

2.1 Introduction

As mentioned in chapter 1, the National Assessment of Achievement of Grade 04 Pupils in Sri Lanka was conducted in 2009 with almost the same objectives as the two previous studies conducted in 2003 and 2007. However, the methodology adapted in the 2009 study was slightly different.

This chapter elaborates the methodology adopted in the 2009 study, highlighting the changes and the rationale for such changes.

2.2 Objectives of the study

The main objective of this study is in accordance with the Education Sector Development Framework Programme (ESDFP) and the Development of Education plan through sector wide approach.

The specific objectives of the study originally identified were:

- 2.2.1 To assess the achievement level of students in the First language, English language and Mathematics completing grade 04 (by 2008).
- 2.2.2 To identify patterns and trends in relation to learning achievement in First language, Mathematics and English language of students who had completed grade 04.
- 2.2.3 To assess the achievement level of students in Mathematics using TIMSS.
- 2.2.4 To assess the reliability of the main test using a newly constructed short test.
- 2.2.5 To produce a National Report related to the assessment results.

However, at the commencement of the study, it was felt that objective 2.2.4 was not feasible. It was decided to prepare a short test and administer it as a separate paper on the same day the previous test paper would be administered. The test was expected to be analyzed using Conquest package. This analysis would not be included in the main report, but would be a separate report which was expected to be used in preparation of fresh test papers for the National Assessments in the future.

In section 2.3, the sampling methodology will be discussed.

2.3 Sampling methodology

The sampling methodology used for this study, was based on an instructional manual designed by the Statistical Consultation Group, Statistics Canada in Ottawa. It 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)

In the previous grade 04 studies, the sampling methodology was based on SAMDEM (Sample Design Manager), designed by the UNESCO International Institute for Educational Planning. However, in this methodology, the demarcation between implicit and explicit strata was not very clear.

Further, in using SAMDEM, the cluster size was 20 per school. When the number of students in a class was less than twenty, pseudo schools were used in the sample. Pseudo schools were formed by joining two schools where number of students was greater than 10 but less than 20 and geographically closed to each other. In the 2009 study, after excluding the extremely small schools (as explained in 2.3.3), intact classes have been used irrespective of the number of students in the class.

Selection of the sample of schools and the sample of students will be discussed next.

2.3.1 Desired target population

The target population of the study has grade-based definition. Therefore, students who have completed fourth grade in the education system of Sri Lanka, in the year 2008 were considered as the desired target population of 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 data for the year 2007) was the sampling frame used for the study.

Although private schools also provide primary and secondary education, they are not controlled by the government, yet follow the local curriculum set up by the Ministry of Education in the local language mediums of Sinhala or Tamil or English. In addition, there are a few international schools which also provide primary and secondary education. However, these two categories of schools are also not included in the sampling frame. Accordingly, as Table 2.1 indicates, the desired target population of the study was 322,270 pupils who completed grade four in 2008, from 9366 government schools, that were listed in the sampling frame.

However, in selecting the final sample, certain schools and consequently number of students had to be excluded from the population.

2.3.3 School level exclusions

Extremely small size :

The schools that consist of less than 10 students in grade 03 of the available MOE database (2007) was considered as extremely small size schools. Such schools had been excluded from sample in the previous study as well. Table 2.1 illustrates school level exclusions by provinces.

As a result of the exclusion of 24.3% of extremely small schools from the desired target all Island *school population*, 3.9% of the desired target all Island *student population* was also excluded.

Table 2.1: School level exclusions by provinces

Province	Number of Schools			Number of Students		
	Desired target Population	excluded	% excluded	Desired Target Population	excluded	% excluded
1. Western	1276	170	13.3	73932	966	1.3
2. Central	1414	357	25.2	40799	1937	4.7
3. Southern	1037	247	23.8	40177	1389	3.5
4. Northern	862	209	24.2	23816	1199	5.0
5. Eastern	938	115	12.2	33521	747	2.2
6. North Western	1189	350	29.4	38263	1930	5.0
7. North Central	762	245	32.1	19538	1393	7.1
8. Uva	824	232	28.1	22352	1262	5.6
9. Sabaragamuwa	1064	351	32.9	29872	1769	5.9
All Island	9366	2276	24.3	322270	12592	3.9

2.3.4 Defined target population

After excluding schools from the desired target population, remaining schools can be defined as the "Defined Target Population".

Table 2.2: Defined target population by provinces

Province	Defined Target School Population	Defined Target Student Population
1. Western	1106	72966
2. Central	1057	38862
3. Southern	790	38788
4. Northern	653	22617
5. Eastern	823	32774
6. North Western	839	36333
7. North Central	517	18145
8. Uva	592	21090
9. Sabaragamuwa	713	28103
	7090	309678

Figure 2.1 illustrates the total percentage of schools and students included in the defined target population.

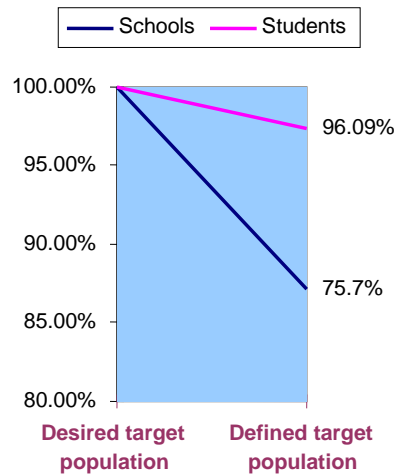


Figure 2.1: Percentage of schools and students included in the defined target population

2.3.5 Sample design - procedure

The sample procedure has a multi stage approach. Multi stage sampling is a strategy, whereby the final sample is derived 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 will be selected in the sample is proportional to some known variable (Ross, K., 2004) Then in the second stage, a group of students were selected from the sampled schools. Cluster sampling approach was the strategy used for selection of students from the grade 04 classes. This means, that an entire grade 04 class from each sampled school was selected.

In selection of the sample, as in the present study, in the two previous studies as well, the province was taken as the main stratum (explicit stratum). The rationale for selecting the province as the explicit stratum is that in the Sri Lankan context, education being a devolved subject the Provincial Education Ministries 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 2.3 illustrates, student sample and school sample per province with other important values, which decide the size of sampling error, such as roh and 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 2.3: Calculated student sample and school sample per province

Province	Data	Total	MOS (average class size)	roh	Design effect	ESS=178	School sample
						Student sample calculated	
Western	students	72966	34.26	0.25	9.31	1658	50
	classes	2130					
Central	students	38862	27.16	0.25	7.54	1342	51
	classes	1431					
Southern	students	38788	30.11	0.25	8.28	1474	51
	classes	1288					
Northern	students	22617	26.24	0.25	7.31	1301	51
	classes	862					
Eastern	students	32774	28.72	0.25	7.93	1412	51
	classes	1141					
North Western	students	36333	29.52	0.25	8.13	1447	51
	classes	1231					
North Central	students	18145	26.68	0.25	7.42	1321	51
	classes	680					
Uva	students	21090	26.70	0.25	7.42	1321	51
	classes	790					
Sabaragamuwa	students	28103	28.76	0.25	7.94	1414	51
	classes	977					
Total						12690	458

Table 2.4 illustrates calculated student sample, allocated student sample and achieved student sample by provinces.

Table 2.4: Calculated, allocated and achieved student sample per each province

Province	Calculated Student Sample	Allocated Student Sample as MOE Student Database	Achieved Student Sample				
			TIMSS	First Language		Mathematics	English language
				Sinhala language	Tamil language		
Western	1658	1802	1613	1448	150	1599	1613
Central	1342	1470	1227	772	463	1235	1227
Southern	1474	1604	1323	1301	60	1360	1348
Northern	1301	1440	811	37	766	803	812
Eastern	1412	1533	1355	254	1108	1364	1358
North Western	1447	1601	1378	1195	197	1394	1378
North Central	1321	1482	1306	1166	148	1310	1297
Uva	1321	1448	1247	1011	216	1241	1246
Sabaragamuwa	1414	1642	1342	1217	101	1368	1342
	12690	14022	11602	8401	3209	11674	11621

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 4 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

As in the 2007 study, five achievement tests were used in the 2009 study, as instruments to assess student achievement.

The construct assessed in these studies had been the essential learning competencies, that were expected to be achieved by grade four students, at the end of Key Stage II. Based on these competencies, Table of specifications was prepared for each subject to maintain content validity.

In the 2007 study, an additional paper, constructed using 25 items, selected from the 1995 and 2003 version of the Trends in International Mathematics and Science Study (TIMSS), was also administered.

In 2009, the Sri Lankan version of TIMSS was revised to include 40 items. This test also conformed to the same framework adopted by TIMSS and it also included items from the 2007 version of TIMSS. The 40 test items covered 19 subject areas/units out of 20 in the grade 4 Mathematics curriculum in Sri Lanka. Although Roman numerals are a content area in the Sri Lankan curriculum, since it is not included in the original versions of TIMSS this area could not be tested. On the other hand, although decimals are a content area in the TIMSS, it was not included in the Sri Lankan version as it is not a content area in the Sri Lankan curriculum. The items selected were translated to the first language of the students - Sinhala and Tamil. A detailed Table of specification for the Sri Lankan version of TIMSS is given in annexure 2. Table 2.5 illustrates the subject wise competency items included in the achievement tests

Table 2.5: The content of Achievement Tests and their distribution in the papers

Subject	Skills	No. of Questions	Que. Numbers on the papers
Sinhala language	Vocabulary	10	1,2,3,4,5,6,7,8,9,10
	Comprehension	11	11,12,13,14,15,16,17,18,19,20,21
	Syntax	10	22,23,24,25,26,27,28,29,30,31
	Writing	9	32,33,34,35,36,37,38,39,40
Tamil language	Vocabulary	07	1,2,3,4,8,9,10
	Comprehension	11	11,12,13,14,15,16,17,18,19,20,21
	Syntax	13	5,6,7,22,23,24,25,26,27,28,29,30,31
	Writing	09	32,33,34,35,36,37,38,39,40
English language	Knowledge	12	1,2,3,4,5,6,7,8,9,10,11,12
	Comprehension	15	17,18,19,20,21,22,23,24,25,26,27,28,29,30,31
	Syntax	11	13,14,15,16,32,33,34,35,36,37,38
	Writing	2	39,40
Mathematics	Concepts	12	1,3,14,18,21,22,23,25,27,29,31,40
	Procedures	15	5,9,11,12,13,16,17,19,20,26,30,34,35,37,38
	Problem Solving	13	2,4,6,7,8,10,15,24,28,32,33,36,39
TIMSS	Knowing	16	1,2,3,4,6,10,11,12,14,16,18,22,26,27,28,30
	Applying	16	5,7,8,13,15,17,19,21,23,24,32,33,34,37,38,39
	Reasoning	09	9,20,25,29,31,35,36,40_1,40_2

2.5 Achievement tests

The tests in Sinhala language, Tamil language, English language and Mathematics were the same as those used in the two previous studies.

Mathematics test consisted of 40 multiple choice questions with four options. The three language tests - Sinhala, Tamil and English consisted of 40 items of different types such as multiple choice, matching activities, completion of sentences and writing simple sentences.

The Sri Lankan version of TIMSS consisted of, 40 items of multiple choice questions and short answer response questions.

2.6 Procedures in administration of the National Assessment 2009

Execution of the National Assessment of Achievement includes three major activities, such as training of Zonal Directors of Education, distribution of relevant documents and test papers and conducting the test.

NEREC organized its training workshop for Zonal Education Officers on 05th, 06th and 07th of May 2009. Zonal Education Officers were given training at three national level seminars conducted by NEREC, based on a manual specifically prepared for this purpose. These Zonal Education Officers, in turn, provided the necessary training to Deputy and Assistant Directors who were in charge of distribution of test papers and collection of answer scripts, and to 458 principals and 458 assistant teachers who were responsible for test administration in selected schools. The Team Leader and members of the research team participated as resource persons.

A special training programme was organized in the Jaffna district with the help of Additional Provincial Director of the Northern Province. Five Zonal Education Officers, Deputy/Assistant Directors, principals and teachers participated in this programme.

In addition, 458 monitors were appointed by the NEREC to closely observe the administering of the test according to the given time table. A special journal incorporating instructions was prepared and distributed among monitors.

The tests were carried out through out the Island, on two week days, on 21st and 22nd of May 2009. Because of a national level celebration held on 22nd in the Western Province, a few schools in Colombo and Sri Jayawardhanapura zones were able to carry out the test only on the 25th May 2009.

Due to the addition of the short tests for each subject and TIMSS containing 40 questions, it was not feasible to hold four tests on the same day. Hence, tests were administered on two working days.

The districts such as Mullativu and Killinochchi, could not participate in the test due to mass displacement of people and they being in IDP camps. NEREC made several attempts to discuss this issue with the officer in charge for education of the displaced children, to find out the possibilities of conducting the test on the due dates. However, the answer was negative. As a result, 3 schools from Mullativu District, 15 schools from Killinochchi District and one school from Thunukkai could not participate in the test.

Given below are some of the measures that were adopted in the 2009 study, which were expected to increase the reliability of the assessment.

- The tests were administered on two weeks days
- In order to better monitor the administering of the tests, in the 2007 study, 434 independent monitors were appointed to the 458 examination centres. These monitors were students of the Faculty of Education, teachers following Post Graduate Courses. However, only 352 monitors had actually performed the task assigned to them.
- As mentioned above, the monitors had to complete a journal in which they had to provide information regarding the conduct of the examination. (Annexure 3)

2.7 Analysis of data

Data gathered through the achievement tests were analysed on a national and provincial basis. In order to minimize the effect of the discrepancy between the expected and the achieved sample, data was weighted.

Patterns and trends in learning achievement was discussed using mean, standard deviation, frequency polygon and skewness.

2.8 Summary

The National Assessment of Achievement of grade 04 pupils of Sri Lanka in the year 2007, was conducted with the main objective of examining, how far equity is promoted in the country, by enabling all children to access and complete basic education.

This chapter elaborated the specific objectives of the study, sampling procedures and the frame work of the assessment.

The next chapter will present the data pertaining to student achievement in order to identify the patterns and trends in their performance.

