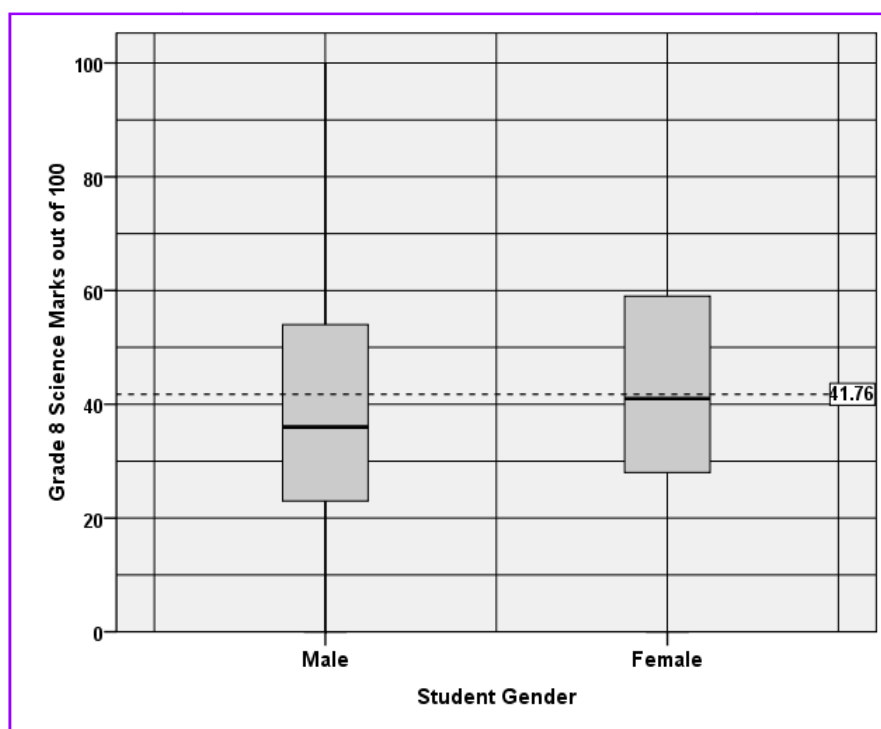
Fig. 4.11: Box plot and whisker plot representing gender wise science marks

Box plot and whisker chart shows that male students' 25th and 50th percentile is lower than the female mark range as well as the all island range.

Summary

- Female performance is better than all island and male performance.
- While 46.87 % of girls has scored below 40, the male percentage is 55.27.

4.6   Achievement levels by medium of instruction

Table 4.8:   Science achievement according to medium of instruction

Medium of Instruction	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Sinhala	44.54	0.04	20.83	0.35	28.00	42.00	60.00	17676.27	0.000
Tamil	34.05	0.06	18.36	0.77	20.00	30.00	45.00		
All Island	41.76	0.04	20.73	0.46	25.00	39.00	56.00		

There is disparity between the students belonging to the different medium of instruction. While the Sinhala medium students' mean achievement is above the all island mean value, the Tamil medium students' mean achievement is below the national mean average.

These disparities are further highlighted through the bar chart given in Fig. 4.12.
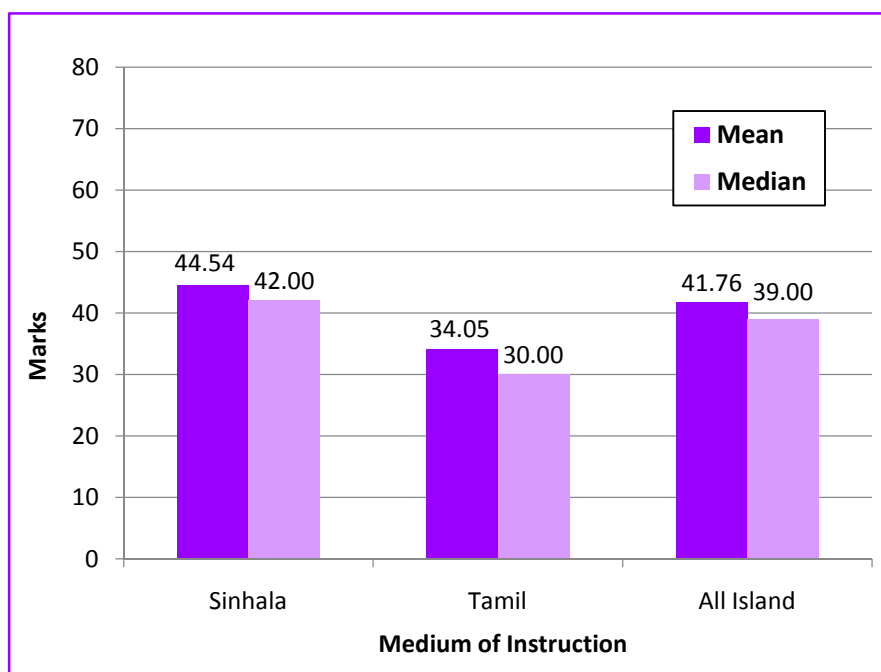
Fig. 4.12: Bar chart representing mean and median values according to medium of instruction - Science

As Table 4.8 indicates Sinhala medium students SD is higher than the Tamil medium students SD. Thus there is greater variation in their performance. However, it is closer to the national SD.

The diversity in achievement scores among the students taught through the different medium of instruction, is further highlighted through the frequency distribution graphs.
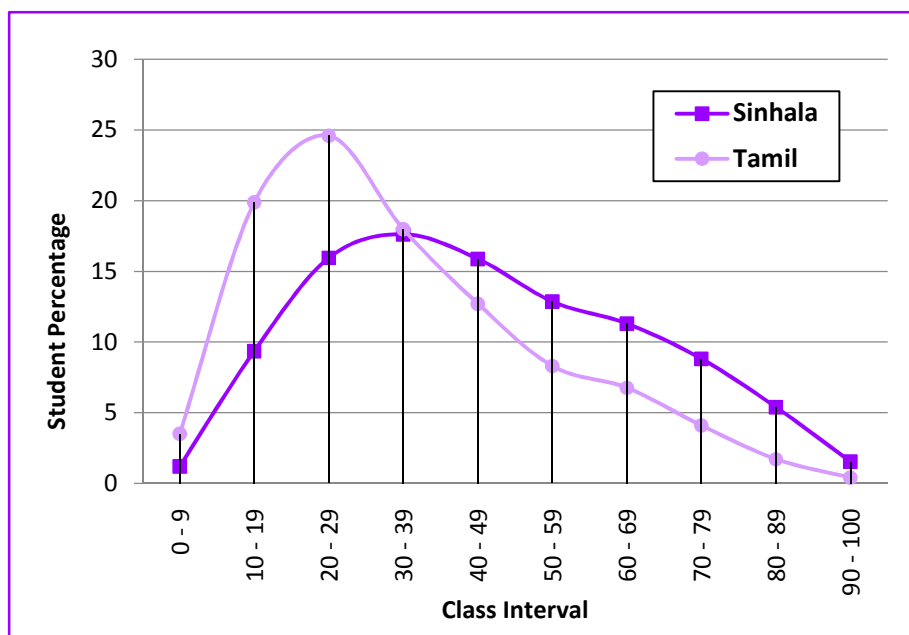
Fig. 4.13: Dispersion of marks by medium of instruction – Science

The two curves on Fig. 4.13 shows two different patterns. While both curves are positively skewed, the Sinhala medium curve is more evenly spread.While the Tamil medium students marks peak at the class interval 20-29, Sinhala medium students marks peak at the 30-39 class interval. Among the Sinhala medium students there are both low achievers as well as high achievers. However, the low achievers are slightly more. This pattern can be explained thorugh Table 4.9.

Table 4.9: Cumulative student percentages according to medium of instruction –Science

Class Interval	Sinhala		Tamil	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	1.21	1.21	3.51	3.51
10 – 19	9.36	10.58	19.89	23.40
20 – 29	15.96	26.54	24.60	48.00
30 – 39	17.63	44.17	17.99	65.99
40 - 49	15.88	60.05	12.71	78.70
50 - 59	12.87	72.92	8.30	87.01
60 - 69	11.31	84.23	6.77	93.77
70 - 79	8.82	93.05	4.10	97.87
80 - 89	5.40	98.45	1.72	99.59
90 - 100	1.55	100.00	0.41	100.00
Total	100.00		100.00	

As Table 4.9 indicates the highest percentage of the Sinhala medium students' marks is in the range of 30-39. On the other hand, the highest percentage of Tamil medium students marks concentrate between 20-29.

Considering the pass mark as 40, 44.17% of Sinhala medium students has scored below the pass mark. On the other hand 65.99% of Tamil medium students has scored below the pass mark.

Box plot for medium wise achievement graphically shows the differences that have been discussed already.
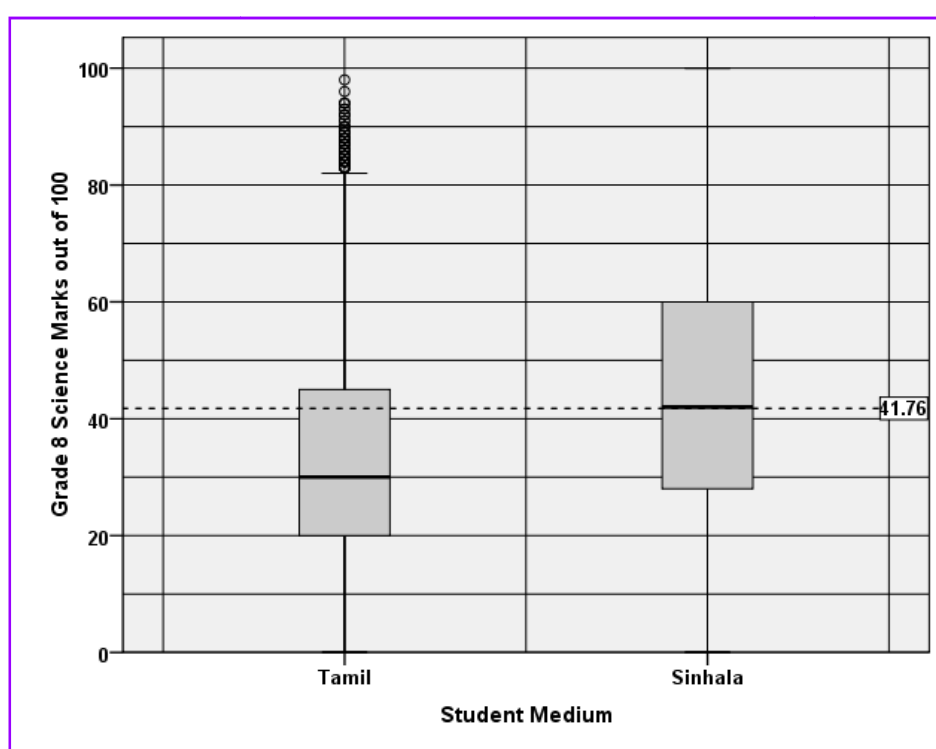
Fig. 4.14: Science marks according to medium of instruction using box plot and whisker plot

Box plot and whisker plot chart shows high differences among both media. Sinhala medium dispersion of marks in the box plot is more than the Tamil medium students' dispersion of marks. Sinhala medium student's 25th, 50th and 75th percentile values are higher than that of the Tamil medium students.

However, there are outliers among the Tamil medium students. Therefore, this confirms that there is disparity between the performance in science of Tamil and Sinhala medium students.

Summary

- There is wide disparity among students belonging to different medium of instruction.
- The Sinhala medium students' mean score is closer to the national mean while the Tamil medium students' mean is lower.

Students' achievement in relation to the location of the school would be discussed next.

4.7   Achievement levels by location

Table 4.10: Science achievement according to location

Location	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Rural	39.56	0.04	19.71	0.52	24.00	37.00	53.00	10210.54	0.000
Urban	47.52	0.07	22.17	0.23	29.00	45.00	66.00		
All Island	41.76	0.04	20.73	0.46	25.00	39.00	56.00		

As Table 4.10 indicates, there is variation in achievement among the schools in the different localities. The urban area schools have performed better than the rural area schools. Rural area schools have performed below the national mean while the urban schools have performed above the national mean.

According to Table 4.10 the SD also differs in the two localities. While the SD of the rural schools is closer to the all island SD, the urban schools SD is higher than the all island SD denoting more variation among the student achievement.

The difference in mean and median values is graphically shown in Fig. 4.15

As Fig. 4.15 indicates in both locations the median value is lower than the mean value.
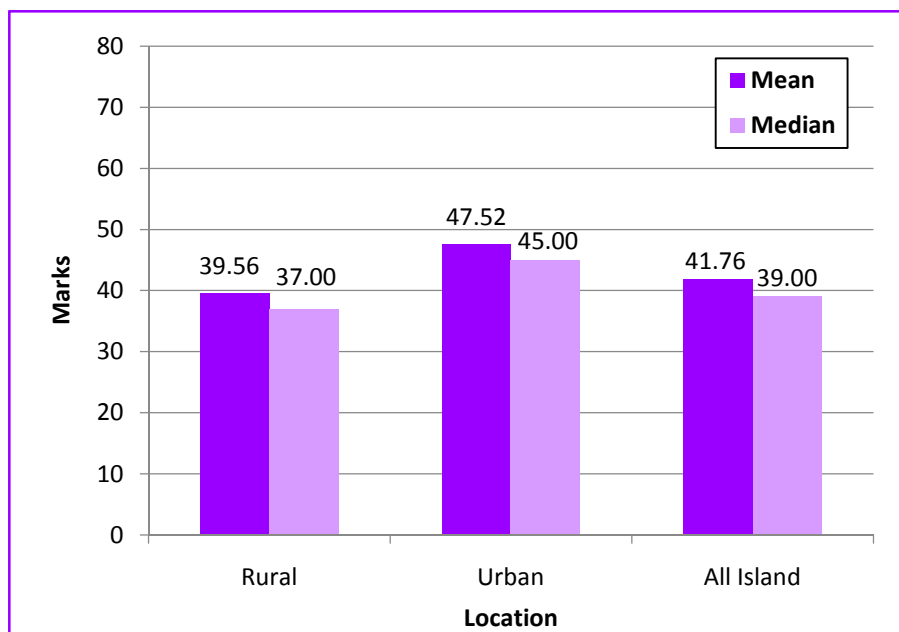
Fig. 4.15: Bar chart representing mean and median values according to location– Science

Students' achievement is further elaborated through the frequency distribution graphs in Fig. 4.16.
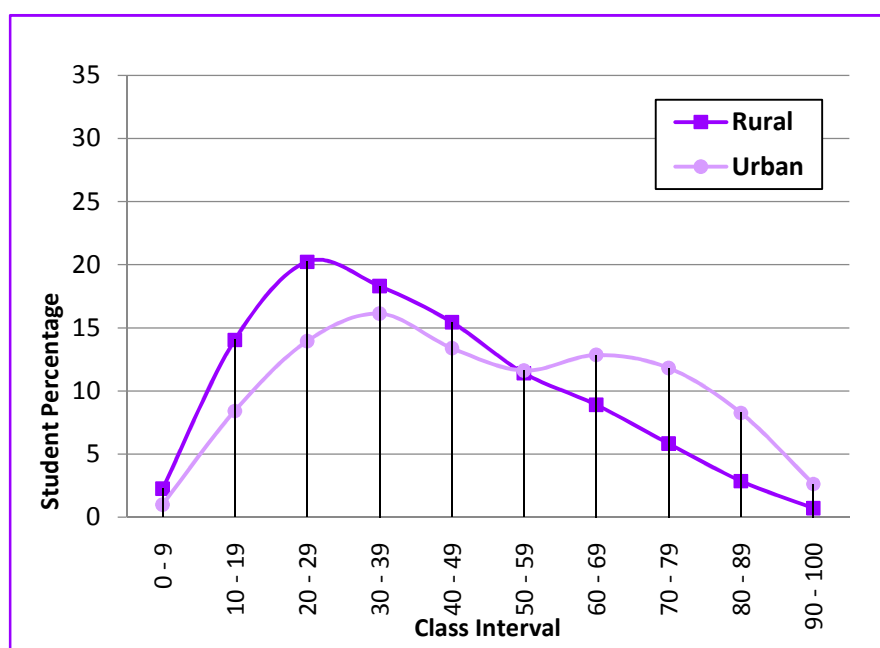
Fig. 4.16: Dispersion of marks by location – Science

Fig. 4.16 displays two differently skewed graphs. While the curve representing the rural areas is positive, the shape of the curve representing the performance of urban

schools is bimodal. This difference can be explained using the cumulative percentage Table 4.11.

Table 4.11: Cumulative student percentages according to the location –Science

Class Interval	Rural		Urban	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	2.25	2.25	0.97	0.97
10 – 19	14.05	16.30	8.42	9.39
20 – 29	20.25	36.55	13.94	23.33
30 – 39	18.31	54.86	16.12	39.44
40 - 49	15.44	70.30	13.39	52.83
50 - 59	11.42	81.72	11.60	64.44
60 - 69	8.89	90.62	12.84	77.28
70 - 79	5.82	96.43	11.81	89.09
80 - 89	2.87	99.30	8.27	97.36
90 - 100	0.70	100.00	2.64	100.00
Total	100.00		100.00	

According to Table 4.11 the highest percentage of students in urban area schools (16.12%) falls into the class interval 30-39. This is the peak of the urban area school curve. However, there is another 12.84% of students falling into the class interval 60-69. On the other hand, in the rural area schools the highest percentage of students falls in to the class interval 20-29 and the percentage is 20.25. Those who have scored between 60-69 are only 8.89%.

The spread of marks is further illustrated through the box plot graph.
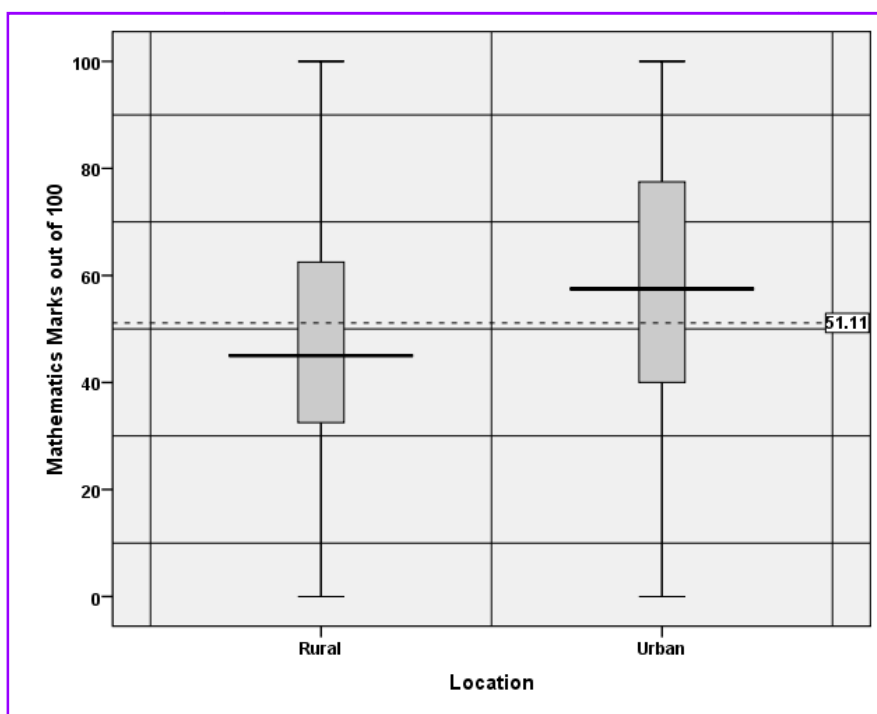
Fig. 4.17: Box plot and whisker plot representing location wise science marks

According to the box plot the urban area schools' performance differ from the rural area schools at the 25th, 50th and 75th percentile. Further, their performance is above the all island performance. The box plot confirms the variation that exists between the performances of the two localities.

Summary

- The performance of the students in the urban areas is better than in the rural areas.
- The deviation of marks is less in the rural area schools.
- Achievement patterns observed in relation to the achievement in science, revealed that there are variations among provinces, school type, gender and medium wise.

Students' achievement in relation to subject content will be discussed next.

4.8   Analysis of achievement by sub skills

In constructing the achievement tests, the test items were designed in relation to the competencies and competency levels identified for grade eight. As discussed in chapter 2, the construct assessed in these studies were the competency levels. Based on the competencies and competency levels table of specification was prepared.

The science paper was based on four main content areas – biology, chemistry, earth science and physics.

Achievement of competencies related to biology

The percentage of students who has answered correctly the questions related to each competency level under biology is given in Table 4.12.

Table 4.12: Achievement of competency levels related to biology

Content	Competency Level	Percentage
Biology	1.1 Discovers the diversity of the natural environments	47.10
	1.2 Investigates the advantages/disadvantages of the built environments	53.10
	1.3 Focuses attention on the venomous animals that are harmful to man	80.70
	1.4 Acquires the ability to use international scientific symbols	71.20
	3.1 Observes the interactions based on life cycles	54.65
	3.3 Explains the importance of use of cultivations under specific conditions	72.10
	3.4 Investigates the biotic factors affecting the perpetuation of the environment.	56.00
	6.1 Conducts explorations to identify the morphological diversity of leaves	5.90
	6.3 Investigates the functions related to the diversity of roots.	37.70
	6.4 Uses plant related products with a scientific attitude	46.60

As Table 4.12 indicates the highest achievement recorded is in relation to competency 1.3. On the other hand, the lowest achievement recorded is in relation to competency 6.1. Out of the 10 competencies tested 50% or more students has been able to achieve only six competencies.

The achievement of competencies is further elaborated in Fig. 4.18.
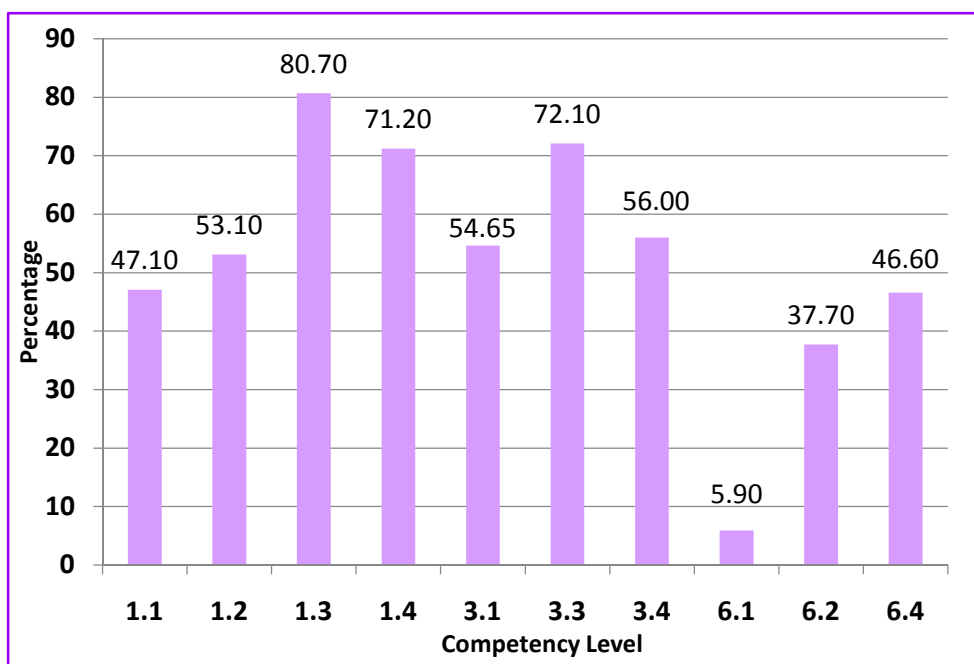
Fig. 4.18: Achievement of competency levels related to biology

Achievement of competency levels related to chemistry will be discussed next.

Achievement of competencies related to chemistry

Table 4.13: Achievement of competency levels related to chemistry

Content	Competency Level	Percentage
Chemistry	2.1 Inquires into the properties of matter	61.00
	2.2 Inquires into the standard symbols used for elements	47.47
	2.3 Display the ability to use the differences in density of substances in day today life.	49.45
	2.4 Uses the expansion of solids, liquids and gases in day today life effectively.	10.23
	2.5 Inquires into the usages of compounds according to their properties.	30. 03
	2.6 Inquires into the domestic uses of chemicals	34.23
	2.7 Uses parallel and serial connections of electrical appliances in human needs.	52.95
	2.8 Uses magnets in day to day life	62.50

According to Table 4.13 the competency levels 2.8 that is "uses magnets in day to day life" is the competency level achieved by the highest percentage of students (62.50). On the other hand, competency level 2.4 (Uses the expansion of solids, liquids and gases in day to day life) is the least achieved competency (10.23%.). Out of the 8 competency levels tested only 3 have been achieved by more than 50% of students.

Percentage of students who achieved the competency levels related to chemistry is graphically illustrated in Fig. 4.19.
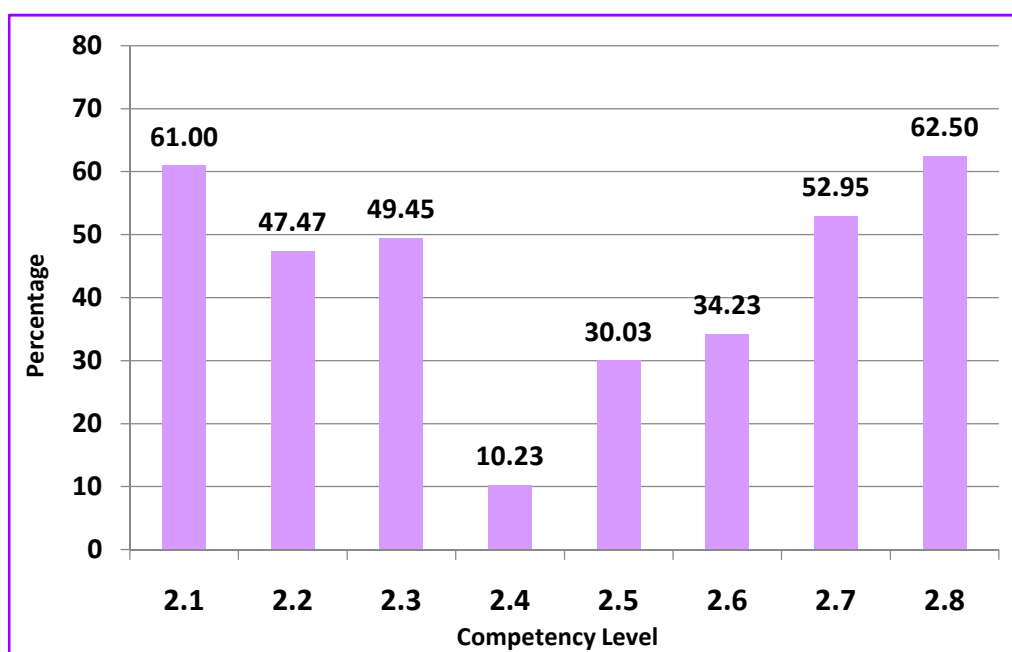
Fig. 4.19: Achievement of competency levels related to chemistry

Achievement of competencies related to earth science

Table 4.14: Achievement of competency levels related to earth science

Content	Competency Level	Percentage
Earth science	4.1 Investigates the constituents of the atmosphere	48.39
	4.2 Acts to maintain optimum composition of the atmosphere	37.83
	4.3 Uses natural resources obtained from the earth effectively	54.94

According to Table 4.14 only the competency level 4.3 "uses natural resource obtained from the earth effectively" has been achieved by more than 50% of students. The least

achieved competency is 4.2 which is "acts to maintain optimum composition from the earth".

The achievement of the competency levels is graphically illustrated in Fig. 4.20.
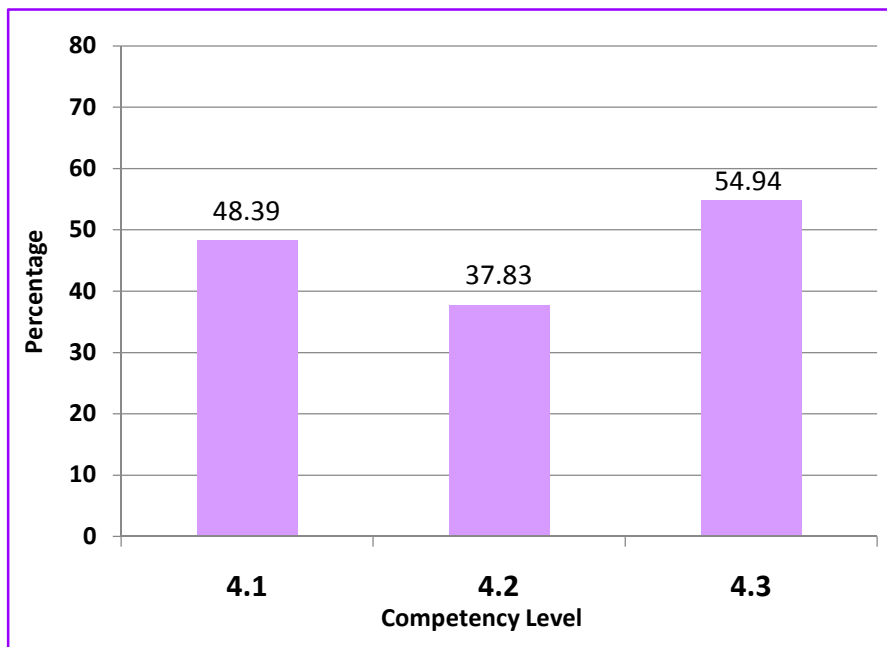
Fig. 4.20: Achievement of competency levels related to earth science

Achievement of competencies related to physics

Table 4.15: Achievement of competency levels related to physics

Content	Competency Level	Percentage
Physics	5.1 Inquires into the application of the concept "pressure" in day to day needs	31.76
	5.2 Inquires into the effect of Center of Gravity on the equilibrium of an object in relation to life experiences	47.85
	5.3 Uses work, energy and power in human concerns/needs	36.50
	7.1 Uses properties of light in human needs	28.05
	7.2 Uses generation and propagation of sound in musical instruments	21.68
	7.3 Explores the scientific basis of modern communication equipment	37.79
	8.1 Contribute to minimize the risks associated with cyclones	53.69
	8.2 Contribute to minimize the risks associated with lightning and thunder	84.34

According to Table 4.15 majority of the students (84.34%) has been able to achieve competency level 8.2 which is "contributes to minimize the risks associated with

lightning and thundering". On the other hand, only 2.68% of students has been able to achieve competency level 7.2 which is "uses generation and propagation of sound in musical instruments".

The achievement of competency levels is graphically shown in Fig. 4.21
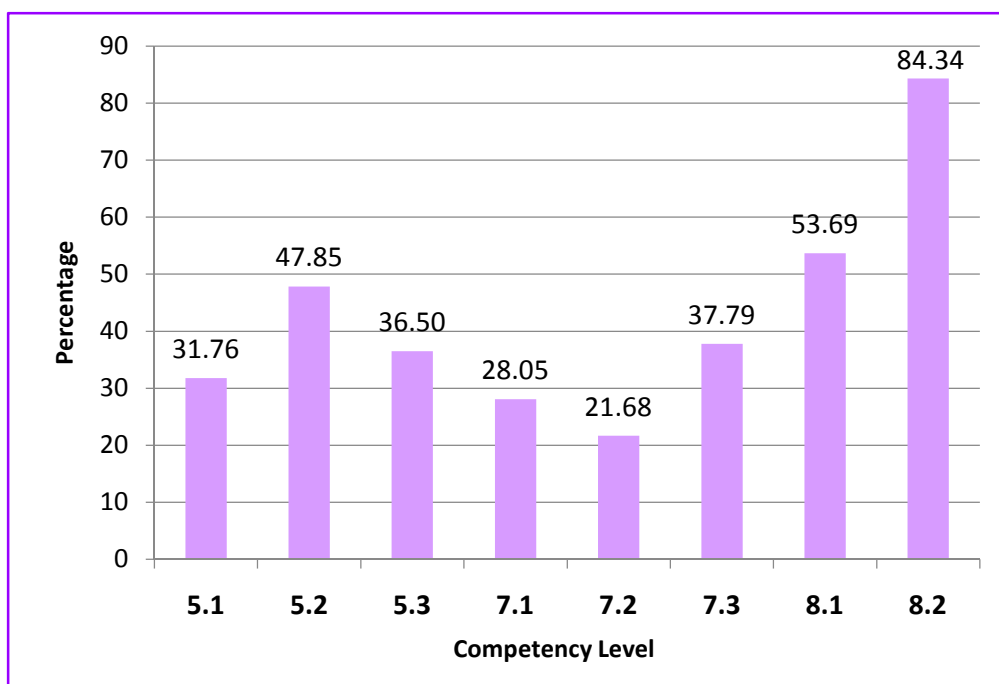
Fig. 4.21: Achievement of competency levels related to physics

As Fig. 4.21 indicates only two competencies out of 8 has been achieved by more than 50% of students.

Part II - Comparison of achievement level of students in 2014 with that of 2016

Trends in achievement over the period 2014-2016 will first be discussed at national level.

4.9   Trends in achievement at national level
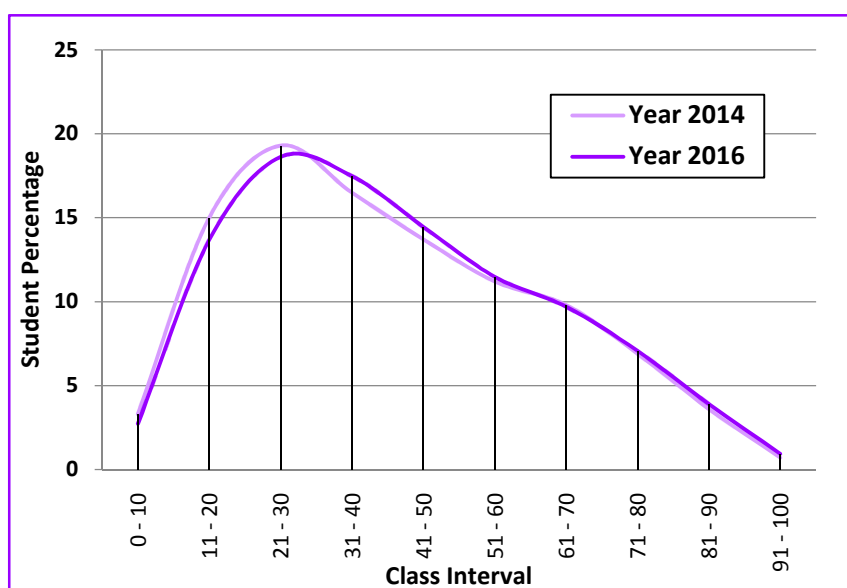
Fig. 4.22: All island achievement in science comparison 2014 -2016– dispersion of marks

As Fig 4.21 indicates there is a slight improvement in students' achievement in the year 2016. The line curve for 2016 shows that the percentage of low achievers has decreased and the percentage of medium level achievers has increased. This has resulted in an increase in the mean value from 41.16 to 41.76. However, the percentage of high achievers has not changed.

The differences in the two curves is further elaborated through the cumulative percentage table.

Table 4.16: Comparison of all island achievement in science - cumulative percentages

Class Interval	Year 2014		Year 2016	
	Student %	**Cumulative %**	**Student %**	**Cumulative %**
0-10	3.29	3.29	2.71	2.71
11-20	15.01	18.30	13.68	16.40
21 - 30	19.30	37.60	18.63	35.02
31 - 40	16.49	54.09	17.48	52.50
41 - 50	13.71	67.80	14.45	66.96
51 - 60	11.20	79.00	11.48	78.43
61 - 70	9.80	88.80	9.69	88.12
71 - 80	6.90	95.70	7.07	95.19
81 - 90	3.60	99.30	3.89	99.08
91-100	0.70	100.00	0.92	100.00
Total	100.00		100.00	

The percentage of low achievers, those who have scored below 40% has decreased from 54.09% to 52.5. On the other hand the percentage of students who has scored between 40-60 has risen from 24.91 to 26.0.

Provincial level performance has contributed to the national level achievement. The trend in provincial level achievement will be discussed next.

4.10 Provincial wise comparison of student achievement

As Fig 4.23 displays while some provinces have contributed positively to the increase in all island mean value some have contributed negatively.
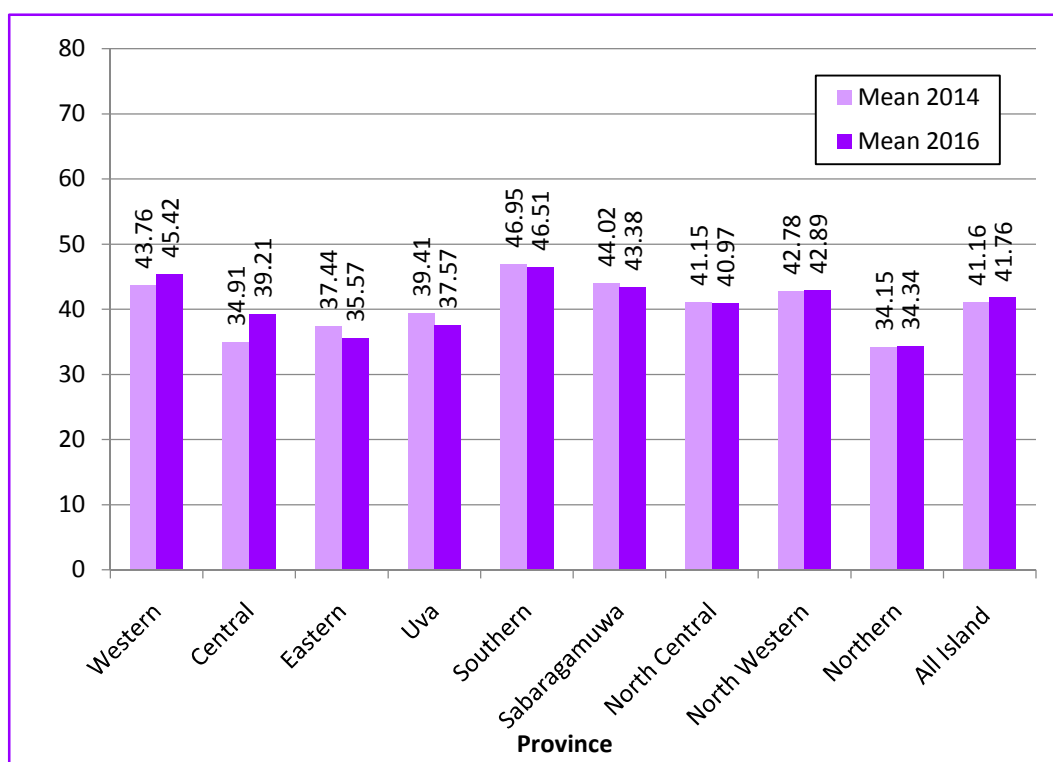
Fig. 4.23: Provincial wise comparison of student achievement - 2014 -2016

The contribution of the changes in the provincial mean values is further clarified in Table 4.17.

Table 4.17: Provincial wise comparison of student achievement – 2014 & 2016

Province	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Western	43.76	22.08	45.42	21.03	2.34**
Central	34.91	18.96	39.21	18.88	6.66**
Eastern	37.44	19.64	35.57	19.63	-2.62**
Uva	39.41	19.31	37.57	18.85	-2.77**
Southern	46.95	22.58	46.51	22.45	-0.58
Sabaragamuwa	44.02	19.97	43.38	19.96	-0.96
North Central	41.15	19.44	40.97	19.16	-0.27
North Western	42.78	20.09	42.89	21.28	0.15
Northern	34.15	18.78	34.34	19.05	0.26
All Island Mean	41.16	20.92	41.76	20.73	2.49**

* Values are significant at 95%   ** Values are significant at 99%

According to Table 4.17 mean values of Western and Central Provinces have increased in 2016 and these increases are significant. On the other hand, the mean values of Uva and Eastern Provinces have decreased and these decreases are also significant. The changes in performance of other provinces are not significant.

Fig. 4.24 depicts the line curves denoting the performance of each province.

As can be seen from the line curves of Western and Central Provinces there is a shift from low marks towards high marks.
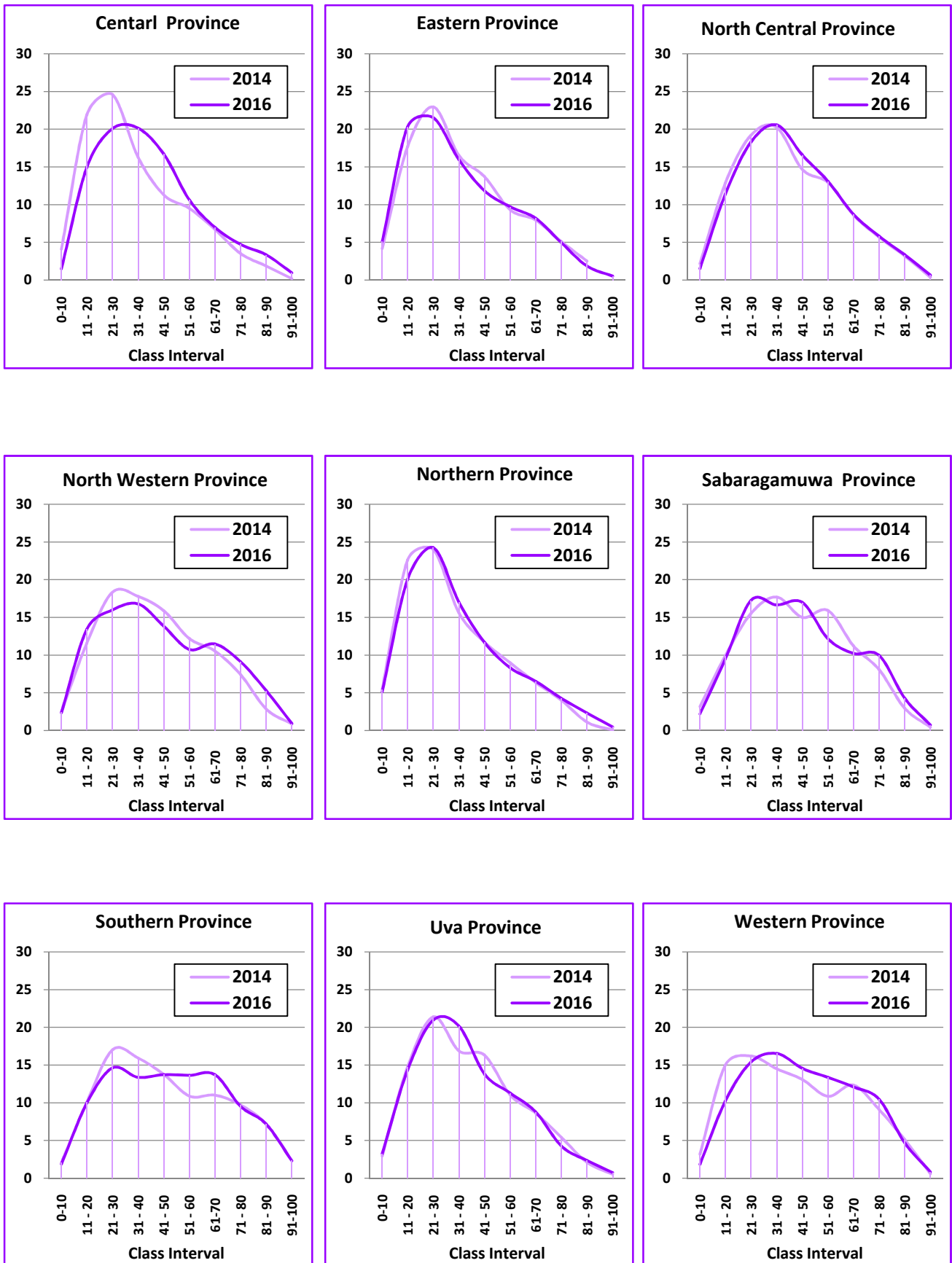
Fig. 4.24: Comparison of provincial wise distribution of marks – Science

4.11   Comparison of marks according to school types
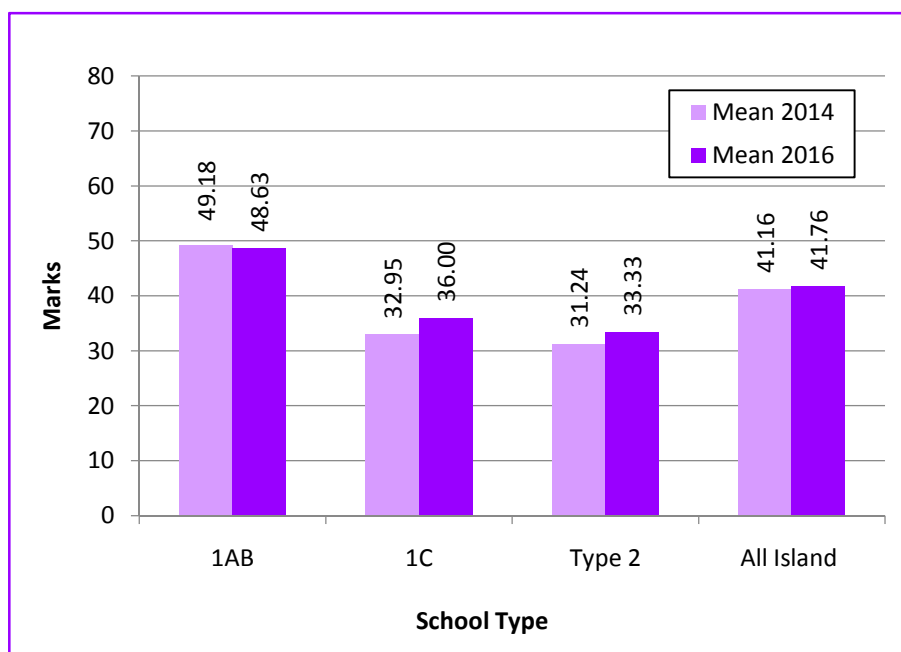
Fig. 4.25: All island comparison of mean values according to school type

As the bar graphs indicate there is a slight decrease in achievement in 1AB schools while there is a slight increase in 1C and Type 2 schools. This increase in 1C and Type 2 schools is a positive sign.

These changes are further elaborated in Table 4.18.

Table 4.18: Comparison of science achievement according to school type

School Type	Year 2014		Year 2016		Z
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
1AB	49.18	20.99	48.63	21.62	-1.64
1C	32.95	16.74	36.00	17.51	8.36**
Type 2	31.24	17.05	33.33	16.94	4.36**
All Island	41.16	20.92	41.76	20.73	2.49**

According to Table 4.18 the decrease in the 1AB schools mean value is not significant. However the increase in 1C and Type 2 schools is significant.

The trend in achievement gender wise will be discussed next.

4.12   Comparison of marks according to gender
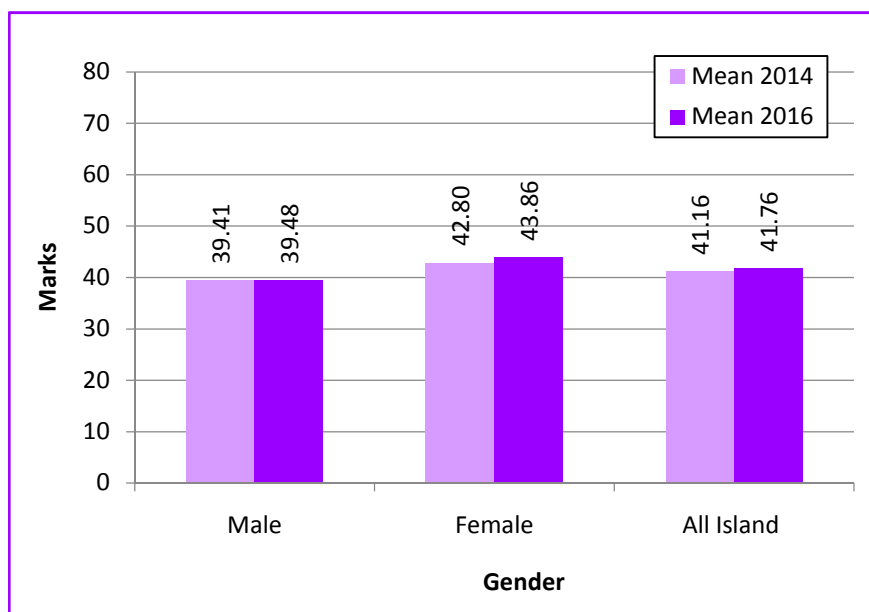
Fig. 4.26: All island comparison of mean values according to gender

As Fig. 4.26 indicates there are slight increases in both male and female performances.

However, according to Table 4.19 even though the change in the male performance is not significant, the increase in the female performance is significant.

Table 4.19: Comparison of science achievement according to gender

Student Gender	Year 2014		Year 2016		Z
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
Male	39.41	21.14	39.48	21.22	0.20
Female	42.80	20.58	43.86	20.03	3.20**
All Island	41.16	20.92	41.76	20.73	2.49**

4.13 Comparison of marks according to medium of instruction
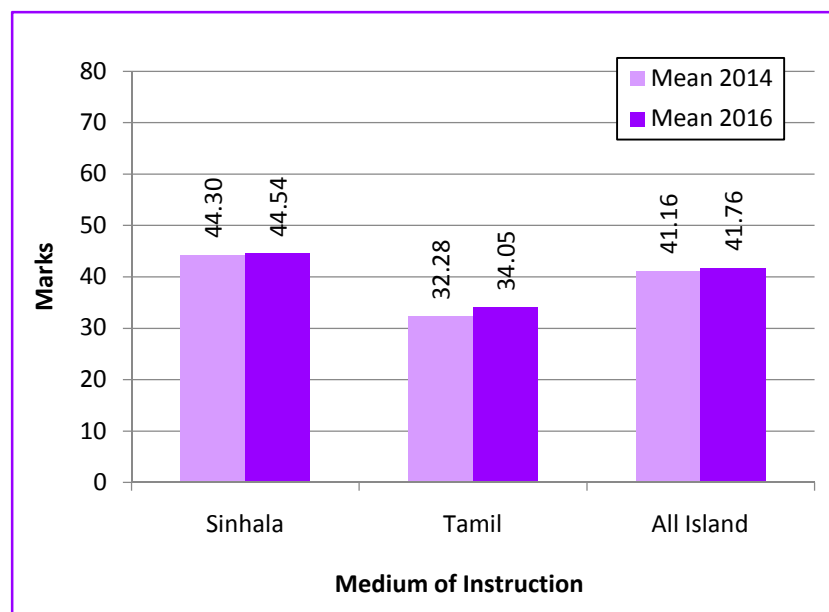
Fig. 4.27: All island comparison of mean values according medium of instruction

There is a very slight improvement in the performance of both Sinhala medium as well as Tamil medium students' performance (Fig. 4.27). However, as Table 4.20 indicates the changes in the Sinhala medium is insignificant. On the other hand, the changes in the Tamil medium performance is significant.

Table 4.20: Comparison of science achievement according to medium of instruction

Medium of Instruction	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Sinhala	44.30	20.98	44.54	20.83	0.84
Tamil	32.38	16.09	34.05	18.36	4.49**
All Island	41.16	20.92	41.76	20.73	2.49**

4.14   Comparison of marks according to location
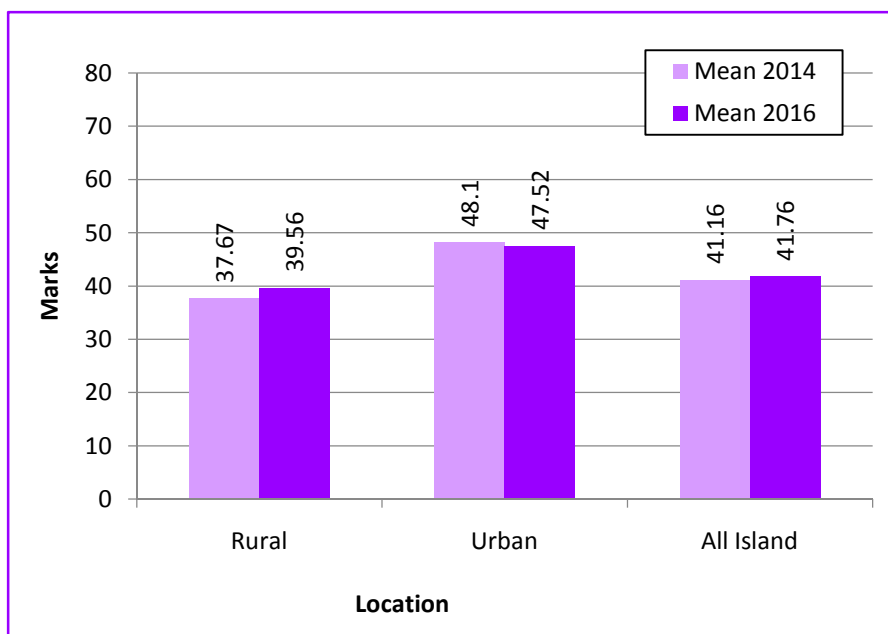
Fig. 4.28: All island comparison of mean values according to location

The urban students' performance has decreased slightly. On the other hand, the rural students' performance has increased by 2 points. According to Table 4.21 this change is significant.

Table 4.21: Comparison of science achievement according to location

Location	Year 2014		Year 2016		Z
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
Rural	37.67	19.13	39.56	19.71	7.23**
Urban	48.10	22.54	47.52	22.17	-1.15
All Island	41.16	20.92	41.76	20.73	2.49**

Increase in rural students' performance is a positive feature even though the urban rural gap in achievement continues.

Trends in performance according to the sub skills in science will be discussed next.

4.15 Comparison of students' achievement in relation to ELCs

Table 4.22: Comparison of achievement of competency levels related to biology

Content	Competency Level	Percentage		Change
		2014	2016	
Biology	1.1 Discovers the diversity of the natural environments	42.00	47.10	5.10
	1.2 Investigates the advantages/disadvantages of the built environments	40.00	53.10	13.10
	1.3 Focuses attention on the venomous animals that are harmful to man	68.00	80.70	12.70
	1.4 Acquires the ability to use international scientific symbols	59.00	71.20	12.20
	3.1 Observes the interactions based on life cycles	36.00	54.65	18.65
	3.3 Explains the importance of use of cultivations under specific conditions	62.00	72.10	10.10
	3.4 Investigates the biotic factors affecting the perpetuation of the environment.	45.00	56.00	11.00
	6.1 Conducts explorations to identify the morphological diversity of leaves	8.00	5.90	-2.10
	6.3 Investigates the functions related to the diversity of roots.	33.00	37.70	4.70
	6.4 Uses plant related products with a scientific attitude	40.00	46.60	6.60

As can be seen from Table 4.22 achievement of all competencies except competency 6.1 that is "conducts explorations to identify the morphological diversity of leaves" has increased. This is a positive feature. On the other hand, the least achieved competency in 2014 not only continues to be the weakest skill but also has declined. Therefore, this is an area that needs further study.

Table 4.23: Comparison of achievement of competency levels related to chemistry

Content	Competency Level	Percentage		Change
		2014	2016	
Chemistry	2.1 Inquires into the properties of matter	50.00	61.00	11.00
	2.2 Inquires into the standard symbols used for elements	47.00	47.47	0.47
	2.3 Display the ability to use the differences in density of substances in day today life.	41.00	49.45	8.45
	2.4 Uses the expansion of solids, liquids and gases in day today life effectively.	8.00	10.23	2.23
	2.5 Inquires into the usages of compounds according to their properties.	25.00	30.03	5.03
	2.6 Inquires into the domestic uses of chemicals	21.00	34.23	13.23
	2.7 Uses parallel and serial connections of electrical appliances in human needs.	44.00	52.95	8.95
	2.8 Uses magnets in day today life	53.00	62.50	9.50

In relation to the achievement of competency levels related to chemistry, in 2014 only one competency level has been achieved by more than 50% of students. In 2016 also only two competency levels have been achieved by more than 50% of students.

However, when compared with the performance in 2014, there is an increase in the achievement of all competency levels. Competency level 2.4 continues to be the least achieved competency.

Table 4.24: Comparison of achievement of competency levels related to earth science

Content	Competency Level	Percentage		Change
		2014	2016	
Earth Science	4.1 Investigates the constituents of the atmosphere	32.00	48.39	16.39
	4.2 Acts to maintain optimum composition of the atmosphere	38.00	37.83	-0.17
	4.3 Uses natural resources obtained from the earth effectively	47.00	54.94	7.94

According to Table 4.24 in 2014 students have not achieved more than 50% in any competency level. In 2016 there has been a slight improvement in the achievement of the sub skill.

Table 4.25: Comparison of achievement of competency levels related to physics

Content	Competency Level	Percentage		Change
		2014	2016	
Physics	5.1 Inquires into the application of the concept "pressure" in day today needs	22.00	31.76	9.76
	5.2 Inquires into the effect of Center of Gravity on the equilibrium of an object in relation to life experiences	58.00	47.85	-10.15
	5.3 Uses work, energy and power in human concerns/needs	31.00	36.50	5.50
	7.1 Uses properties of light in human needs	21.00	28.05	7.05
	7.2 Uses generation and propagation of sound in musical instruments	17.00	21.68	4.68
	7.3 Explores the scientific basis of modern communication equipment	31.00	37.79	6.79
	8.1 Contribute to minimize the risks associated with cyclones	44.00	53.69	9.69
	8.2 Contribute to minimize the risks associated with lightning and thunder	59.00	84.34	25.34

In 2014 only two competency levels have been achieved by more than 50% of students. However, in 2016 also only two competency levels have been achieved by more than 50% of students. Yet while this is an increase in the achievement of all other competency levels there is almost 10 points decrease in competency level 5.2.

4.16 Summary

Part I of this chapter described student performance in relation to the achievement of learning outcomes in science. The discussion pertained to both national and provincial level. Further, achievement was analyzed according to school type, gender, medium of instruction and location.

Test items used to assess students' performance were analyzed to assess how far they have been successful in achieving competency levels expected to be achieved by grade 8 pupils related to science.

Part II described the trends in achievement between 2014-2016.

It could be concluded that even though there is a slight improvement in overall performance in science there is still disparity in achievement provincial wise as well as location, medium and gender wise. A slight increase in achievement in rural schools and 1C and Type 2 schools is a positive sign. There is a slight improvement in overall achievement of competencies related to the main content areas in science. However, achievement of certain competencies continues to be unsatisfactory.

Patterns and Trends in Achievement: English Language 2016

5.1 Introduction

This chapter presents the patterns and trends in achievement of the students in the English language.

The patterns of achievement in 2016 will be presented in part I and the trends will be presented in part II.

Part I – Patterns in achievement in the English language

First, national level student achievement would be discussed in relation to student performance pertaining to English Language.

5.2 Patterns of achievement at national level
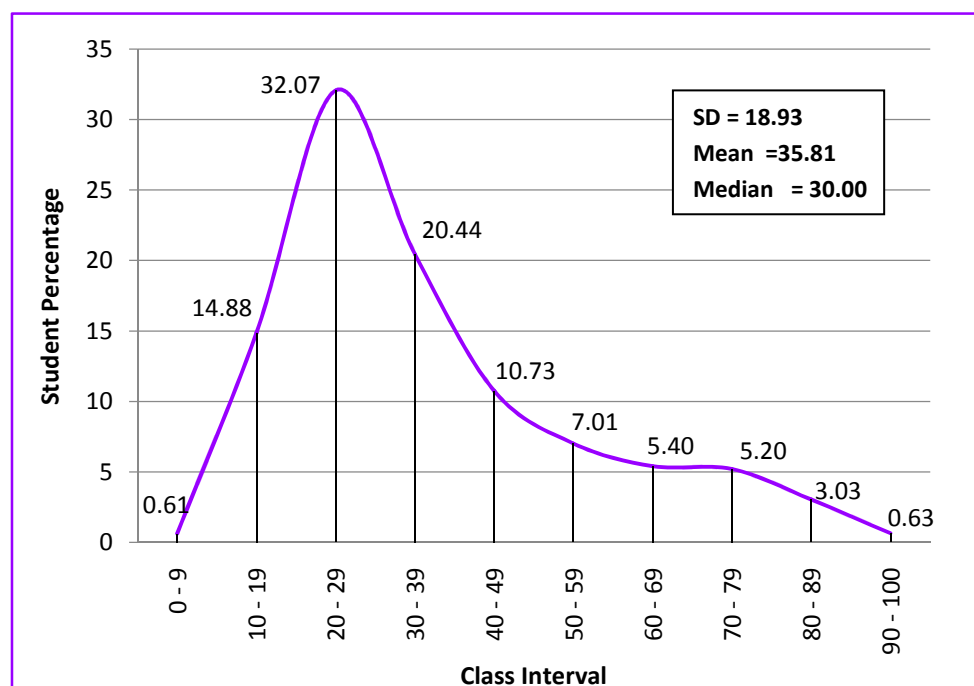
Fig. 5.1: All island achievement in English 2016 – dispersion of marks

The frequency polygon shown in Fig. 5.1 outlines the total picture of the distribution of marks of grade 8 students in English. According to this curve the average marks obtained by the students (Mean) is 35.81 and the median is 30. Therefore, the achievement in the English language cannot be considered as satisfactory.

Fig. 5.1 depicts a positively skewed distribution of marks displaying that majority of the students has scored low marks in English. The distribution of marks is further clarified in Table 5.1.

Table 5.1: All island achievement in English 2016– cumulative percentages

Class Interval	Student %	Cumulative %
0 - 9	0.61	0.61
10 - 19	14.88	15.49
20 - 29	32.07	47.56
30 - 39	**20.44**	**68.00**
40 - 49	10.73	78.73
50 - 59	7.01	85.74
60 - 69	5.40	91.14
70 - 79	5.20	96.34
80 - 89	3.03	99.37
90 - 100	0.63	100.00
Total	100.00	

According to this table the highest percent of students (32%) has scored between 20-29 marks. Further, 68% of students has scored below 40 marks.

Fig. 5.2 illustrates student achievement patterns further.

As Fig. 5.2, the box plot displays average marks (mean) is 35.81. On the other hand the median of the achievement is 30. Therefore, more than 50% of the students has achieved values above the average marks.

While 25% of the students (25th percentile) has scored below 22 marks, another 25% of the students has scored above the 46 marks. However, there are also some outliers.
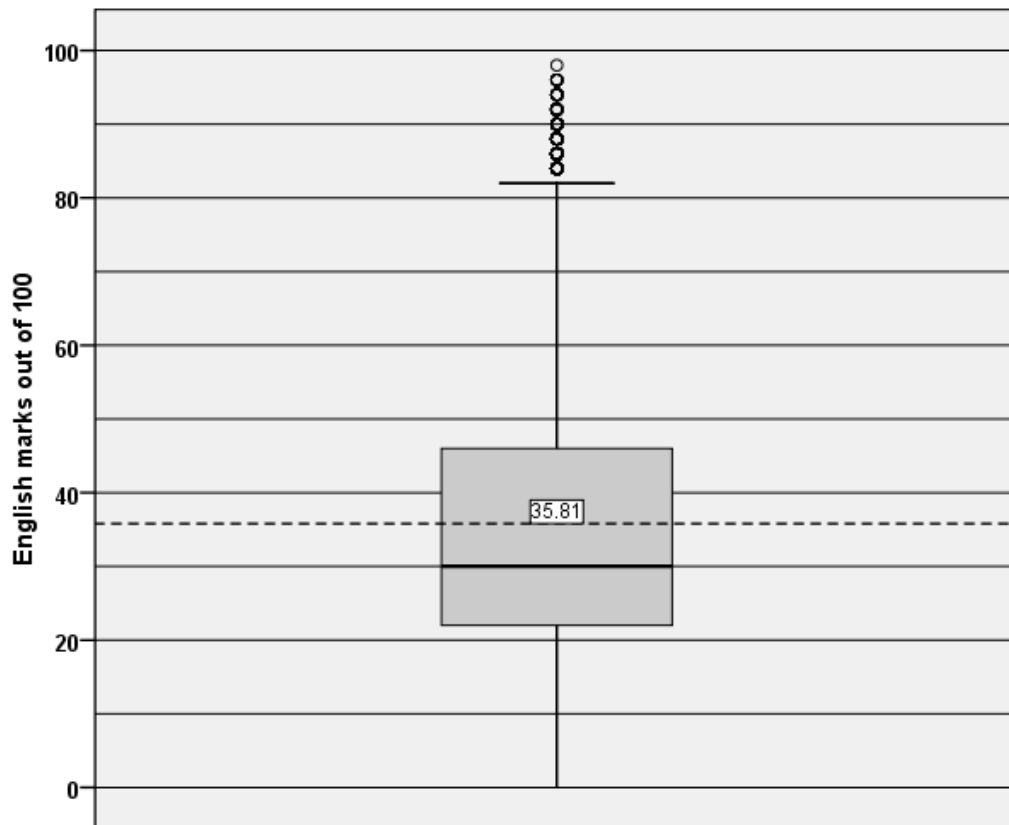
Fig. 5.2: Box plot and whisker chart representing all island English achievement

Summary of national level achievement

- National level mean is 35.81, while the median is 30.
- The highest number of students falls within the marks range of 20-29.
- 68% of students has scored below 40 marks.

Provincial wise student achievement will be discussed next.

5.3   Provincial wise student achievement

The nature of the distribution of scores provincial wise reveals certain patterns. These patterns are discussed based on Table 5.2.

Table 5.2: Provincial achievement in English 2016 – Summary statistics

Province	Mean	Rank	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75
Western	41.64	1	0.08	21.06	0.70	26.00	36.00	54.00
Southern	38.62	2	0.10	19.70	0.89	24.00	32.00	50.00
Sabaragamuwa	35.65	3	0.10	18.09	0.98	22.00	30.00	46.00
Central	35.45	4	0.09	18.72	1.04	22.00	30.00	44.00
North Western	34.33	5	0.09	17.27	1.02	22.00	30.00	44.00
North Central	33.95	6	0.12	17.58	1.23	22.00	28.00	42.00
Uva	31.44	7	0.10	15.78	1.45	20.00	28.00	36.00
Eastern	29.24	8	0.08	14.87	1.55	20.00	26.00	34.00
Northern	28.96	9	0.11	15.98	1.76	18.00	24.00	32.00
All Island	35.81		0.03	18.93	1.05	22.00	30.00	46.00

As Table 5.2 and Fig. 5.3 indicate based on provincial wise mean achievements Western Province ranks first. The Southern Province is ranked second.

Achievement wise the provinces fall into three categories. Western and Southern Provinces with mean scores above the national mean, fall into the higher category. All the other provinces are below the national mean. However, Sabaragamuwa and Central Provinces mean values are closer to the National mean. Between the Western and Northern Provinces there is almost thirteen point difference in mean values indicating the disparity in achievement among the provinces.

The mean and the median values for the different provinces are depicted in Fig. 5.3
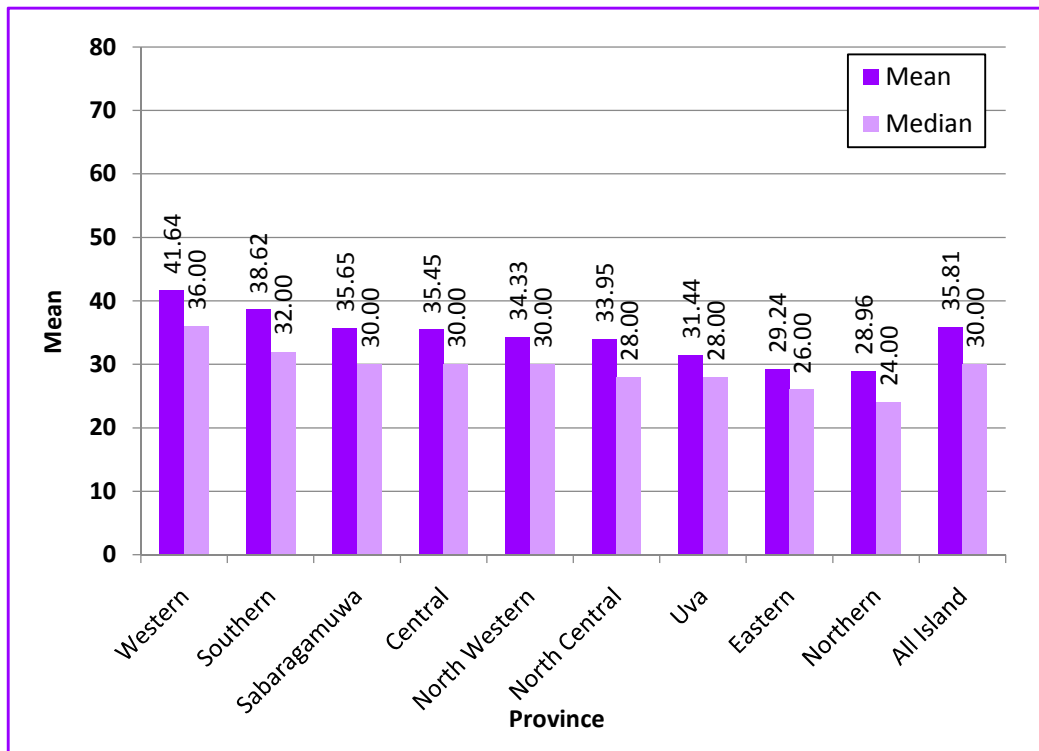
Fig. 5.3: Bar chart to represent mean and median among the provinces – English Language

As Fig. 5.3 displays the median values of all the provinces are below the mean value. Therefore, 50% of the students has scored above the average marks.

Disparity in achievement among provinces

According to Table 5.2 and Fig. 5.3, Western Province has the highest mean value but its SD is also the highest. Thus the variation of students' marks is the highest in this province. The SD value is lowest in the Eastern Province indicating that there is less student variation in achievement. However, its mean value is also very low.

All the provinces have obtained positive skewed values. This indicates that student performance is low. Only Southern and Western indicate low skewness values and their curves are slightly bimodal compared to other provinces. The two curves being bimodal suggests that there are both high achievers and low achievers in these provinces. However, the low achiever group is higher than the high achievers group.

Central Province

Eastern Province

North Central Province

North Western Province

Northern Province

Sabaragamuwa Province

Southern Province

Uva Province

Western Province
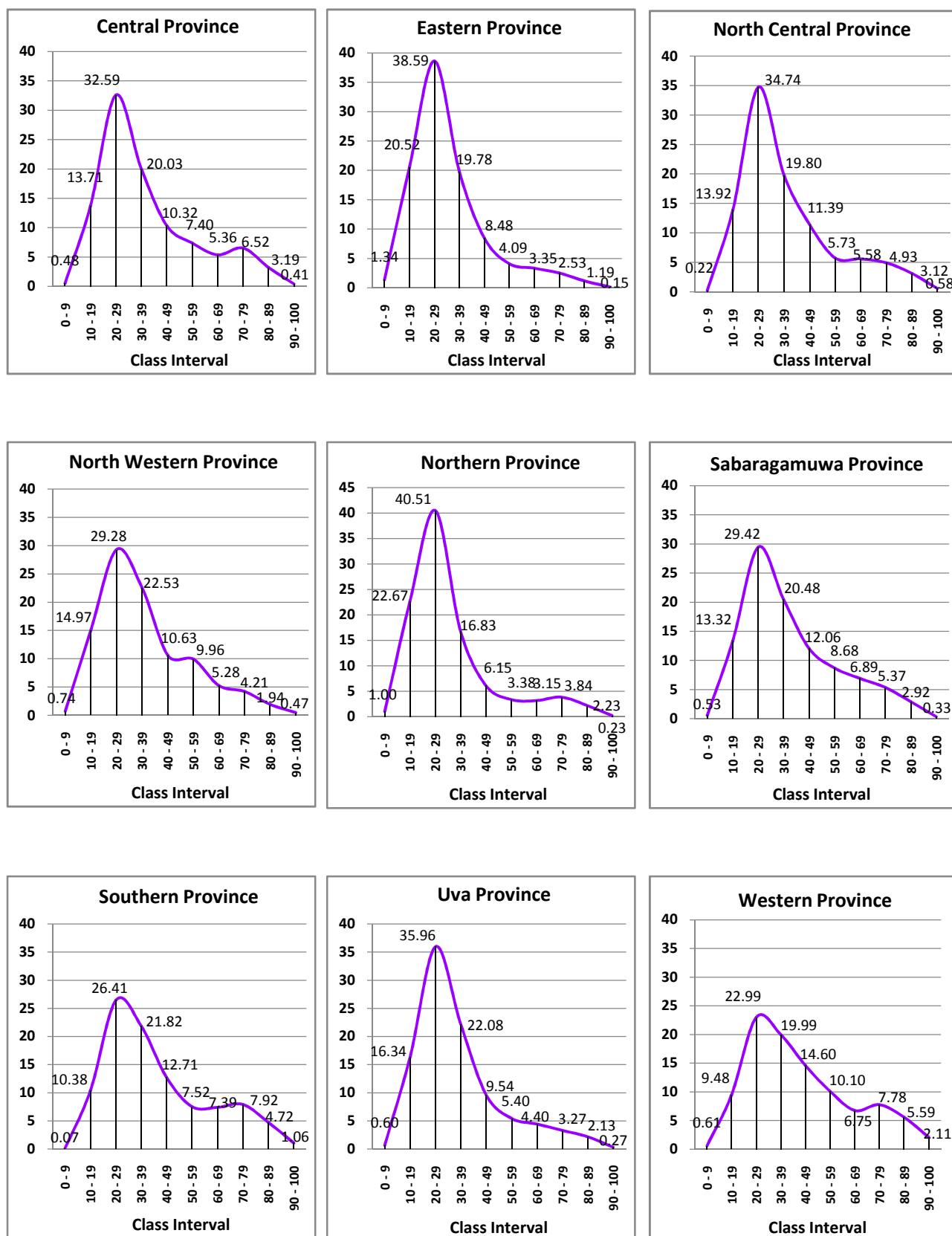
Fig. 5.4: Provincial wise distribution of marks –English Language

Patterns of achievement in the different provinces are further elaborated through the box plot chart.
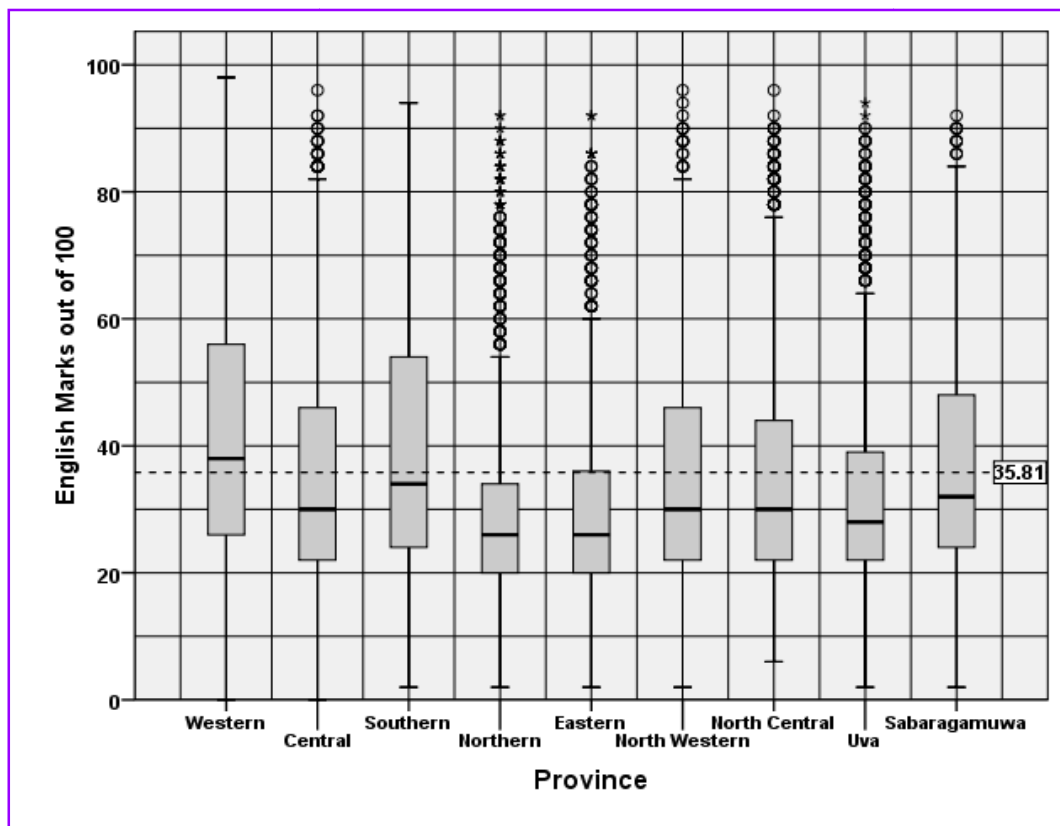
Fig. 5.5:   Box plot and whisker chart representing provincial wise English achievement

This chart also confirms the achievement patterns discussed above. Western and Southern are the two provinces that have similar characteristics. Further, there are no outliers in these two provinces. On the other hand, in all other provinces there are outliers. Northern and the Eastern are the lowest performing districts and they have the highest number of outliers. The diverse nature of the box plots of different provinces indicate the heterogeneous student performance in the English language among the provinces.

Table 5.3: Percentage of student scoring 50 or above, and below 50 – English language

Province	Greater than or Equal to50	Less than 50
Central	22.88	77.12
Eastern	11.30	88.70
North Central	19.94	80.06
North Western	21.86	78.14
Northern	12.84	87.16
Sabaragamuwa	24.19	75.81
Southern	28.61	71.39
Uva	15.48	84.52
Western	32.33	67.67
All Island	21.27	78.73

Summary of provincial level analysis

- Achievement wise the provinces fall into three categories.

  Category 1 – Southern and Western, with mean scores above the national mean (35.81)

  Category 2 –Sabaragamuwa and Central Provinces cluster in the middle.

  Category 3 –The other provinces with mean scores below the national mean.

5.4   Achievement levels by type of school

Table 5.4: English Language achievement according to school type

School Type	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
1AB	42.72	0.05	21.02	0.60	26.00	38.00	58.00		
1C	29.62	0.04	13.74	1.31	20.00	26.00	36.00	26249.57	0.000
Type 2	27.55	0.05	12.57	1.48	20.00	24.00	32.00		
All Island	35.81	0.03	18.93	1.05	22.00	30.00	46.00		

As Table 5.4 and Fig. 5.6 indicate there is a considerable gap between the mean scores of different school types. However, 1AB schools' mean score is above that of the other types and also above the national mean. On the other hand, the mean scores of Type 2 and 1C schools, are below the national mean.

The difference in mean and median scores is graphically shown in Fig. 5.6
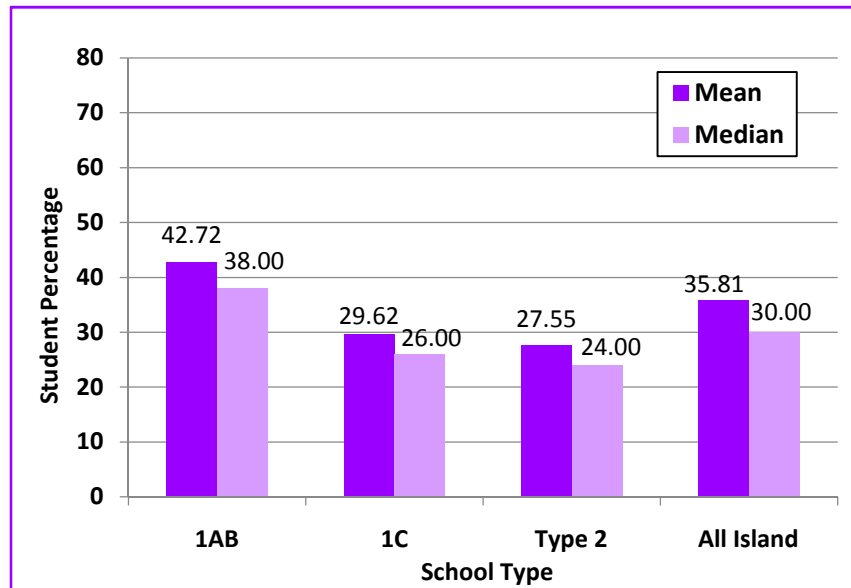
Fig. 5.6: Bar chart representing the mean and median among the school types - English Language

As Fig. 5.6 displays median values of all school types are below the mean values. This means that fifty percent of students in all school types have obtained scores above their mean values. However, 1AB schools mean and median are above the value of other two school types.

On the other hand, according to Table 5.3 the SD of the 1AB schools is quite high compared to the other two school types. Therefore, it could be concluded that there is greater variation among student achievement within 1AB schools.

Variation among students

Variation in student achievement in 1C and Type 2 schools is low. Those values are lower than the all island SD value as well. It reveals that higher number of student achievement lies closer to the mean value. The dispersion from the mean value is very low. Type 2 schools standard deviation value is the lowest among the school types. This indicates that student achievement deviation from the mean is very low.

Disparity in achievement

All school types have obtained positive skewed values. It reveals that in all school types higher number of students has achieved low marks while lower marks are obtained by a higher number of students. Highest skewed value has been obtained by Type 2 schools. Next higher value has been obtained by 1C schools. Both values are above the all island skewness value.

The variation in student performance in different types of schools is further highlighted through the frequency distribution graphs.
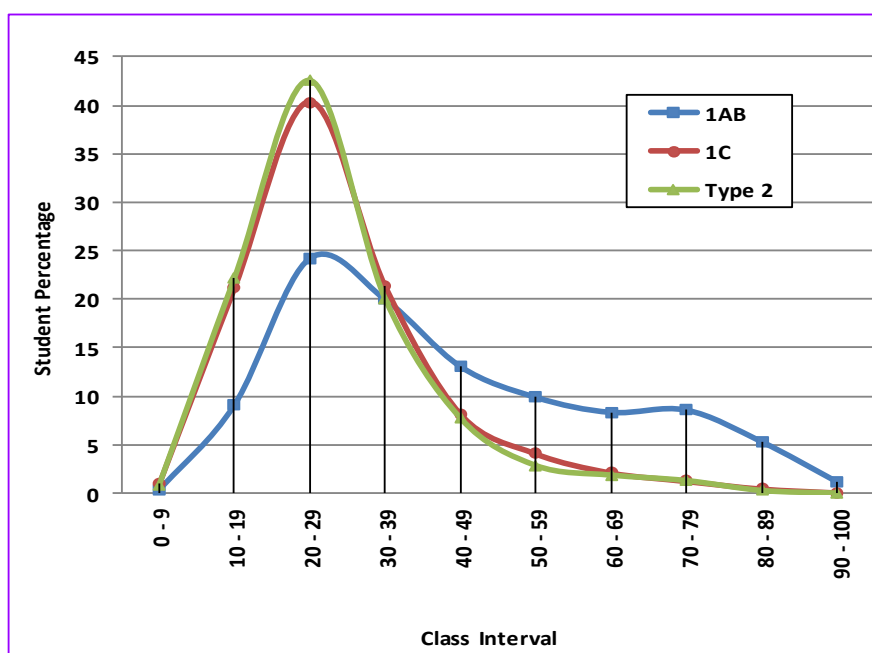
Fig. 5.7:   Dispersion of marks by school type– English Language

Fig. 5.7 displays that 1C and Type 2 school curves peak at 20-29 class interval and the curves are quite similar. While in Type 1AB schools even though the peak is at 20-29 class interval the percentage of students scoring this mark range is less. Further, the marks spreads over three mark intervals indicating that there are also high achievers even though a lesser percentage.

The spread of marks at different mark intervals is further illustrated in the cumulative percentage Table 5.5.

Table 5.5: Cumulative student percentages according to school type- English Language

Class Interval	1AB		1C		Type 2	
	Student %	Cumulative %	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.32	0.32	0.98	0.98	0.89	0.89
10 – 19	9.12	9.44	21.15	22.13	22.27	23.17
20 – 29	**24.24**	**33.67**	**40.34**	**62.47**	**42.62**	**65.79**
30 – 39	20.01	53.68	21.38	83.85	20.11	85.90
40 - 49	13.07	66.76	8.17	92.01	7.75	93.66
50 - 59	9.90	76.66	4.10	96.11	2.87	96.52
60 - 69	8.32	84.97	2.11	98.22	1.88	98.40
70 - 79	8.58	93.55	1.26	99.48	1.32	99.72
80 - 89	5.30	98.85	0.46	99.95	0.28	100.00
90 - 100	1.15	100.00	0.05	100.00	0.00	100.00
Total	100.00		100.00		100.00	

As Table 5.5 indicates in all school types the highest percentage of students has scored between 20-29. However, while in 1AB schools this percentage is 24.24 in 1C schools it is 40.34 and in Type 2 it is 42.62. On the other hand, in 1AB schools there are also 16% of students scoring above 70%. In the other two school types the percentage of students scoring above 70% is below 5%.

The analysis of data pertaining to the school types indicates disparity in achievement.

This is further illustrated through the box plot.
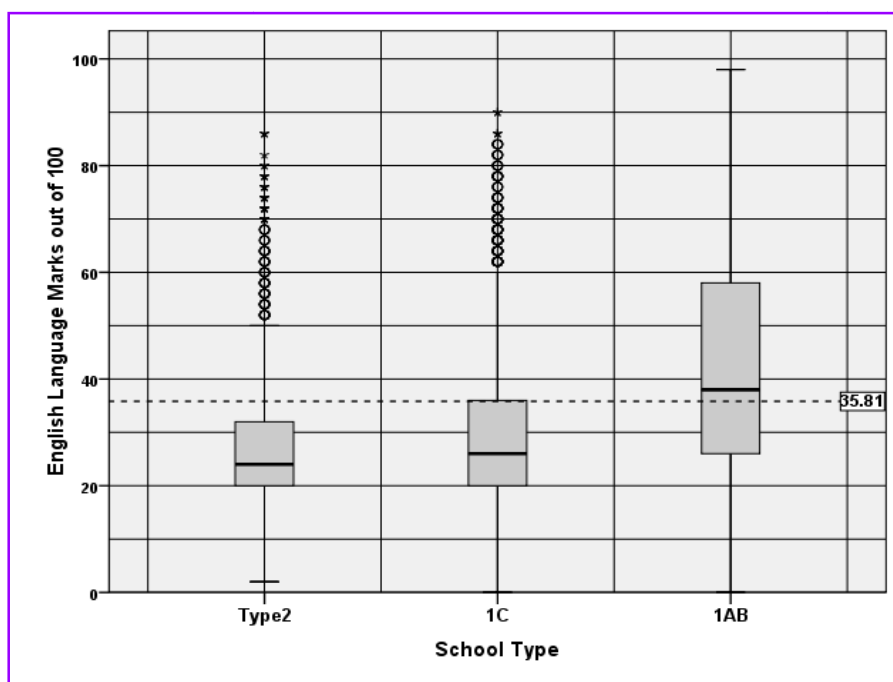
Fig. 5.8: English marks according to school types using box plot and whisker plot

The box plots of the 1C and Type 2 schools are similar. This indicates that their performances are similar. In both school types there are also outliers who's performance is higher than the other students. On the other hand, the 1AB schools performance is different. Their 25th as well as the 75th percentiles are higher than that of the Type 2 and 1C schools. It also indicates that their performance is high. Further, there are no outliers.

Summary

- The achievement in English in 1C and Type 2 schools are relatively similar.
- 1AB schools' performance is quite different and higher than the other two school types.
- The gap in achievement between school types continues.

5.5 Achievement levels by gender

Table 5.6: English Language achievement according to gender

Gender	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Male	33.57	0.05	18.76	1.281	20.00	28.00	40.00	4491.66	0.000
Female	37.92	0.05	18.85	.883	24.00	32.00	48.00		
All Island	35.81	0.03	18.93	1.055	22.00	30.00	46.00		

There is a difference in the achievement of female students over male students. As Table 5.6 indicates, male performance is also lower than the all island mean score, while female performance is above the all island mean.

These differences could also be seen in Fig. 5.9.
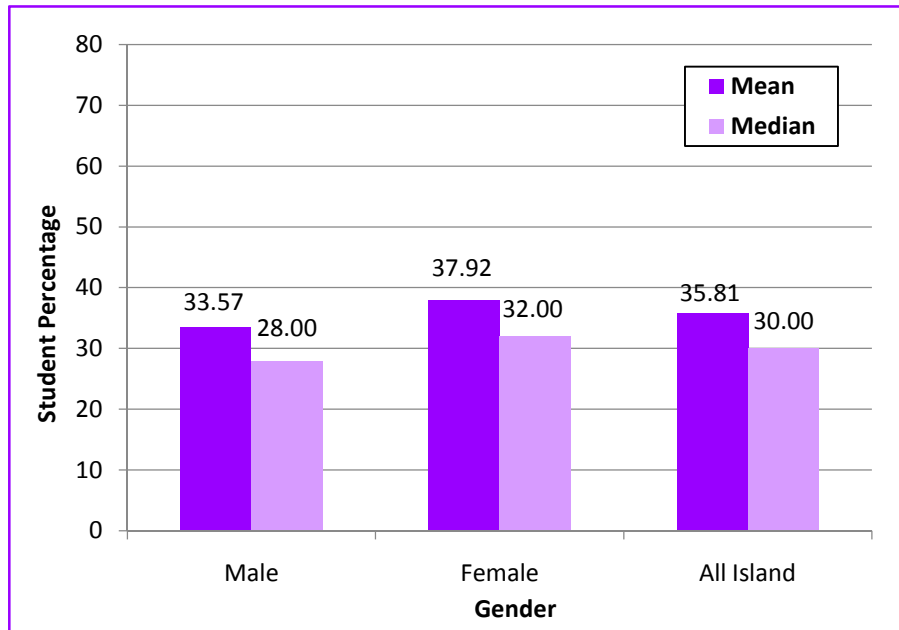
Fig. 5.9: Bar chart representing mean and median values according to gender –English

As Fig. 5.9 indicates when mean and median values are compared the median values of both males and females are below that of the mean values. Therefore 50% of the students has reached the mean values.

Variation among students

As indicated in Table 5.6, variation in achievement among male students is higher than that of the female students. This is indicated by the female students obtaining a higher SD value than the male students (Table 5.5). On the other hand, the male students SD is below the all island SD. Further, the male skewness value is higher than the all island as well as the female value.

Fig. 5.10 graphically illustrates the dispersion of marks according to gender.
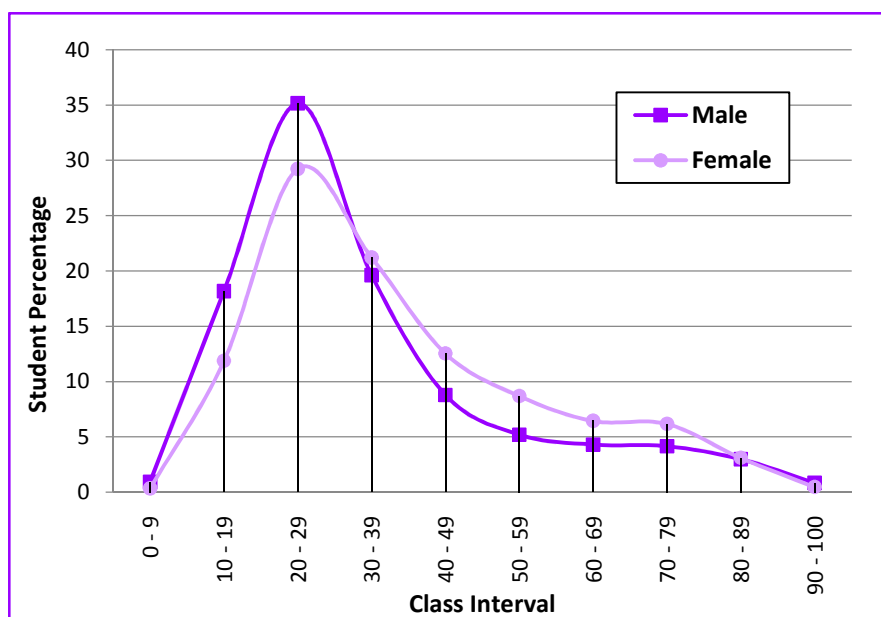
Fig. 5.10: Dispersion of marks by gender – English

Fig. 5.10 displays two curves which are both positively skewed. As can be seen there are more low achievers than high achievers among both males and females. However the pattern of the two curves are slightly different. At the beginning the curves are similar, but the male curve is higher. Then the curves become different and at the 30-39 class interval they cut across. But the female curve then rises above the male curve and finally, both curves become similar again.

The disparity in the male students' achievement can be elaborated better through the cumulative percentages.

Table 5.7: Cumulative student percentages according to gender –English Language

Class Interval	Male		Female	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.92	0.92	0.33	0.33
10 – 19	18.16	19.08	11.87	12.19
20 – 29	35.16	54.23	29.24	41.43
30 – 39	19.61	73.84	21.20	62.63
40 - 49	8.77	82.61	12.53	75.16
50 - 59	5.18	87.80	8.68	83.84
60 - 69	4.28	92.08	6.44	90.28
70 - 79	4.14	96.22	6.17	96.45
80 - 89	2.96	99.18	3.09	99.54
90 - 100	0.82	100.00	0.46	100.00
Total	100.00		100.00	

According to Table 5.7 and Fig. 510 it could be concluded that among both females and males, there are low performing students. The highest percentage (29.24%) of female students' marks fall into the class interval 20-29. The highest percentage of male students' marks, a higher percentage (35.16) falls into the same class interval. Considering 40% as the pass mark 62.63% of female students and 73.84% of male students have not reached the pass mark.

Box plot and whisker for gender wise English achievement shows similarities that has been discussed already.
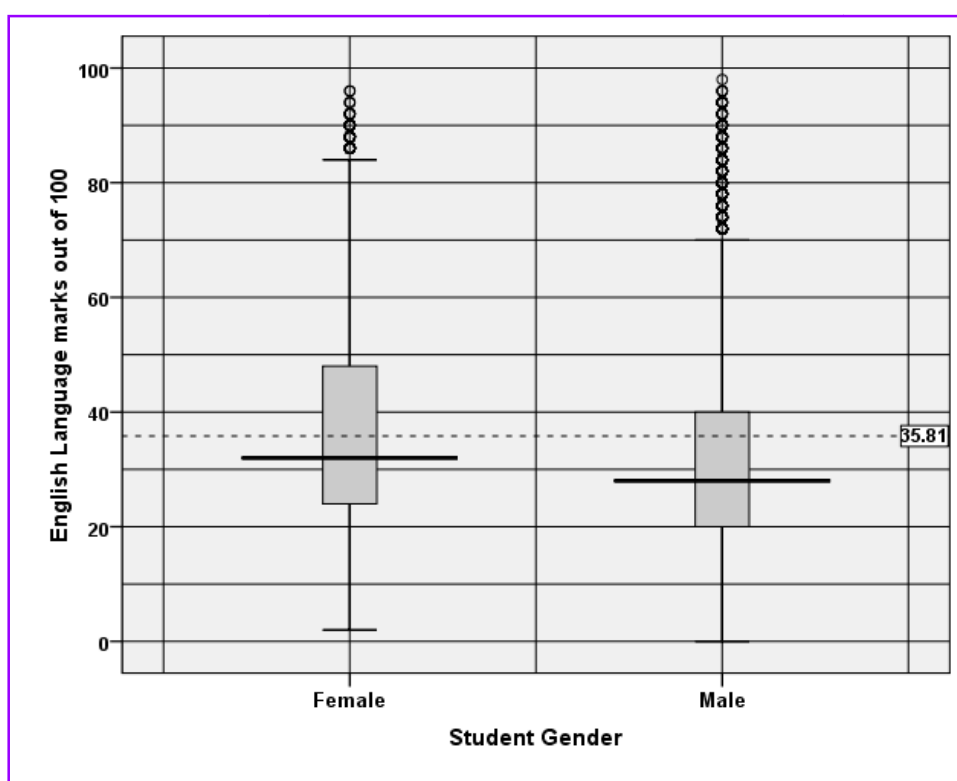
Fig. 5.11: Box plot and whisker plot representing gender wise English Language marks

Box plot and whisker chart show that male students' 25th and 50th percentile is lower than the female mark range as well as the all island range.

There are outliers among both males and females. However, the number of outliers among the males is greater.

Summary

- Female performance is better than all island and male performance.
- While 62.63% of female students has scored below 40, the male student percentage is 73.84%.

5.6   Achievement levels by medium of instruction

Table 5.8: English achievement according to medium of instruction

Medium of Instruction	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Sinhala	37.83	0.04	19.62	0.93	24.00	32.00	48.00	11230.93	0.000
Tamil	30.06	0.05	15.44	1.44	20.00	26.00	36.00		
All Island	35.81	0.03	18.93	1.06	22.00	30.00	46.00		

There is disparity between the students belonging to the different medium of instruction. While the Sinhala medium students' mean achievement is above the all island mean value, the Tamil medium students' mean achievement is below the national mean average.

These disparities are further highlighted through the bar chart given in Fig. 5.12.
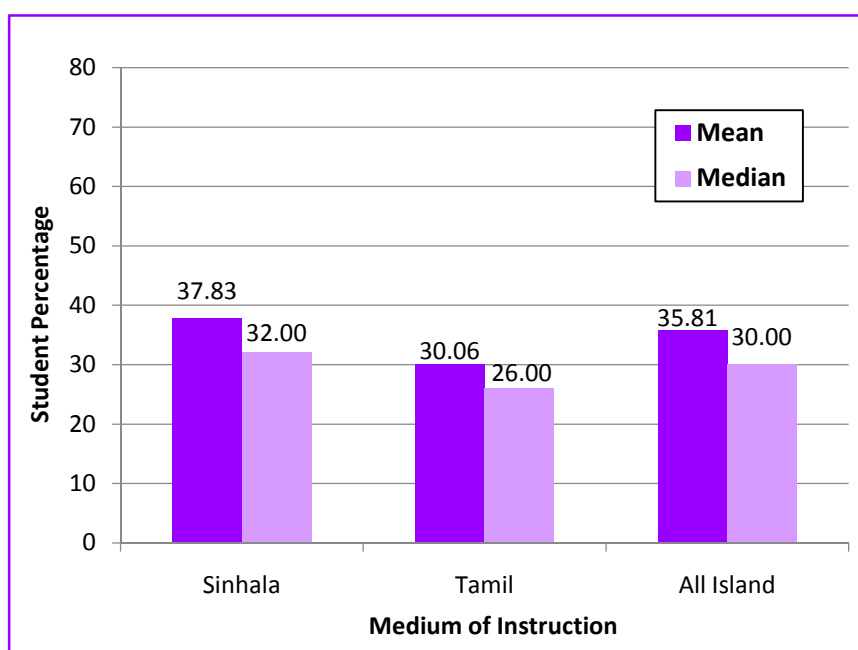
Fig. 5 12: Bar chart representing mean and median values according to medium of instruction – English

As Table 5.8 indicates Sinhala medium students SD is higher than the Tamil medium students and is higher than the national SD. Thus there is greater variation in their performance.

Both Sinhala medium as well as Tamil medium students' achievement curves show positive skewness value. This means that majority of the students has scored low marks.

The diversity in achievement scores among the students taught through the different medium of instruction, is further highlighted through the frequency distribution graphs.
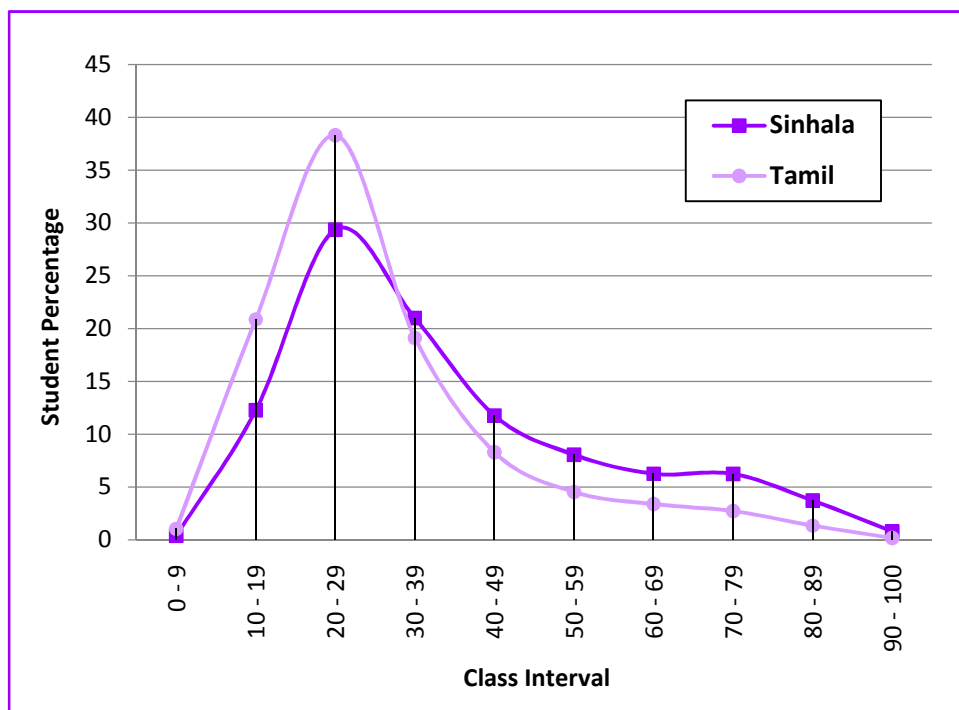
Fig. 5.13: Dispersion of marks by medium of instruction – English

The two curves on Fig. 5.13 has similarities as well as differences, While both curves peak at the class interval 20-29, the percentage of Tamil medium students scoring 20-29 is higher than the Sinhala medium percentage . On the other hand the percentage of students scoring high marks are higher among the Sinhala medium than among the Tamil medium. This pattern can be explained through Table 5.9.

**Table 5.9:   Cumulative student percentages according to medium of instruction –
English Language**

Class Interval	Sinhala		Tamil	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.41	0.41	1.07	1.07
10 – 19	12.28	12.69	20.87	21.94
20 – 29	29.36	42.05	38.30	60.24
30 – 39	21.00	63.05	19.14	79.38
40 - 49	11.78	74.83	8.32	87.71
50 - 59	8.07	82.90	4.56	92.26
60 - 69	6.27	89.17	3.41	95.67
70 - 79	6.26	95.43	2.75	98.42
80 - 89	3.75	99.18	1.37	99.80
90 - 100	0.82	100.00	0.20	100.00
Total	100.00		100.00	

As Table 5.9 indicates the highest percentage of the Sinhala medium students' marks is in the range of 20-29. The highest percentage of Tamil medium students marks is also in the range of 20-29.

Considering the pass mark as 40, only 63.05% of Sinhala medium students has scored below the pass mark. On the other hand 79.38% of Tamil medium students has scored below the pass mark.

Box plot for medium wise achievement graphically shows the differences that have been discussed already.
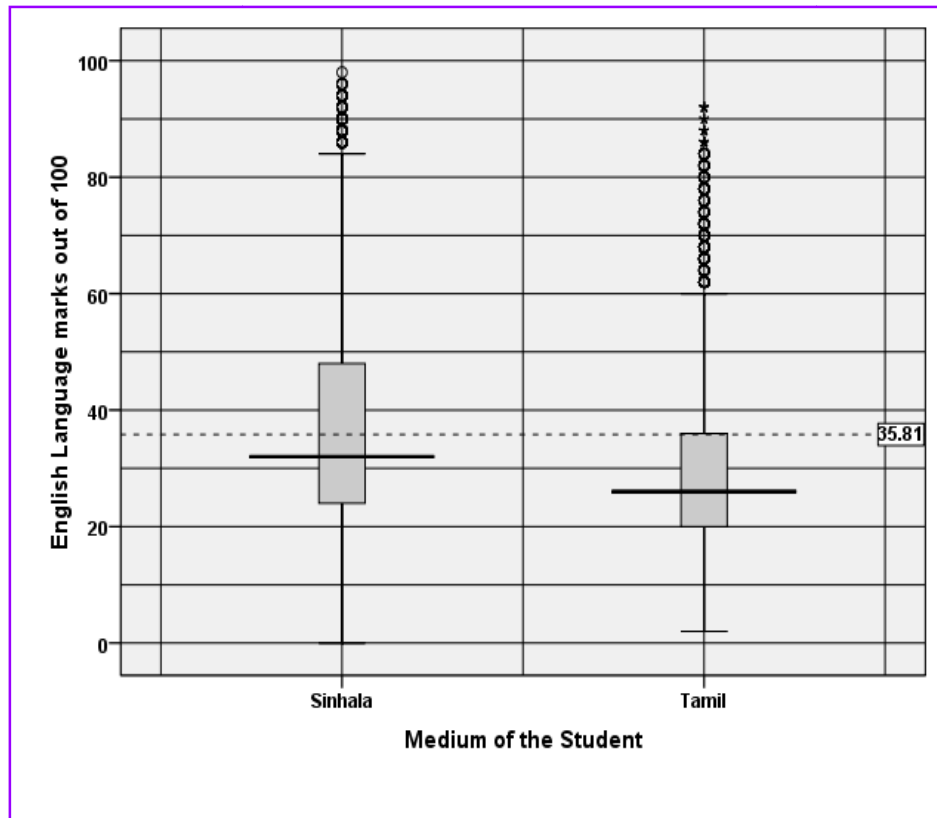
Fig. 514: English marks according to medium of instruction using box plot and whisker plot

Box plot and whisker plot chart shows differences among both media. However, Sinhala medium dispersion of marks in the box plot is less than the Tamil medium students' dispersion of marks. On the other hand, among both groups there are outliers.

Sinhala medium students' 25th, 50thand 75th percentile values are higher than that of the Tamil medium students. Therefore, this confirms that there is disparity between the performance of Tamil and Sinhala medium students in English.

Summary

- There is wide disparity among students belonging to different medium of instruction.
- The Sinhala medium students' mean score is above the national mean while the Tamil medium students' mean is lower.

Students' achievement in relation to the location of the school would be discussed next.

5.7   Achievement levels by location

Table 5.10: English achievement according to location

Location	Mean	Std. Error of Mean	Std. Deviation	Skewness	Percentile 25	Median	Percentile 75	F	Sig.
Rural	32.50	0.03	16.56	1.27	20.00	28.00	40.00	29600.51	0.000
Urban	44.58	0.07	21.80	0.48	26.00	40.00	62.00		
All Island	35.81	0.03	18.93	1.06	22.00	30.00	46.00		

As Table 5.10 indicates, there is variation in achievement among the schools in the different localities. The urban area schools have performed better than the rural area schools. Rural area schools have performed below the national mean while the urban schools have performed above the national mean.

According to Table 5.10 the SD also differs in the two localities even though not to a great extent. However, while the SD of the rural schools is closer to the all island SD, the urban schools SD is higher than the all island SD denoting more variation among the student achievement.

The difference in mean and median values is graphically shown in Fig. 5.15. As Fig. 5.15 indicates the median value in the rural area schools is lower than the mean value.
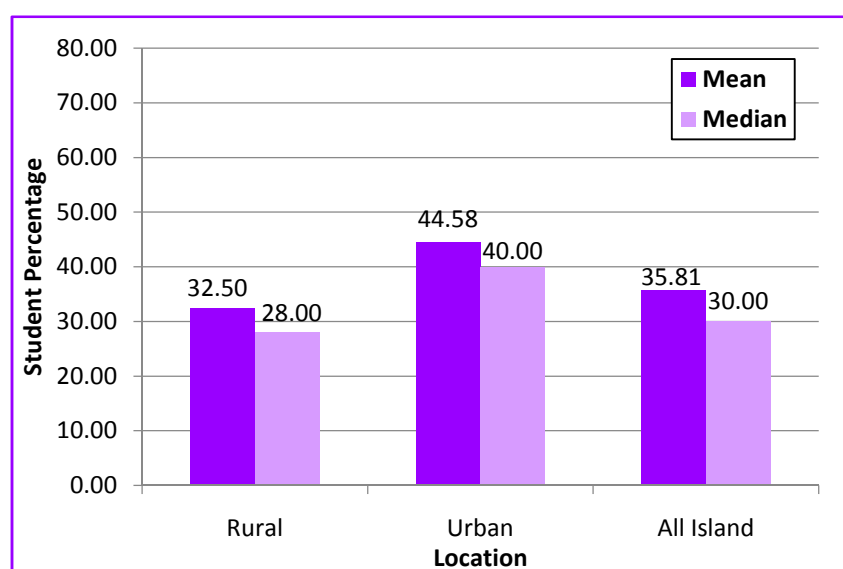
Fig. 5.15: Bar chart representing mean and median values according to location–English

As Fig. 5.15 indicates in both urban and rural areas the median value is lower than the mean value. Therefore, 50% of the students has reached the mean value in both localities.

Students' achievement is further elaborated through the frequency distribution graphs in Fig. 5.16.
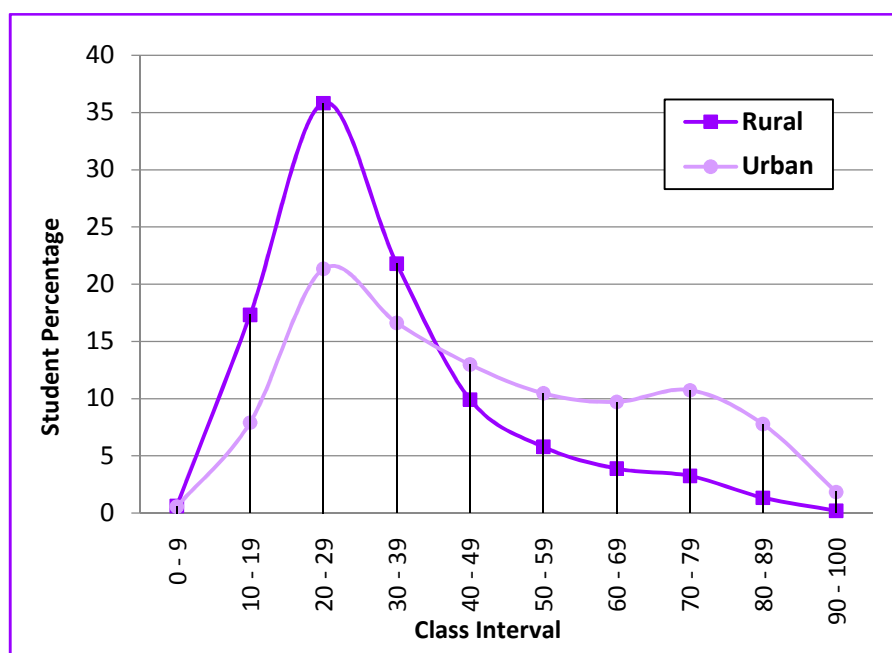
Fig. 5.16: Dispersion of marks by location – English

Fig. 5.16 displays two differently skewed graphs. While the curve representing the rural areas is positive, the shape of the curve representing the performance of urban schools is bimodal. While the rural area curve peaks at the class interval 20-29 the urban area curve peaks at both class intervals 20-29 and 70-79. This difference can be explained using the cumulative percentage Table 5.11.

Table 5.11: Cumulative student percentages according to location – English Language

Class Interval	Rural		Urban	
	Student %	Cumulative %	Student %	Cumulative %
0 – 9	0.62	0.62	0.56	0.56
10 – 19	17.31	17.93	7.934	8.50
20 – 29	35.84	53.77	21.33	29.83
30 – 39	21.78	75.55	16.60	46.43
40 - 49	9.95	85.50	12.989	59.42
50 - 59	5.80	91.30	10.46	69.88
60 - 69	3.89	95.19	9.71	79.59
70 - 79	3.25	98.44	10.75	90.34
80 - 89	1.36	99.80	7.79	98.13
90 - 100	0.20	100.00	1.87	100.00
Total	100.00		100.00	

According to Table 5.11 the highest percentage of students in both urban area schools and rural schools fall into the class interval 20-29. However, in the urban area schools the percentage is 21.33 and in the rural area schools the percentage is 35.84. In addition, in the urban area schools 10.7% of students has also scored between 70-79 marks which has caused the curve to be bi model.

The spread of marks is further illustrated through the box plot graph.
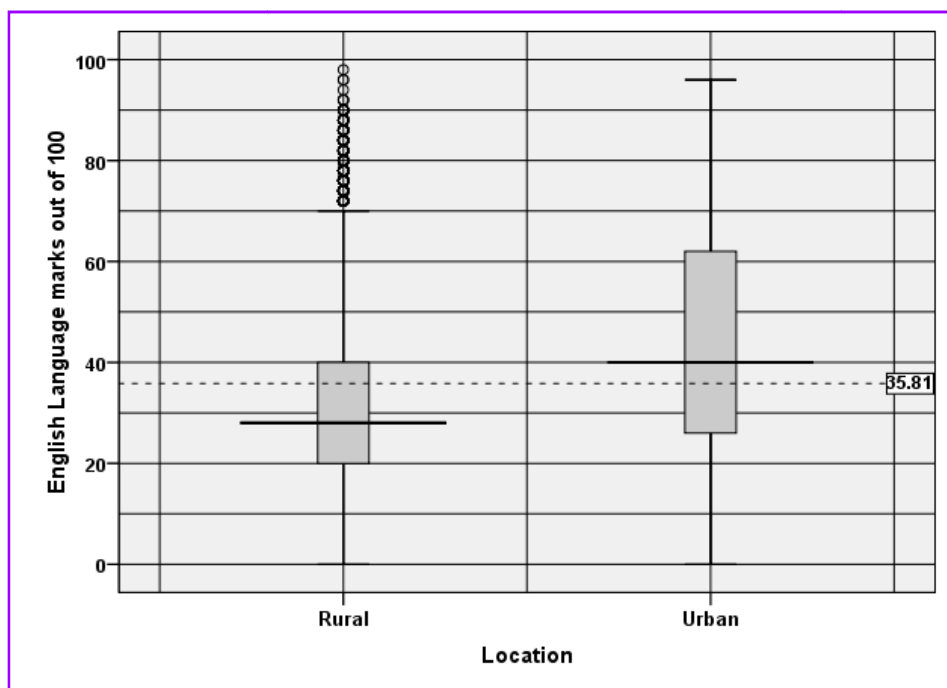
Fig. 5.17: Box plot and whisker plot representing location wise English marks

According to the box plot the urban area schools' performance differs from the rural area schools at the 25th, 50th and 75th percentile. Further their performance is above the all island performance. There are also outliers in the rural areas. The box plot confirms the variation that exists between the performance of the two localities.

Summary

- The performance of the students in the urban areas is better than in the rural areas.
- The deviation of marks is less in the rural area schools.

Achievement patterns observed in relation to the achievement in English, revealed that there were variations among provinces, school type, gender and medium wise.

Students' achievement in relation to subject content will be discussed next.

5.8   Analysis of achievement by sub skills

In constructing the achievement tests, the test items were designed in relation to the competencies and competency levels identified for grade eight. As discussed in chapter 2, the construct assessed in these studies were the competency levels. Based on the competencies and competency levels table of specification was prepared. In preparing the Table of specification, competencies related to oral skills were excluded as they could not be measured through a written paper.

The English language paper was based on four competencies. That is vocabulary, reading, grammar and writing.

Table 5.12 analyses the achievement of competency levels.

Table 5.12: Achievement of competency levels – English language

Competency	Competency Level	Percentage
Vocabulary	4.4 Uses English words in the proper contexts	56.72
	4.5 Uses the dictionary effectively	42.72
	4.6 Uses visual clues and contextual clues to derive the meaning of words	47.82
Reading	5.4 Transfers information into other forms	36.45
	5.5 Extracts the general idea of a text	49.22
Grammar	6.2 Analyze the grammatical relations within a sentence	44.07
	6.6 Construct complex sentences through the process of subordination	48.86
Mechanics of Writing	2.4 Uses commas with understanding	34.07

The achievement of competency levels is graphically depicted in Fig. 5.18.
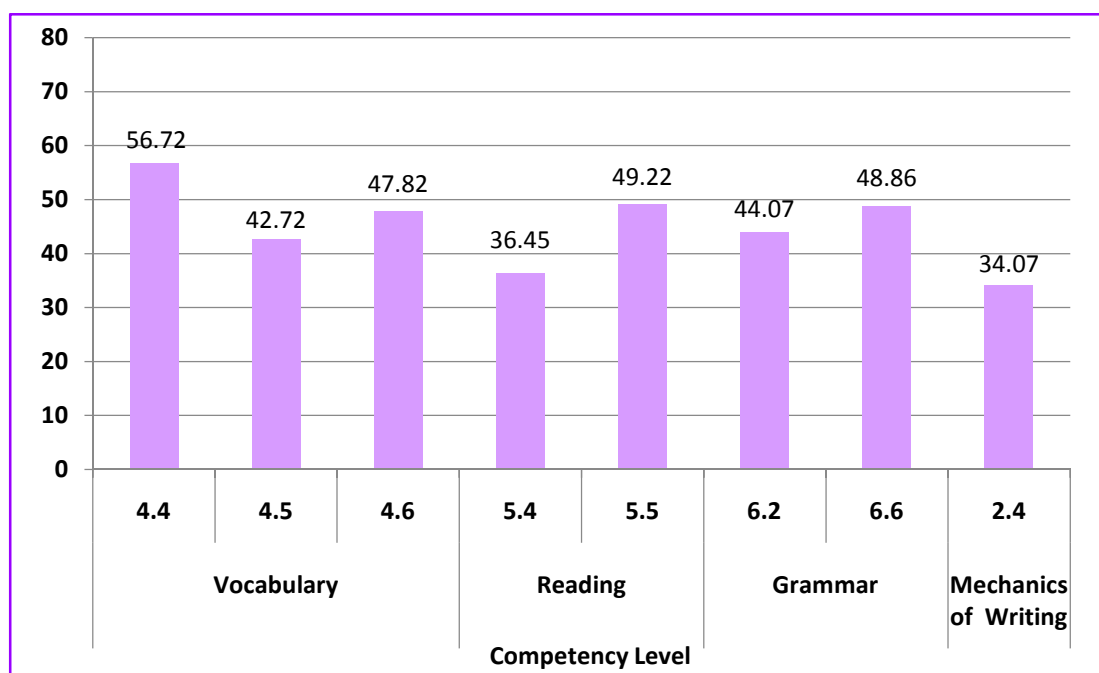
Fig. 5.18: Achievement of competency levels – English language

The writing task would be analysed separately in Table 5.13 and 5.14.

In relation to the achievement of competencies vocabulary is the highest. Uses English words in the proper context is the competency level achieved by the highest percentage of students.

Achievement in grammar is better than reading. However, achievement of these two competency levels is less than 50%. In reading the weakest competency level is transferring information into other forms.
The poorest achievement is shown in the skill 'writing'.

The two competency levels related to writing to be achieved in grade 8 are as follows;

    7.5   writes short stories

    7.6   writes brief notes

One of the tasks was writing a brief note and it was evaluated according o the following criteria.

Salutation	1 mark
Thanking	1mark
Express regret	1 mark
Reason	1 mark
Ending	1 mark
Total	5 marks

Most of the students have not attempted to answer the given questions related to writing task. Table 5.13 shows the performance indicated by the marks obtained for writing a brief note.

Table 5.13: Performance in writing a brief note

	Not Attempted	Attempted Marks Obtained						
Marks		**0**	**1**	**2**	**3**	**4**	**5**	**Total**
%	34.15	34.51	3.49	4.93	6.87	6.61	10.84	100

According to Table 5.13, only a very small percentage of students have been able to achieve the expected level in writing a brief note. Only 10.84% of the students have been able to score the highest mark for this writing task. There had been 34.15% of students who have not even attempted this task.

Writing a guided short story was another question to assess the competencies that relate to the skill, writing. Performance achieved in this regard is given in Table 5.14.

Table 5.14: Performance in writing a guided short story

	Not Attempted	Attempted Marks Obtained											
Marks		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
%	43.04	40.16	1.60	2.24	2.61	3.16	3.07	1.82	0.99	0.67	0.37	0.29	100

In this task too, majority of the students has not attempted to answer the question. According to Table 5.14 achievement level in this task is not satisfactory. Only 0.29 percent of the students has been able to score the total marks for this question. There had been 43.04% of students who had not attempted this task. Further, of those attempted 40.16% has not scored a single mark. These answers were either "irrelevant" or "question copied". In general, therefore it could be claimed that achievement of competency levels with regard to writing is not satisfactory.

Part II - Comparison of achievement level of students in 2014 with that of 2016

Trends in achievement over the period 2014-2016 will first be discussed at national level.

5.9 Trends in achievement at national level
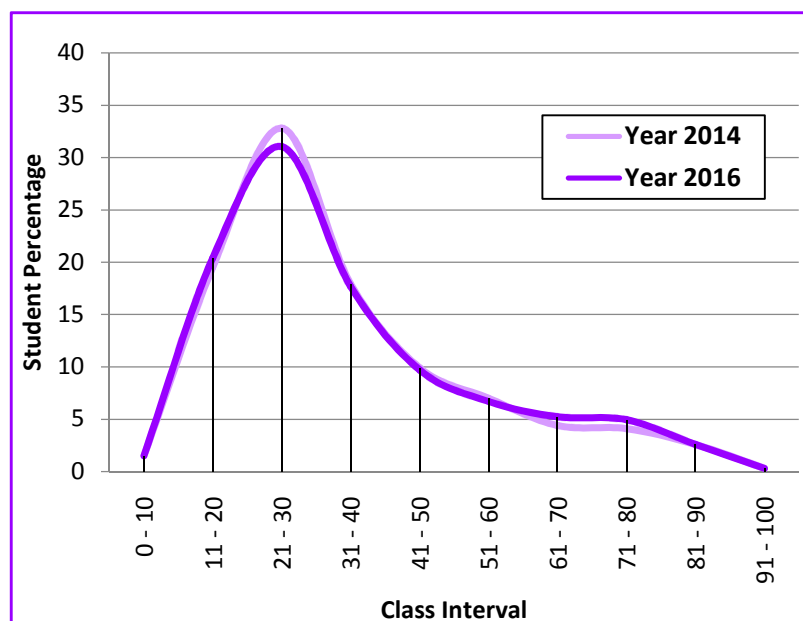
Fig. 5.19: All island achievement in English comparison 2014 -2016– dispersion of marks

As Fig 5.19 indicates there is a slight improvement in students' achievement in the year 2016. The line curve for 2016 shows that the percentage of low achievers has decreased and the percentage of high achievers has increased slightly. This has resulted in an increase in the mean value from 35.23 to 35.81.

This change is further elaborated through the cumulative percentage table.

Table 5.15: Comparison of all island achievement in English - cumulative percentages

Class Interval	Year 2014		Year 2016	
	Student %	Cumulative %	Student %	Cumulative %
0-10	1.50	1.50	1.47	1.47
11-20	19.50	21.00	20.39	21.86
21 - 30	32.80	53.80	31.05	52.91
31 - 40	17.90	71.70	17.68	70.59
41 - 50	9.90	81.60	9.68	80.27
51 - 60	7.00	88.60	6.68	86.95
61 - 70	4.40	93.00	5.22	92.17
71 - 80	4.10	97.10	4.93	97.10
81 - 90	2.60	99.70	2.59	99.69
91-100	0.30	100.00	0.31	100.00
Total	100		100	

The percentage of low achievers, those who have scored below 40% has decreased from 71.70% to 70.59%. On the other hand the percentage of students who has scored between 50-100 has risen from 18.40 to 19.73.

Provincial level performance has contributed to the national level achievement. The trends in provincial level achievement will be discussed next.

5.10 Provincial wise comparison of student achievement

As Fig 5.20 displays while some provinces have contributed positively to the increase in all island mean value some have contributed negatively.
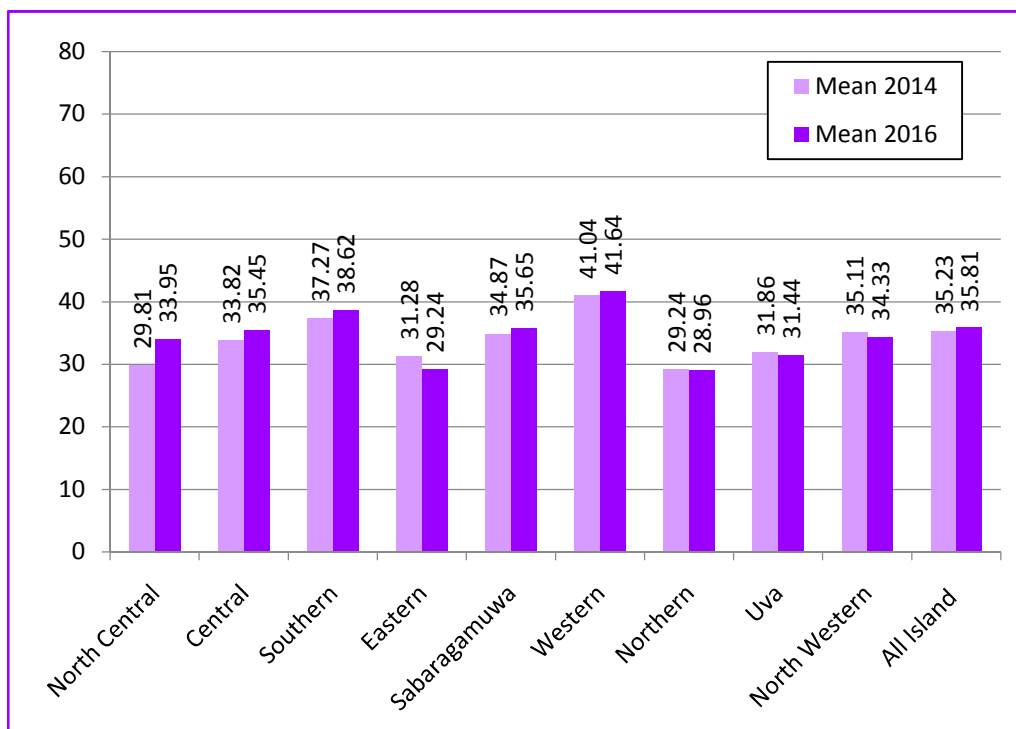
Fig. 5.20: Provincial wise comparison of student achievement – 2014 & 2016

Table 5.16: Provincial wise comparison of student achievement – 2014 & 2016

Province	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
North Central	29.81	13.32	33.95	17.58	7.55**
Central	33.82	17.82	35.45	18.72	2.61**
Southern	37.27	19.75	38.62	19.70	2.05*
Eastern	31.28	14.27	29.24	14.87	-3.85**
Sabaragamuwa	34.87	16.60	35.65	18.09	1.34
Western	41.04	20.86	41.64	21.06	0.87
Northern	29.24	15.87	28.96	15.98	-0.46
Uva	31.86	15.79	31.44	15.78	-0.76
North Western	35.11	17.76	34.33	17.27	-1.29
All Island	**35.23**	**18.32**	**35.81**	**18.93**	**2.69****

* Values are significant at 95%   ** Values are significant at 99%

According to Table 5.16 mean values of North Central, Central and Southern have increased in 2016 and these increases are significant. On the other hand, the mean values of Eastern Province has decreased significantly. Even though, the mean value in the Western Province has increased it is not significant. At the same time, Northern, Uva and North Western records declines in mean values. Yet, they are also not significant. The contributions of these provincial changes in the mean values has contributed significantly to increase the all island mean value even though slightly.

Fig: 5.21 depicts the line curves denoting the performance of each province.

As the line curve for the North Central Province illustrates the percentage of high achievers in the range of 50-100 has increased while the low achievers in the range of 21-30 has decreased. This has resulted in a significant increase in the mean value of the province. A similar pattern is observed in the curves of Central and Southern provinces.
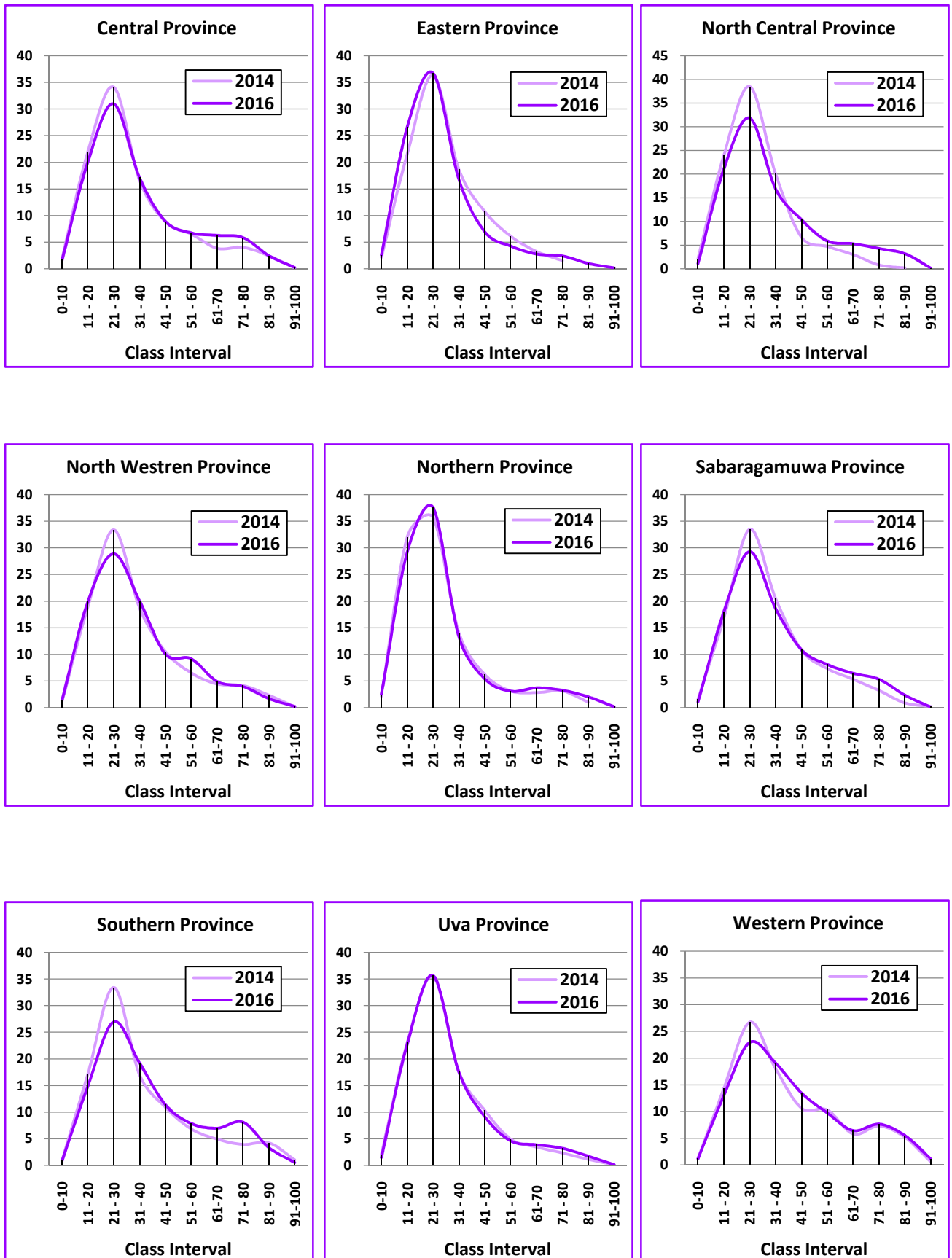
Fig. 5.21: Comparison of provincial wise distribution of marks – English Language

5.11   Comparison of marks according to school types
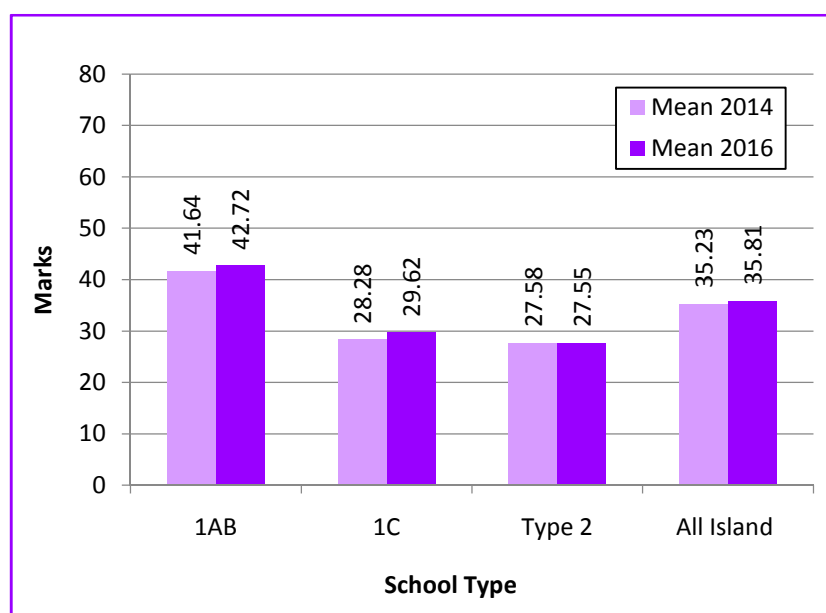
Fig. 5.22: All island comparison of mean values according to school type

As the bar graph indicates there is a slight increase in achievement in 1AB and 1C type schools while there is a slight decrease in Type 2 schools. This increase in 1C schools is a positive sign.

According to Table 5.17 the increase in the 1AB and 1C schools mean values is significant. At the same time the decrease in Type 2 schools is insignificant. The changes in the mean values in the 1AB and 1C schools has positively contributed to the increase in the all island mean value.

Table 5.17: Comparison of English Language achievement according to school type

School Type	Year 2014		Year 2016		Z
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
1AB	41.64	20.28	42.72	21.02	3.32**
1C	28.28	11.9	29.62	13.74	4.90**
Type 2	27.58	12.94	27.55	12.57	-0.08
All Island	35.23	18.32	35.81	18.93	2.69**

* Values are significant at 95%   ** Values are significant at 99%

The trend in achievement gender wise will be discussed next.

5.12   Comparison of marks according to gender
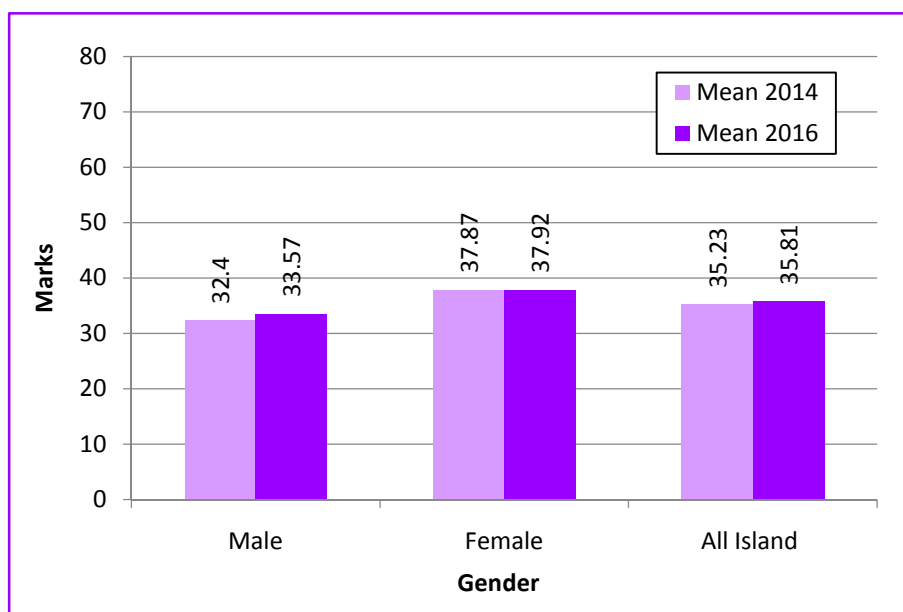
Fig. 5.23: All island comparison of mean values according to gender

As Fig. 5.23 indicates there are slight increases in both male and female performances. However, the increase in male performance in higher than the change in the female performance. Further, as Table 5.18 indicates while the increase in the mean value of males is significant the change in the female performance is not significant.

The increase in male performance is a positive sign.

Table 5.18: Comparison of English Language achievement according to gender

Student Gender	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Male	32.40	16.89	33.57	18.76	4.00**
Female	37.87	19.18	37.92	18.85	0.16
All Island	35.23	18.32	35.81	18.93	2.69**

5.13   Comparison of marks according to medium of instruction
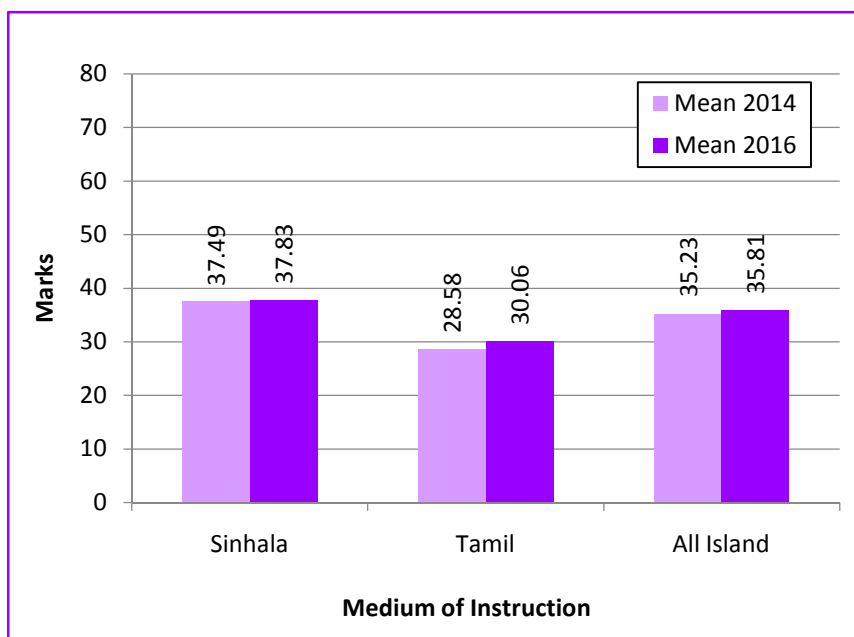
Fig. 5.24: All island comparison of mean values according medium of instruction

There is a very slight improvement in the performance of both Sinhala medium as well as Tamil medium students' performance (Fig. 5.24). However, as Table 5.19 indicates these changes are significant.

Table 5.19: Comparison of English Language achievement according to medium of instruction

Medium of Instruction	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Sinhala	37.49	19.26	37.83	19.62	1.28
Tamil	28.58	13.08	30.06	15.44	4.80**
All Island	35.23	18.32	35.81	18.93	2.69**

5.14 Comparison of marks according to location
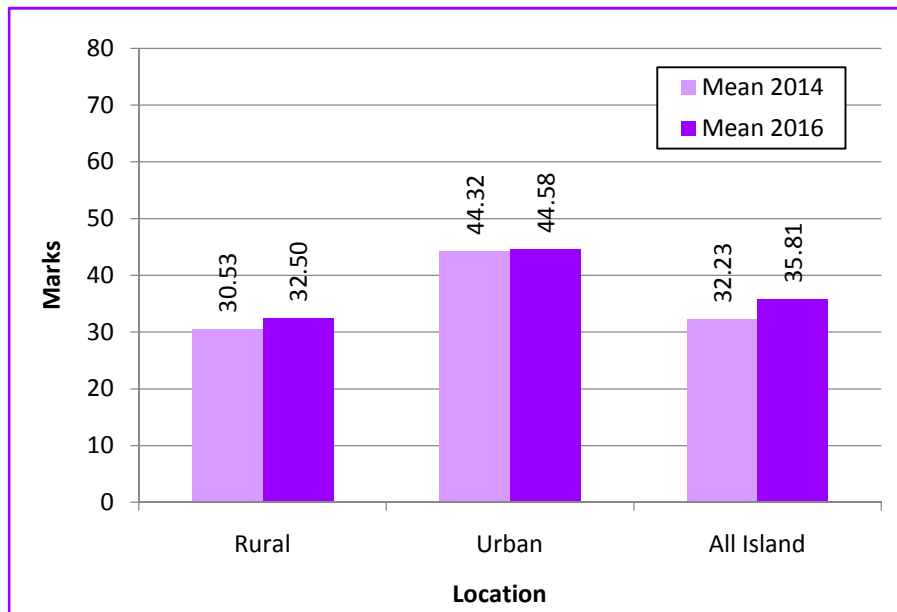
Fig 5.25: All island comparison of mean values according to location

In both urban and rural settings students' achievement has increased. However, compared to the rural performance the increase in urban performance is very slight and according to Table 5.20 this change is insignificant. On the other hand, the change in the rural performance is significant.

Table 5.20: Comparison of English Language achievement according to location

Location	Year 2014		Year 2016		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Rural	30.53	14.26	32.5	16.56	9.47**
Urban	44.32	21.57	44.58	21.80	0.53
All Island	35.23	18.32	35.81	18.93	2.69**

Increase in rural students' performance is a positive feature even though the urban rural gap in achievement continues.

Trends in performance according to the sub skills in English will be discussed next.

5.15 Comparison of students' achievement in relation to ELCs

Table 5.21: Comparison of competency levels related to the English Language

Competency	Competency Level	2014 Percentage	2016 Percentage	Change
Vocabulary	4.4 Uses English words in the proper contexts	49.60	56.72	7.12
	4.5 Uses the dictionary effectively	40.40	42.72	2.32
	4.6 Uses visual clues and contextual clues to derive the meaning of words	54.30	47.82	-6.48
Reading	5.4 Transfers information into other forms	35.70	36.45	0.75
	5.5 Extracts the general idea of a text	46.50	49.22	2.72
Grammar	6.2 Analyze the grammatical relations within a sentence	45.40	44.07	-1.33
	6.6 Construct complex sentences through the process of subordination	44.40	48.86	4.46
Mechanics of Writing	2.4 Uses commas with understanding	47.30	34.07	-13.23

Considering the Table 5.21 there is not much change in the achievement of skills between 2014 -2016. In 2014 only one competency has been achieved by more than 50% of students. However, there is a reduction in the achievement of competency 4.6 which was achieved by more than 50% students in 2014. There are also decreases in the achievement of competencies 2.4 and 6.2. On the other hand, in 2016 there are increases in achievement in all other competency levels with more than 50% of students achieving competency level 4.4 that is "Uses English words in the proper contexts".

The poorest achievement is shown in the skill 'writing'. Most of the students have not attempted to answer the given questions related to writing task. Table 5.22 shows the performance indicated by the marks obtained for writing a brief note.

Table 5.22: Comparison of performance in writing a brief note

Year		Not Attempted	Attempted Marks Obtained						
	Marks		0	1	2	3	4	5	Total
2014	%	60.00	7.70	3.90	5.30	6.90	6.40	10.50	100
2016		34.15	34.51	3.49	4.93	6.87	6.61	10.84	100

According to Table 5.22 compared to 2014 there is a very slight improvement in the performance of this task. In 2014, 60% of the students had not even attempted this task. In 2016 the percentage of not attempted students had reduced to 34.15. However, of the number attempted another 34.51% has obtained zero marks. It was noted that most of these students had either copied the question or what was written was irrelevant.

Writing a guided short story was the question to assess the competency level 7.5.

Table 5.23 shows the performance indicated by the marks obtained for this question.

Table 5.23: Comparison of performance in writing a guided short story

Year	Marks	Not Attempted	Attempted											
			0	1	2	3	4	5	6	7	8	9	10	Total
2014	%	75.00	10.00	2.20	2.50	1.70	2.10	2.60	2.00	1.80	1.80	1.40	0.70	100
2016		43.04	40.16	1.60	2.24	2.61	3.16	3.07	1.82	0.99	0.67	0.37	0.29	

Compared to 2014 when 75% of the students did not attempt this task. In 2016 only 43.04% of students had not attempted this task. Further, of those attempted 40.16% has not scored a single mark. These answers were either "irrelevant" or "question copied". In general, therefore it could be claimed that achievement of competency levels with regard to writing is not satisfactory, especially as the percentage of students who scored 10 marks had declined.

5.16 Summary

Part I of this chapter described student performance in relation to the achievement of learning outcomes in the English language. The discussion pertained to both national and provincial level. Further, achievement was analyzed according to school type, gender, medium of instruction and location.

Test items used to assess students' performance were analyzed to assess how far they have been successful in achieving sub skills of the language expected to be achieved by grade 8 pupils.

Part II described the trends in achievement between 2014-2016.

It could be concluded that overall the achievement of learning outcomes in English is not satisfactory. There is still disparity in achievement provincial wise as well as location and gender wise. However, the performance of male students and those in rural area schools has improved. The achievement of competency levels remains not satisfactory and writing skills achievement appears to be declining.

Conclusion and the Way Forward

6.1 Introduction

The purpose of this chapter is to discuss the main findings of the national assessment 2016. These findings will be discussed in relation to the objectives of the study and in accordance with the objectives of a national assessment (Kellaghan and Greaney, 2008) as mentioned in chapter 1.

- How well are students learning in the education system (with reference to general expectations, aims of the curriculum, preparation for further learning, or preparation for life)?
- Do particular subgroups in the population perform poorly? Do disparities exist, for example, between the achievements of (a) boys and girls, (b) students in urban and rural locations, (c) students from different language or ethnic groups, or (d) students in different regions of the country?
- Does evidence indicate particular strengths and weaknesses in students' knowledge and skills?
- Do the achievements of students change over time?
  (Kellaghan and Greaney, 2008, p.9).

In order to find answers to the first question and the first objective of assessing the extent to which, patterns identified in the achievement of learning outcomes 2016 in mathematics, science and English will be discussed at national level

6.2 Patterns identified in the achievement of learning outcomes - 2016

6.2.1 National level performance

The overall performance in **mathematics** can be considered satisfactory with a mean score above 50%, that is 51.11, while the median is 47.50.

However, disparity in achievement prevails with approximately 32.72% of students scoring below 40 and 25% of students scoring above 70. The highest number of students falls within the marks range of 30-39.

The performance in **science** is not very satisfactory with a mean score of 41.76, while the median is 39.00.

Disparity in achievement prevails with approximately 50.86% of students scoring below 40. However, the highest number of students (18.61%) has scored between the marks range of 20-29.

The performance in English is very low with a mean value of 35.81 and a median value of 30. The highest number of students falls within the marks range of 20-29. Sixty eight percent of students have scored below 40 marks.

Therefore, it could be concluded that the majority of the students have scored low marks in science and English. On the other hand there is disparity in all island achievement in all three subjects.

The next objective is to find out whether certain subgroups in the population perform poorly and whether there are disparities in achievement among these sub groups.

6.3 Disparity in achievement among the sub groups

6.3.1 Provincial wise performance

The findings of the present study indicate that there are variations in provincial wise achievement in all three subjects.

Achievement wise the provinces fall into three categories.

With regards to mathematics achievement Southern, Western and Sabaragamuwa, with mean scores above the national mean (51.11) fall into category one.

North Central and North Western Provinces cluster in the middle. While Uva, Eastern, Central and Northern Provinces achievement is very much below the mean value.

When the science achievement is considered similar to the mathematics achievement Southern, Western and Sabaragamuwa have mean scores above the national mean (41.76). In contrast to mathematics in science North Western has also scored above the national mean. While North Central and Central Provinces cluster in the middle.

Uva, Eastern and Northern Provinces performance like in mathematics is quite below the national mean.

Provincial achievement in English is different to the other two subjects. Only Southern, and Western, have scored mean scores above the national mean (35.81) while Sabaragamuwa and Central Provinces cluster in the middle.

The other provinces performance is very much below the national mean.

Therefore, it could be concluded that disparities exist among the provinces with relation to all three subjects.

6.3.2 Achievement according to school types

The gap between the achievement of students in 1AB schools and 1C and Type 2 is wide in all three subjects.

In all three subjects the achievement curve of the 1AB schools is bimodal denoting that there are both high and low achievers. On the other hand, in 1C and Type 2 schools the curves are positively skewed indicating that majority of the students has scored low marks. While in mathematics majority of the students in these schools (Type 1C and Type 2) has scored between 30-39, in science and English the majority has scored between 20-29.

Therefore, it could be concluded that disparity in achievement exists between 1AB schools and 1C and Type 2 schools.

6.3.3 Achievement according to gender

In all subjects females have performed better than their male counterparts.

In all subjects while the male performance is lower than the all island mean score, female performance is above the all island mean.

Therefore, there is a gap between male and female performance in all three subjects.

6.3.4 Achievement according to medium of instruction

There is wide disparity in achievement among students belonging to different medium of instruction in all three subjects.

In all three subjects while the Sinhala medium students mean value is above that national mean, the Tamil medium students mean value is below the national mean.

6.3.5 Achievement according to location

Disparity in achievement can also be seen according to the location where the school is situated. In all three subjects the mean value of the schools located in urban areas is very much higher than that of the rural schools. This gap is eight points in science and nine points in mathematics. On the other hand, in the achievement of English the urban rural disparity is quite high with a difference in mean values of twelve points.

According to the above discussion it could be concluded that disparity in achievement exists among sub groups such as among different provinces, school types, male/ female and students studying in different medium of instruction and urban/rural areas.

Section 6.4 will discuss the identified particular strengths and weaknesses in students' knowledge and skills.

6.4   Strengths and weaknesses in students' knowledge and skills

Achievement in relationships, and reasoning is satisfactory. However, problem solving and majority of the competency levels in knowledge and skills and communication need to be improved.

Achievement of competency levels related to Biology is satisfactory to a certain extent as the average achievement is more than 50%. On the other hand, achievement of competency levels related to chemistry, earth science and physics need to be improved.

English language skill achievement is not satisfactory except for vocabulary. Grammar, and reading skills as well as writing which is the weakest skill have to be improved.

6.5   Trends in achievement 2014 -2016

6.5.1 National level trends

Achievement in mathematics

There is a slight increase in students' performance in 2016. The percentage of low achievers has decreased and the percentage of high achievers has increased. This has resulted in an increase in the mean value from 50.87 to 51.11

Achievement in science

There is a slight improvement in students' achievement in the year 2016. The percentage of low achievers has decreased and the percentage of medium level achievers has increased. This has resulted in an increase in the mean value from 41.16 to 41.76. However, the percentage of high achievers has not changed.

Achievement in English

A slight improvement in students' achievement can be seen in the year 2016. The percentage of low achievers has decreased and the percentage of high achievers has increased slightly. This has resulted in an increase in the mean value from 35.23 to 35.81.

It could be concluded that students' achievement has improved slightly over the period 2014 – 2016 in all three subjects evaluated.

6.5.2 Provincial level trends

There has been significant changes in achievement in certain provinces over the period 2014 -2016.

In the Central Province an increase in achievement is noted in all three subjects and these changes are significant. Similarly North Central and Southern Provinces records significant improvement in mathematics and English. Improvement in science achievement is seen in the Western Province.

On the other hand, a significant decline in achievement is recorded in the Eastern Province in all three subjects. Similar decline is recorded in the Uva Province in mathematics and science.

In all other provinces the changes either positive or negative is insignificant.

6.5.3 Trends according to school types

In mathematics achievement there has been a significant increase in achievement in 1C and Type 2 schools. On the other hand, similar significant increase can be seen in science achievement in 1AB and 1C schools which is a positive trend. On the other hand, in English achievement there is a significant increase in 1AB and 1C schools.

6.5.4 Trends according to gender

A positive trend is seen in the achievement of English language when compared with 2014. In 2016, male performance has increased significantly. On the other hand, in science, female achievement has increased significantly there by widening the gap between male and female performance. In mathematics there is no significant change in achievement over the two year period.

6.5.5 Trends according to medium of instruction

Even though there are slight changes in the achievement of mathematics both among Sinhala and Tamil medium students during 2014-2016 these changes are not significant. On the other hand in both science and English achievement the Tamil medium students' performance has increased significantly which is a positive sign as it will reduce the gap in disparity.

6.5.6 Trends according to location of the school

The gap between urban and rural seems to be widening with respect to mathematics achievement. On the other hand, in both science and English achievement the rural performance has increased significantly.

6.6 What the findings reveal

As discussed in chapter 1, Sri Lanka is also committed to achieve the Sustainable Development Goals, especially Goal 4. That is "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'. In other words to "leave no one behind".

In this context findings of the national assessment of learning outcomes of grade 8 students reveal that much more effort is needed to achieving this target. At national level while mathematics achievement is satisfactory to a certain level, (50%) achievement in science and English is below at least 50% benchmark.

The comparison of achievement between 2014 and 2016 reveals a slight improvement. However, though slight this improvement is a positive sign. The need at present is to find out the factors that contributed to the improvement and sustain it through effective monitoring.

6.7   The way forward

Provincial level contribution

It was revealed that in both science and mathematics achievement at least three provinces and in English, two provinces have achieved mean values above the national mean. Therefore these provinces need to sustain this growth.

On the other hand, there are also provinces that have shown significant decline in achievement. Therefore, the provincial authorities need to have a systematic monitoring and support mechanism in place.

It is recommended that NEREC findings should be disseminated to provincial and zonal levels.

Subject wise discussions on improving the achievement level of students based on NEREC findings should be included in the annual plan.

Bridging disparities

As discussed in section 6.5 disparities in achievement in relation to school type, gender, medium of instruction and location continues.

However, the comparison between the achievements in 2014 -2016 revealed that in the science and English achievement in rural areas and in Tamil medium schools has increased. Similarly, increase in mathematics and science achievement in 1C and Type 2 schools and English in 1C and in male performance indicate that bridging the gap is possible. Therefore, it is necessary to identify best practices that contributed to these increases and disseminate them to other schools.

Achievement of competencies

It was stated in the 2014 report that "majority of the students had not been able to display satisfactory achievement in the competency levels expected to be achieved" p.81.

The same statement is applicable to the 2016 assessment. However, there are some positive changes that had taken place. Percentage of students that has achieved majority of the competency levels pertaining to science and mathematics has increased. They need to improve further. However, from 2014 -2016 there are positive changes.

On the other hand, some of the competencies of which the achievement was not satisfactory continues to be weak and has even declined. With regards to the achievement in the writing skills in English is very unsatisfactory. Therefore, these issues should have been addressed in a curriculum revision and Teacher Development programmes.

Classroom based assessment and the term end assessment should be designed more scientifically to test competency levels and learning outcomes.

Curriculum revision

Under theme 2 of the ESDFP one of the areas identified for improvement is the secondary stage revision of the national curriculum. The subject curriculum committees had already identified certain issues such as content overload, over weight of textbooks and lack of discovery learning through practical projects especially in science. The national Assessment 2016 confirms that student achievement in certain competencies remain weak. Therefore, there is a doubt as to whether the proposals of the ESDFP has been implemented.

It is recommended that the National Institute of Education review whether these competencies and competency levels identified for all three subjects – mathematics, science and English have been addressed in the curriculum revision.

The content of the science curriculum was over burdened and there was an imbalance between subject content. Further, there should be more practical work and activities to enable students to use science in their day to day activities.

English language curriculum should have been revised to provide more opportunities to apply the basic concepts in developing reading and writing skills. Reordering of the competency levels was also necessary as at present competency level for creative

writing precedes writing a brief note. Majority of the students could not write a simple sentence. Hence, the syllabus, the teaching content and the methodology need revision.

Teacher development

Teachers need to identify the students with exceptional abilities as well as learners needing special attention. Further, they should be able to adapt the learning material to provide fast track programmes for the best students and remedial programmes for the low achievers. This teacher development programmes should include these skills as well as to train teachers in the use of strategies such as mixed ability and same ability groupings, action research to find out solutions to context specific problems.

Teachers who pass out of National Colleges of Education should be aware of the National Assessment results and how they can be utliszed to improve classroom teaching and learning process.

Research and monitoring

Further research based on the National Assessments should be carried out at provincial and zonal levels. These should be annual events in the year planner.

Research grants given by the Ministry to teachers could be for action research based on NEREC findings to find out best practices.

Conclusion

The purpose of the national assessment was not only to provide information on the state of the achievement of learning outcomes, but also that information should lead to improvement in quality learning and teaching. It is hoped that the findings will provide feedback to the curriculum and teaching learning practices in order to achieve better outcomes for students and to inform policy.

References

Aturupane, H. (2009). The Pearl of Great Price: Achieving equitable Access to Primary and Secondary Education and Enhancing Learning in Sri Lanka. UK: CREATE

Burks, J. & Christopher, L. (2012) Education Research. Qualitative, Quantitative and Mixed approaches. UK; Sage Publications.

Kamens, D. H. & McNeely, C. L. (2010). Globalization and the growth of international educational testing and national assessment. *Comparative Education Review*, *54*(1), 5-25.

Kellaghan, T. & Greaney, V. (2008) Assessing National Achievement Levels in Education. Washington: World Bank.

Kellaghan, T., Greaney, V. & Murray, S. (2009) Using the Results of a National Assessment of Educational Assessment. Washington: World Bank.

Masters, G. (2017) The science of large-scale assessment in P. Lietz, J. Cresswell, R. Adams, & K, Rust (eds) Implementation of large-scale assessments in education. New York: Wiley

Ministry of Education (2011). The National Strategic Plan for the General Education Sector. Education Sector Development Framework and Programme (ESDFP) 2012 - 2016. Colombo, Sri Lanka.

Ministry of Education (2013). The National Strategic Plan for the General Education Sector. Education Sector Development Framework and Programme (ESDFP) 2013-2017. Colombo, Sri Lanka.

National Education Research and Evaluation Centre (NEREC) (2005). National Assessment of Achievement of Grade 8 and 10 Students in Sri Lanka, University of Colombo, Sri Lanka.

National Education Research and Evaluation Centre (NEREC) (2008). National Assessment of Achievement of Grade 8 Students in Sri Lanka. University of Colombo, Sri Lanka.

National Institute of Education (NIE) (2008). An Evaluation of the Process of Development and Implementation of the New Curriculum in Grades 6 and 10, Colombo, Sri Lanka

National Institute of Education (NIE) (2009). An Evaluation of the Process of Development and Implementation of the New Curriculum in Grades 7 and 11, Colombo, Sri Lanka.

National Institute of Education (NIE) (2009). English Grade 8 Teacher's Instructional Manual. Colombo, Sri Lanka.

National Institute of Education (NIE) (2009). Mathematics Grade 8 Teacher's Instructional Manual. Colombo, Sri Lanka.

National Institute of Education (NIE) (2009). Science Grade 8 Teacher's Instructional Manual. Colombo, Sri Lanka.

Ross, N. (eds.) 2005. Sample design for educational survey research. Paris: IIEP, UNESCO

UNESCO, 2000. The Dakar Framework for Action: Education for All – Meeting our Collective Commitment. Paris: UNESCO

UNESCO, (2015). Equitable and inclusive quality education and lifelong learning for all by 2030. http://en.unesco.org/world-eudcation-froum-2015 accessed on 30th March 2016

WISEMAN, A. (2010). The uses of evidence for educational policy-making: global context and international trends. Review of Research in Education , v. 34, n. 1, p. 1-124,

World Bank (2011). Strengthening Mathematics Education in Sri Lanka. Discussion Paper Series Report no.43. July 2011. The World Bank. Washington D.C., U.S.A.

World Bank (2011). Transforming School Education in Sri Lanka. From cut stones to polished jewels. The World Bank. Washington D.C., U.S.A.

World Bank, (2011). Transforming school education in Sri Lanka. The World Bank, Washington, D.C., U.S.A

Series of National Assessments

National Assessment of Achievement of Grade 4 Pupils in Sri Lanka. (2004)

National Assessment of Achievement of Grade 8 and 10 Students in Sri Lanka. (2005)

National Assessment of Achievement of Students Completing Grade 4 in Year 2006 in Sri Lanka.

National Assessment of Achievement of Students Completing Grade 8 in Year 2007 in Sri Lanka.

National Assessment of Achievement of Students Completing Grade 4 in Year 2008 in Sri Lanka.

National Assessment of   of Students Completing Grade 8 in Year 2012 in Sri Lanka.

National Assessment of Achievement of Students Completing Grade 4 in Year 2013 in Sri Lanka.

National Assessment of Achievement of Students Completing Grade 8 in Year 2014 in Sri Lanka.

National Assessment of Achievement of Students Completing Grade 4 in Year 2015 in Sri Lanka.