



## CHAPTER TWO

### 2.0 RESEARCH METHODOLOGY

#### 2.1 Introduction

This chapter outlines the methodology of the study focusing on research design, population, sample and sampling procedures, study instruments, data collection and data analysis procedures.

## 2.2. Research design

This study adopted a survey research design because it allows for data collection from wide geographical coverage, and a large sample as dictated by the nature of NASMLA. In addition, the survey design entails the study of situations in their natural settings without manipulation of variables.

## 2.3 General and Target Populations

The study population was derived from the sampled primary schools from all the eight provinces. The primary school section consists of 3 distinct levels namely lower primary (1-3), mid primary (4-6) and upper primary (7-8). In assessing learning achievement, it is important to capture the completion of each of these 3 levels. Pupils who had completed class 3 and were in the first term of their fourth class formed the target population for NASMLA study. The lower primary classes provide the foundation of the development of numeracy and literacy skills, hence impacting subsequent levels of learning.

The class 3 Literacy and Numeracy teachers formed part of the target population. Also included were the Headteachers of the sampled schools.

The defined target population was derived from public and private primary schools with the exception of special needs schools as well as those with an enrolment of less than 15 pupils in class 3.

## 2.4 Study sites

Schools with the defined target population were obtained from the Education Management Information System (EMIS) database at the Ministry of Education Headquarters. The sample of schools was generated using the Sample Design Manager-SAMDEM (Sylla, K. et al 2003) which is a specialized software system that enables generation of a range of sampling options, which satisfy the statistical accuracy as set down for the study. At the same time SAMDEM addressed the logistical and financial realities of this study. In addition the software helped to address issues of variation in sample size when schools were selected with equal probability by employing the Probability Proportional to Size (PPS) sampling.

## 2.5 SAMPLE SIZE AND SAMPLING PROCEDURES

### 2.5.1 Selection of Schools

At the time of the study there were 156 districts in Kenya's 8 provinces. It was from these districts that a total of 328 schools were sampled as detailed in **Table 2.1**. Rift Valley, which is the largest province with the largest number of districts provided the highest number of schools (95) while Nairobi which is the country's metropolitan capital city and the smallest province provided the least number of schools (8).

**Table 2.1: The distribution of the sampled schools by province**

|   | Province      | Districts  | Number of schools |           |            |
|---|---------------|------------|-------------------|-----------|------------|
|   |               |            | Public            | Private   | Total      |
| 1 | Coast         | 12         | 25                | 2         | 27         |
| 2 | Central       | 12         | 25                | 4         | 29         |
| 3 | Eastern       | 30         | 55                | 5         | 60         |
| 4 | Nairobi       | 4          | 6                 | 2         | 8          |
| 5 | Rift Valley   | 48         | 85                | 10        | 95         |
| 6 | Western       | 18         | 39                | 0         | 39         |
| 7 | Nyanza        | 22         | 47                | 1         | 48         |
| 8 | North Eastern | 10         | 22                | 0         | 22         |
|   | <b>Total</b>  | <b>156</b> | <b>304</b>        | <b>24</b> | <b>328</b> |

**Table 2.2: Sample of pupils by gender and province**

| Province      | Girls        | Boys         | Missing   | Total        |
|---------------|--------------|--------------|-----------|--------------|
| Coast         | 322          | 317          | 4         | 643          |
| Central       | 353          | 345          | 1         | 699          |
| Eastern       | 680          | 718          | 14        | 1,412        |
| Nairobi       | 99           | 100          | 1         | 200          |
| Rift Valley   | 1,118        | 1,184        | 8         | 2,310        |
| Western       | 474          | 491          | 4         | 969          |
| Nyanza        | 578          | 580          | 4         | 1,162        |
| North Eastern | 158          | 373          | 5         | 536          |
| <b>Total</b>  | <b>3,782</b> | <b>4,108</b> | <b>41</b> | <b>7,931</b> |

### 2.5.2 Selection of Pupils Within Schools

A stratified random sample of 25 pupils in each of the schools was selected to participate in the study. The stratified sample was generated to ensure proportional representation of boys and girls. This was done using the pupil information form that was compiled through the following steps:

- (i) Obtaining the class 4 attendance register;
- (ii) Assigning sequential numbers to all target pupils by gender;
- (iii) Locating the appropriate set of selection numbers from the table of random numbers by each gender;
- (iv) Using the appropriate set of selection numbers in the sampling frame generated through the SAMDEM to identify the 25 pupils.

A total of 7,931 pupils were sampled as indicated in **Table 2.2**. Rift valley had the highest number of pupils in the sample (2,310) while Nairobi had the lowest (200).

Boys and girls accounted for about 52% and 48% of the sample, respectively. Some pupils (41) did not provide sufficient information on their gender and though they were part of the sample, they were not included in analysis of gender-aggregated data.

### 2.5.3 Sampling of Teachers and Head teachers

Two or three teachers were purposively sampled in each school culminating to a total of 513 who participated in this study. These teachers were selected on the basis of teaching English and Mathematics in class 3. In cases where the same teacher taught both subjects in the same class, the teacher was selected.

A total of 328 head teachers participated in this study. They were purposefully sampled by virtue of being in the study schools. Head teachers are in charge of administration of schools and ensuring curriculum implementation, manage human, financial and physical resources, and are responsible for the implementation of Government policies in schools. Their participation in this study is imperative because of their knowledge of these issues.

## 2.6 Study Instruments

### 2.6.1 Item development

A team of researchers and education experts was constituted to construct research instruments. The development of the instruments was based on identified contextual factors relating to pupil learning, and which are known to influence achievement in literacy and numeracy competencies. The factors included crucial and manipulable variables such as time allocated to curriculum areas, syllabus content coverage and the availability of textbooks. Other factors included those relating to policy on the allocation of human and financial resources, training needs and other relevant strategic interventions.

### 2.6.2 Data Collection Instruments

This study utilized 6 instruments, namely 3 questionnaires, 2 tests, and an observation schedule. The following is a list of the instruments used in this study:

- (a) Pupil questionnaire
- (b) Teacher Questionnaire
- (c) Headteacher Questionnaire
- (d) School Observation Schedule
- (e) Literacy Test
- (f) Numeracy Test

The study also utilised several administrative documents to facilitate effective sampling and conducting of fieldwork. These included:

- a) Pupil Information Sheet
- b) School Information Sheet
- c) Data Collector Manual
- d) Guidelines For Report Writing

### 2.6.3 Development of Questionnaires

The 3 questionnaires developed targeted the pupils, class 3 teachers and head teachers of sampled schools. In addition to providing bio-data, the pupil questionnaire was designed to inform the conditions of learning at home and school. The teacher questionnaire dwelt on personal and professional characteristics, teaching

and learning conditions, as well as special needs issues. The Headteacher questionnaire also had items on personal and professional issues, but in addition it majored on school and human resource issues.

### 2.6.4 Development of Literacy and Numeracy Test Items

The literacy and numeracy test item instruments were developed by a team of researchers, curriculum specialists, and primary school teachers. Based on Blooms' Taxonomy, a table of specifications/test blue print that identified the skills domain to be tested in literacy and numeracy was used to guide the development of test items.

The preparation of the table of specifications involved identification of the content to be measured; decisions on the weighting to be allocated to various topics of the syllabus; identification of the abilities to be tested and the weighting to be given to each; and, determination of the total number of items in the test; and the type of test items, such as multiple choice or structured questions. The blueprints for the Literacy and Numeracy tests are shown in **tables 2.3.** and **2.4** respectively.

#### Literacy Test Blueprint

A total of 54 literacy test items drawn from 6 topics from the class 3 syllabus were developed. Their descriptions and numbers are presented in **Table 2.3.**

**Table 2.3: Literacy Test Blueprint**

|              | Theme/Topic             | Description of Competency   | Skill Level        | Number of Items |
|--------------|-------------------------|---|--------------------|-----------------|
| i            | Alphabet                | Ability to apply knowledge of the alphabet; Ability to spell words correctly  | Recall/knowledge   | 4               |
| ii           | Spelling and Vocabulary | Ability to match words with their meanings  | Recall/knowledge   | 6               |
| iii          | Sentence construction   | Ability to read and comprehend  | Comprehension      | 10              |
| iv           |                         | Ability to complete sentences using appropriate words; Ability to match different elements to form complete sentences | Analysis/synthesis | 10              |
| v            | Reading comprehension   | Read, comprehend respond to questions appropriately.  | Analysis/synthesis | 8               |
| vi           | Shapes and patterns     | Ability to identify and write down the names of given shapes.   | Application        | 8               |
| vii          | Numbers                 | Ability to read given numbers and write them in words.  | Comprehension      | 8               |
| <b>Total</b> |                         |   |                    | <b>54</b>       |

## Numeracy Test Blueprint

A total of 30 numeracy test items drawn from 5 topics in the class 3 syllabus were developed. Their descriptions and numbers are presented in **Table 2.4**.

**Table 2.4: Numeracy Test Blueprint**

|      | Topic                       | Description of Competency  | Skill level                   | Number of items |
|------|-----------------------------|--|-------------------------------|-----------------|
| i    | Numbers                     | Ability to recognize and identify place value  | Knowing                       | 1               |
| ii   | Operations on whole numbers | Ability to develop and use patterns in subtraction.  | Knowing                       | 2               |
| iii  |                             | Ability to subtract numbers not exceeding 99 horizontally.   | Problem solving               | 3               |
| iv   |                             | Ability to work out addition problems with sums up to 99 vertically without carrying.              | Solving routine procedures    | 4               |
| v    |                             | Ability to work out problems involving horizontal subtraction using missing numbers.               | Performing complex procedures | 2               |
| vi   |                             | Ability to add fractions with the same denominator involving eights.                               | Knowing                       | 2               |
|      | Operations of fractions     | Ability to identify the relationship between multiplication and division                           | Performing routine procedure  | 3               |
| vii  |                             | Divide up to 2 digit number by single digit numbers  | Problem solving               | 2               |
| viii |                             | Ability to divide up to two digit numbers by single digit number using basic multiplication factor | Performing complex procedure  | 2               |
| ix   | Measurement                 | Ability to work out additions involving conversions.   | Knowing                       | 2               |
| x    |                             | Ability to work out divisions in currency, litres  | Performing complex procedures | 3               |
| xi   | Geometry                    | Ability to recognize and identify different shapes   | Identifying different shapes  | 4               |
|      | <b>Total</b>                |  |                               | <b>30</b>       |

### 2.6.5 Pre-test and Piloting of the Data Collection Instruments

The developed research instruments were pre-tested in April 2007 in 5 schools in Nairobi. The aim of the pre-testing was to validate the instruments and the data collection procedures. The curriculum experts, test moderators and the research specialists used the pre-test reports to refine the research instruments as well as

to develop the manual for data collection. Thereafter a pilot study was conducted in 5 districts involving 25 schools, where further verification and audit of the assessment procedure was carried out. Using the Rasch analysis, an item analysis and reliability check was carried out after the main study. Details of the outcomes of these analyses are presented in chapter 6.



## 2.7 Main Study Data Collection Process

### 2.7.1 Training of Data Collection Personnel

A team of 24 Trainers facilitated a 5-day intensive training to 245 data collectors in 2 training centres. On average 3 or 4 data collectors from each sampled district who were trained on the techniques of data collection including focus group discussions (FGD), key informant interviews and self-administration of questionnaires. The training also covered modalities of visiting the sampled schools, engaging the administrators in explaining objectives of the exercise, in addition to ways of addressing logistical and administrative issues.

The training emphasised the need to ensure that data collection was conducted according to specified procedures to ensure that similar conditions were observed for questionnaire completion and testing for pupils, teachers, and school heads. This was to enhance validity of the data.

### 2.7.2 Data Collection Process

Under the supervision of senior researchers from the MoE and KNEC, teams of 3- 4 research assistants in each district were assigned to collect data from the sample schools. Field work was designed to take 3 days to ensure independence of responses. The first day was dedicated to preparation at the school level.

The preparation comprised of establishment of rapport with respondents and the sampling of pupil and teachers. In the second day, researchers administered the Literacy and Numeracy tests, as well as questionnaires to the sampled pupils. On the third day teachers and headteachers filled their questionnaires.

## 2.8 Data Capture, Processing and Analysis

The Census and Survey Processing System (CSPPro) Version 3.3 was identified as the computer programme for data capture and management for NASMLA. The software has been extensively used to capture and analyze survey data in many countries. The programme has in-built controls and procedures that enable accurate data capture. It enables double entry, conversion from and to different programmes, and also performs tabulations.

The data from CSPPro were thereafter transferred to Statistical Package for Social Sciences (SPSS version 12) for data cleaning, analysis and tabulation. The statistical analysis produced results in terms of frequencies and means which are described in the form of tables, bar-graphs and pie-charts.

In the analysis of pupils' competency levels, the Rasch analysis was used. Rasch analysis provides an item map, which is a chart of the item difficulties and pupil abilities on the same scale. This approach makes it possible to align the ability of pupils with the difficulty levels of test items. A cluster of test items forms the competency level and therefore provides the level of competency attainment linked to the pupils.

In determining the relative contribution of a variety of predictor variables to achievement, a multilevel analysis of the data was carried out using the Hierarchical Linear Modelling (HLM) Version 6 software. This enabled analysis of the relative contribution of factors at the personal, home, class, and school levels.