# Chapter Two
# Methodology

## 2.1 Introduction

As mentioned in chapter 1, the National Assessment of Achievement of Grade 04 Pupils in Sri Lanka was conducted in 2013.

This chapter elaborates the methodology adopted in the 2013 study which was slightly different from the two previous studies conducted in 2007 and 2009 as new instruments were constructed for this purpose.

## 2.2 Objectives of the study

In accordance with the Education Sector Development Framework Programme (ESDFP 2012-2016) and the Development of Education plan through sector wide approach, the main objective of the study was to:
Assess the performance of students completing Grade 04 in the year 2013 in Sri Lanka.

### 2.2.1 Specific objectives of the study

2.2.1.1 Assess the learning outcomes achieved by Grade 4 students.

2.2.2.2 Identify the areas of strengths and weaknesses of student achievements in relation to subject content and related skills.

2.2.23 Examine differences in levels of achievement of Grade 4 students based on school type, medium, gender and location.

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).

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 2013 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 database for the year 2010 June) was the sampling frame used for the study.

Although private schools also provide primary and secondary education, they are not controlled by the government. However, they follow the local curriculum set up by the Ministry of Education in either Sinhala or Tamil or English. In addition there are a few international schools which also provide primary and secondary education. These schools are also not included in the sampling frame. Accordingly, as Table 2.1 indicates the desired target population of the study was 345430 pupils who completed grade four in 2013 from 9777 government schools.

However, in selecting the final sample certain schools and consequently a 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 04 of the available MOE database were considered as extremely small size schools. Such schools had been excluded from the sample in the previous study as well. Table 2.1 illustrates school level exclusions by provinces.

As a result of the exclusion of 6.00% of extremely small schools from the desired target all island school population, 1.84% 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 | 1333 | 102 | 7.65% | 79913 | 900 | 1.13% |
| 2. Central | 1461 | 93 | 6.37% | 46344 | 800 | 1.73% |
| 3. Southern | 1094 | 87 | 7.95% | 43368 | 850 | 1.96% |
| 4. Northern | 930 | 89 | 9.57% | 20346 | 890 | 4.37% |
| 5. Eastern | 1021 | 27 | 2.64% | 32198 | 570 | 1.77% |
| 6. North Western | 1215 | 54 | 4.44% | 41851 | 500 | 1.19% |
| 7. North Central | 777 | 35 | 4.50% | 41851 | 500 | 1.19% |
| 8. Uva | 837 | 25 | 2.99% | 25003 | 755 | 3.02% |
| 9. Sabaragamuwa | 1109 | 75 | 6.76% | 33228 | 650 | 1.96% |
| **All Island** | **9777** | **587** | **6.00%** | **345430** | **6365** | **1.84%** |

### 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 | 1231 | 78813 |
| 2. Central | 1368 | 45544 |
| 3. Southern | 1007 | 42518 |
| 4. Northern | 841 | 19456 |
| 5. Eastern | 994 | 31628 |
| 6. North Western | 994 | 31628 |
| 7. North Central | 742 | 22929 |
| 8. Uva | 812 | 24248 |
| 9. Sabaragamuwa | 1034 | 32578 |
| | **9190** | **339065** |

### 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 multi-stage 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., 2005). Then in the second stage, a group of students was selected from the sampled schools. Cluster sampling approach was the strategy used for selection of students from grade 04 classes. This means that an entire grade 04 class from each sampled school was selected.

In selecting the sample for the present study, as in the two previous studies, 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 Ministries of Education have a key role in planning, implementing and monitoring educational plans. Medium of instruction (Sinhala or

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**

| PROV | Data | Total | MOS (average class size) | roh | Design effect | ESS=178 student sample calculated | School sample |
|---|---|---|---|---|---|---|---|
| Western | students | 78813 | 33.623 | 0.25 | 9.1558234 | 1630 | 49 |
| | classes | 2344 | | | | | |
| Central | students | 45544 | 25.19 | 0.25 | 7.0475664 | 1254 | 50 |
| | classes | 1808 | | | | | |
| Southern | students | 42518 | 27.826 | 0.25 | 7.7064791 | 1372 | 49 |
| | classes | 1528 | | | | | |
| Northern | students | 22929 | 23.835 | 0.25 | 6.7086798 | 1194.145 | 50 |
| | classes | 1008 | | | | | |
| Eastern | students | 31628 | 23.942 | 0.25 | 6.735617 | 1199 | 50 |
| | classes | 1321 | | | | | |
| North Western | students | 41351 | 25.861 | 0.25 | 7.2151345 | 1284 | 50 |
| | classes | 1599 | | | | | |
| North Central | students | 22929 | 23.835 | 0.25 | 6.7086798 | 1194.145 | 50 |
| | classes | 962 | | | | | |
| Uva | students | 24248 | 23.182 | 0.25 | 6.5454111 | 1165 | 50 |
| | classes | 1046 | | | | | |
| Sabaragamuwa | students | 32578 | 24.276 | 0.25 | 6.818927 | 1214 | 50 |
| | classes | 1342 | | | | | |
| Total | | | | | | *11305* | 449 |

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 | Science | Mathematics | English |
| Western | 1630 | 1934 | 1758 | 1754 | 1760 | 1759 |
| Central | 1254 | 1814 | 1699 | 1699 | 1704 | 1688 |
| Southern | 1372 | 1957 | 1813 | 1812 | 1844 | 1843 |
| Northern | 992 | 1284 | 1192 | 1186 | 1201 | 1205 |
| Eastern | 1199 | 1436 | 1336 | 1333 | 1305 | 1306 |
| North Western | 1284 | 1720 | 1630 | 1630 | 1610 | 1609 |
| North Central | 1194 | 1702 | 1577 | 1576 | 1564 | 1563 |
| Uva | 1165 | 1503 | 1390 | 1390 | 1393 | 1395 |
| Sabaragamuwa | 1214 | 1861 | 1753 | 1754 | 1768 | 1769 |
| | **11304** | **15211** | **14148** | **14134** | **14149** | **14137** |

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 Achievement tests

The tests in first languages- Sinhala and Tamil, the second language – English, and mathematics, were designed using the framework for each subject.

Test construction was done by a panel appointed for each subject. Table of specifications were prepared by reviewing the curriculum materials and considering the Essential Learning Competencies (ELCs) and sub skills for each subject. Four parallel papers were constructed for each subject maintaining the content validity through the table of specifications.

These four papers were pre tested in 10 Sinhala medium and 04 Tamil medium schools in the Western province. Pilot testing was conducted on 31st July and 01st August 2013.

After the item analysis, one paper for each subject was designed selecting items within the facility values ranging from .4-6.5 and in consultation with the subject panel.

Structure and the number of test items for each paper depended on the subject. While the mathematics paper consisted only selective type questions, the English language and first language papers consisted of both selective and supply type items.

Mathematics test consisted of 40 multiple choice questions with four options. The English language paper consisted of 35 items of different types such as multiple choice, matching activities, completion of sentences and writing simple sentences.

In addition to mathematics, first language and English language, an additional paper the Sri Lankan version of the TIMSS, was also administered. This paper was constructed in 2009, using 40 items from the Trends in International Mathematics and Science Study (TIMSS) framework compatible with the Sri Lankan curriculum. As this paper was used only once to assess achievement levels, the same test paper was used in the 2013 study as well.

The Sri Lankan version of TIMSS consisted of 40 items of multiple choice questions and short answer response questions. The achievement in TIMSS could be analysed in a separate report.

## 2.5 Framework for the national assessment

Content of the achievement tests and their distribution in the papers are given in Table 2.5.

**Table 2.5: Content of the achievement tests and their distribution in the papers**

| Subject | Sub skill | No. of Questions | Duration |
|---|---|---|---|
| Sinhala Language | Vocabulary | 10 | One hour |
| | Comprehension | 11 | |
| | Syntax | 10 | |
| | Writing | 9 | |
| Tamil Language | Vocabulary | 10 | One hour |
| | Comprehension | 11 | |
| | Syntax | 10 | |
| | Writing | 9 | |
| English Language | Vocabulary | 12 | One hour |
| | Comprehension | 15 | |
| | Syntax | 11 | |
| | Writing | 2 | |
| Mathematics | Concepts | 12 | One hour |
| | Procedures | 15 | |
| | Problem Solving | 13 | |
| TIMSS | Knowing | 16 | One Hour and 15 minutes |
| | Applying | 16 | |
| | Reasoning | 08 | |

In deciding on the questions for different sub skills the Essential Learning Competencies (ELC) to be achieved at the end of key stage 2 were also considered.

## 2.6 Procedures in administration of the national assessment 2013

National Assessment of Grade 04 students was administered island wide on 3rd and 4th of December, 2013.

### Test coordinators

Coordinators to administer the test from 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. The services of lecturers from Jaffna, Batticaloa, Addalachchenai Colleges of Education and Project Officers from National Institute of Education were also obtained. To assist them, experienced teachers from the same schools were appointed with the

consent of the principals. Coordinators' contribution in the process of test administration and other activities involved were very much appreciated.

## Training workshop for coordinators

Training workshops for coordinators were organized in three phases. A team representing NEREC visited the Northern region from 25th – 29th November and conducted the training workshops in Anuradhapura, Vavuniya, Kilinochchi, Jaffna, Trincomalee, Batticaloa and Polonnaruwa. Test papers and other relevant documents were handed over to all coordinators with necessary instructions.

The team who visited the Phase II covered the Uva and Southern provinces from 25th – 27th November 2013. Another group of team members conducted the training programme at Bandarawela, Monaragala, Hambantota and Galle.

In Phase III, the training workshops were held at the NEREC for four provinces Western, Central, North Western and Sabaragamuwa on 28th and 29th November 2013.

The following measures which were expected to increase the reliability of the assessment, were adopted in this study as well.

- In order to assess the achievement of grade 4 pupils who completed grade 4 in 2013, tests were held at the end of the academic year 2013
- The tests were administered on two week days.
- In order to better monitor the administering of the tests, in the 2013 study 449 independent coordinators were appointed to the 449 examination centers.
- The coordinators had to complete a journal in which they had to provide information regarding the conduct of the examination and the collection of other relevant background information.

## Test administration

All necessary instructions were sent in advance to all Provincial Directors, Zonal Directors and relevant school principals regarding the test administration. The test was administered on 3rd and 4th of December 2013, as per the time table prepared by NEREC.

**Return of answer scripts and other documents**

Coordinators from Central, Southern, Western, North Western, Subragamuwa and Uva provinces handed over the answer scripts and other documents to the NEREC from 08th to 20th December 2013. A team from NEREC visited the North Central, Northern and Eastern provinces to collect answer scripts and other documents from 18th to 23rd December 2013.

## 2.7 Analysis of data

Data gathered through the achievement tests were analyzed 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 in learning achievement was discussed using measures of central tendency (mean, standard deviation and median) error of mean, skewness, cumulative percentages and percentile ranks. In addition, graphs, frequency polygon and boxplots were also used.

## 2.8 Summary

The National Assessment of Achievement of Students Completing Grade 04 in Year 2013 in Sri Lanka 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 framework of the assessment.

The next three chapters will present the data pertaining to student achievement in relation to the three subjects – First language – Sinhala and Tamil, second language – English, and mathematics.