

**ANALYSING THE EFFECTIVENESS OF SELECTED
INTERVENTIONS ON SCHOOL RESOURCES FOR
IMPROVING QUALITY OF PRIMARY EDUCATION
IN KENYA**

by

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Abstract

This study examines SACMEQ policy suggestions and agenda for action on school resources and the impact of the policy interventions in Kenya's primary education system. The research dwells on the extent the school instructional materials support, a large scale investment, has contributed to quality in primary education. The Government did also implement targeted infrastructure improvement programme for improving pupil learning environment.

The Kenya SACMEQ I, II and III project data was used in this study that took place in 1998, 2000 and 2007 respectively. The school learning environment (SLE) and the School Instructional materials (SIM) variable scales were constructed using Item Response Theory technique. Descriptive and inferential analysis was used to explain level and trends of school instructional materials and the relationship to pupil learning outcomes in reading and mathematics among standard 6 pupils' across the provinces.

The findings of this study illustrate the importance of the SACMEQ policy suggestions that guided policy makers in formulating Free Primary Education (FPE) and Kenya Education Sector Support programme (KESSP). Primary schools had autonomy (based on guidelines) to manage school grants so as to improve pupils' access to adequate school instructional materials. The results depict that the level of school instructional materials was not sufficient, despite provision of large financial resources. In particular, standard 6 pupils in good learning environment were worse off 7 years later despite the 5 years of FPE implementation. Similarly, improvement of pupil learning achievement was not significant with fewer pupils attaining advanced competency skills in reading and mathematics. In other words, higher school resources did not necessarily translate to better performance for the standard 6 pupils. Kenya's primary education system was characterised of: ineffective mechanism in governance and accountability of school resource; and inadequate supervision to ensure pupils had sufficient access to school instructional materials.

Finally, strategies for effective implementation of school resources policy intervention were recommended. These includes: policy review and harmonization for learning achievement; research, monitoring and evaluation; resource mobilization and allocation for school development; capacity development for enhanced governance and accountability and; coordination, partnerships and collaboration. Further research was also proposed to be conducted to determine effectiveness of the interventions as at 2010.

Abbreviations

| | |
|--------|---|
| AIDS | Acquired Immune Deficiency Symptoms |
| CDF | Constituency Development Fund |
| CPD | Continuing Professional Development |
| DFID | Department for International Development |
| EFA | Education for All |
| ELN | English Language Norms |
| EMIS | Education Management Information System |
| ERS | Economic Recovery Strategy |
| FPE | Free Primary Education |
| GDP | Gross Domestic Product |
| GOK | Government of Kenya |
| HIV | Human Immune Deficiency |
| ICT | Information, Communication and Technology |
| IIEP | International Institute of Education Planning |
| IRT | Item Response Theory |
| KADU | Kenya African Democratic Union |
| KANU | Kenya African National Union |
| KCPE | Kenya Certificate of Primary Education |
| KDHS | Kenya Demographic and Health Survey |
| KESSP | Kenya Education Sector Support Programme |
| KIE | Kenya Institute of Education |
| KNBS | Kenya National Bureau of Statistics |
| KNEC | Kenya National Examination Council |
| KNLS | Kenya National Library Services |
| LATF | Local Authority Transfer Fund |
| MDG | Millennium Development Goal |
| MoEST | Ministry of Education, Science and Technology |
| MoE | Ministry of Education |
| MoU | Memorandum of Understanding |
| NASMLA | National Assessment for Monitoring Learner Assessment |
| NGO | Non-Governmental Organisation |
| NICE | Non-Governmental Organization Network of Initiatives for Computers in Education |

| | |
|--------|--|
| NRC | National Research Coordinator |
| OECD | Organization for Economic Cooperation and Development |
| ODM | Orange Democratic Party |
| PNU | Party of National Unity |
| PTE | Primary Training Education |
| QASO | Quality Assurance and Standards Officer |
| SACMEQ | Southern and Eastern Africa Consortium for Monitoring Education Quality |
| SAMDEM | Sampling Design Manager (later replaced by IIEPSAMP) |
| SbTD | School Based Teacher Development |
| SIM | School Instructional Materials |
| SIMSC | School Instructional Materials Selection Committee |
| SLE | School Learning Environment |
| SMC | School Management Committee |
| SWAp | Sector Wide Approach to planning |
| UIS | United Nations Educational, Scientific and Cultural Organisation Institute of Statistics |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| VFM | Value for Money |
| WCEFA | World Conference on Education for All |

Chapter 1 : Introduction

The study is a synthesis of data and information for education policy makers and implementers of selected policy suggestions on school resources and interventions. The results are to inform on the effectiveness of school resource interventions in improving quality in Kenya's primary education. In this chapter, the background, rationale, the problematic, research questions and objectives of the study are deliberated. Also, the methodology used, scope and limitation of the study are stated and finally the structure of the memoir is outlined.

1.1 Background

The theme of quality in education was consistently discussed in international forums undoubtedly as a reaction to emphasis placed on expanding primary education access to engaging inputs and processes for better learning outcomes. The World Conference on Education for All (EFA) in Jomtien in 1990 placed significant importance of learning achievement. In 2000, this was further reaffirmed when the EFA Dakar Framework for Action was adopted in the World Education Forum that took place in Dakar, Senegal. Clearly there was progress in basic schooling expansion but pupil performance was low and especially that even the minimum basic skills were not attainable. The outcome was that basic education did not fully translate into higher literacy rates in many developing countries. In particular, the high dropout rates observed and non-completion of the full primary education cycle illustrates that pupils do not acquire prerequisite basic literacy and numeracy skills. This adversely affects quality of human capital required towards a sustainable economic growth.

In Kenya, the introduction of Free Primary Education (FPE) in 2003 led to significant increase in enrolment of over one million pupils (MoEST, 2003). In the process, primary schools were characterised of inadequate infrastructure, teacher shortages and lack of adequate school instructional materials, among others. FPE was a big bang policy that lacked comprehensive facilitation of education institutions and hence the capacity challenges. To address the challenges, a stockholder's conference was held in 2003 that culminated in development of Sessional Paper No. 1 of 2005, a policy framework for the education sector, and subsequently preparation of the Kenya Education Sector Support Programme (KESSP). KESSP was a sector wide approach to planning (SWAp), based on the principles of joint financing mechanism and in the spirit of aid effectiveness. The Government and

Development Partners injected financial resources into 23 priority areas of investment in KESSP.

KESSP focused on delivering quality education and training to all Kenyans. In particular, key investment plans that addressed quality of education in KESSP were: school instructional materials, school infrastructure improvement, school health and nutrition, teacher management, in-service training, pre-service training, capacity building and quality assurance. Quality assurance had two components, that is, supervision and monitoring of learner assessment. The learning assessment was coordinated by the National Assessment Centre in the Kenya National Examination Council (KNEC). The centre is responsible for the National Assessment for Monitoring Learner Assessment (NASMLA) and facilitates the Kenya chapter of Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) project.

The SACMEQ project is a capacity building forum for education planners of the member state countries. The establishment of NASMLA centre benefited from SACMEQ with Standard 6 being one of the selected levels of assessment. The SACMEQ studies delivered benchmark data that informed education policy formulation and planning. The policy makers easily identified clear priorities and with political commitment led to sustained resource mobilization for FPE and KESSP interventions. The interventions were pro-poor programs with significant importance, first, to cushion majority of the Kenyan population (56 percent, Households in absolute poverty) from school levies and secondly, improve quality of primary education (KNBS, 2007).

1.2 Rationale of the Topic

Kenya recorded rapid increase in enrolment from 5.9 million in 2002 to 9.4million in 2009. However the investments in school resources in primary education did not match the participation levels and thus resulted to low retention rates and insufficient quality learning. The Government of Kenya invested heavily in education on several large scale investments such as the Free Primary Education, School Infrastructure improvement programme and economic stimulus package for model primary schools. The investments did not only address access but also included provision of quality primary education. This can be said to be a positive commitment in social investments especially in education by the Government.

According to the 2011 Economic Survey report (KNBS, 2011), education had several challenges. First, it reported primary education outputs of 65 percent for the FPE Grade 1 of 2003 who completed in 2010. Second, the low primary education output was further aggravated with reported low performance. The KCPE mean scores have remained below the average of 250 marks in the five subjects with slight increase or decline for the years 2002 to 2009. From the mean scores obtained it is very difficult to discern impacts of inputs into the primary education sector.

Since primary education outputs are an important gateway to secondary and tertiary education, the aspects of retention and achievement in primary education becomes an integral issue in the equation of economic development. Therefore, low successful primary education completion and poor learner achievement negates the target of ensuring adequate human manpower for Vision 2030 targets on skills development and achievement of EFA Goals on quality and equality.

Despite the Government's commitment in provision of resources there is no evidence of improved learning outcomes. The circumstances that led to ineffective quality learning resulting to low primary education outputs require investigation. In order to establish the issues, first and foremost, there is need to analyse the extent to which SACMEQ policy suggestions and agenda for action were addressed by the policy makers. The next step is to verify the extent to which school resources policy interventions implemented were effective and their influence on pupil learning outcomes.

1.3 The Research Problematic

Kenya introduced FPE in 2003 and put in place policies and interventions through SWAp, in 2005 so as to enhance access and improve quality of education. Although the measures resulted in massive increase in enrolment, they may not have translated into better learner outcomes as illustrated in the end of primary cycle national examination results and the national learning assessments, compounded by the facts that the EMIS data illustrates disparities, high dropout rates and many pupils do not complete the full primary cycle. Furthermore, lack of adequate opportunities for learners from disadvantaged communities' means that there is lower learning acquisition of the primary school going age population.

Worse still, even for those who have completed the full cycle may not have acquired the necessary skills.

The study, therefore, seeks to identify the challenges that exist, by analysing level and variation of selected school resources and pupil learning achievements. The analysis is based on conceptual framework on quality of education based on existing interventions on inputs and resulting outputs. The information shall answer the effectiveness of the policy intervention since magnitude of resources and the learning outcomes are determined. The Standard 6 pupils from SACMEQ studies form the source of the analysis. The findings represent the basis for suggested policy recommendations that would ascertain appropriate and effective interventions in the provision of quality primary education.

1.4 Research Questions

Concretely, the study answers the following questions:

- i. How the school resource issues were featured in SACMEQ I, II and III policy suggestions and agenda for actions and integrated into policy interventions from 2000 to 2009?
- ii. What are the trends and disparities of selected school resources in primary education?
- iii. What are the contributions of school resources towards learning outcomes in reading and mathematics for Standard 6 pupils?
- iv. What other factors influence reading and mathematics achievement for Standard 6 pupils?
- v. What are the constraints and challenges facing provision of quality primary education?
- vi. What are the policy recommendations for effective implementation of interventions that address quality in primary education?

1.5 Objectives of the Study

The following were objectives of the study:

- i. Review the SACMEQ policy suggestions and agenda for action in relation to school resources policy intervention for the years 2003 to 2009.
- ii. Analyse trends and disparities of selected school resources and their contribution to pupil learning achievement.

- iii. Examine the implication of the school resources attainment and the learning outcomes.
- iv. Analyse significant factors that influence the pupil learning achievement for Standard 6 pupils in Kenya.
- v. Identify constraints and challenges in the provision of quality education at primary level.
- vi. Recommend appropriate policy suggestions for effective implementation of interventions for provision of quality primary education.

1.6 Study Methodology

The study utilises mixed approach of qualitative and quantitative data presentation. The qualitative information is based on content analysis of policies, strategies and school resources interventions from various documents on primary education. The quantitative data involves use of both descriptive and inferential statistics techniques. These data were obtained from Kenya SACMEQ project databases for the years 1998, 2000 and 2007. The descriptive data analysis ensures the level and trends of the school resources in primary schools. The information is presented in the form of tables and figures so as to provide the differential in the education system on the basis of the school inputs. Also, the inferential analysis tools are used to determine the factors that influence learning outcomes.

The data collection for the SACMEQ databases was for Standard 6 pupils at country level in the 10th month of the academic year. This ensured that the pupils had covered sufficiently the Standard 6 curriculum during the study year. In order to have provincial comparison, SACMEQ project employed explicit and implicit stratification procedure on the sampling frame. The province was the explicit variable generating a list of schools while the 'school size' of standard 6 pupils was the implicit stratification variable (Hungu, et al, 2010). SACMEQ I data collection took place in 1998 covering 3,233 pupils from 185 schools sampled using the IIEP's SANDEM sampling software (Nzomo et al, 2000). In 2000, SACMEQ II was undertaken in 185 schools of 3,299 pupils (Onsomu et al, 2005). SACMEQ III study data was collected in 2007 from a sample of 193 primary schools involving 4,436 Standard 6 pupils across eight provinces in Kenya (Wasanga et al, 2011). In the three data sets, test construction was carried with each study having common test items for comparability of the learning outcome results. Eight levels of competency for reading and

mathematics were developed using Item Response Theory (IRT) analysis. The SACMEQ project provides regional benchmarks on quality of education for Kenya and 14 other primary education systems. The data analysed with the SACMEQ studies included; pupils' characteristics, teaching and learning process interaction, classroom resources, school infrastructure, resource allocation and reading and mathematics scores for pupils.

The study introduced two new scales of school resources based on SACMEQ I, II and III Kenya data: the first scale is on schools' learning environment (SLE) using a pool of physical facilities resource items and the second is the school instructional materials (SIM) based on a set of teaching and learning materials. The scales were constructed using Rasch technique based on the RUMM software. The IRT was used to analyse the reliability of the scale and investigate the fit of items. The SIM variable was identified as a proxy for the determining the results of the school grants investment on school resources and pupil learning outcomes.

1.7 Study Limitation

This study contributes to the evaluation of impact of large scale investment on the learning achievement in primary education. However, not all the variables that need to be analysed in the context of home and school environment are taken into consideration. A comprehensive review of the impact on quality of education would have required all the components of a quality framework. In this regard, the study makes use of only selected variables under SACMEQ I, II and III project on school instructional materials resources and learner achievements. The fact that SACMEQ III was carried in 2007 implies lack of information to determine the outcome at the end of KESSP cycle or pioneer FPE graduate (those who completed grade 8) in 2010. However, these data were adequate for use in the evaluation, for a mid-term impact selected school resource interventions under FPE and KESSP.

1.8 Structure of the Memoir

The memoir is divided into seven chapters that elaborate the approach taken in the research to obtain the study findings.

Chapter one: Introduction. The chapter presents the rationale for the study, research problematic, research objectives, study methodology and study limitations.

Chapter two: Socio-economic context and conceptual framework. The chapter describes the context of the country, Kenya, in terms of the political, geographical, economic and education profile. The conceptual framework sets the ground for understanding the concept of quality in education at primary level and identifies factors that influence pupil learning outcomes.

Chapter three: Existing policy suggestions and implemented interventions on school resources. The chapter is a discussion on selected policy suggestions and agenda for action on school resources that were identified in SACMEQ studies and the extent they were adopted in policy interventions in Kenya's primary education system implemented between 2003 to 2010.

Chapter four: Level and variation of school resources along a scale. The chapter is on data presentation and interpretation of selected school resources in primary schools using Kenya's SACMEQ I, II and III data. Item Response Theory procedure is used to create new variables that is a basis for explaining the standard 6 pupils' school learning environment and level of school instructional materials.

Chapter five: Relationship between pupil learning achievement and school resources. This chapter is about data analysis on pupil scores and competency in reading and mathematics based on correlation analysis and multi-linear regression of selected variables when considering the school learning environment and school instructional materials scale.

Chapter six: Analysing policy interventions on school resources and leaning outcomes. This chapter is a synthesis of school resources, effectiveness of the policy interventions and pupil learning outcomes.

Chapter seven: Summary, conclusion and policy recommendations. The final chapter of the study is a brief of the main findings, lessons and draws suggestion for future action by the education policy planners and implementers in policy interventions on school resources.

Chapter 2 : Socio-economic setting and conceptual framework for quality education

This chapter has two sections. The first section provides a detailed account of the socio-economic settings of the country. The country settings are important because any meaningful education policy research requires the interpretation of the context within which an education system is provided. The second section describes the conceptual framework of the study laying down guiding principles that determine quality of education at school level. The conceptual framework sets the stage to link large scale education sector interventions with school level data.

2.1 The setting: socio-economic background

This section sets the stage for analysis of the socio-economic background of Kenya. The discussion is based on the following context: historical background and socio-cultural context; geographical and demographic context; economy and employment; education policies, regulations and structure; and management and planning in education.

2.1.1 Historical background and socio-cultural context

Historical background

Since independence in 1963, Kenya has had relative peace with a strong centralised state and a dominant executive (Mueller, 2008)¹. Multiparty politics was introduced in early 1990s, with subsequent elections won by the KANU government. However, the opposition won unanimously in December, 2002 and a NARC government formed, promising to improve the economy with zero corruption tolerance and introducing Free Primary Education. In 2007/2008, the relative peace in Kenya was jeopardized. This was after the 2007 elections were contested by the Party of National Unity (PNU) and its main rival Orange Democratic Movement (ODM) party. The result was Kenya's worst election violence that led to about 1,350 deaths and over 350,000 persons displaced from their homes². The need for national cohesion and strong accountable governance led to accelerated referendum and enactment of

¹ At independence there were two major political parties; the Kenya African National Union (KANU) and the Kenyan African Democratic Union (KADU). In 1964, KADU which advocated the adoption of a system of regional federalism merged with KANU making Kenya a *de facto* one party state.

² However, calm was restored after rigorous peace initiative led by Mr Koffi Annan under the auspices of the African Union. The outcome was formation of a coalition government with PNU, taking presidency and ODM getting the position of Prime Minister

a new constitution in 2010. This transformed the country into a devolved governance system of 47 counties.

Socio-cultural context

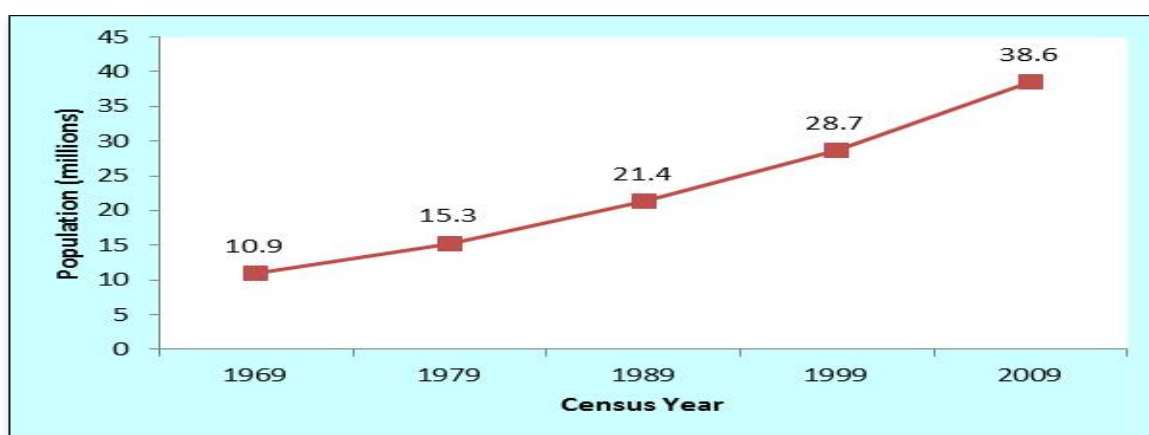
The country has a very diverse population comprising 42 ethnic communities that include three of Africa's major sociolinguistic groups: Bantu (67 percent), Nilotic (30 percent), and Cushitic (3 percent). A total of 80 percent of Kenyans are Christian, 10 percent Muslim, and 10 percent other faiths including traditional African religions. Hence, with the diversity, the official languages (English and Kiswahili) promote national cohesion and integration while local languages at community level preserve cultural heritage and values (Njoroge, 1991). The ethnic population groups live in varied settings of socio-economic activities ranging from agriculture in high potential areas to fishing in lake side regions and pastoralist in semi-arid areas.

2.1.2 Geographical and demographic context

Kenya occupies a strategic position in eastern part of the African continent providing linkage to the Indian Ocean to the land locked countries. The total land area is 582,650 km² with 569,250 km² of land and 13,400 km² being a water mass. The country had major physical features that are of tourist attraction. The country experiences an equatorial kind of climate in the central highlands, whereas along the coastline it is mainly tropical. Only 20 percent of the land is arable while remaining 80 percent is arid or semi-arid.

Kenya has experienced a fast population growth since independence; rising from 8.04 million in 1963 to 38.6 million in 2009. The inter censal population growth for 1989-1999 was 2.9 percent per year and 3.4 percent in 1979-1989 but declined to 2.8 percent in 1999-2009. Figure 2-1 illustrates the population trend while Table 2-1 presents the regional population distribution and adult literacy levels for the year 2009 and 2006 respectively.

Figure 2-1: Kenya's population trend during the census years



Source: Kenya National Bureau of Statistics, 2009

Table 2-1: Population and adult literacy rate by sex and province, 2009

| Province | 2009 Population | | | 2006 Adult Literacy Rate | | |
|---------------|-------------------|-------------------|-------------------|--------------------------|-------------|-------------|
| | Male | Female | Total | Male | Female | Total |
| Nairobi | 1,605,230 | 1,533,139 | 3,138,369 | 87.1 | 86.9 | 87.1 |
| Central | 2,152,983 | 2,230,760 | 4,383,743 | 75.7 | 71.0 | 73.3 |
| Coast | 1,656,679 | 1,668,628 | 3,325,307 | 72.2 | 57.5 | 65.1 |
| Eastern | 2,783,347 | 2,884,776 | 5,668,123 | 54.1 | 55.3 | 54.7 |
| North Eastern | 1,258,648 | 1,052,109 | 2,310,757 | 12.3 | 4.3 | 8.1 |
| Nyanza | 2,617,734 | 2,824,977 | 5,442,711 | 69.6 | 62.4 | 66.0 |
| Rift Valley | 5,026,462 | 4,980,343 | 10,006,805 | 60.0 | 53.1 | 56.5 |
| Western | 2,091,375 | 2,242,907 | 4,334,282 | 58.5 | 55.5 | 56.9 |
| Total | 19,192,458 | 19,417,639 | 38,610,097 | 64.2 | 58.9 | 61.5 |

Source: 2009 Kenya Population and Housing Census & 2007 Kenya National Adult Literacy Survey, KNBS

The adult literacy rate based on a national literacy skills survey in 2006 indicated that 64.2 percent of the male adults and 58.9 percent of female adults were literate and significant regional and gender disparities recorded. To improve on the literacy levels, the Government put in place mechanisms for strengthening adult and literacy programmes in the country. The Total Fertility Rate (TFR) of Kenya was 4.6 children per woman in 2008/09 compared to 4.9 children reported in 2002. This implies that fertility levels remain higher compared to other countries like Turkey with 2.5 births per woman (KNBS, 2010). The Crude birth rate was 48 per 1,000 in 1989 and declined to 34.8 per 1,000 in 2009. The crude death rate was 11 per 1,000 populations in 1979-1989 and increased to 12 per 1,000 in 1989-99. There infant mortality rate as at 1969 was 119 deaths per 1,000 live births and reduced to 52 deaths per 1,000 live births in 2009.

2.1.3 Economy and employment

The country's economic performance was below its potential in the 1980s, with low economic and employment growth and a decline in productivity. However, implementation of Economic Recovery Strategy (ERS) for the years 2003 to 2007 ensured stable macro-economic framework supported by appropriate structural and sectoral reforms. Throughout the ERS period, the value of exports grew faster than imports, with domestic export value increasing by 99.1 percent between 2002 and 2007. In 2002, the Value of domestic exports as a percentage of GDP was 12.7 percent and it increased to 14.8 percent in 2005. The value declined further to 14.4 percent in 2007. The inflation rate rose from 2002 mainly due to high crude oil prices on domestic costs and a world-wide food shortage, which led to increased prices. The food shortage was attributed to the long episodes of drought and flooding in different parts of the country.

During the ERS period 2.6 million jobs were created within the informal sector, poverty levels declined from 56.8 percent in 2002 to 45.9 percent in 2005/06 (KNBS, 2009). This improvement was attributed to implementation of economic and governance reforms, targeted poverty interventions, and increased funding to social sectors. The social sectors that benefited in increased public expenditure targeting pro poor programmes were education, health and infrastructure.

In 2003, The Gross Domestic Product (GDP) at market prices was 4.8 percent and rose to 8.3 percent in 2006. In the subsequent year of 2007 it dropped to 7.0 percent in 2007 (GOK, 2009). However, the situation changed after the Post-Election Violence and other factors, leading a drastic decline in GDP to 1.5 percent in 2008. Then the GDP rose to 2.8 percent in 2009 and further increased to 5.8 percent in 2010 following improved political situation and investor confidence (KNBS, 2011).

2.1.4 Education policies, regulations and structure

Since independence several education reforms have been implemented towards improving the provision of education and training. To this end, the Government commissioned three education reforms in 1964, 1976 and 1984 that formed the basis of key reform agenda. The Education Act that was enacted in 1970 established details of the institutional framework, registration and inspection of schools and examination of the education sector. A taskforce

also was formed in 2009 that was to review some of the legal framework with numerous conflicts, ambiguities and gaps on the governance of the education sector.

The Education Act is not explicit on the Minister's engagement of the parents, communities, sponsors, the civil society and the private sector in management of education and training. There are no laid down mechanisms to guide collaboration between the Minister of Education and the stakeholders. It only states that education institutions are under the management of Board of Governors (BOG) at secondary level and school management committee at primary level. According to the Education Act, the Minister is empowered to appoint school boards, declare a BOG corporate, suspend a board for impropriety and appoint an administrator to oversee a school if a board is suspended. On the other hand, the school committee is responsible for the overall management of schools under the jurisdiction of local authorities. They comprise representatives of local authorities, sponsors and members of local communities.

The current 8-4-4 system of education system in Kenya was revised in 1985 from the 7-4-2-3 system. It is a broad based curriculum that included technical and vocational education programmes. However, the primary and secondary curriculum subjects on pre-vocational skills and technical education did not receive adequate support. Coupled to that, there was a hue and cry about burdening learners with many examinable subjects. This necessitated Kenya Institute of Education (KIE) to undertake curriculum reviews between 2000 and 2005 that led to removal of vocational subjects in primary and secondary schools.

The Sessional Paper No 1 of 2005 is categorical on the Government's commitment to achieve the MDGs and EFA goals by 2015 as a signatory of international commitments. This was affirmed in the new 2010 constitution which stipulates the right to education for its citizens including compulsory basic education. Also, various education policies have embraced affirmative action to improve access opportunities in education and training.

2.1.5 Management and planning in education

In 2005, the Ministry of Education implemented a Sector Wide Approach to Planning (SWAp) under the 2005-2010 Kenya Education Sector Support Programme (KESSP). KESSP focused on the entire education sector through prioritized interventions. The

objectives of KESSP address the national policy agenda of the ERS and Sessional Paper No. 1 of 2005. The education sector SWAp was inbuilt into the Medium Term Expenditure Framework (MTEF) and the annual budgetary cycle. The target was to ‘operationalize’ the pro-poor programmes, as suggested in the strategy papers (MoEST, 2005).

The education sector partners held Joint Review Missions and Budget Workshop on annual basis. These forums were used to share experiences, monitor progress in the implementation and undertake budget reviews. At the end of the missions, an Aide Memoire, a communique that spelt agreed actions was prepared and was used as a basis for implementing the partnership principles and resource mobilization.

2.1.6 Participation and education Financing

The discussion presented is on the level of participation in primary education and education financing for the years 2000 to 2010.

Primary education participation

Primary schools enrolment increased by 28.8 percent from 5.9 million in 2000 to 7.6 million in 2005. The enrolment continued to increase to reach 9.4 million in 2010. Table 4 illustrates that the participation levels greatly improved. The GER and NER rose from 92.7 percent and 68.2 percent in 2000 to 109.8 percent and 91.4 percent in 2010 respectively. The rapid growth in enrolment is explained by the implementation of Free Primary Education (FPE) in 2003 that cushioned poor households from some of the costs in primary education.

Table 2-2: Selected primary education statistics and indicators

| Indicator | 2000 | 2003 | 2005 | 2008 | 2010 |
|--------------------|------------|------------|------------|------------|------------|
| Enrolment | 5, 926,964 | 7, 159,524 | 7, 602,511 | 7, 159,524 | 9, 381,211 |
| GER | 92.7 | 107.8 | 107.6 | 109.8 | 109.8 |
| NER | 68.2 | 84.3 | 83.2 | 92.5 | 91.4 |
| Transition rate | 43.3 | 43.3 | 56.2 | 64.1 | 72.5 |
| GPI (based on NER) | 0.97 | 0.95 | 0.94 | 0.96 | 1.02 |

Source: Education Statistical Booklets, 1999-2004& 2003-2007 and EMIS MoE Returns, 2011

Despite the significant growth in enrolment from the year 2003 to 2010, the primary education sector had out of school children at 8.6 percent as at 2010. The out of school children are as a result of: marginalised population; insecurity; poverty; and cultural factors among others. The primary education also faced severe shortages of teachers and classrooms among others and characterised of internal inefficiency due to high dropout and repetition

rates. According to EMIS data from the Ministry of Education, repetition rate declined from 9.8 percent in 2003 to 6.5 percent in 2010. There was a rise in dropout rate from 2.0 percent in 2003 to 4.9 percent in 2005. It thereafter declined to 3.5 percent in 2007 but rose to 5.0 percent in 2010. Primary pupil completion rate improved from 59.5 percent in 2000 to 81.0 percent in 2007 but declined to 76.8 percent in 2010. The data also showed that survival rate was low in 2010 at 59.8% as compared to 81.0 percent in 2003. The main reason is the overage FPE entrants who did never completed the cycle (KNBS, 2011).

Education Financing

Public provision of educational services faces budgetary constraints especially in the developing countries due to weak public resource collection capacity (UIS, 2011). The education budget is mainly financed by the Government in Kenya, as in most countries of the world. Table 2-3 presents information on education financing for the last five years. Over the years, the education sector had the highest expenditure as percentage of GDP at about 7.0 percent. The percentage of public education budget for education was 23.3 percent in FY 2006/2007 and declined to 18.0 percent in 2009/10, before increasing marginally to 20.2 percent in 2010/11. The share of education budget of GDP was 7.3 percent in 2006/2007 but declined to 6.7 percent in 2007/08 and thereafter increased to 7.6 percent in 2010/2011.

Table 2-3: Education budget, 2006/07 to 2010/11

| Expenditure | 2006/2007 | 2007/08 | 2008/09 | 2009/10 | 2010/11 |
|---|------------------|----------------|----------------|----------------|----------------|
| % of Education budget of Government Expenditure | 23.3 | 18.5 | 20.8 | 18.0 | 20.2 |
| % of Education budget as % of GDP | 7.3 | 6.7 | 6.7 | 7.0 | 7.6 |

Source: Ministry of Finance: Budget Estimates and Audit Accounts

The total recurrent and development expenditure in 2007/08 Financial Year (FY) for the education sector was KSh 123.6 billion (1.3 billion US), rising to KSh 195.0 billion (2.2 billion USD) in 2010/11 FY in the MoF budget estimates, 2010/11FY and Government audit reports. Analysis shows that in the 2010/11 FY, development expenditure was 9.7 percent while salaries that are reflected under general administration and planning constituted, 62.0 percent. The key reforms in the education sector that address access and equity are the implementation of Free Primary Education (FPE) and Free Day Secondary Education (FDSE).

KESSP benefited from basket funding contribution from the Government and Development partners between 2005 and 2009. The civil society, parents, corporate organization and the communities were expected to voluntarily support the primary schools within their ability. A total of KSh 161.0 billion (2.15 Billion US Dollars) was used in all the 23 various interventions during the period 2005 to 2010. Development partner contribution was KSh 22.26 billion (222 million US Dollars), accounting for 13.8 percent of the total KESSP operations budget (excluding salaries for the education sector).

2.2 Conceptual framework

Much has been said on the context of the education system and now the crucial aspect is bringing into focus the interest of the study. This section describes what is entailed in quality in education and presents the conceptual framework.

According to UNESCO, quality in education is a multifaceted dimension with no single definition. In order to introduce the conceptual framework, two levels of interventions for quality education in primary schools in Kenya are presented. The first level of discussion is education administration that is, on the policy intervention decisions and implementation by the education policy makers and the second level is the school administration, that is, in school we look at the process of resources available and the learning. The education administration level illustrates the scenario education planner's face in use of education information to implement evidence based policy decisions on school resources towards improving quality of education. The school administration level presents the factors that influence pupil performance at school level.

Therefore, the conceptual framework from this study is defined focusing on inputs and outputs connected to the selected policy interventions on school resources and the learning outcomes.

2.2.1 Why there is need for evidence based policy decisions?

Various studies indicate that educational planners around the world tend to mobilise huge resources to facilitate delivery of large scale educational inputs with the assumption that it would lead to improvement of educational outputs (Ross & Mahlck, 1990). However, there is need for education planners to use evidence to ascertain the level of educational inputs and

resulting outputs. In this case, the national assessment results deliver opportunity for exploitation of input-output model on functioning of education systems focusing more intensively on process of education.

A country's performance is judged based on the trends in the school output and subsequent outcomes as a result of the deliberate interventions based on the set objectives. It is for this reason that critical review of the system necessitates use of national assessment so as to evaluate the effectiveness of the interventions. Ross & Mahlck (1990) indicate that educational information and educational decision making for raising quality can be established through self-evident links. More evidently, analysis by Lockheed & Verspoor (1989) reported that to support teaching and learning at least some instructional materials are critical such as paper, writing instruments, blackboards, chalkboards and textbooks. Therefore, an education planner can now match the pupil performance with corresponding aspects of curriculum, textbooks, instructional strategies and teacher competencies. Where instructional are not adequate it is reasonable to raise quality through increasing these inputs.

An effective education system refers to the degree to which educational means or processes result in the attainment of educational goals, or outcomes'. In an educational organization, the term 'effective' is associated with the quality of education and includes efficiency, productivity and survival. Also based on an *input-process-output* systems model of education, effectiveness is therefore referred to as, the translation of *inputs* by means of *processes* into desired *outputs*'.

In order to determine the performance of the primary education system it is important that that data at school level is used. Enquiring about an effective education system is the same as undertaking an analysis of school effectiveness. School effectiveness basically means assessing the quality of education. In this study, therefore, the model adopted is based on a vision in which the nature of the *results* of the educational process is determined by a number of input factors as well as by other contextual factors.

The conceptual framework of this study limits itself to aspects of the input-output model that relate to school resources. An examination on the policy suggestions and agenda of action derived from SACMEQ I, II and III are used to analyse the policy interventions that deal with school resources. The interest is to see how the policy suggestions were adopted, formulated

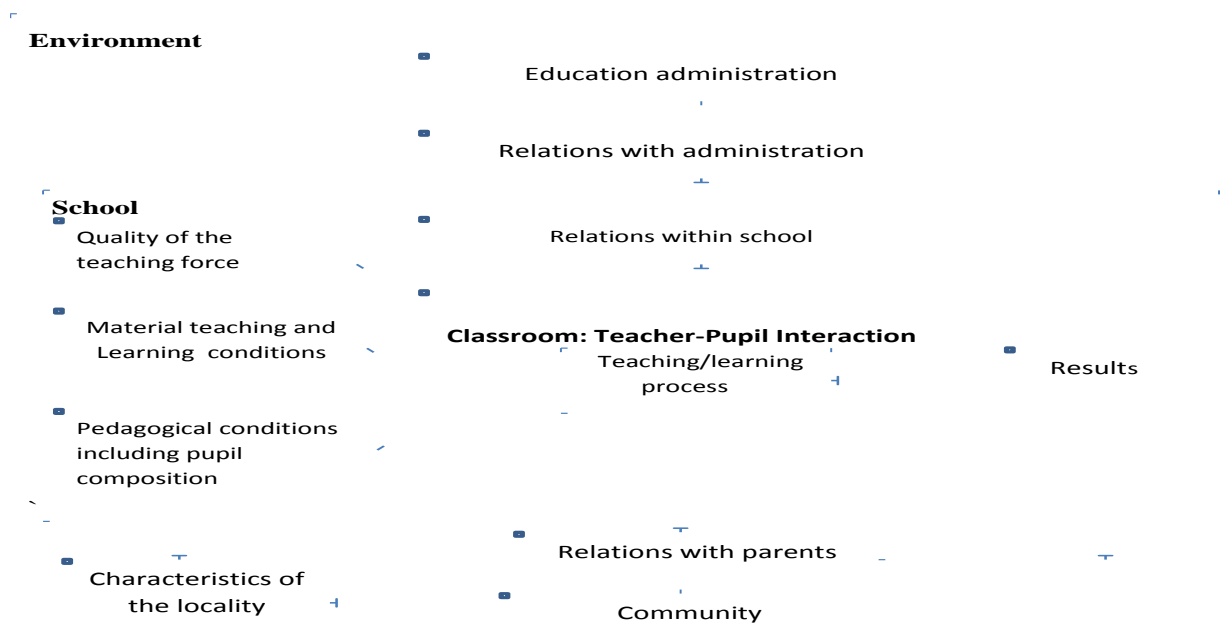
and implemented. This is then linked to input and output factors based on school resources and learning achievement based on the SACMEQ project for the years 1998, 2000 and 2007.

2.2.2 Functioning of a school

According to Gabriel and Chau (2007) in analysing performance at schools, a conceptual framework is therefore presented that looks at the factors influencing the functioning of a school and its interrelations. Figure 1 represents the conceptual framework that is useful to analyse school effectiveness. The functioning of a school is determined based on the factors that influence its performance. These factors include: context of environment; relationship with administration, relationship with parents; relations within school; teaching-learning materials, pedagogical issues including pupils, teaching and learning process and the results.

Context of environment: Analysis of the environment that influences the functioning of the schools shall help to understand the support schools receive from the state, community and parents. Such information is well under scored when we deliberate on: geographical context, demographic situation, economic activities, the social structure of the community, religious and language, health and nutrition, financing and educational development.

Figure 2-2: Functioning of the school



Source: Gabriel & Chau (2007)

Relationship with education administration: The management of the Kenyan education system is both vertical and horizontal reporting at various administrative levels. The school functioning is, therefore, influenced by the relationship between the head teacher and the districts, province and headquarter officials. The ability of the head teacher and the teachers to carry out their tasks is dependent on the pedagogical support, reporting regulation and standards; and quality of policy formulation, planning and management.

Relationship with parents: Parents have direct responsibility of the pupils and hence collaborate with the teachers and hence influence the school functioning. This will require analysis of the communication and support provided towards improving the education provision. They are represented in the school management committees and are expected to provide support when required.

Relationship within school: The characteristics of the head teacher and the leadership's skills are critical in addressing the relationship within school. The head teacher is responsible for quality assurance for ensuring that there is effective curriculum implementation

Material teaching-learning conditions: The functioning of a school is dependent on the availability and quality of infrastructure, equipment, pupil supplies and teaching materials.

Pedagogical Teaching and learning conditions: These conditions include the composition of learners in classroom, their gender, age, issues of absenteeism and repetition, and socio-cultural background. The organization of the classrooms like existence of multi-grade or multi-shift among others can also be considered.

Teaching learning process: The availability and quality of teaching staff in terms of their qualification, training and experience is also an important factor in the teaching process. Other aspects are competency, job satisfaction and motivation.

School Results: The results are the direct outcomes of teaching process leading to knowledge, skills, attitude and learners require surviving, improving living conditions and continuing learning. They are measured based on the reading and numeracy scored and skills acquired. The performance of the pupils and completion of the education cycle is the required school results.

2.2.3 Conceptual framework for effective policy interventions on school resources

The school is a unit that encompasses educational resources, that is, teachers, books, buildings, equipment and the students. According to Levacic (2005), “it is important that education planners have an understanding of the interaction of the education process other than a simple relationship between resource-level and pupil achievement”. In this way the priority policies are designed to ensure optimal allocation efficiency leading to higher returns of investments with effective utilisation of school resources.

In many developing countries you would find policy intervention on school resources may not be playing a role in helping pupils achieve desirable outcomes. In a study conducted in Brazil it was reported that, “there are positive effects of resource variation on pupil achievement, however, socioeconomic characteristics and previous ability show far more robust influence”. In Ghana, Glewwe (2002) identified large estimated impacts for some school inputs. However, the estimated effects were small and not statistically significant. According to Fuller (1987) improving school quality requires one to address the infrastructure and class size, teacher quality and availability of instructional materials. This was mostly seen to be true in low-income countries where in such instances there was increased pupil performance.

In this study, the angle of analysis taken is to relate policy interventions on school resources with the learning outcomes based on the input-output model. An evaluation of interaction between inputs and education process towards achieving the outputs and outcomes is incorporated. Table 2-2, illustrates the conceptual framework relating school resources inputs with education process interaction and learning outcomes.

Table 2-4: Conceptual framework on effectiveness of school resources interventions

| Policy interventions | School resources variables | Education process interaction | Learning outcomes |
|--|---|---|--|
| Teaching and learning materials | <u>Instructional materials</u> Textbooks Writing material Pen/pencil Teachers guide | Pupil interaction Teacher interaction | Reading pupil mean score Mathematics pupil mean score |
| | <u>School facilities</u> Classrooms Desks Benches Blackboard Library Cupboards Book corners | Curriculum supervision Parents interaction | Minimum competency level Desired competency level |

According to Burtless (1996), it is important to look at effective use of school resources. This is only possible when you look beyond simple resource policies by analysing elements of running a school system. In this way it is possible to create low investment policies that ensure optimal allocation and utilisation of school resources. The end result is that schools tend to have improved pupil learning outcome and hence satisfy parents and policy-makers. In most instances funding is a positive indirect variable to pupil achievement. However when making funding allocation decisions they are more directly related to pupil achievement. Learning therefore becomes the cause and resources facilitators or inhibitors of pupil learning achievement.

A favourable school learning environment is also important based on the minimum basic school facilities. Availability of sufficient infrastructure such as school building, water supply, electricity, library among others is strongly associated with pupils' attainment in reading and mathematics. It is noted that good schools have better working conditions for pupils and teachers, and their infrastructure is well maintained. In most instances parents and policy makers are more appreciative of schools with well-kept infrastructure (Fuller, 1987). According to KESSP, the Government of Kenya recognized the need for school infrastructure improvement to address the shortages of classrooms due the large influx of enrolment precipitated from introduction of FPE in 2003. However, it doesn't necessary mean that school with good buildings, size and does not necessarily mean a higher pupil achievement.

This conceptual framework provides the road map for the analysis presented on the policy interventions on school teaching and learning material, school learning environment and the pupil learning outcomes. The policy suggestions and agenda for action provide the necessary linkage to the expected policy interventions the Government of Kenya was to institute. The process of formulation, implementation, monitoring and evaluation is a key determinant of the gains made in the policy interventions.

2.3 Summary

The Government of Kenya has put emphasis on access, equity and quality in education through policy reforms, sector wide planning and sustained budgetary provision. Education accounts for over 20 percent of the budgetary provision and about 7 percent share of GDP. Large scale resources such as Free Primary Education and targeted KESSP interventions (pro-poor programmes) were designed and implemented. An effective education system therefore, ensures that acquired inputs are prudently utilised to achieve desired outputs.

The study conceptual framework considers the benefits of policy interventions by relating the level of school resources during education process interaction which culminates in pupils' learning outcome. This entails reviewing the policy interventions, the status of school resources and analysing the pupils learning achievement in specified school learning environment and existing teaching and learning materials.

Chapter 3 : Existing Policy Suggestions and Implemented Interventions on School

Resources

This chapter examines the three SACMEQ studies' policy suggestions that were made throughout and gives account of matching school resource interventions in primary education during the period 2003 to 2009.

According to the Government of Kenya's commission of enquiry conducted in 1998, it was noted that effective provision of primary education is the cornerstone for ensuring quality in education. The Government therefore had a responsibility to ensure that there was quality learning taking place in schools. This commitment was charted through implementation of free primary education, incorporating two objectives; increasing access and improving quality in primary education.

According to Saito (2007) educational efficiency requires more effective use of educational possessions especially given that Governments face limitation in resources. In 2005, KESSP, a sector wide approach to education planning was introduced covering the period 2005 to 2010. The goal was to reduce duplication, mobilise resources and common partnership between the Government and Development partners.

The sections below therefore explicitly interrogate the policy suggestions identified from SACMEQ studies and policy interventions on primary education school resources for the period 2000 to 2009.

3.1 Which are the SACMEQ policy suggestions and agenda for action on school resources?

There were three policy suggestions from SACMEQ I, seven from SACMEQ II and six from SACMEQ III which are analysed in reference to concerns on school resources. In this way we are establishing the process of interaction between education planners and policy makers' on priority concerns as raised in SACMEQ studies towards improving quality in primary education. The issue we need to find out is whether the Ministry of Education implemented policy interventions that address the policy suggestions.

3.1.1 SACMEQ I policy suggestions and agenda for action

SACMEQ I study was carried out in 1998 amidst an environment when process of education policy formulation lacked data on conditions of schooling. The study made available

baseline data on school resources, in particular; level of inputs, variation of inputs across regions and among schools, and relationship between school resources and learning achievement. A total of 40 policy suggestions were made in SACMEQ 1. Three of the policy suggestions concerning selected school resources are presented in Table 3-1. These policy suggestions have been broadly categorised under the following themes: Textbook and pupil reading culture; School inspection; and Monitoring and evaluation.

Textbooks and pupil reading culture

Two policy suggestions presented dwelt first on, pupils' access to reading materials to improve on comprehension and second, availability of reading materials. Pupil performance improves with clear interventions at school and good home environment. Hence, reading skills are an important tool that pupils need in learning process. Goodman (1980) asserts that learning to read involves almost simultaneous processing of ideas in written materials; the interpretation of the sentence patterns expressing these ideas and recognition of the words within the sentences. It is noted that reading comprehension can be a complex process. It requires that the reader constructs meaning. This involves interacting with text using previous knowledge and experience. However, you find that most pupils usually read books so as to pass exams. This implies that reading is considered for passing tests or exams and therefore such a person would stop reading.

According to Otike (2011), there are no policies in form of legislation, regulation or guidelines on promotion of reading habit in Kenyan primary schools. Though schools are mandated to promote a reading habit through lessons on how to use libraries, there are no guidelines on how to go about the activity. Conversely, several bodies that include KNLS promote reading culture among the citizens and especially school going children in the country. KNLS³ is mandated to encourage public access books and promote reading culture as a leisure activity. The National Book Development Council of Kenya promotes a reading culture in collaboration with other interested bodies including establishment of reading tents in strategic areas (Makenzi, 2004).

³ Empowered through the Kenya National Library Service(KNLS) as stipulated in the Board Act in Chapter 225 of 1986

Availability of textbooks received a boost since 2003 when the government introduced FPE to support public primary schools to acquire teaching and learning materials. However, the building and stocking of school libraries was left in the hands of schools, parents and the civil society. The Textbook unit has manuals for procurement and inventory of book issuance to pupils at school level.

The lack of a policy that gives emphasis on the promotion and cultivation of reading in schools is still an issue. This would have compelled collaboration between various concerned parties, such as schools, publishers, public libraries, curriculum developers among others.

School inspection

The third policy suggestion concerns the role of school inspection in monitoring the utilisation of textbooks in schools. In Kenya, school inspection is set up as a public education system supervision service, whose main task is to control and offer support to schools and teachers. The school inspection visits in Kenya were rare and did not serve the aim of providing guidance to the schools nor the teachers or parents or students. The inspectors were labelled as fault finding and because of that the Ministry decided to designate them as Quality and Assurance Standards Officers (QASOs). Whether or not such reform did touch the fundamental characteristics of the supervision system is yet to be verified.

Supervision visits is an important monitoring tool used by QASOs to undertake assessments of education institutions. The model used in supervisory visits involves a few selected schools with officers developing a close relationship with institutions; holding classroom observation, workshops and, discussions with teachers and school community. QASOs are not able to reach out to a large number of schools; hence not able to ensure effective textbook utilisation.

Research, Monitoring and Evaluation

The last four policy suggestions from SACMEQ I concern research, monitoring and evaluation targeting parental role in pupil homework, pupils' competency skills and school resources. An effective education system requires interaction of information, authority and vision of institutional or system success. The education system requires timely, accurate and reliable information on teaching materials (input), test scores (output).

Table 3-1: Policy suggestions and agenda for action in SACMEQ I on school resources and Ministry' Interventions

| | Policy suggestion | Responsible | Timeframe | Cost | Interventions |
|----|--|---|----------------------------|-------------|---|
| 1. | <p>Textbooks and pupil reading culture</p> <p>(a) Given that the availability of books is essential if children are to improve their comprehension, it is incumbent on educational authorities to ensure that children access books either through school or mobile libraries. This help is needed especially in Western and North Eastern provinces.</p> <p>(b) There is a disturbing dearth of reading materials in Kenyan primary schools. Given the known relationship between the availability of books and pupil performance, it is incumbent on the Ministry to remedy the situation regarding classroom libraries, being able to borrow books, and the existence of sufficient readers in schools</p> | Supplies branch | Long | High | Free Primary Education (FPE) programme |
| 2. | <p>School inspection</p> <p>The Ministry through the Inspectorate and relevant department should ensure effective utilisation of textbooks and other readers supplied to schools through various projects</p> | Inspectorate and school heads | Medium | Low | School quality assurance visits |
| 3. | <p>Research, monitoring and evaluation</p> <p>(a) The Ministry should institute an investigation in all the provinces except for Nairobi and Central in order to discover why the amount of homework being given is so little. The Ministry should then take steps to ensure that all pupils receive regular homework</p> <p>(b) The inspectorate should undertake a major investigation into why the reading skills of standard 6 pupils in Kenya are so poor in comparison with the minimum and desirable performance standards set down by the Kenya reading specialists.</p> <p>(c) As a matter of urgency the Ministry should instigate a census of all primary schools in order to ascertain the levels of teaching materials and classroom furniture and then take steps to ensure that all these basic supplies are made available to all schools</p> <p>(d) The Ministry should identify, through its data collection process, schools where standard 6 pupils do not have their own writing place and take action to address this need.</p> | <p>Planning Division</p> <p>Inspectorate and school heads Local communities</p> | <p>Short</p> <p>Medium</p> | Low | EMIS, Action Research and national assessment |

Source: Nzomo et al, 2001(SACMEQ I Report), EMIS Statistical Reports and KESSP-MoE

The Ministry recognizes the importance of EMIS, Monitoring and Evaluation and National assessment as key framework for collecting, analysing and publishing information on the education sector (KESSP, 2005). This programmes form key investment plans for research, monitoring and evaluation in education sector planning and management. However, the limitation is that the EMIS system is not robust in providing timely and accurate information that is useful for policy formulation and management in KESSP. However, there has been progress in implementing education evaluations, with adoption of a policy framework to undertake national assessments at grade 3 and 6 in primary education and Form 2 in secondary education (Kimani, 2006).

3.1.2 SACMEQ II policy suggestions and agenda for action

SACMEQ II study that was carried out in 2000 analysed data on school resources on level of inputs, variation of inputs across regions and among schools, and relationship between school resources and learning achievement. Table 3-2 presents six out of 65 policy suggestions for SACMEQ II on selected school resources. The identified policy suggestions have been broadly categorised under the following themes: school instructional materials; pedagogical skills; and Impact assessment and management audit.

School instructional materials

The three policy suggestions presented in SACMEQ II dwelt on three main areas of policy interventions: continued government commitments to support schools to procure school instructional materials; support for book storage facilities such as book box, or library or book corner; and pupils access to reading books at school and at home. According to KESSP, each enrolled pupil in public primary schools received, KShs 650 out of the Ksh 1,020 for school instructional materials. This was to enable the schools procure new textbooks and pupil ratios. The target for each school is to attain Pupil Book Ratio of 1:2 at upper primary and 1:3 in lower primary. The amount provided for school instructional materials was also to ensure replacement of textbooks.

The items to be procured were exercise books, pencils, dusters, chalk, registers, charts and wall maps. To address the issue of book storage, the government allocated Ksh 50,000 to each school in 2005, for a book corner (MoE, 2010). The aim was to ensure that the book storage facilities existed in classrooms to enhance pupils borrow. Among the strategies outlined in KESSP is to address issues related to textbooks was improving availability of

instructional materials; enhancing equity textbooks across provinces or socio-economic background and improving learning outcomes.

Pedagogical skills

All public primary school teachers in Kenya are trained. However, the quality of teachers is hampered by weaknesses in teachers' pedagogical content knowledge and classroom practice. In order to address learning outcomes, the government strengthened in-service training programme for teachers in pedagogical skills, intensified quality monitoring and teacher support and implemented English Language Norms (ELN) project (Gathumbi, 2003).

As a strategy to improve the pedagogical skills, the Ministry introduced continuing professional development (CPD) programmes for teachers. However, there has been little CPD emphasis on key curriculum areas that include early grade reading and mathematics. The school based management programme was carried from 2001 to 2005 targeting classroom teachers. It promoted quality and cost effectiveness of teaching and learning in by training teachers acquiring in new skills that are pupil centred. Teachers were also given training in textbooks use based on active and independent forms. In this way of learning it was possible to promote reading with critical thinking (Alexander, 2001). However, according to Bunyi (2011), there has been no serious effort to interrogate the concept of quality teachers and reviewing of Primary Teacher Education (PTE) curriculum to enhance quality of training and quality of teaching in the country.

Impact assessment and management audit

The last two policy suggestions presented in SACMEQ II dwelt on impact assessment studies and audit of school resources. The Ministry carried out baseline on learner achievements in 2005, midterm review of KESSP in 2008 and value for money audit in 2009. Other assessments carried were school-based Teacher Development (SbTD) and Mid-Term evaluation of KESSP. Monitoring of school instructional materials revealed that most schools had a Pupil book ratio of 1:2 or 1:3, although some schools recorded higher ratios in in upper primary and lower primary. It was also noted that school development plans are essential and continuous and effective capacity building of the SMCs are required. A value for money audit was also carried out to ascertain that all the funds were utilised in procurement of school instructional materials.

Table 3-2: Policy suggestions and agenda for action in SACMEQ II on school resources and Ministry Interventions

| | Policy suggestion on school resources | Responsibility | Timeframe | Cost | Interventions |
|----|--|---|-------------------------------|--|--|
| 1. | <p>School instructional materials</p> <p>(a) Through the free primary education programme, the government should continue fulfilling its commitment of providing basic learning materials (e.g., pens, pencils, erasers, exercise books, notebooks and rulers) to all pupils.</p> <p>(b) The MoEST should improve the supply of cupboards, bookshelves and libraries or book corners in all public primary schools, with special emphasis on the provinces with severe shortfalls.</p> <p>(c)The government should ensure that children have access to books through their schools or mobile libraries. Civil society organizations should also be encouraged to establish community libraries that allow children to borrow books.</p> | <p>Primary Division</p> <p>MoEST</p> <p>Provincial Directors of Education</p> | <p>Medium</p> <p>Short</p> | <p>Low</p> <p>High</p> <p>Moderate</p> | <p>FPE and Textbook Management Unit</p> <p>FPE</p> |
| 2. | <p>Pedagogical skills</p> <p>It is important that all the teachers in all provinces give homework in all subjects. This could help teachers in identifying mastery levels of curriculum content for individual pupils and consequently ensure remedial classes for the weak students</p> | <p>Inspectorate division</p> | <p>Short</p> <p>Medium</p> | <p>Low</p> | <p>School inspection</p> |
| 3. | <p>Impact assessment and management audit</p> <p>(a) The planning and development department, in collaboration with the inspectorate division to carry out an impact assessment survey in primary schools with a view of establishing the impact of major programmes including the SbTD, provision of textbooks and capitation grants to schools, among other initiatives, on quality outcomes such as pupil learning achievements</p> <p>(b) The MoEST Planning and Development department should undertake a school audit in all schools to establish supply of resources, including library facilities</p> | <p>Planning and development department</p> <p>Inspectorate division</p> | <p>Short</p> | <p>Moderate</p> <p>Low</p> | <p>KESSP Impact studies</p> <p>KESSP: Value for money Audit</p> |

Source: Onsomu et al (SACMEQ II, 2005) and KESSP, MoE

3.1.3 SACMEQ III policy suggestions and agenda for action

In SACMEQ III, eight out of 63 policy suggestions on selected school resources are presented in Table 3-3 below. The policy suggestions have been broadly categorised under the following themes: Management, governance and accountability; Community and parental support; and Effective schools and e-learning.

Management, governance and accountability

The Ministry developed guidelines used at school for procurement of school instructional materials and issue of textbooks. The programme was designed to include identification of key risks and institutions of controls to manage them. Further, the system engaged the private sector - banks and commercial in disbursing funds and then also publishers to publish and distribute textbooks. However, the programme faced several weakness, that include: loss of textbooks through wear and tear, theft vandalism and natural disasters; lack of textbook funding policy; weak performance monitoring system; lack of regular schools audits and quality assurance visits.

The Ministry had not mainstreamed the school instructional materials information into the EMIS database and it lacked a system for school records on bank statements to ensure banks fully comply with terms and conditions of a signed MoUs. Also, there was no capacity for the Schools Audit Service and QASOs to routinely examine whether textbook discounts are effectively obtained, properly applied and recorded. Though parents are members of the management committee, their involvement was minimal (DFID, 2010).

Community and parental support

The policy suggestion on pupil homework support at home and community is important in improving learning outcomes. Community libraries lending books and offer reading placed to school pupils where they can do their homework and read other related materials. The community libraries are mainly small and have limited space and resources. They have no modern facilities including ICT.

Table 3-3: Policy suggestions and agenda for action in SACMEQ III on school resources and Ministry Interventions

| | Policy suggestion | Responsibility | Timeframe | Cost | Interventions |
|----|---|--|---|---|-----------------------------------|
| 1. | <p>Management, governance and accountability</p> <p>(a) The emphasis on access to reading materials should move beyond provision and maintenance of textbooks to pupils having the reading materials in their hands and using them. There should be a clear monitoring and evaluation process to determine utilization of resources.</p> <p>(b) The MoE and other stakeholders in education should strengthen the monitoring of the use of FPE funds in acquisition of stationery and learning resources.</p> <p>(c) The government should ensure equitable provision and development of teaching aids in all provinces.</p> | <p>MoE, SMCs</p> <p>MoE, SMCs</p> <p>MoE</p> | <p>Long</p> <p>Long</p> <p>Short</p> | <p>Low</p> <p>moderate</p> <p>Low</p> | <p>No documented intervention</p> |
| 2. | <p>Community and parental support</p> <p>(a) To support reading and learning, parents/guardians should be encouraged to provide learning materials at home for their children.</p> <p>(b) School administrators should strengthen strategies on involvement of parents in learning of pupils</p> <p>(c) Pupils should be encouraged to utilise libraries in school and those found in the community and more community libraries need to be established</p> | <p>Parents</p> <p>SMCs</p> <p>School heads Development</p> | <p>Long</p> <p>Long</p> <p>Medium</p> | <p>Low</p> <p>Low</p> <p>Moderate</p> | <p>No documented intervention</p> |
| 3. | <p>Effective schools and e-learning</p> <p>(a) Urgent interventions by all education stakeholders need to be taken to improve reading and mathematics achievement in primary schools. Special attention should be paid to Western Province</p> <p>(b) E-learning strategies should be utilised to supplement traditional methods of teaching and learning mathematics in primary schools</p> | <p>MoE, Stakeholders in Western Province MoE</p> | <p>Short Long</p> | <p>Moderate</p> <p>High</p> | <p>No documented intervention</p> |

Source: Wasanga et al (SACMEQ III, 2009) and KESSP, MoE

Parents are not integrated in the community and even homework support. Their support is not possible due to socio-economic factors. There are no clear, written policy on homework and no linkage between homework with curriculum as unwritten area of consideration (Ogoye-Ndegwa et al, 2007). According to Ngware et al (2007), use of textbooks when doing homework especially at home has a positive impact on KCPE performance. According to Ngware et al (2007), use of textbooks when doing homework especially at home has a positive impact on KCPE performance.

Effective schools and e-learning

The specific initiatives to improve quality require attention made on learners' needs, curriculum change teachers and school instructional materials (Barret A et al, 2007). It is important that learner-centred and outcomes-based pedagogies are utilized. The teachers, pupils are all beneficiaries of the school instructional materials.

It is worth noting that ICT in education has the potentiality to make teaching and learning an easy process. Teachers require training and technical support, to implement an ICT based classroom activities. This has positive impact on didactic practices and learning achievement. ICT is one of the investments in KESSP and is being implemented based on the National ICT Policy.

The core problem in implementing ICT integration in education is that Kenya has under developed ICT infrastructure. However, a digitisation of the curriculum has already been initiated by the Kenya Institute of Education. Kenya Institute of Education (KIE) has the mandate to develop ICT curriculum and distributed educational material. KIE oversees other institutions that develop appropriate e-content for pre-primary, primary and secondary education (Farrell, 2007).

3.2 What was the process and status of school resource interventions on quality education?

Evidence of relationship between resources invested and pupil's achievement in low income countries is limited. What makes the most difference is not how much money is spent, but how it is spent. This was confirmed based on randomised testing indicating that de-worming is more cost effective with increasing attendance as compared to provision of school uniforms (Miguel and Kremer, 2004). This means well with effectiveness of the school health

and nutrition programme in KESSP which provides school feeding and deworming support to targeted priority regions in the country.

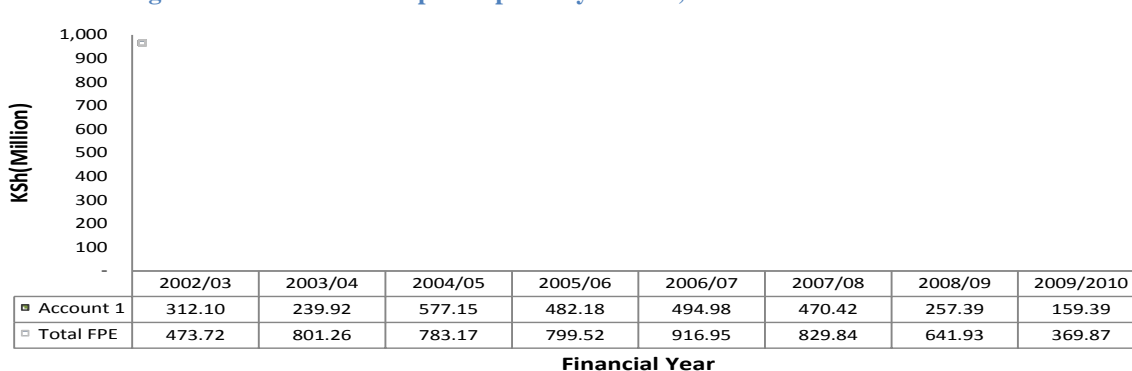
In this section, the focus is on selected school resource interventions, provided through the FPE grants for the years 2003 to 2009.

3.2.1 Free primary education grants

The FPE funds were disbursed to schools every half year into two bank accounts; Account I and Account II for school instructional materials and general purpose expenses respectively. The FPE funding is a capitation grant to schools with each child receiving KSh 650/= for account I and KSh 470/= for account II. In Account I, the schools were then required to procure according to their needs and priorities, the following school instructional materials: textbooks, teachers guide, readers, teaching aids, writing materials, chalks and pens/pencils. In account II, the schools were to meet other costs such as support staff salaries, electricity, water and conservancy, co-curricular activities and maintenance.

Figure 3-1 shows the trends in Account I for financing school instructional materials and total FPE grants disbursed to the public primary schools. The number of public primary schools increased from 17,666 in 2003 to 18,786 in 2010 with an enrolment of 6,854,482 to 8,226,363 respectively.

Figure 3-1: FPE grants disbursement to public primary schools, 2002/03 to 2009/10



Source: Finance Section, MoE

The analysis shows that the Government disbursed more funds to schools between 2002/03 to 2006/07 to meet the increased enrolment. However, it is not the case for capitation grants in 2007/08 which declined by 9.5 percent and a further 22.6 percent and 42.4 percent in 2008/9 and 2009/10 respectively. The level of disbursement in 2009/10 was lower than the amount

disbursed during the introduction of FPE by 21.9 percent against an increase in enrolment of 20.0 percent. Similar trend is recorded in the share of grants disbursed to schools under Account I. The total disbursement to schools in Account I grew from KSh 312.1 million in 2002/03 to KShs 577.15 million in 2004/05, an increase of 85 percent. However, the amount declined as from 2005/06 to the lowest in 2009/10 at KSh 159.40 million. This amount was even lower than that provided during the introduction of FPE by 48.9 percent. The total FPE grants disbursement during the 8 years was KSh 56 billion of which school instructional materials accounted for 53.4 percent (Ksh 29.9 billion).

3.2.2 Implementation of school instructional materials

The Ministry developed guidelines, which were implemented at school by the School Instructional Materials Selection Committee (SIMSC) with membership drawn from class teachers and parents.

Since the implementation of the new curriculum, three phases of new textbooks of curriculum started in 2003 and completed in 2005. A list of six recommended titles per subject from each of the publishers with specified prices is published every year in a publication known as the orange book. The publishers were required to produce inexpensive but durable books of good quality that last for 3 to 4 years.

According to the Value for Money (VFM) Audit (MoE, 2010), it was noted that most schools had attained the recommended textbook pupil ratio. Hence, the disbursement criterion was changed to a higher capitation grant sent to schools with lower textbook pupil ratio, which explains the drastic reduction of FPE funding in 2009/2010.

The Ministry did not have frameworks to monitor the associated costs and unit cost of infrastructure or textbooks. That could even encouraged competitive bidding including international tendering to obtain not only quality but a good price.

3.2.3 Challenges of school instructional materials implementation process

However, there are many other areas where progress has been slow that includes:

- Reforms in the audit and development of a new audit manual.
- Addressing weaknesses in the management of the Instructional Materials Programme at school and district level through revision of the Instructional Materials Management Handbook.

- Lower Pupil book ratio in most primary schools compared to target 1:1 or 1:2.
- Wide difference in the book ratios across the different provinces that could be attributed to bad management or unfair funding criteria between more resource schools.
- Varied unit cost of textbooks was a good opportunity to obtain greater efficiency in their procurement.

3.3 What are emerging issues in policy suggestions, agenda for action and interventions?

So far, several policy issues and agenda for action from SACMEQ studies on school resources' are acknowledged and existing interventions elucidated. The document review conducted shows that monitoring and evaluation strategies were in place, albeit implementation challenges. In particular, a Value for Money Audit on school instructional materials and funding process was instituted between 2008 and 2009. However, the exercise was carried out after SACMEQ III study giving relevance on institutionalisation of management audit framework. This notwithstanding, policy suggestions derived were a critical input for policy makers during the education sector preparation and implementation under KESSP.

Therefore, with the understanding that there exists a school resource intervention, this research sought to evaluate emerging issues on: trends and level of school instructional materials (SIM); influence of SIM on learning outcomes; trends and level of reading and mathematics achievement; other factors such as school supervision, parental involvement and school environment. The detail analysis is presented in subsequent chapters.

3.4 Summary

A total of 16 out of 168 policy suggestions proposed in the three SACMEQ studies were reviewed. The study identified policy suggestions and agenda for action on selected school resources including their management strategies. These policies mainly targeted: availability of school instructional materials; utilisation and culture of reading; assessment visits on resource utilization; research, M&E systems; in-service training on school resource management; governance and accountability, parental and community support; and use of e-learning strategy for school instructional materials.

In all these areas, the review showed existence of numerous interventions albeit with challenges. The Government improved availability of school instructional materials through the Free Primary Education grants disbursed to public primary schools as from 2003. The

schools had autonomy to plan for acquisition of these school resources according to their needs within the available funds. The Ministry of Education monitoring and evaluation reports indicated improvement in level of school instructional materials. However, it was worrisome, when the VFM audit report disclosed mismanagement of funds and poor record keeping in the public primary schools. The implementation of the VFM report led to reduced FPE funding to schools, with schools that had enough textbooks receiving less funds. The data also shows that funds to primary schools started to decline after Financial Year 2006/07 with a drastic reduction in FY 2009/2010 attributed to the VFM report.

Given this background, the study was to determine the progress made in the course of implementing the adopted policy interventions on school resources using the SACMEQ I, II and III data. This therefore, called for detailed data analysis of the trends in level of school instructional materials, extent of variation among the schools and also link to the pupil learning achievement.

Chapter 4 : Level and Variation of School Resources along a Scale

This chapter presents information generated on the teaching and learning resources expended in primary schools towards addressing quality of primary education. The MoE implemented two main large scale investments on quality of primary education, that is; school infrastructure improvement programme and school instructional materials programme. The first programme on infrastructure targeted needy schools meeting a criterion that incorporated crowding index and proportion of schools with non-permanent classrooms (MoEST, 2005). The target is improving the school learning environment in prioritized schools. The selected schools received grants for either new classrooms construction or classroom rehabilitation. In the second programme, all public primary schools received capitation grants. According to KESSP, the policy on grants disbursement was based on total enrolment for each school. This meant that all schools equally had the means of meeting the school instructional materials needs of the pupils. This study therefore, determines changes in level of school instructional materials for pupils analysed depending on the level of school learning environment and variation among provinces.

In order to determine the change in level of school resources, the study introduced two new scales of school resources based on SACMEQ I, II and III Kenya data. To start with, the schools' learning environment (SLE) was determined by the use of a pool of physical facilities resource items. A second set of items for teaching and learning materials were pooled as school instructional materials (SIM). The SIM variable was identified as a proxy for the determining the results of the school grants investment on school resources and pupil learning outcomes. In addition, the SLE variable was useful in classifying the pupils' conditions of learning. From here, the two indices were constructed and used to analyse the variation of school resources among Standard 6 pupils.

4.1 Construction of school learning environment and school instructional materials

Indices

The construction and application of SACMEQ school resources based on 68 items using item calibration procedures was demonstrated by Saito (2007). Rasch measurement technique was applied using data aggregated at school level from 15 SACMEQ school systems that took part in SACMEQ I and II. This method was applied on Kenya's SACMEQ data with selected items relevant to two different types of school resource interventions to construct SLE and SIM indices as described below.

4.1.1 School Learning Environment (SLE) Index

The role of positive learning environments in promoting wellbeing and achievement of learners has drawn increased attention with several studies looking at effects of physical conditions on emotional and physical health of learners and teachers. It is, therefore, beneficial to have a critical look at the state of schools in the management of school resources.

There were a total of 21 items on school facilities that constitute the school learning environment (SLE) from the pupil, school head and teachers questionnaires. Two items were from the pupil questionnaire; sitting place and writing place. Another 12 were from the school head questionnaire, that is: library, hall, staff room, school head office, sports ground, fence, water, electricity, photocopier, computers, buildings' in good condition, sanitation and pupil toilet ratio and class size. The remaining 6 were from the teacher questionnaires; teacher table, teacher chair, class library and cupboard/bookshelf.

In order to construct the SLE index, the item variables were recoded. The recoded variables for the SLE index were as follows: sitting place (0=no sitting place, 1= sitting place); writing place(0=no writing place, 1=writing place); library(0=no library hall, 1=library hall); staff room(0=no staff room, 1=staff room); school head office(0=no head office, 1=head office); sports ground(0=no sports ground, 1=sports ground); fence(0=no fence, 1= fence); water(0=no water facility, 1=water facility); electricity(0=no electricity, 1=electricity); photocopier(0=no photocopier, 1= photocopier); computers(0=no computer, 1= computer); school building condition(0=poor building condition, 1=good building condition); sanitation(0=no sanitation, 1= has sanitation); pupil toilet ratio (0=less than 45:1, 1=> 45:1), and class size(0= 40:1, 1= greater than equal to 40:1); teacher table(0=no teacher table, 1=had teacher table); teacher chair(0= no teacher chair, 1=has teacher chair); class library(0= no class library, 1= has class library); and cupboard/bookshelf(0=no cupboard, 1=cupboard). In the case of building conditions, good condition referred to permanent classrooms while poor conditions were those with temporary and open air classrooms. Also, according to the Ministry of Education benchmarks, schools should have a pupil toilet ratio of 45 and a classroom size of 40 and above.

An item response theory (IRT) was used to analyse the reliability of the scale and investigate the fit of items and cases to a scale for the SLE index which is a special type of Rasch measurement model. According to Siniscalco & Ross (1997), “the probability that a pupil

has a given resource is a function of level of resource power of the item and level of resource endowment of the pupils''. In this case, the item resource power is defined as the ratio of number of pupils which have that item to the number pupils that do not have that item. Also, the pupil resource endowment is defined as the number of resource items that a pupil has to the number of items pupils that do not have that item. Therefore using the RUMM software, the data were first aggregated at pupils' level and after that the items subjected to the IRT analysis to obtain their fit residuals. Table 4-1 presents the individual item for the 20 SLE.

Table 4-1: Individual Item Fit for SLE Index

| S. No | ItemCode | Item Name | Location | SE | Fit Residual | DF | ChiSqu | DF | Prob |
|-------|----------|---------------------------|----------|-------|--------------|--------|---------|--------|------|
| 1 | phtco | Photocopy | | 4.82 | 0.07 | -8.04 | 10284.6 | 11.9 | 0.22 |
| 2 | compu | Computer | | 3.48 | 0.04 | -11.24 | 10284.6 | 15.49 | 0.08 |
| 3 | mhall | School meeting hall | | 2.12 | 0.03 | -5.44 | 10284.6 | 3.43 | 0.94 |
| 4 | cpbdb | Cupboard | | 1.76 | 0.03 | -8.14 | 10084.9 | 7.28 | 0.61 |
| 5 | elect | Electricity | | 1.58 | 0.02 | -14.87 | 10284.6 | 18.76 | 0.03 |
| 6 | zssan | Santitation | | 1.44 | 0.02 | 5.36 | 10260.9 | 14.15 | 0.12 |
| 7 | zxcli | Class library | | 1.15 | 0.02 | 17.3 | 10084.9 | 56.41 | 0 |
| 8 | clsiz | Class size | | 1.147 | 0.02 | 17.295 | 10084.9 | 11.018 | 0 |
| 9 | slibr | School library | | 0.87 | 0.02 | 9.64 | 10284.6 | 10.34 | 0.32 |
| 10 | scond | School building condition | | 0.13 | 0.02 | 1.91 | 10300.7 | 5.28 | 0.81 |
| 11 | zxtab | Teacher chair | | -0.13 | 0.02 | -16.07 | 10084.9 | 28.81 | 0 |
| 12 | zsptr | Pupil teacher ratio | | -0.24 | 0.02 | 11.71 | 10284.6 | 11.02 | 0.27 |
| 13 | zxcha | Teacher table | | -0.35 | 0.02 | -10.85 | 10084.9 | 16.32 | 0.06 |
| 14 | water | Water facility | | -1.14 | 0.03 | -0.04 | 10284.6 | 8.22 | 0.51 |
| 15 | fence | School fence | | -1.43 | 0.03 | 0.89 | 7241.78 | 3.53 | 0.94 |
| 16 | shoff | School head office | | -1.5 | 0.03 | -5.84 | 10284.6 | 8.79 | 0.46 |
| 17 | sgrou | Sporst ground | | -2.22 | 0.03 | 3.28 | 10284.6 | 10.56 | 0.31 |
| 18 | sroom | Staff room | | -2.65 | 0.04 | -1.17 | 10284.6 | 11.48 | 0.24 |
| 19 | pwrit | Pupil writing place | | -2.68 | 0.04 | 4.51 | 10287.4 | 10.07 | 0.34 |
| 20 | psit | Pupil sitting place | | -5 | 0.11 | -0.81 | 10297.8 | 1.12 | 1 |

All the items with $p < 0.05$ could be said to be of poor fit to the scale but to confirm on that, they were further subjected to item characteristics curve analysis. The items with such low probability value were; electricity, teacher table, class library and class size. For example, the results of the school library and the class size represent good and bad items respectively as shown in Figures 4-1 and 4-2. The outcome of the item fit curve for school library fits the scale while the class size did not fit the scale.

Figure 4-1: Good item results of item calibration - School library

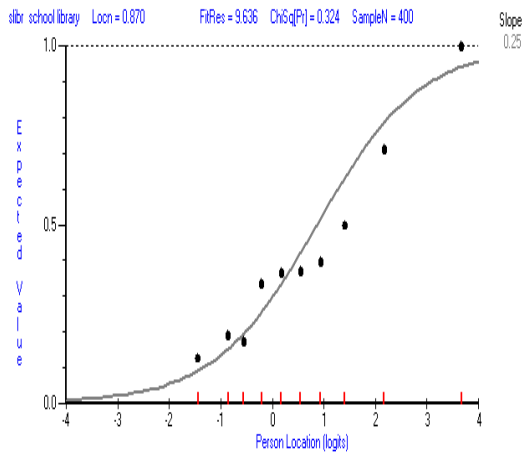
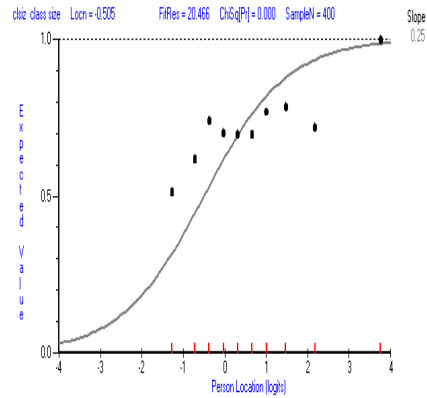


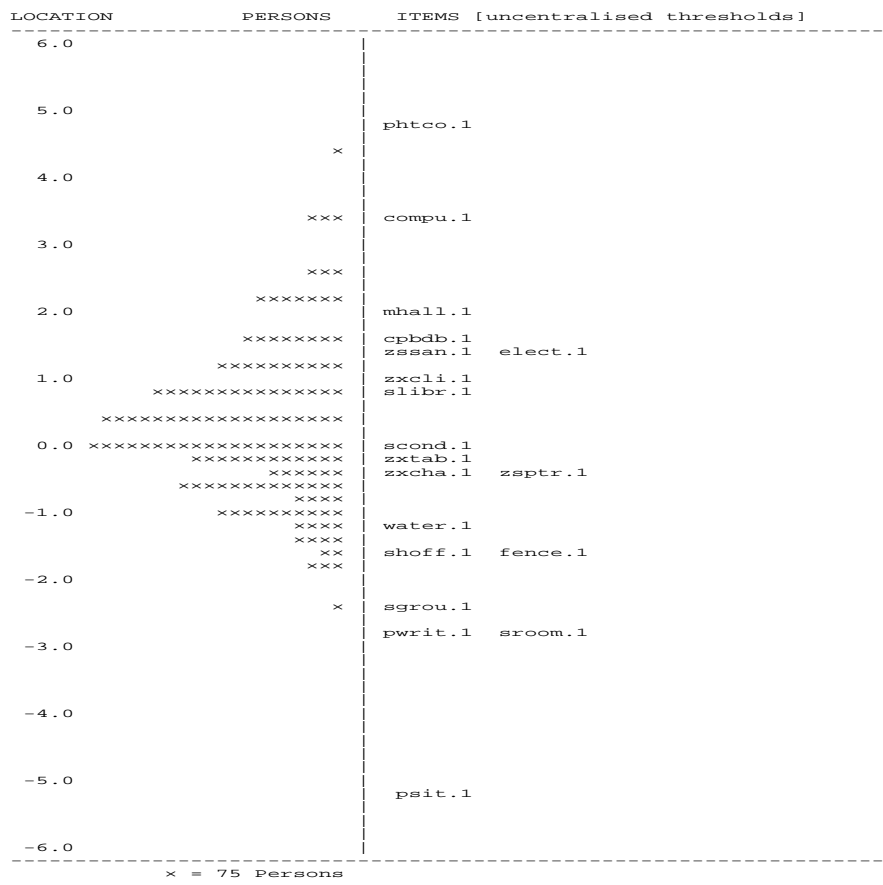
Figure 4-2: Bad item results of Item calibration - Class size



Since only the class size was not fit, the item was dropped from the SLE index variables to be used. Based on the 19 SLE items, a person separation index of 0.72 with a reported power of test-of-fit scale stated as ‘Good’ was obtained (Annexe A2.3). A variable map of the individual SLE items indicating the pupils’ distribution on the same scale was obtained as illustrated in Figure 4-3. The SLE items were put on a scale in relation to the corresponding number of pupils with the item. The item variable map puts the items against an X depicting a total of 75 pupils. When an SLE item is above the zero line, then the item is available in fewer pupils, than the average item. Also, if SLE item is below zero line, then the item is available in more pupils than the average item. A further generalisation is made as regards the pupils in relation to the individual SLE items. A pupil that is located at a certain level of the scale is likely to have resource items at or below this level and less likely to have the resource items above this level.

Figure 4-3: Variable map for the distribution of Items and case estimation of SLE Index

(Item estimates=thresholds, Number of pupils=10,950..., Number of items=19, each X represents 75 pupils)



In the standardization of pupil scores for the SACMEQ studies, the scores were anchored to the SACMEQ II study as the point of reference. This is because the standardization of the pupil scores was carried on completion of the SACMEQ II study and before the SACMEQ III data were available. In this study, a decision was made to standardize the SLE for all the three SACMEQ studies concurrently so as to capture the average situations of these indices overtime in Kenya. Nevertheless, the approach used to standardize the SLE indices (whether anchoring or concurrent) would not affect the results because the relative differences between the scores across studies would remain the same.

Therefore the 19 items formed the basis of the final SLE index, from which a mean score was obtained. The overall mean and standard deviation for SLE variable for the combined data of SACMEQ I, II and III were set at 50 and 10, respectively. Based on the mean score, the schools were therefore categorised into Poor and Good learning environment as shown in Table 4-2.

Table 4-2: School Learning Environment (SLE) Score by Category

| SLE index score | Type of school |
|----------------------------|----------------------------------|
| Below SLE mean score of 50 | Poor School Learning Environment |
| Above SLE mean score | Good School Learning Environment |

4.1.2 School Instructional Materials (SIM) Index

Studies carried out before Jomtien EFA meeting in 1990 identified factors affecting learning. According to Lockheed & Verspoor, (1989), these factors were: ‘‘effective schools; curriculum implementation; provision of learning materials; instructional time; and teacher quality and child readiness to learn’’. In the context of selected policy intervention in Kenya on school instructional materials, this study focuses on provision of learning materials utilizing SACMEQ I, II and III data sets. A total of 9 items on learning materials were drawn. Two of the items were from the teachers’ questionnaire, that is, reading and mathematics teacher’s guide and dictionary. The other 7 items, that is, reading textbook, mathematics textbook, exercise books, pens/pencils and geometrical set, were drawn from the pupil questionnaire. However, the reading and mathematics textbook were categorised into two separate thresholds, own textbooks and no textbook/sharing of at least one textbook. All the schools reported to have chalks and hence during the construction, the software automatically eliminated them.

In order to construct the School Instruction Material (SIM) Index, a total of 11 item variables were recoded with the mathematics and reading textbooks items categorised into two thresholds. The recoded variables for SIM index were as follows: reading teacher access to a dictionary (0=no access; 1=has access); reading teacher access to teacher’s guide (0=no access; 1=has access); pupil possession of exercise books(0=has 5 exercise books or less; 1=has 6 exercise books or more); pupil possession of a pen (0=has no pen; 1=has at least one pen); pupil possession of a pencil (0=has no pencil; 1=has at least one pencil); pupil possession of reading textbook ; (0=no textbook/sharing; 1=own reading textbook); mathematics teacher access to a geometrical set (0=no access; 1=has access); mathematics teacher access to teacher’s guide (0=no access; 1=has access); pupil possession of mathematics textbook (0=no textbook/sharing; 1=own mathematics textbook). The variables for school resource scales for reading and mathematics were put together to construct one resource scale.

An item response theory (IRT), a special type of Rasch measurement model was used to analyse the reliability of the scale and investigate the fit of items and cases to a scale for the SIM index. The data was first aggregated at pupils' level and after that the SIM items subjected to the IRT analysis to obtain their fit residuals. Table 4-3 presents the individual item for the SIM Index.

Table 4-3: Final Individual Item Fit for SIM Index

| Seq | ItemCode | Item Name | Type | Location | SE | Fit Residual | DF | ChiSqu | DF | Prob |
|-----|----------|--------------------|------|----------|------|--------------|---------|--------|----|------|
| 1 | Exbk | Exercise Book | Poly | 0.73 | 0.03 | 12.06 | 7245.69 | 31.99 | 7 | 0 |
| 2 | Pmatx | Maths Textbook | Poly | 0.71 | 0.02 | -9.74 | 5302.42 | 14.18 | 5 | 0.01 |
| 3 | Prdtx | Reading Textbook | Poly | 0.48 | 0.02 | -7.49 | 7557.24 | 27.12 | 7 | 0 |
| 4 | Dicti | Dictionary | Poly | 0.34 | 0.03 | 0.18 | 7402.33 | 43.81 | 7 | 0 |
| 5 | Geoms | Geometrical set | Poly | -0.11 | 0.04 | -6.47 | 5247.6 | 9.87 | 5 | 0.08 |
| 6 | Pen | Pen | Poly | -0.12 | 0.03 | -0.4 | 7557.24 | 19.5 | 7 | 0.01 |
| 7 | Magui | Maths Guide book | Poly | -0.22 | 0.04 | -6.06 | 5247.6 | 6.96 | 5 | 0.22 |
| 8 | Penci | Pencil | Poly | -0.73 | 0.03 | -3.84 | 7557.24 | 10.37 | 7 | 0.17 |
| 9 | Rdgui | Reading guide book | Poly | -1.09 | 0.05 | -3.94 | 5193.64 | 3.72 | 5 | 0.59 |

The SIM items that had a probability of $p < 0.05$ could be said to be of poor fit to the scale but to confirm on that, they were further subjected to item characteristics curve analysis. The results show that only pencils, reading guide, geometrical set and mathematics guide had a higher probability value. The remaining items were subjected into item characteristics curve analysis, and all were fitting to the scale. Figure 4-4 and 4-5 are results illustrate the Item characteristics curve (ICC) for reasonably good items of the exercise books and the reading textbook.

Figure 4-4: Exercise book item calibration curve

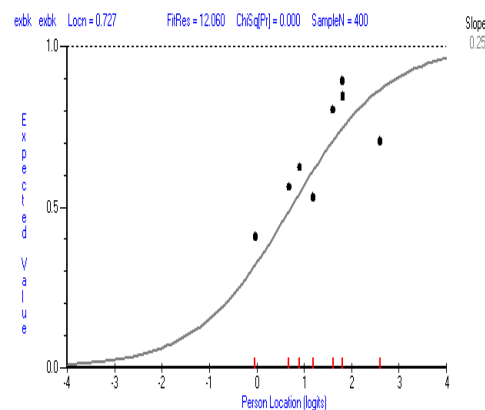
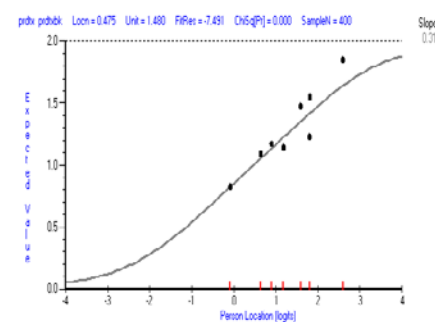


Figure 4-5: Reading textbook item calibration curve



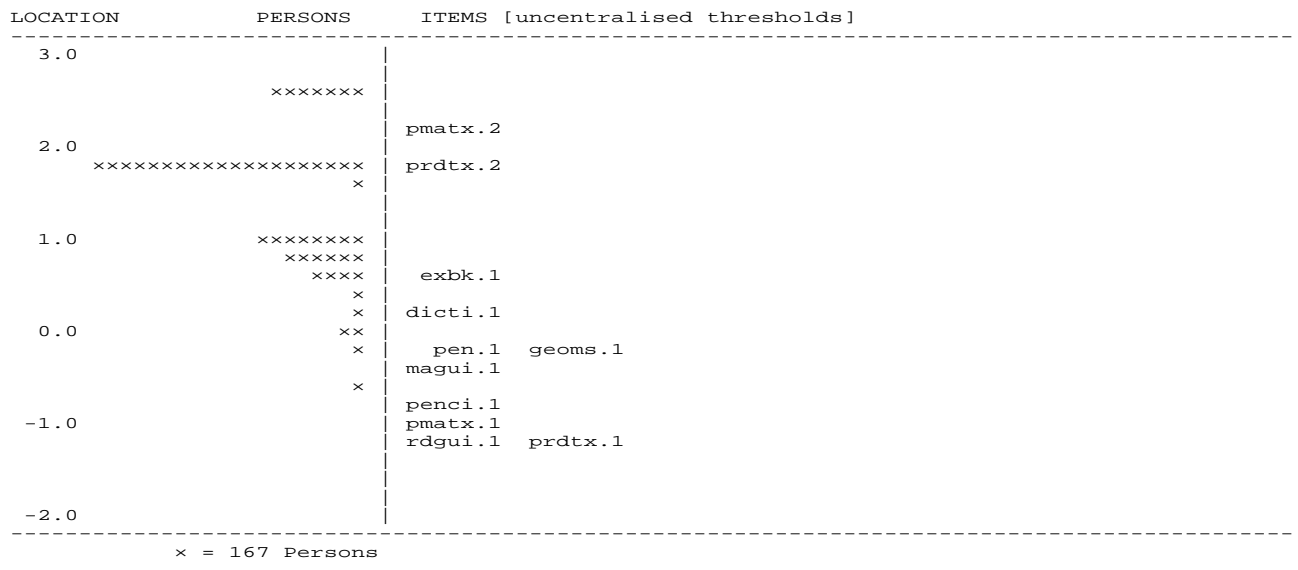
In overall result, the SIM items had a person separation index of 0.539 with a reported power of test-of-fit scale stated as 'Reasonable' (see Annexe A2.3). Though the power of fit was

not good enough, to determine the effectiveness of the interventions, only the items under the school instructional materials (SIM) were to be used. Hence, it was not possible to increase the number of items in the construction of SIM scale, in order to get a higher person separation index.

Figure 4-6 presents the individual SIM items and the distribution of pupils according to the resource level on the same scale. Each SIM item was recorded on the scale in relation to the corresponding number of pupils accessing. When a SIM item is above the zero line, then the item is available in fewer schools, than the average item. Also, if SIM item is below zero line, then the item is available in more schools than the average item. A further generalisation is made as regards the pupils in relation to the individual SIM items. A pupil that is located at a certain level of the scale is likely to have resource items at or below this level and less likely to have the resource items above this level.

Figure 4-6: Variable map for the distribution of Items and case estimation of SIM index

(Item estimates=thresholds, Number of pupils=8,684, Number of items=9, each X represents 167 pupils)



So as to have different levels of resources available to pupils at school, the SIM were divided into 3 intervals as shown in Table 4-4.

Table 4-4: Description of School Instructional Materials (SIM) Scale by Level and Items

| SIM Level | Location | Description of resource level | Items in possession at level |
|------------------|-----------------|---|---|
| Level 1 | <-0.925 | Inadequate school instruction materials | Share reading textbook, share mathematics textbook, pencils, reading teacher guide, mathematics teacher guide |
| Level 2 | -0.925-1.824 | Moderate school instruction materials | All above and in addition a pen, geometric set, dictionary and exercise books |
| Level 3 | >1.824 | Adequate school instruction materials | All items above and in addition own reading & mathematics textbooks including exercise books |

The SIM scale was constructed, with distribution of resources analysed into three increasing levels of resources. The items falling into each of the levels are presented and as you go up the level it implies that the SIM items include those in the lower level.

The most distinct SIM items available in level 1 is that pupils share reading and mathematics textbooks, though the schools have a teacher's guide for reading and mathematics and pencils. Level 2 has a distinction from level 1 that in addition to items in level 1, the pupils have access to a geometric sets, dictionary and pen. At level 3, the distinct difference is that in addition to all the items in level 2 except for textbooks where pupils have their own reading and mathematics textbooks.

4.2. Characteristic of the pupils' school learning environment

4.2.1 School learning environment

The SLE index score was used to differentiate schools with good and poor learning environment. At the national level, the pupils in schools with good learning environment accounted for 44.1 percent in 1998 and increased further to 49.6 percent in 2000. However in 2007, the proportion of pupils in good school learning environment declined to 40.7 percent with a standard error of 3.9 percent. The results of the analysis are presented in Table 4-5 below.

Table 4-5: Percentage of Standard 6 pupils from good learning environment by province

| | 1998 | | 2000 | | 2007 | |
|---------------|-------------|------------|-------------|------------|-------------|------------|
| | % | SE | % | SE | % | SE |
| Central | 60.7 | 10.8 | 75.5 | 8.6 | 60.4 | 11.2 |
| Coast | 40.6 | 11.1 | 32.5 | 10.7 | 21.1 | 10.3 |
| Eastern | 36.1 | 9.6 | 56.5 | 10.4 | 30.3 | 10.0 |
| Nairobi | 99.7 | 0.3 | 94.4 | 5.6 | 94.1 | 4.1 |
| North Eastern | 24.5 | 11.2 | 15.6 | 8.2 | 10.2 | 7.3 |
| Nyanza | 21.4 | 9.1 | 28.3 | 9.3 | 27.2 | 8.1 |
| Rift Valley | 59.5 | 10.4 | 45.1 | 9.7 | 39.7 | 8.3 |
| Western | 30.8 | 10.6 | 41.3 | 10.4 | 46.6 | 11.5 |
| KENYA | 44.1 | 4.2 | 49.6 | 4.0 | 40.7 | 3.9 |

Nearly all the pupils in Nairobi province were in good school learning environment with a slight decline from 99.7 percent in 1998 to 94.1 percent in 2007. In 2007, the provinces with the least proportion of pupils in good learning environment were North Eastern and Coast followed by Nyanza at 10.2 percent, 21.1 percent and 27.2 percent respectively. Only Western province recorded an improvement in proportion of pupils in good school learning environment over the three studies.

These results are consistent with the context of the outcome after the implementation of free primary education in 2003. The influx in children enrolment within a year was a situation that most schools could not cope up with. Consequently, for this reason the schools were worse off in dealing with the ability to improve infrastructure needs of the pupils. This is depicted by the considerable decline in standard 6 pupils in good learning environment at the national level.

4.2.2 Availability of school instruction resources within good and poor environments

Table 4-6 presents the distribution of own reading textbooks among Standard 6 pupils across all the provinces between 1998, 2000 and 2007(SACMEQ I, II and III). In 1998 and 2000, the good SLE had more pupils with own reading textbooks, at 29.8 percent and 32.8 percent. At national level, it can be seen that proportion of pupils with own reading text textbooks declined in 2007 for all schools and more so, worse off in good SLE. The decline in poor SLE was not significant but that of good SLE was very high. Pupils with own textbooks accounted for 16.6 percent in good SLE compared to 18.6 percent in poor SLE.

Table 4-6: Percentages of Standard 6 pupils with own reading textbook by SLE and province

| Province | Poor SLE | | | | | | Good SLE | | | | | |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|------------|
| | 1998 | | 2000 | | 2007 | | 1998 | | 2000 | | 2007 | |
| | % | SE | % | SE | % | SE | % | SE | % | SE | SE | |
| Central | 15.8 | 5.79 | 27.6 | 10.84 | 12.6 | 7.49 | 29.2 | 5.13 | 24.4 | 6.13 | 25.5 | 8.44 |
| Coast | 21.1 | 5.61 | 15.3 | 5.22 | 21.7 | 4.43 | 27.8 | 10.39 | 40.8 | 12.7 | 19.6 | 6.85 |
| Eastern | 20.7 | 7.25 | 26.0 | 11.77 | 15.4 | 5.23 | 21.5 | 7.58 | 42.0 | 10.9 | 23.4 | 12.3 |
| Nairobi | 100.0 | 0 | 29.4 | 0 | 38.9 | 11.75 | 57.0 | 5.96 | 44.6 | 6.33 | 43.7 | 7.82 |
| North Eastern | 17.4 | 3.44 | 15.9 | 7.13 | 14.6 | 3.71 | 38.4 | 9.44 | 10.8 | 7.57 | 58.6 | 22 |
| Nyanza | 26.3 | 5.5 | 25.8 | 9.02 | 21.7 | 3.47 | 26.6 | 12.36 | 39.9 | 16.1 | 8.8 | 4.52 |
| Rift Valley | 21.6 | 5.45 | 16.8 | 5.05 | 21.2 | 7.06 | 31.1 | 8.22 | 33.8 | 8.52 | 4.4 | 2.09 |
| Western | 10.5 | 2.71 | 14.3 | 4.05 | 14.2 | 3.9 | 26.4 | 10.49 | 19.9 | 5.95 | 6.4 | 2.75 |
| KENYA | 20.0 | 2.53 | 20.9 | 3.44 | 18.6 | 2.44 | 29.8 | 3.5 | 32.8 | 3.86 | 16.6 | 2.8 |

North Eastern provinces recorded the highest proportion of pupils with own reading textbooks for in good SLE while Nairobi in poor SLE. The provinces with the lowest own reading textbooks were Rift Valley and Western in good and poor SLE respectively. For Nairobi, the analysis shows that 57 percent of those pupils had own reading textbooks in 2000, declining to 43.7 percent in 2007. The provinces with least proportion of pupils in good SLE in 2007 were Rift Valley (4.4 percent), Western (6.4 percent) and Nyanza (8.8 percent). Similarly, in 2007, the provinces with lowest proportion of pupils in poor SLE schools with own reading textbooks were Central (12.6 percent), North Eastern (14.6 percent) and Eastern (15.4 percent).

Information on distribution of pupils with own mathematics textbooks in 2000 and 2007 is presented in Table 4-7. The pupils with own mathematics textbooks in good SLE constituted 31.1 percent in 2000 and 16.4 percent in 2007 while in poor SLE it was 15.9 percent and 14.2 percent respectively. In both cases there was significant decline in proportion of pupils, with those from good SLE performing being worse off.

When analysing the provincial variation, Nairobi province accounted for the highest proportion of pupils with own textbooks in both poor and good SLE at 35.3 percent and 47.5 percent in 2000 and 2007. There was marginal improvement in Standard 6 pupils with own mathematics textbooks. In 2007, the provinces with the lowest proportion of pupils with own textbooks were Rift Valley and Coast for good and poor SLE respectively.

Table 4-7: Percentages of Standard 6 pupils with own mathematics textbook by SLE and province

| Province | Poor SLE | | | | Good SLE | | | |
|---------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2000 | | 2007 | | 2000 | | 2007 | |
| | % | SE | % | SE | % | SE | % | SE |
| Central | 26.5 | 11.44 | 12.3 | 6.7 | 22.5 | 6.23 | 24.9 | 8.17 |
| Coast | 8.9 | 3.24 | 10.8 | 2.68 | 37.7 | 10.7 | 33.1 | 11.94 |
| Eastern | 22.8 | 11.86 | 16 | 5.64 | 39.7 | 11.09 | 24.5 | 12.84 |
| Nairobi | 35.3 | 0 | 35.4 | 8.81 | 44.7 | 6.85 | 47.5 | 8.72 |
| North Eastern | 6.5 | 2.94 | 11 | 3.26 | 12.6 | 9.72 | 48.2 | 20.88 |
| Nyanza | 16.4 | 6.19 | 16.3 | 3.25 | 39.2 | 15.57 | 8.8 | 3.0 |
| Rift Valley | 13.3 | 4.29 | 14.3 | 5.71 | 30.7 | 8.18 | 2.0 | 0.89 |
| Western | 10.7 | 3.25 | 11.5 | 4.32 | 21.1 | 5.54 | 2.5 | 1.31 |
| KENYA | 15.9 | 2.9 | 14.2 | 2.14 | 31.1 | 3.82 | 16.4 | 2.85 |

However, most of the other provinces had a substantial decline in proportion of pupils' with own mathematics textbooks in good SLE. Similarly, there was improvement with a lower proportion of pupils reported to be in poor SLE in Central province from 26.5 percent in 2000 to 12.3 percent in 2007.

Table 4-8 presents the percentage of pupils with adequate exercise books in poor and good SLE across all the provinces for the years 1998, 2000 and 2007. In both poor and good school environments 73.4 percent and 70.7 percent of the pupils had adequate exercise books. The situation improved in 2007, recording 74.3 percent and 81.8 percent respectively of the pupils' with adequate exercise books.

Table 4-8: Percentages of Standard 6 pupils with adequate exercise books by SLE and province

| Province | Poor SLE | | | | | | Good SLE | | | | | |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 1998 | | 2000 | | 2007 | | 1998 | | 2000 | | 2007 | |
| | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE |
| Central | 80.5 | 5.92 | 40.4 | 9.73 | 96.7 | 1.93 | 76.1 | 4.88 | 76.0 | 4.46 | 94.0 | 2.08 |
| Coast | 79.9 | 7.16 | 51.1 | 11.99 | 62.0 | 6.9 | 69.6 | 13.49 | 91.6 | 2.93 | 62.2 | 21.76 |
| Eastern | 68.2 | 8.56 | 87.9 | 4.74 | 61.6 | 10.46 | 75.6 | 6.26 | 97.2 | 1.55 | 52.8 | 15.78 |
| Nairobi | 100.0 | 0.0 | 23.5 | 0.0 | 94.9 | 3.25 | 83.7 | 3.48 | 80.0 | 4.76 | 81.0 | 3.43 |
| North Eastern | 87.2 | 5.42 | 96.4 | 1.39 | 60.8 | 10.12 | 82.9 | 6.32 | 94.0 | 1.91 | 77.9 | 14.67 |
| Nyanza | 85.8 | 5.12 | 86.4 | 5.4 | 82.4 | 3.46 | 70.2 | 15.77 | 85.8 | 3.63 | 87.3 | 3.73 |
| Rift Valley | 56.5 | 10.31 | 66.8 | 8.84 | 79.5 | 7.16 | 66.5 | 9.44 | 67.7 | 10.8 | 86.1 | 5.43 |
| Western | 66.7 | 7.87 | 83.0 | 7.26 | 61.2 | 7.49 | 55.0 | 14.64 | 72.5 | 9.81 | 81.3 | 6.35 |
| KENYA | 73.4 | 3.57 | 74.4 | 3.56 | 74.3 | 3.19 | 70.7 | 3.98 | 80.1 | 3.15 | 81.8 | 3.15 |

In 2007, Central province had the highest proportion of pupils with adequate exercise books accounting for 96.7 percent and 94.0 percent in poor and good SLE respectively. This was

followed by Nairobi and Nyanza provinces. The analysis shows that Eastern and Coast provinces recorded a drop in the proportion of pupils in good SLE with adequate exercise books between 2000 and 2007.

4.3 Distribution of schools in the SIM index scale

4.3.1 Proportion of pupils' in schools at SIM index scale

The SIM index scale evaluates the availability level of school instructional materials for Standard 6 pupils as presented in Table 4-9. The data indicates that there has been a decline in the proportion of pupils at level 1 from 49.6 percent in SACMEQ I to 18.6 percent in SACMEQ II and lastly 9.7 percent in SACMEQ III. Conversely, the proportion of pupils at level 2 increased from 32.5 percent in SACMEQ I to 59.9 percent in SACMEQ II and finally, 71.1 percent in SACMEQ III. This level is an improvement of school resources items that includes availability of geometric set, exercise books and dictionary. On the other hand, at this level the pupils share reading and mathematics textbooks.

Table 4-9: Percentage of Standard 6 pupils by level of school instructional materials and province

| Province | 1998 | | | | | | 2000 | | | | | | 2007 | | | | | |
|---------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|------------|-------------|-------------|------------|------------|-------------|------------|-------------|------------|
| | L1 | | L2 | | L3 | | L1 | | L2 | | L3 | | L1 | | L2 | | L3 | |
| | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE |
| Central | 48.3 | 7.48 | 26.1 | 3.92 | 25.5 | 5.79 | 14.3 | 4.17 | 69.2 | 4.88 | 16.5 | 4.73 | 4.0 | 2.11 | 73.0 | 6.57 | 23.0 | 6.08 |
| Coast | 44.5 | 8.82 | 38.5 | 6.48 | 17.0 | 4.95 | 39.4 | 9.18 | 42.5 | 7.96 | 18.1 | 7.80 | 17.4 | 7.05 | 66.2 | 6.2 | 16.3 | 4.30 |
| Eastern | 66.4 | 6.62 | 25.1 | 5.02 | 8.5 | 3.61 | 7.4 | 3.11 | 51.0 | 7.53 | 41.6 | 8.17 | 12.4 | 4.25 | 68.0 | 5.78 | 19.6 | 5.71 |
| Nairobi | 18.6 | 5.36 | 29.9 | 4.01 | 51.5 | 6.99 | 10.5 | 5.44 | 53.6 | 7.27 | 35.9 | 7.38 | 19.6 | 6.02 | 45.4 | 6.67 | 35.0 | 6.43 |
| North Eastern | 50.3 | 9.39 | 40.9 | 8.10 | 8.8 | 2.85 | 16.7 | 6.97 | 74.3 | 8.55 | 9.0 | 6.33 | 19.5 | 5.58 | 68.6 | 6.26 | 11.9 | 4.96 |
| Nyanza | 43.8 | 7.54 | 44.0 | 6.02 | 12.2 | 4.52 | 28.5 | 6.84 | 46.1 | 6.32 | 25.5 | 7.49 | 10.9 | 3.89 | 65.5 | 4.47 | 23.6 | 3.80 |
| Rift Valley | 39.1 | 7.35 | 36.4 | 5.72 | 24.5 | 7.41 | 14.6 | 3.02 | 71.9 | 4.28 | 13.5 | 4.29 | 5.7 | 2.33 | 76.2 | 4.53 | 18.0 | 4.36 |
| Western | 60.7 | 7.29 | 26.6 | 5.38 | 12.7 | 4.1 | 25.6 | 5.73 | 64.7 | 4.95 | 9.7 | 2.86 | 10.3 | 2.25 | 81.6 | 2.68 | 8.1 | 2.38 |
| KENYA | 49.6 | 3.1 | 32.5 | 2.27 | 17.9 | 2.33 | 18.6 | 2.0 | 59.9 | 2.4 | 21.5 | 2.46 | 9.7 | 1.4 | 71.1 | 2.1 | 19.2 | 1.9 |

The data also illustrates that at Level 3, there was an improvement from 17.9 percent to 21.5 percent of the pupils with own reading and mathematics textbooks in SACMEQ I to SACMEQ II respectively. However, the situation declined, though marginally during SACMEQ III to 19.2 percent (SE=±1.9 percent) of the standard 6 pupils. Pupils in this level have adequate instructional materials. That is, they have their own textbooks, adequate exercise books among other learning materials. Their teachers have access to all instructional materials that includes teachers guide and dictionary.

Most of the provinces recorded more pupils at level 2 in SACMEQ III (year 2007). Nairobi province that had 51.5 percent of the pupils in Level 1 in 1998 declined to 35.9 percent and 35.0 percent in 2000 and 2007 respectively. Eastern province also had fewer pupils at Level 3 from 41.6 percent in 2000 to 19.6 percent in 2007. To some extent there was improvement in pupils' access to additional school instructional materials. However, the fact that only a limited number of pupils had adequate instructional materials at level 3; it can be observed as a concern.

4.3.2 Distribution of SIM Mean score among provinces

In the standardization of pupil scores for the SACMEQ studies, the scores were anchored to the SACMEQ II study as the point of reference. This is because the standardization of the pupil scores was carried on completion of the SACMEQ II study and before the SACMEQ III data were available. In this study, a decision was made to standardize the SLE and SIM for all the three SACMEQ studies concurrently so as to capture the average situations of these indices overtime in Kenya. Nevertheless, the approach used to standardize the SLE and SIM indices (whether anchoring or concurrent) would not affect the results because the relative differences between the scores across studies would remain the same.

Therefore, based on the SLE and SIM indices an estimate of the mean score at pupil level was computed. The overall mean and standard deviation for SIM and SLE for the combined data for SACMEQ I, II and III were set at 50 and 10, respectively. The descriptive statistics of the SIM and SLE for the combined data (SACMEQ I, II, and III) are shown in Table 4-10.

Table 4-10: Estimates of the Mean and Standard Deviation of SIM and SLE Scales

| Descriptive Statistics | | | | | |
|------------------------|-------|---------|---------|---------|----------------|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| zSIM | 10968 | 5.32 | 68.95 | 50.0000 | 10.00000 |
| zSLE | 10968 | 22.92 | 100.40 | 50.0000 | 10.00000 |
| Valid N (listwise) | 10968 | | | | |

In Table 4-11 the mean and standard error for SIM have been presented for each province using the standardized scores. At national level, in 1998, the mean SIM score was 46.2 and increased significantly to 51.7 in 2007. Nairobi province recorded the highest means SIM score of 54.5 in 1998 while Eastern (56.6) was highest in 2000. Similarly, Nairobi had the highest mean SIM score in 2007 followed by Central at 54.0 and 53.1 respectively.

Table 4-11: the mean school instructional material index score by province

| Province | 1998 | | 2000 | | 2007 | |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Mean | SE | Mean | SE | Mean | SE |
| Central | 47.4 | 1.67 | 51.3 | 1.32 | 53.1 | 1.24 |
| Coast | 46.3 | 1.81 | 47.4 | 2.21 | 50.7 | 1.59 |
| Eastern | 42.9 | 1.37 | 56.6 | 1.71 | 50.9 | 1.52 |
| Nairobi | 54.5 | 1.61 | 56.2 | 1.67 | 54.0 | 1.86 |
| North Eastern | 45.9 | 1.16 | 48.9 | 1.96 | 48.8 | 1.51 |
| Nyanza | 46.3 | 1.42 | 50.7 | 2.09 | 52.2 | 1.20 |
| Rift Valley | 48.5 | 1.89 | 50.5 | 1.04 | 52.4 | 0.97 |
| Western | 43.7 | 1.63 | 48.1 | 1.22 | 49.5 | 0.67 |
| KENYA | 46.2 | 0.68 | 51.4 | 0.63 | 51.7 | 0.47 |

The mean SIM scores are further presented by poor and good SLE in 1998, 2000 and 2007 in Table 4-12. In poor SLE, the mean SIM score improved from 43.8 in 1998 to 48.6 in 2000 and increased further to 51.2 in 2007. Similarly, in good SLE, the mean score was 49.2 in 1998 as compared to 52.5 in 2007. It can also be deduced that the mean score for 2007 was above the average mean SIM score of 50 for both poor and good SLE but was lower in 1998 and 2000. This indicates an improvement of school instructional materials availability for Standard 6 pupils as at 2007.

Table 4-12: The mean of school instructional material index score by SLE and province

| Province | Poor SLE | | | | | | Good SLE | | | | | |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|
| | 1998 | | 2000 | | 2007 | | 1998 | | 2000 | | 2007 | |
| | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Central | 43.7 | 2.32 | 47.7 | 2.32 | 51.4 | 2.24 | 49.9 | 1.8 | 52.5 | 1.43 | 54.3 | 1.38 |
| Coast | 45.9 | 2.51 | 42.7 | 1.29 | 49.2 | 1.68 | 47.0 | 2.49 | 57.3 | 3.58 | 56.6 | 1.18 |
| Eastern | 40.7 | 1.67 | 53.9 | 2.69 | 50.9 | 1.83 | 46.7 | 1.41 | 58.6 | 2.04 | 50.9 | 2.71 |
| Nairobi | 63.3 | 0.0 | 40.4 | 0 | 48.0 | 0.48 | 54.5 | 1.62 | 57.2 | 1.45 | 54.3 | 1.96 |
| North Eastern | 46.0 | 1.48 | 50.0 | 1.97 | 47.8 | 1.35 | 45.7 | 1.13 | 42.7 | 3.46 | 58.0 | 4.25 |
| Nyanza | 46.8 | 1.43 | 48.6 | 2.51 | 51.2 | 1.44 | 44.5 | 4.16 | 56.0 | 2.85 | 54.9 | 1.84 |
| Rift Valley | 44.8 | 2.48 | 49.3 | 1.31 | 53.4 | 1.28 | 51.0 | 2.33 | 51.8 | 1.55 | 50.9 | 1.29 |
| Western | 41.5 | 1.84 | 45.9 | 1.61 | 49.4 | 0.91 | 48.5 | 2.36 | 51.1 | 1.59 | 49.5 | 0.98 |
| KENYA | 43.8 | 0.83 | 48.6 | 0.93 | 51.2 | 0.64 | 49.2 | 1.00 | 54.2 | 0.8 | 52.5 | 0.67 |

In general, at national level the attained mean SIM scores at pupil levels in good SLE have declined when comparing 2000 and 2007. The analysis shows disparities have declined, given that the mean score range for the SIM scales at province level for pupils in poor SLE, for 1998, 2000 and 2007 was 22.6, 13.5 and 5.2 respectively. While pupils from good SLE, the variation among provinces of the mean SIM index score was 10, 15.9 and 8.5 in 1998, 2000 and 2007 respectively. The decline in the range of mean score for the SIM among

pupils in all the provinces in poor SLE can be attributed to the same grants disbursement criteria to all public primary schools.

4.4 Summary

The information on the level and variation of school instructional materials among the pupils was analysed. Two key scales were constructed, that is, school learning environment (SLE) and school instructional materials (SIM) to categorise pupils. In general, pupils' in good school learning environment declined within the study period. The results indicated that pupils with own reading and mathematics books declined. However, all the pupils had adequate exercise books. On the other hand, considering a pool of school instructional materials, there was improvement in level of school resources. The SIM mean scores improved for both reading and mathematics. However, compared to pupils in poor school learning environment, the mean score for pupils in good school learning environment decreased. Similarly, when looking at the SIM scale, there was a reduction of pupils at scale 3 (highest).

This therefore implies there was mixed performance in the level of school instructional materials despite the large scale investments. The pupils in both poor and good school faced the same status of the selected school resources, but those in good schools were worse off. Another phenomenon was the huge disparities across the provinces in SIM and SLE scale.

Chapter 5 : Relationship between Pupil Learning Achievement and School Resources

Resources devoted to education are one among many factors which influence learning outcomes. Information on relation between school resources and learning outcomes allows policy makers considerable scope in addressing quality of educational systems within framework of ensuring adequate teaching and learning resources in schools.

5.1 Correlation between school instructional materials and achievement

The coefficient of correlation between the SIM score and reading and mathematics scores is presented in Table 5-1. At national level, the results show that mathematics and reading scores are correlated with SIM resource score in 1998, 2000 and 2007 (SACMEQ I, II and III) in good SLE. However, in poor SLE, the correlation between mathematics and reading scores with SIM score is positive and weak in 1998 and 2000 but negative and weak in 2007. In all the studies, the good SLE attained a significant positive coefficient (≥ 0.10), indicating a strong likelihood of pupils' higher reading and mathematics score with increased SIM resource score. In poor school learning environment, the correlation between pupil scores and SIM scores is negligible (< 0.10). In other words, there is no relationship between pupil scores and SIM scores in poor SLE schools.

Table 5-1: Coefficient of correlation between the school instructional material (SIM) index and pupils reading and mathematics scores

| Province | Reading | | | | | | Mathematics | | | |
|---------------|--------------|---------------|---------------|---------------|--------------|---------------|---------------|--------------|--------------|---------------|
| | Poor SLE | | | Good SLE | | | Poor SLE | | Good SLE | |
| | 1998 | 2000 | 2007 | 1998 | 2000 | 2007 | 2000 | 2007 | 2000 | 2007 |
| Central | 0.190 | 0.290 | <i>-0.130</i> | 0.170 | 0.310 | 0.080 | 0.370 | -0.020 | 0.210 | 0.050 |
| Coast | 0.360 | 0.180 | 0.110 | <i>-0.160</i> | 0.050 | -0.080 | -0.010 | 0.070 | 0.090 | -0.010 |
| Eastern | -0.070 | <i>-0.230</i> | -0.030 | <i>-0.110</i> | 0.170 | 0.330 | <i>-0.230</i> | -0.010 | 0.060 | 0.300 |
| Nairobi | 0.0 | 0.430 | 0.450 | 0.390 | 0.330 | 0.220 | 0.300 | 0.210 | 0.310 | 0.240 |
| North Eastern | -0.050 | 0.170 | 0.250 | -0.010 | -0.040 | 0.510 | 0.090 | 0.210 | -0.010 | 0.550 |
| Nyanza | 0.060 | -0.060 | -0.080 | 0.050 | 0.210 | <i>-0.110</i> | 0.000 | -0.060 | 0.380 | <i>-0.100</i> |
| Rift Valley | 0.030 | 0.260 | -0.010 | 0.320 | 0.440 | 0.290 | 0.240 | -0.090 | 0.410 | 0.180 |
| Western | 0.280 | 0.020 | <i>-0.100</i> | 0.010 | 0.260 | 0.220 | -0.040 | 0.010 | 0.240 | 0.160 |
| KENYA | 0.064 | 0.045 | -0.030 | 0.223 | 0.326 | 0.220 | 0.040 | -0.020 | 0.278 | 0.180 |

bold italics significant positive coefficient

Italics significant negative coefficient

Note: S=SACMEQ

The data also indicates that among provinces, there were variations in the correlation coefficient between the reading and mathematics scores with SIM resource score. There was a slight improvement in the correlation coefficient for both poor and good SLE in North

Eastern province with a correlation coefficient of -0.05 in 1998 to 0.25 in 2007 in reading scores. The same improvement occurred for mathematics scores in the same province. Eastern provinces recorded negative correlation coefficient in 1998, 2000 and 2007 in poor SLE but positive in good SLE for only 1998. Nairobi province reported significant positive correlation in both poor and good SLE in 1998, 2000 and 2007($p>0.01$).

5.2 Pupils competency levels in reading and mathematics

In SACMEQ I, the study the National Research Coordinators (NRCs) derived minimum and desired mastery levels in reading for Standard 6 pupils (Nzomo et al, 2000) after deliberations with subject panel from the Ministries of Education. Similarly in SACMEQ II, at the initial stage, the SACMEQ NRCs undertook a skills audit for reading and mathematics curriculum and when the tasks and skills were linked to the test items, eight levels of pupil competency were derived (Onsomu et al, 2005). The Rasch scaling procedures were used to generate reading and mathematics scores which were transformed into a mean and standard deviation of pupil scores at 500 and 100 respectively. It implies that a score of 500 was equal to the average of the country mean scores in SACMEQ II project (Hungu et al, 2010). Thereafter, the reading and mathematics test items were sequentially skills from the lowest to highest levels of difficulty. This procedure allowed the pupils' ability to be realigned to a difficulty level of test items placing them in a continuum of skills by linking person ability and item difficulty. In SACMEQ I, II and III, a subset of similar items were used and hence making it possible to compare pupils performance over time. Hence, the Standard 6 pupils in SACMEQ II and III were scored and placed according to their performance along the eight competency levels in reading and mathematics.

For purposes of this study, two levels of competencies were adopted and defined, namely; basic skills and advanced skills. The two competency levels for reading and mathematics were derived by merging broadly the eight levels established in SACMEQ. It was possible by considering the skills required at basic and advanced level as explained in the curriculum to meet minimum and desired mastery skills. This approach was taken to augment the analysis of the relationship between pupil reading and mathematics scores with SIM resource levels.

5.2.1 Defining basic and advanced pupil competency skills in reading

The basic and advanced competency levels for reading are presented. The basic reading skills cover reading competency Levels 1 to 5 mainly on mechanical reading skills that include:-

recognising and decoding words; matching individual words and phrases and extracting information directly from the text; and reading forward and interpreting adjacent pieces of information. Table 5-2 presents detailed description of the levels corresponding to basic competency in reading.

Table 5-2: Basic Reading skills at Level 1 to5

| Level | Reading Skills Attained |
|--------------|---|
| Level 1 | Pre-reading: Matches words and pictures involving concrete concepts and everyday objects, and follows short simple written instructions. |
| Level 2 | Emergent reading: Matches words and pictures involving prepositions and abstract concepts; uses cuing systems (by sounding out, using simple sentence structure, and familiar words) to interpret phrases by reading forwards. |
| Level 3 | Basic reading: Interprets meaning (by matching words and phrases completing a sentence, matching adjacent words) in a short and simple text by reading forwards or backwards. |
| Level 4 | Reading for meaning: Reads forwards and backwards in order to link and interpret information located in various parts of the text. |
| Level 5 | Interpretive reading: Reads forwards and backwards in order to combine and interpret information from various parts of the text in association with external information (based on recalled factual knowledge) that “completes” and contextualises meaning. |

Source: SACMEQ II Report, Kenya

Also, the advanced reading skills cover reading competency Levels 6 to 8. These skills are mainly on inferential reading for meaning from within and outside the text and includes: - interpreting and making inferences from different types of text; analysing detailed texts or extended documents for underlying messages; and reading forward and backward making judgements about the assumptions, values and biases of the author. Table 5-3 presents detailed description of the levels corresponding to advanced competency in reading.

Table 5-3: Advanced Reading Skills at Level 6 to 8

| Level | Reading Skills Attained |
|--------------|--|
| Level 6 | Inferential reading: Reads forwards and backwards through longer (narrative, document or expository) texts in order to combine information from various parts of the text so as to infer the writer's purpose. |
| Level 7 | Analytical reading: Locates information in longer (narrative, document or expository) texts by reading forwards and backwards in order to combine information from various parts of the text so as to infer the writer's personal beliefs (value systems, prejudices, and/or biases). |
| Level 8 | Critical reading: Locates information in longer (narrative, document or expository) texts by reading forwards and backwards in order to combine information from various parts of the text so as to infer and evaluate what the writer has assumed about both the topic and the characteristics of the reader - such as age, knowledge, and personal beliefs (value systems, prejudices, and/or biases). |

Source: SACMEQ II Report, Kenya

5.2.2 Defining basic and advanced pupil competency skills in mathematics

The basic and advanced competency skills for mathematics are described. Basic mathematics skills cover mathematics competency Levels 1 to 4. They are mainly on manipulation of basic operations and recognition of shapes and figures that includes: - applying single- to two-step addition or subtraction of whole numbers and basic fractions; recognising three-dimensional shapes and number units; and translating simple textual/verbal information into basic arithmetic forms using whole numbers and fractions. Table 5-4 presents detailed description of the levels corresponding to basic competency in mathematics.

Table 5-4: Basic Mathematics Skills at Level 1 to 4

| Level | Mathematics Skill Levels |
|---------|--|
| Level 1 | Pre-numeracy: Applies single step addition or subtraction operations. Recognises simple shapes. Matches numbers and pictures. Counts in whole numbers. |
| Level 2 | Emergent numeracy: Applies a two-step addition or subtraction operation involving carrying, checking (through very basic estimation), or conversion of pictures to numbers. Estimates the length of familiar objects. Recognizes common two-dimensional shapes. |
| Level 3 | Basic numeracy: Translates verbal information (presented in a sentence, simple graph or table using one arithmetic operation) in several repeated steps. Translates graphical information into fractions. Interprets place value of whole numbers up to thousands. Interprets simple common everyday units of measurement. |
| Level 4 | Beginning numeracy: Translates verbal or graphic information into simple arithmetic problems. Uses multiple different arithmetic operations (in the correct order) on whole numbers, fractions, and/or decimals. |

Source: SACMEQ II Report, Kenya

Also, advance mathematics skills cover Level 5 to 8 mainly on problem solving which includes:-solving multiple-operation problems using the correct order of arithmetic operations on whole and mixed numbers, fractions, ratios, and decimals; extracting and converting information from tables, charts, visual and symbolic presentations in order to identify, and then solves multi-step problems and identifying the nature of an unstated mathematical problem embedded within verbal or graphic information, and then translating this into symbolic, algebraic, or equation form to solve the problem. Table 5-5 presents detailed description of the levels corresponding to advanced competency in mathematics.

Table 5-5: Advanced Mathematics Skills at Level 5 to 8

| Level | Mathematics Skill Levels |
|---------|---|
| Level 5 | Competent numeracy: Translates verbal, graphic, or tabular information into an arithmetic form in order to solve a given problem. Solves multiple-operation problems (using the correct order of arithmetic operations) involving everyday units of measurements and/or whole and mixed numbers. Converts basic measurement units from one level of measurement to another (for example metres to centimetres). |
| Level 6 | Mathematically skilled: Solves multiple-operation problems (using the correct order of arithmetic operations) involving fractions, ratios, and decimals. Translates verbal and graphic representation information into symbolic, algebraic, and equation form in order to solve a given mathematical problem. Checks and estimates answers using external knowledge (not provided within the problem). |
| Level 7 | Problem solving: Extracts and converts (for example, with respect to measurement units) information from tables, charts, visual and symbolic presentations in order to identify, and then solve multi-step problems. |
| Level 8 | Abstract problem solving: Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information, and then translate this into algebraic or equation form in order to solve the problem. |

Source: SACMEQ II Report, Kenya

5.3 Pupil competency attainment

Analysis of the pupil competency attainment is presented for reading and mathematics that illustrates the variation among pupils in poor and good SLE. The same analysis is also deliberated among the pupils across the three levels of SIM resources for the period 1998, 2000 and 2007(SACMEQ I, II and III).

5.3.1 Pupils' performance in reading by SLE

The percentage of pupils with advanced reading skills by province, gender, socio economic status and location is presented in Table 5-6. There was an increase in pupils' with advanced reading skills in poor SLE at 26.1 percent, 27.5 percent and 31.1 percent in 1998, 2000 and 2007 respectively. Similarly, pupils in good SLE with advanced reading schools increased from 42.8 percent in 1998, to 48.4 percent in 2000, and to 49.9 percent in 2007.

Between 2000 and 2007, Nairobi province recorded a drop in pupils reaching advanced reading skills in poor SLE. However, the proportion of pupils in good SLE with advanced reading skills did not differ significantly between 1998, 2000 and 2007. Less than half of the pupils in good SLE for Rift Valley (36.8 percent) and Western (33.8 percent) provinces attained advanced reading skills in 2007. Except for Nairobi, all the other provinces had less than half of the pupils' in poor SLE attaining advanced reading skills.

Table 5-6: Percentage of pupils reached advanced reading skills by SLE

| Category | Poor SLE | | | | | | Good SLE | | | | | |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 1998 | | 2000 | | 2007 | | 1998 | | 2000 | | 2007 | |
| | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE |
| <i>Province</i> | | | | | | | | | | | | |
| Central | 35.2 | 6.82 | 28.7 | 11.86 | 46.4 | 12.05 | 36.7 | 4.61 | 43.7 | 6.49 | 57.9 | 7.06 |
| Coast | 35.5 | 7.51 | 34.4 | 8.95 | 34.4 | 4.93 | 44.9 | 11.18 | 74.5 | 5.16 | 64.4 | 15.29 |
| Eastern | 30.3 | 8.54 | 29.7 | 10.01 | 33.7 | 6.16 | 37.3 | 7.85 | 67.4 | 5.91 | 59.6 | 12.00 |
| Nairobi | 0.0 | 0.0 | 88.2 | 0.0 | 50.0 | 0.0 | 69.8 | 5.19 | 71.6 | 4.53 | 69.9 | 6.11 |
| North Eastern | 21.7 | 5.71 | 28.1 | 4.55 | 45.7 | 8.67 | 23.0 | 8.28 | 51.7 | 8.04 | 67.6 | 18.77 |
| Nyanza | 13.1 | 3.56 | 28.4 | 6.17 | 34.1 | 4.18 | 22.5 | 7.83 | 29.4 | 12.27 | 53.9 | 10.47 |
| Rift Valley | 27.1 | 6.18 | 27.1 | 7.07 | 28.5 | 4.29 | 57.1 | 7.1 | 41.6 | 8.72 | 36.8 | 8.22 |
| Western | 29.6 | 6.35 | 19.1 | 3.41 | 11.4 | 2.34 | 19.4 | 7.36 | 35.2 | 9.12 | 33.2 | 7.88 |
| <i>Gender</i> | | | | | | | | | | | | |
| Boys | 26.6 | 3.23 | 29.7 | 3.41 | 31.5 | 2.54 | 43.6 | 3.83 | 48.8 | 3.85 | 49.3 | 3.80 |
| Girls | 25.5 | 3.1 | 25.4 | 3.63 | 30.7 | 2.79 | 41.8 | 3.86 | 48.0 | 3.97 | 50.6 | 4.17 |
| <i>SES</i> | | | | | | | | | | | | |
| Low SES | 22.9 | 4.34 | 16.0 | 3.28 | 26.1 | 2.39 | 34.8 | 7.24 | 33.8 | 5.38 | 27.6 | 4.33 |
| High SES | 31.7 | 3.62 | 52.3 | 6.10 | 43.5 | 4.07 | 49.2 | 3.79 | 64.2 | 3.69 | 73.9 | 3.29 |
| <i>Location</i> | | | | | | | | | | | | |
| Rural | 22.6 | 3.11 | 24.4 | 3.37 | 29.4 | 2.83 | 33.0 | 4.29 | 37.5 | 4.67 | 37.7 | 5.01 |
| Urban | 36.2 | 5.85 | 38.6 | 7.62 | 36.8 | 4.53 | 55.4 | 5 | 62.4 | 4.5 | 60.7 | 5.31 |
| KENYA | 26.1 | 2.90 | 27.5 | 3.17 | 31.1 | 2.40 | 42.8 | 3.38 | 48.4 | 3.53 | 49.9 | 3.77 |

NOTE: "advanced" reading skills = competency levels 6 to 8

Based on gender, there was a slight improvement of both boys and girls for those reaching advanced skills in poor SLE from 26.6 percent and 25.5 percent in 1998 to 31.5 percent and 30.7 percent in 2000 respectively. Similarly for good SLE, the proportion of boys and girls with advanced reading skills increased in the same period with girls reporting a better performance at 50.6 percent in 2007 as compared to boys at 49.3 percent. More pupils from a higher socio-economic status (SES) attained advanced reading skills in both poor and good SLE compared to those of lower SES. Also, majority of the high SES pupils in good SLE schools (73.9 percent) had advanced reading skills. The same scenario is replicated with pupils from urban areas from good SLE at 60.7 percent compared to 37.7 percent from the rural areas.

5.3.2 Pupils' performance in reading skills by SIM resource scale

Table 5-7 presents the percentage of pupils reaching advanced reading skills by SIM scale by province, gender, SES and location. The pupils with advanced reading skills at level 1 declined from 28.6 percent in 1998 to 26.3 percent in 2000. However, there was an increase in 2007 to 33.9 percent. The proportion of pupils at SIM level 2 with advanced reading skills

improved marginally from 36.0 percent in 2000 to 37.4 percent in 2007. Conversely, proportion of pupils at SIM level 3 with advanced reading skills declined from 53.2 percent to 46.2 percent between 1998 and 2000 respectively. Nairobi province had the largest proportion of pupils at SIM level 3, with slight improvement from 79.8 percent in SACMEQ I to 80.2 percent in 2007. As at 2007, the most improved province was North Eastern, with 82.1 percent of the pupils at level 3 having attained advanced reading skills compared to 28.1 percent in 1998.

Table 5-7: Percentage of pupils reached advanced reading skills by instruction materials level

| Category | 1998 | | | | | | 2000 | | | | | | 2007 | | | | | | |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|
| | L1 | | L2 | | L3 | | L1 | | L2 | | L3 | | L1 | | L2 | | L3 | | |
| | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE | |
| <i>Province</i> | | | | | | | | | | | | | | | | | | | |
| Central | 32.3 | 4.86 | 38.9 | 4.72 | 40.7 | 6.5 | 22.8 | 6.19 | 39.5 | 6.3 | 57.1 | 12.88 | 19.2 | 15.13 | 54.9 | 7.23 | 54.5 | 9.00 | |
| Coast | 31.6 | 11.31 | 44.0 | 7.37 | 48.8 | 8.01 | 34.2 | 10.61 | 46.4 | 9.61 | 78.5 | 6.13 | 38.4 | 12.26 | 35.9 | 6.18 | 62.7 | 8.44 | |
| Eastern | 34.2 | 8.37 | 36.2 | 4.16 | 12.6 | 4.44 | 34.8 | 11.76 | 50.8 | 8.28 | 54.2 | 8.71 | 32.7 | 9.78 | 42.4 | 6.73 | 44.2 | 9.99 | |
| Nairobi | 43.9 | 5.20 | 68.1 | 6.41 | 79.8 | 5.86 | 67.9 | 10.29 | 67.5 | 5.59 | 81.5 | 4.90 | 61.9 | 10.10 | 62.8 | 6.33 | 80.2 | 6.95 | |
| North Eastern | 25.4 | 5.87 | 16.6 | 7.05 | 28.1 | 13.86 | 33.1 | 7.19 | 29.1 | 5.21 | 51.1 | 11.85 | 29.3 | 8.64 | 47.2 | 9.62 | 82.1 | 9.52 | |
| Nyanza | 12.9 | 4.89 | 18.7 | 4.12 | 10.0 | 4.16 | 28.3 | 5.42 | 26.1 | 5.95 | 33.6 | 14.72 | 36.2 | 11.07 | 41.3 | 5.34 | 36.0 | 4.60 | |
| Rift Valley | 35.0 | 5.46 | 44.2 | 7.68 | 61.9 | 10.45 | 18.3 | 6.23 | 31.8 | 6.15 | 60.5 | 11.9 | 39.6 | 12.57 | 29.6 | 4.31 | 38.7 | 9.68 | |
| Western | 23.0 | 4.56 | 36.0 | 8.73 | 22.9 | 8.91 | 21.3 | 6.16 | 24.8 | 4.59 | 43.6 | 16.34 | 10.5 | 4.50 | 22.5 | 4.36 | 25.8 | 16.6 | |
| <i>Gender</i> | | | | | | | | | | | | | | | | | | | |
| Boys | 31.2 | 3.38 | 36.8 | 3.61 | 37.7 | 6.02 | 23.9 | 3.42 | 37.9 | 2.98 | 56.3 | 6.25 | 35.9 | 5.11 | 36.9 | 2.41 | 47.0 | 3.69 | |
| Girls | 26.1 | 3.03 | 34.1 | 3.24 | 48.5 | 6.03 | 28.7 | 3.99 | 34.1 | 3.33 | 50.4 | 5.64 | 31.9 | 5.23 | 38 | 2.73 | 45.4 | 4.34 | |
| <i>SES</i> | | | | | | | | | | | | | | | | | | | |
| Low SES | 25.8 | 4.11 | 31.7 | 8.42 | 28.8 | 7.9 | 15.9 | 3.56 | 24.9 | 3.69 | 25.6 | 9.49 | 30.7 | 4.23 | 25.8 | 2.39 | 25.7 | 5.01 | |
| High SES | 33.8 | 3.27 | 41.5 | 3.86 | 51.0 | 6.25 | 49.7 | 4.93 | 53.0 | 4.11 | 74.8 | 4.10 | 57.9 | 7.02 | 62.6 | 3.38 | 66.6 | 4.53 | |
| Rural | 23.8 | 3.23 | 29.8 | 3.33 | 29.6 | 5.39 | 23.4 | 3.31 | 29.4 | 3.29 | 38.5 | 7.51 | 26.4 | 6.09 | 31.9 | 2.85 | 34.1 | 4.03 | |
| Urban | 41.8 | 4.96 | 46.2 | 4.67 | 57.0 | 7.8 | 34.5 | 6.13 | 51.2 | 4.92 | 72 | 5.23 | 43.9 | 6.34 | 48.1 | 4.05 | 68.9 | 4.62 | |
| KENYA | 28.6 | 2.91 | 35.5 | 2.74 | 42.9 | 5.44 | 26.3 | 2.85 | 36.0 | 2.87 | 53.2 | 5.36 | 33.9 | 4.46 | 37.4 | 2.31 | 46.2 | 3.70 | |

NOTE: "advanced" reading skills = competency levels 6 to 8

The data on gender depicts that, slightly more boys than girls at Level 3 reached advanced reading skills in 2000 (56.3 percent boys, 50.4 percent girls) and 2007 (47.0 percent boys, 45.4 percent girls). In terms of SES, pupils in High SES were likely to reached advanced reading skills than those in low SES. The same is recurring in school location, with 68.9 percent of pupils in urban areas reaching advanced reading skills as compared to 34.1 percent in 2007 in rural areas.

5.3.3 Pupils' performance in Mathematics skills by SLE

Analysis of Table 5-8 reveals the percentage of pupils with advanced mathematics skills by province, gender, socio economic status and location. There was a marginal increase in

pupils' with advanced mathematics skills in 2000 and 2007 in poor SLE at 23.8 percent, and 24.2 percent. Conversely, pupils in good SLE with advanced reading schools declined from 42.1 percent to 37.4 percent during the same period.

Table 5-8: percentage of pupils reached "advanced" mathematics skills by category of school

| Category | Poor SLE | | | | Good SLE | | | |
|------------------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2000 | | 2007 | | 2000 | | 2007 | |
| | % | SE | % | SE | % | SE | % | SE |
| <i>Province</i> | | | | | | | | |
| Central | 25.2 | 6.26 | 32.2 | 7.1 | 44.8 | 5.68 | 45.2 | 7.13 |
| Coast | 33.2 | 10.31 | 29.4 | 3.3 | 53 | 6.29 | 52.9 | 14.6 |
| Eastern | 25.1 | 9.64 | 30.1 | 5.86 | 53.6 | 6.51 | 38.3 | 12.94 |
| Nairobi | 64.7 | 0 | 26.4 | 5.87 | 50.7 | 6.06 | 51.2 | 8.34 |
| North Eastern | 21.4 | 3.44 | 44.8 | 7.66 | 51.1 | 9.18 | 67.1 | 22.14 |
| Nyanza | 24.5 | 5.1 | 23.9 | 3.59 | 40.3 | 10.39 | 35.7 | 5.32 |
| Rift Valley | 23.8 | 5.66 | 22.3 | 3.27 | 34 | 8.8 | 31.7 | 6.09 |
| Western | 14.7 | 3.41 | 8.3 | 1.84 | 24.1 | 8.35 | 23.7 | 5.71 |
| <i>Gender</i> | | | | | | | | |
| Boys | 28.8 | 3.07 | 30.2 | 2.24 | 47.5 | 4.16 | 42.6 | 3.44 |
| Girls | 18.8 | 2.79 | 18 | 1.93 | 37 | 3.4 | 32.2 | 3.31 |
| <i>SES</i> | | | | | | | | |
| Low SES | 16.5 | 2.67 | 22.6 | 1.76 | 30.2 | 6.31 | 19.7 | 3.78 |
| High SES | 42.1 | 5.85 | 31.6 | 3.76 | 56.3 | 4.16 | 55.8 | 3.66 |
| <i>Location</i> | | | | | | | | |
| Rural | 21.5 | 3 | 22.7 | 2.15 | 35.4 | 4.63 | 26.8 | 3.86 |
| Urban | 31.3 | 5.91 | 29.6 | 3.84 | 50.7 | 4.09 | 46.8 | 4.3 |
| KENYA | 23.8 | 2.7 | 24.2 | 1.87 | 42.1 | 3.33 | 37.4 | 3.15 |

NOTE: "advanced" math skills = competency levels 5 to 8

North Eastern province improved significantly in pupils reaching advanced mathematics skills in both poor and good SLE. In 2007, North Eastern province had the highest pupils with advanced mathematics skills among the good SLE, at 67.1 percent. This was followed by Coast and Nairobi provinces at 52.9 percent and 51.2 percent respectively. Conversely, Western province had the lowest pupils' with advanced mathematics skills at poor and good SLE, 8.3 percent and 23.7 percent respectively.

With respect to gender, more boys than girls had attained advanced mathematics skills in 2000 and 2007. However, in both poor and good SLE, less than half of the boys and girls had reached the advanced mathematics skills. Also, the results indicate that there was a decline in both gender in attainment of the advanced mathematics skills between 2000 and 2007. For pupils from high SES there was a decline in pupils reaching advanced mathematics skills. A

small proportion of pupils from low SES in poor SLE had advanced mathematics skills, with slight improvement from 16.5 percent in 2000 to 22.6 percent in 2007. Conversely, over half of the pupils in high SES reached advanced mathematics skills in good SLE at 56.3 percent and 55.8 percent in 2000 and 2007 respectively. Also a decline in pupils reaching advanced mathematics in rural and urban in good SLE from 35.4 percent to 26.8 percent and 50.7 percent to 46.8 percent in the same period.

5.3.4 Pupils' performance in mathematics skills by SIM scale

Data in Table 5-9 indicates the percentage of pupils reaching advanced mathematics skills by SIM scale at province, gender, SES and location. The pupils with advanced mathematics skills at level 2 and level 3 and declined from 31.0 percent and 45.9 percent in 2000 to 28.7 and 35.0 percent in 2007 respectively. During the same period, the proportion of pupils at SIM level 2 with advanced reading skills at Level 2 improved marginally from 36.0 percent to 37.4 percent (results in Table 5-3). Nairobi province had more pupils at SIM level 3, attaining advanced mathematics skills at 65.1 percent in 2000 while North Eastern was higher at 80.6 percent in 2007. All the provinces recorded less than half of the pupils in Level 1 and 2 reaching advanced mathematics skills in 2000 and 2007.

Table 5-9: Pupils reached "advanced" mathematics skills by school instruction materials level

| Category | 2000 | | | | | | 2007 | | | | | |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | L1 | | L2 | | L3 | | L1 | | L2 | | L3 | |
| | % | SE | % | SE | % | SE | % | SE | % | SE | % | SE |
| Province | | | | | | | | | | | | |
| Central | 28.5 | 7.79 | 37.3 | 4.73 | 61.2 | 11.64 | 17.6 | 12.89 | 39.4 | 5.03 | 46 | 9.43 |
| Coast | 33.5 | 13.24 | 37.6 | 7.45 | 57.5 | 8.26 | 25.5 | 8.13 | 35.6 | 4.90 | 38.8 | 8.61 |
| Eastern | 28.2 | 13.79 | 42.4 | 8.16 | 41.9 | 9.12 | 34.0 | 9.45 | 30.7 | 6.08 | 38.2 | 8.86 |
| Nairobi | 43.9 | 12.21 | 43.9 | 7.11 | 65.1 | 6.52 | 39.3 | 11.54 | 40.9 | 8.63 | 66.8 | 8.83 |
| North Eastern | 35.8 | 5.42 | 22.1 | 5.15 | 40.3 | 7.71 | 30.4 | 9.05 | 46 | 8.20 | 80.6 | 7.93 |
| Nyanza | 22.6 | 4.55 | 29.1 | 5.47 | 35.9 | 14.13 | 27.8 | 6.65 | 28.8 | 3.90 | 22.2 | 3.30 |
| Rift Valley | 16.3 | 5.36 | 26.8 | 5.10 | 50.5 | 12.54 | 26.1 | 7.76 | 25.6 | 3.49 | 28.1 | 6.89 |
| Western | 19.7 | 5.92 | 16.5 | 3.81 | 29.5 | 15.54 | 4.6 | 2.80 | 16.6 | 3.03 | 18 | 12.63 |
| Gender | | | | | | | | | | | | |
| Boys | 27.8 | 3.98 | 35.5 | 2.88 | 54.1 | 6.28 | 29.8 | 3.82 | 34.7 | 2.12 | 40.1 | 3.26 |
| Girls | 20.2 | 3.14 | 26.4 | 2.67 | 38.4 | 4.99 | 21.5 | 4.12 | 22.4 | 1.83 | 29.9 | 3.76 |
| SES | | | | | | | | | | | | |
| Low SES | 21.4 | 3.94 | 22.3 | 3.66 | 20.1 | 8.30 | 19.9 | 4.08 | 22.2 | 1.96 | 21.7 | 3.40 |
| High SES | 39.1 | 5.51 | 46.6 | 3.73 | 63.8 | 5.46 | 43.9 | 6.40 | 45 | 3.10 | 53.6 | 4.63 |
| Rural | 22.8 | 3.38 | 25.9 | 2.95 | 37.4 | 7.63 | 21.4 | 4.64 | 23.2 | 1.93 | 27.3 | 3.49 |
| Urban | 27.2 | 5.64 | 42.7 | 3.74 | 56.8 | 5.89 | 31.2 | 4.96 | 39.3 | 3.15 | 49.4 | 5.23 |
| KENYA | 23.9 | 2.90 | 31.0 | 2.47 | 45.9 | 5.21 | 25.6 | 3.42 | 28.7 | 1.77 | 35.0 | 3.17 |

NOTE: "advanced" math skills = competency levels 5 to 8

In 2007, less than half of the boys and girls reached advanced mathematics skills in all the SIM resource levels. For pupil of High SES at level 1, the percentages of pupils with advanced mathematics skills increased slightly from 39.1 percent (2000) to 43.9 percent (2007). Also, pupils in urban schools at level 1 increased marginally from 27.2 percent (2000) to 31.2 percent (2007).

5.4 Selected factors that influence pupils learning achievement

So far, this study looked at the differences in pupil learning achievement using SLE and SIM as separate variables. However, learning outcomes are in general influenced by many variables. In this regard, further consideration has been taken into account based on reading and mathematics models to determine the extent to which SLE and SIM variables explain the differences in pupil learning achievement if included in a model together. In this respect, Table 5-10 shows the output of the multi linear regression of the selected variables in reading and mathematics. Pupil sex, school location and pupil SES were included in the regression model because past studies based on SACMEQ data identified these variables as key predictors of pupil achievement in Kenya (Hungu et al, 2010a).

5.4.1 Reading achievement model

The reading model presented is based on the selected variables that were analysed separately but have a combine effect on the pupil learning achievement. The model therefore determines the magnitude of influence of selected variables relevant to the study. The results presented indicate the extent some of the factors impact on pupils reading achievement such as Pupil sex, school location, pupil SES, SIM index and SLE index variables. All selected variables except pupil sex had significant influences on achievement in reading. These variables therefore are identified as potential predictors of pupil achievement using Multiple Linear Regression (MLR) analysis. In general the variables impacting on pupil reading achievement can be explained as follows:

- **Pupil Sex:** Girls were likely to perform better than boys in reading
- **School location:** Pupils in schools located in urban areas outperformed pupils in school located in rural areas in reading.
- **Pupil SES:** Pupils from richer home backgrounds and more educated parents achieved better than pupils from poorer home backgrounds and less educated parents.

Table 5-10: Reading and Mathematics regression models

| | Reading model | | | | | | | | | | | | | | |
|-------------------|---------------|--------|--------|-------|----|---------------|--------|--------|-------|----|---------------|-------|--------|-------|----|
| | SACMEQ I | | | | | SACMEQ II | | | | | SACMEQ III | | | | |
| | Coef. | SE | t | Sig. | | Coef. | SE | t | Sig. | | Coef. | SE | t | Sig. | |
| (Constant) | 334.674 | 11.461 | 29.201 | 0 | | 244.784 | 12.388 | 19.759 | 0 | | 285.389 | 11.83 | 24.124 | 0 | |
| Variables | | | | | | | | | | | | | | | |
| Pupil sex | -2.88 | 2.617 | -1.1 | 0.271 | ns | -1.117 | 2.762 | -0.404 | 0.686 | ns | -1.935 | 2.642 | -0.732 | 0.464 | ns |
| School location | 25.297 | 2.951 | 8.573 | 0 | | 17.224 | 3.192 | 5.395 | 0 | | 20.757 | 3.072 | 6.758 | 0 | |
| Pupil SES | 0.173 | 0.019 | 8.89 | 0 | | 0.378 | 0.025 | 15.08 | 0 | | 0.384 | 0.022 | 17.328 | 0 | |
| SIM index | 0.487 | 0.136 | 3.573 | 0 | | 0.778 | 0.148 | 5.252 | 0 | | 0.179 | 0.152 | 1.173 | 0.241 | ns |
| SLE index | 1.957 | 0.152 | 12.86 | 0 | | 1.547 | 0.157 | 9.836 | 0 | | 1.313 | 0.158 | 8.323 | 0 | |
| Total variation | $R^2 = 0.169$ | | | | | $R^2 = 0.217$ | | | | | $R^2 = 0.173$ | | | | |

| | Math model | | | | | | | | | | | | | | |
|-------------------|------------|----|---|------|--|---------------|--------|--------|------|--|---------------|--------|--------|-------|----|
| | SACMEQ I | | | | | SACMEQ II | | | | | SACMEQ III | | | | |
| | Coef. | SE | t | Sig. | | Coef. | SE | t | Sig. | | Coef. | SE | t | Sig. | |
| (Constant) | | | | | | 342.862 | 12.616 | 27.176 | 0 | | 396.003 | 10.869 | 36.436 | 0 | |
| Variables | | | | | | | | | | | | | | | |
| Pupil sex | | | | | | -22.632 | 2.813 | -8.045 | 0 | | -21.65 | 2.428 | -8.917 | 0 | |
| School location | | | | | | 7.07 | 3.252 | 2.174 | 0.03 | | 13.004 | 2.823 | 4.607 | 0 | |
| Pupil SES | | | | | | 0.292 | 0.026 | 11.452 | 0 | | 0.281 | 0.02 | 13.837 | 0 | |
| SIM index | | | | | | 0.747 | 0.151 | 4.95 | 0 | | 0.157 | 0.14 | 1.124 | 0.261 | ns |
| SLE index | | | | | | 1.472 | 0.16 | 9.189 | 0 | | 0.993 | 0.145 | 6.848 | 0 | |
| Total variation | | | | | | $R^2 = 0.162$ | | | | | $R^2 = 0.129$ | | | | |

Note : ns=not significant at p<0.05.

- ***SIM index:*** Pupils in school with more instructional materials performed better in reading than pupils in schools in less instructional materials. Nevertheless, it should be noted that the SIM index was not significant in the reading model for SACMEQ III.
- ***SLE index:*** Pupils in schools with better learning environment did better in reading than their counterparts in schools with poor learning environment.

The total variance explained by the variables included in the reading model for SACMEQ I, II and III was 16.9 percent, 21.7 percent and 17.3 percent respectively (this is obtained from R^2). These results indicate that there are other important variables not included in the model that influence learning outcomes.

5.4.2 Mathematics achievement model

Table 5-10 also, illustrates that the pupil mathematics achievement was influenced by Pupil sex, school location, Pupil SES, SIM index and SLE index. Apart from Pupil sex, these were the same variables identified as potential predictors of pupil achievement in the reading models. In general the variables impacting on pupil reading achievement can be explained as follows:

- ***Pupil sex:*** Boys were likely to perform better than girls in mathematics.
- ***School location:*** Pupils in schools located in urban areas outperformed pupils in school located in rural areas in mathematics.
- ***Pupil SES:*** Pupils from richer home backgrounds and more educated parents achieved better than pupils from poorer home backgrounds and less educated parents.
- ***SIM index:*** Pupils in school with more instructional materials performed better in mathematics than pupils in schools in less instructional materials.
- ***SLE index:*** Pupils in schools with better learning environment did better in mathematics than their counterparts in schools with poor learning environment.

The total variance explained by the variables included in the mathematics model for SACMEQ II and III was 16.2 percent and 12.9 percent respectively (this is obtained from R^2). The results indicating weak total variance show that there are other important variables not included in the model that influence learning outcomes.

5.5 Summary

School instructional materials and learning environment are known to have positive impact on pupil achievement. The results indicate pupils from good SLE achieved better in reading and mathematics with more instructional materials. This was not the case for pupils from poor SLE where impact of SIM was negligible. In both good and poor SLE, there was improvement in pupils attaining advanced competency in reading and mathematics. However, there was a decline in proportion of pupils with advanced competency in reading despite having a higher SIM resource. Conversely, for mathematics, a higher SIM scale meant more pupils with advanced competency. Pupil achievement is influenced by pupil sex, school location, pupil SES, SIM and SLE as illustrated by the regression analysis. In general, pupil achievement is moderately influenced by school instructional materials and school learning environment.

Chapter 6 : Analysing Policy Interventions on School Resources and Learning

Outcomes

This chapter describes the nature of the school resource physical progress following the formulation and implementation of policy interventions for primary education in Kenya. This is then linked to the learning achievement of standard 6 pupils over a period of seven years between 1998 and 2007. The first subsection is on the usefulness of the policy interventions and agenda for action followed by accounting for the trends and disparities of teaching and learning materials. In subsequent subsections, the significance of the SIM resources and selected variables in pupil learning achievement is presented. Finally, constraints, challenges and lessons learnt in the implementation of school instructional materials intervention are identified and elaborated.

6.1 Usefulness and adoption of SACMEQ policy suggestions and agenda for action in Kenya's planning and policy formulation process

The information generated on schooling conditions and quality of learning from SACMEQ studies covered the years 1998, 2000 and 2007. The final report for SACMEQ I was disseminated in 2000 while results for SACMEQ II and III were available in 2004 and 2010 respectively. SACMEQ I provided the baseline data for the quality framework that encompasses the input, output and outcome of the primary education system. The SACMEQ reports synthesised relevant policy suggestions and agenda for action to assist policy makers in developing appropriate interventions that address quality in primary education.

The analysis in this study demonstrates that the education sector SWAp process was enriched with information and policy suggestions from SACMEQ I and II. This process was engaged after introduction of FPE (in 2003) culminating with KESSP implementation (2005 to 2010). The key KESSP investment programs that infused the SACMEQ findings included; school instructional material, quality assurance and monitoring and evaluation. The school instructional material was a large scale investment that addressed school resources availability in primary education. The FPE school grants were the largest direct disbursement that benefited public primary schools. A total of 53 percent of the FPE grants enabled schools to procure teaching and learning materials, hence a significant investment. The remaining 47 percent of the FPE investment were operating expenses to ascertain a good learning environment. Besides that, another large scale investment for selected schools (using targeted approach) was school infrastructure improvement programme. However, this approach of

investment needed to have been taken cautiously since increasing spending as shown in some developing countries in Sub Sahara, was not likely to improve quality of education (Pritchett, 2004). This therefore means, government should not assume that once the financing has been done, then the mission of quality of education has been accomplished. Financing needs to be followed on definite implementation plan and results of the outcome.

The provision of resources has to be hand in hand with the management structure. It is for this reason that for implementation of KESSP interventions administrative responsibilities at school, district, provincial and headquarter levels are stipulated. At school level, the school management committees were entrusted with management of school funds based on specified guidelines for procurement and utilisation of school resources. According to Wößmann (2003), when administration responsibilities are well defined and the schools have autonomy in management and process decisions there is a likelihood of improved student performance. This valuable information is useful in the interrogation of effectiveness of the school resource policy intervention given the administrative roles provided.

6.2 Accounting for trends and disparities of school instructional material resources

In order to analyse the trends and disparities of school instructional materials among Standard 6 pupils, two variables were constructed, that is, SLE and SIM index scores. This was necessary considering the context of primary education policy interventions in FPE and KESSP. In this study, the physical progress of the large scale investments are linked to the SLE and SIM indices for the period 2003 to 2009. This approach is similar to that adopted by Saito (2007) as it makes it possible to determine magnitude of school resources and pupil achievement in any particular time.

The results indicate that pupils enrolled in schools with good learning environment declined from 49.6 percent in 2000 to 40.7 percent in 2007. Only Nairobi province (94.1 percent, SE= \pm 4.1 percent) had nearly all pupils in good school learning environment. This scenario could be attributed to abolition of school levies and hence less parents' involvement in school infrastructure improvement and no funding from government for the same. The situation was no better, due to limited Government education budget that deprived the education planners' opportunity to implement a comprehensive infrastructure financing. However, several new schools were constructed through local initiatives through Constituency Development Fund (CDF), Local Authority Transfer Fund (LATF), development partners and other corporate

initiatives. This study intended to consider schooling conditions based on physical facilities when analysing the school instructional materials resources levels. This approach allows nesting of pupils at similar school learning environment and compares their SIM resources.

The analysed data from SACMEQ II and III projects assesses the availability of school instructional materials intervention for up to ten years, from 1998 to 2007. The Ministry of Education had set a policy target on textbooks pupil ratio of 1:1 for mathematics and reading in upper primary education to be achieved by 2010. The results show less pupils with own reading textbook in 2007 (29 percent) compared to 2000 (32.8 percent) in good SLE. Similarly, in poor SLE, only 18.6 percent in 2007 had own reading textbook compared to 20.9 percent in 2000. There were huge range in own reading textbooks recorded among the provinces and only two provinces reported over 40 percent of pupils in good SLE. The same situation is replicated with mathematics textbooks. There was a decline in pupils with own mathematics textbook in both poor and good SLE between 2000 and 2007. Only 14.2 percent and 16.4 percent of the pupils in poor and good SLE respectively had own maths textbook in 2007. The schools faced a herculean task to ensure that the target is met in 2010, given that majority of the pupils are sharing the textbooks. The results indicate no progress or limited progress in availability of textbooks among the pupils, a situation that can only mean that either funding was not adequate or there was a higher wastage despite sustained funding of textbooks. On the other hand, pupils with adequate exercise books were high and remained nearly the same. In 2007, pupils in poor and good SLE with adequate exercise books were 74.3 percent and 81.8 percent respectively. However, for both textbooks and exercise books, pupils from poor school learning environment are the most underprivileged.

The SIM scale and SIM mean score are useful in determining the physical progress of policy intervention on teaching and learning materials in primary schools. This approach of combining selected school resources systematically pupils within the level of resources they access. In overall, a large group of pupils were in SIM level 2 at 71.1 percent in 2007 compared to 59.9 percent in 2000. Conversely, the pupils in SIM level 3 declined marginally from 21.5 percent in 2000 to 19.2 percent in 2007. The same scenario is replicated across the regions with Nairobi, Nyanza and Central provinces reporting the highest proportion of pupils at SIM Level 3 compared to national attainment in 2007.

The analysis further utilised the SLE and SIM mean score to determine the level of school resource over the study period. Based on SACMEQ I, II and III, the mean SIM and SLE were established at 50 with a standard deviation of 10. The SIM mean score in 2007 (51.7, SE=0.47) improved slightly compared to 2000 (51.4, SE=0.63), despite huge resources for implementation of the policy strategy in the provision of teaching and learning materials. Upon introducing the pupil learning environment, the good SLE attained a mean of 52.5(SE=0.67) in 2007 compared to 54.2(SE=0.80) in 2000. Conversely, in poor SLE there was a higher improvement from 48.6(SE=0.93) in 2000 to 51.2(SE=0.64) in 2007. The results indicate similarity in the mean SIM score for pupils in poor and good SLE in 2007. The outcome shows that pupils from both poor and good SLE had same levels of SIM resources. Information generated reflects disparities among the provinces with the highest and lowest mean scores significantly reduced from 11.2 (poor SLE) and 15.9 (good SLE) in 2000 to 3.2 (poor SLE) and 8.5 (good SLE) in 2007. They do not deny that some investments are productive. The question is if the level of change is significant given the large resources provided to the schools. In general, according to Lockheed, M. E., and Hanushek E. A. (1988), there is evidence that some minimal levels of key resources are valuable in promoting student learning. This explains why pupils of the same SIM levels in poor and good SLE had similar mean scores. Therefore, in the next section, a discussion is made on pupils' performance in reading and mathematics.

6.3 Contribution of selected school resources to pupils' learning outcomes

The policy intervention on school instructional materials was designed to increase availability of teaching and learning materials in school and to improve learning outcomes. This study considered reading and mathematics subjects that were captured under SACMEQ I, II and III. In this regard, the relationship between pupil learning achievement and SLE and SIM scale was analysed. The results indicate that there was a correlation between the SLE and learning achievement. In 2007, it was surprising to note that in poor SLE, though not significant, the pupil reading and mathematics scores were negatively correlated with SIM scores. This may not be surprising because according to Hungi (2010a), key predictors of pupil achievement in Kenya at group level were pupil-teacher ratio, pupils' behaviour problems and average SES. Pupils in poor SLE could likely face this kind of scenarios and hence the SIM may not necessarily lead to improved learning achievement. Conversely, pupil achievement in good SLE and SIM scores had significant positive coefficient. The outcome implies that pupils in good SLE were likely to perform better with increased SIM resources. This according to

Siniscaclo and Ross (1997), means that higher level of resources correspond to higher reading outcomes as illustrated in Canada, France and Zimbabwe.

It was not enough to know the relationship between pupil achievement and SIM scores and therefore further analysis was carried out to determine Standard 6 pupils' competency skills. In this study two competency skills were defined and adopted that were based on the 8 SACMEQ competency levels. These skills in reading and mathematics are; basic competency skills and advanced competency skills. Pupils with advanced competency skills in poor SLE increased from 27.5 percent in 2000 to 31.1 percent in 2007. Similarly, in good SLE, the proportion of pupils increased from 48.4 percent to 49.9 percent in the same period. The results further revealed that over the years, more pupils from good SLE achieved advanced basic competency reading skills than from poor SLE. On gender, more girls than boys had advanced reading skills while more pupils from High SES and urban location attained advanced reading skills. Likewise, there were more pupils in good SLE with advanced mathematics skills than those from poor SLE in 1998, 2000 and 2007. Also, more pupils had advanced mathematics skills in high SES and urban locations. It can also be noted that more boys than girls attained advanced mathematics skills in both poor and good SLE. However, the pupils with advanced mathematics in good SLE declined from 42.1 percent in 2000 to 37.4 percent in 2007. In all, less than half of the pupils attained advanced reading and mathematics skills.

Using assessment to measure the cognitive skills learned gives impetus to the role of education in economic development (Hanushek and Wößmann, 2007). It makes a lot sense to analyse the pupil learning achievement at different SIM scale to determine the effectiveness of the school resources interventions. The percentage of pupils with advanced reading competency skills was less than half at all SIM scale levels except in 2000 for SIM Level 3 which had 53.2 percent. The results showed marginal improvement in pupils with advanced reading competency skills for SIM scale I and II at 26.3 percent and 36.0 percent to 33.9 percent and 37.4 percent in 2000 and 2007 respectively. Conversely, the percentage of pupils at SIM level III with advanced reading competency skills declined from 53.2 percent to 46.2 percent in the same period. At the same time, there were more boys than girls with advanced reading competency skills in SIM II and III in 2000 and 2007. Looking at the pupils' home background, more than half of the pupils in High SES had attained advanced reading competency skills at all SIM levels in 2007. However, based on school location, only the

urban schools had more than half the pupils at SIM level III with advanced reading competency skills.

The performance in mathematics was worse off at SIM level II and III with a decline in percentage of pupils with advanced mathematics competency skills. At SIM Level II and III, the pupils declined from 31.0 percent and 45.9 percent in 2000 to 28.7 percent and 35.0 percent in 2007 respectively. There were more boys than girls with advanced mathematics competency levels. However, both boys and girls recorded decline in pupils at advanced competency levels between 2000 and 2007. More pupils from high SES and those from urban schools attained advanced mathematics competency levels.

Based on the reading and mathematics model, the results show that pupil reading and mathematics achievement are directly influenced by the school location, pupil SES, SIM index and SLE index variables. The pupils in urban areas performed better than pupils from rural areas while those from high SES were better than those from low SE. It has also been confirmed that pupils with higher SIM index and good SLE performed better than those with lower SIM index and poor SLE. It should also be noted in this study, only these variables were utilised and they accounted for 17.3 percent and 12.9 percent of the explanatory variables in pupil achievement for reading and mathematics respectively. This means that there are other variables that explain the Standard 6 pupil achievement that were not considered in the study.

6.4 Lessons learnt, constraints and challenges in implementation of selected school resource interventions

Since the introduction of Free Primary Education in 2003, the Government sustained grants support to public primary schools with funds disbursed to two accounts; SIMBA and GPA. The SIMBA account financed procurement of teaching and learning materials, that included; textbooks, exercise books, reference materials, chalks, dusters, pens and pencils. The GPA account financed operating expenses such as co-curricular activities, repair and maintenance, salaries among others. The financing of the school funds was coordinated by the School Management Committee and the School Instructional Materials Selection Committee. The Government policy was to disburse the school grants twice every financial year based on a capitation grant of KSh 1,020 per child (USD 13.6). However, the actual disbursement per

child varied from one year to another, with schools receiving KSh 957.1 in 2003 to KSh 1,171 in 2006. Thereafter, the capitation grant declined to KSh 862.2 in 2007 to KSh 581.8 in 2009. The direct disbursement of funds to schools was a positive move as it gave the schools the mandate to prioritize the school requirements within specified guidelines.

According to the 2010 KESSP Mid Term M&E report and Ministry of Education, VFM Study, showed that most schools had attained a textbook ratio of 1:2 in upper primary and 1:3 in lower primary as at 2008. There was also an indication that a few schools had a book pupil ratio of 1:1 but many others had a better Pupil book ratio. This results and the analysis attained in this study, means that the 2010 target of 1:1 pupil book ratio could not be attained or elusive. In particular, the Value for Money report gave a critical view of the facilitation and management of the SIM resources. There were serious accountability issues, with a critical doubt of purchases and report on heavy losses of books through poor record keeping, thefts, tear and wear. Based on the VFM report, the Government drastically reduced the capitation grants to public primary schools for the financial years 2009/10 and 2010/11. This decision appears to be more to address the fact that there was mismanagement of FPE funds at school level, without taking into consideration actual school resource needs of the schools. The schools were also finding it difficult to plan and execute their needs as the funding was inadequate and disbursement of FPE funds was irregular.

The apparent draw back in reduced resource flow to public schools can be linked to a weak monitoring and evaluation system and lack of an accurate and timely database on school instructional materials. The framework in place required that besides the Ministry headquarter staff responsible for SIM who monitored FPE, at local level, the quality and assurance and standard officers were expected to undertake regular quality visits. This was a herculean task given the large number of primary schools against a very limited quality assurance staff at all levels. The fact that the monitoring system was weak, could be breeding ground for possible mismanagement of funds as reported by the VFM report and forensic audit reports conducted on KESSP funds (MoE, 2011).

The implementation of the policy intervention on school resources is a large scale investment on provision of quality education at primary level. By itself, it doesn't mean that quality has been attained. This is why the policy suggestions in SACMEQ on school instructional materials took into consideration, borrowing and use of textbooks, pupil homework support

by parents and frequency of marking by the teachers. The borrowing of books by the pupils can also occur where there exists a library in a school or in the community. The ultimate aim is to ensure that there is improvement in learning achievement especially in reading and mathematics. This is where therefore; the Ministry of Education is expected to have guidelines for collaboration and adoption at school or community levels. It has been documented that collaboration with other actors like the Kenya National Library Services is weak or non-existent and guidelines for parents support are lacking. Lack of these less costly strategies hinder effective teaching and learning that complements availability of school instructional materials hampered. The ultimate end is that policy intervention of school resources under FPE does not realise tangible results improvement in pupil learning achievements. The fact that there were no significant change in results in SACMEQ results in 2007 compared 2000, reveals that there are issues that need to be addressed other than providing funds for school instructional materials.

6.5 Summary

The importance of evidenced based education policy formulation, planning and management is the thrust in the use of SACMEQ research studies. Kenya's education sector utilised extensively the policy suggestions and agenda for action in programme implementation. However, it is clear that the policy targets for school instructional materials had not been achieved despite, massive resource being made available. Pupils' performance is closely linked to the state of the school instructional materials and school learning environment, with pupils' from poor school learning environment and low school instruction materials performing lower. The country was characterized with disparities in school instructional materials resulting in differences in pupils' performance. However, where the school resources were higher, the pupil achievement was certainly better.

The education system faces challenges in management of school resources with high wastage. The monitoring and evaluation, though in existence are weak. This implies that effective measures are not taken in time that addresses governance and accountability. The supervision mechanism is weak and hence there is poor utilisation of school instructional materials that leads to lower performance in reading and mathematics. Collaboration and partnership with community and other stakeholders is not adequate. This implies that despite the large scale investment, the effectiveness of the policy interventions is therefore in doubt and the outcome is not consistent with resource input.

Chapter 7 : Summary of Findings, Conclusion and Policy Recommendations

The chapter describes a summary of the memoir, draws conclusion and makes appropriate policy recommendations on implementation of effective interventions towards improving quality in primary education.

7.1 Summary of findings

Quality in education is reflected in the pupil achievement after accounting for all the factors both internal and external to the schooling system. Several studies have shown strong evidence that school quality contributes to higher pupil achievements in developing countries (Fuller, 1985). It was therefore, prudent that the Government implemented Free Primary Education, not only to increase access but ensure adequacy of inputs that have direct impact on quality of education. The Government's commitment is reflected in the sustained increase in education expenditure (between 20 to 27 percent) and GDP share of education budget (between 6 to 7 percent) for the period 2003 to 2010. The implementation of, KESSP, a SWAp process from 2005 to 2010, demonstrated the importance the GOK accorded to education.

The Ministry of Education integrated the SACMEQ policy suggestions and agenda for action in the planning, formulation and management of school resource interventions. The FPE policy, school infrastructure and economic stimulus package were pro-poor large scale investments for enhancing teaching and learning resources and improving physical facilities in public primary schools. The baseline information on schooling conditions and learning outcomes from SACMEQ studies informed policy makers on appropriate strategies to be put in place. This study focused on selected SACMEQ I, II and III policy suggestions and provides detailed analysis on levels of school instructional materials and pupil learning outcomes. Notwithstanding, capacity building of teachers, parents' involvement in pupil homework and provision of school and community library resources are also articulated. Other areas of policy suggestions dwelt on were monitoring and evaluation in addressing governance and accountability of the school resource interventions.

The study employed Item Response Theory through pooling of items for school learning environment (SLE) and other items on School Instructional Materials (SIM). In using the

SLE average index score, the Standard 6 pupils were categorised into poor and good SLE based on the school physical learning conditions. The pupils were also categorised into three levels of SIM scale, which recognised improvement of teaching and learning materials. In particular, Level 3 was distinct from the two levels because it had pupils with own reading and mathematics textbooks. Level 2 was distinct from Level 1 due to having geometrical sets and adequate exercise books, but both levels had pupils sharing textbooks.

The study added value in evaluating the achievement effects of school instruction materials intervention in good and poor school learning environment. There were more pupils in poor school learning environment in 2007 compared to 1998 and 2007. This outcome is credible because there were no elaborate school infrastructure support implemented due to limited funding and only most needy schools were targeted. Proportion of pupils with own reading and mathematics textbooks reduced, with a higher decline recorded in good SLE. The pupils with own textbooks ranged declined significantly between 2000. However, there was improvement in adequacy of exercise books in both poor and good SLE. Overall, achievement in the school instructional materials intervention was significant at Level 2 complementing with a decline in Level 1. The very low proportion of pupils at Level 3 meant that less achievement effect of policy intervention for higher school resources. The large influx of enrolment in 2003 meant that the initial years required a higher investment. Hence, schools had lower purchasing power to meet a 1:1 pupil textbook ratio in the initial 5 years of FPE.

There was a significant positive coefficient between school instruction materials index and reading and mathematics scores in good SLE. Variation among provinces existed with Nairobi and North Eastern provinces reporting significant positive correlation in both poor and good SLE. The positive coefficient meant that there was likelihood of the pupils' learning achievement improving with increased SIM resources. In 2007 overall, the pupils in poor SLE had a negative correlation between the SIM resources and the reading and mathematics scores. The implication is that the school learning environment is also equally important for a likelihood of the pupils attaining higher scores. The explanation to this divergence in poor school learning environment can be attributed to pupil access to school and classroom library, home context, parents' attitude and participation among others.

The pupil's competency skills are anticipated to improve with increased school resource levels. Using the eight SACMEQ competency levels, two broad skills were derived that is, basic or advanced skills in reading and mathematics. About double the pupils in good SLE had advanced reading and mathematics skills compared to those from poor SLE. The same scenario was replicated in pupils from High SES, urban areas and with relatively more pupils with advanced skills from good than poor SLE. Over half the pupils from high SES and in good SLE had attained advanced reading and mathematics skills. The results also indicate that with increasing SIM scale, more pupils attain advanced skills in reading and mathematics. However, there was a decline in the proportion of pupils in SIM Level 2 and 3 with advanced reading and mathematics from 2000 to 2007. This being the period of policy intervention, with proven increase in schools resource levels in level 2. This means that despite the large scale intervention, there were other factors that downplayed the skills achievement levels in reading and mathematics. The possible explanation is on utilisation of textbooks and reading culture so as to improve reading comprehension and numeracy skills. A further analysis conducted based on a regression model for mathematics and reading indicated that in 2007, the school location, pupil SES, SIM index and SLE index accounted for a total variance of 17.3 percent and 12.9 percent in reading and mathematics respectively.

7.2 Conclusion

The adoption of SACMEQ policy suggestions on school resources is demonstrated in the implementation of Free Primary Education and integrated in KESSP investment plans. In particular, the Government maintained large scale financing targeting school instructional materials to all public primary schools. According to the Mckinsey report and other studies, it has been demonstrated that significant improvement in educational attainment can be achieved within as little as six years (Mourshed M. et al, 2007). In Kenya, school instructional materials interventions were implemented from 2003 and within the KESSP framework from 2005 to 2010. In all those years, financing significantly increased except for a reduction in funding during the financial years 2008/09 and 2009/10. The reduction was mainly attributed to suspicion of resource leakage especially in school instructional materials (MoE, 2009). Since available SACMEQ data covers 1998, 2000 and 2007, the level of school resources and learning outcomes is determined for the intervention covering the years 2003 to 2007. This can be seen as a mid-term evaluation of 2005-2010 KESSP and evaluation of effectiveness of FPE grants on improving school resource levels and pupil achievement in public primary schools at the end of 5 years.

The study has also noted that there are policy suggestions on utilisation of school instructional materials that required minimal resources but were not implemented. For example, the improvement of pupil reading culture was dependent on access to reading materials in library facilities within the school and community. Various studies indicate that the Ministry of Education lacked policy guidelines on use of reading materials especially on parents' role. Several organisations formed networks for improving pupil reading culture but no indication of formal link with the Ministry of Education. At the same time, quality assurance at school level was to be enforced to improve on pupil learning achievement. However, reviewed literature showed limited role if any, that was undertaken by the Directorate of Quality Assurance and Standards in ensuring availability and utilisation of textbooks at school level.

The need for improving the learning environment of the pupils is critical, since less than half of the pupils were from schools categorised as good learning environment. This explains the importance of the large scale funding for school infrastructure improvement programme that targeted very needy schools. Though all schools received FPE funds to cater for operating expenses including general maintenance, the amount was insufficient. However, the Government is still committed in expending funds for improving school facilities.

Though there has been improvement in availability of school instructional materials in primary schools, it is not sufficient. Given the progress made so far, there is no guarantee that the KESSP target of 1:1 textbook pupil ratio for reading and mathematics can be attained in 2010. There are also wide provincial variations in the level of school instructional materials.

In terms of performance, there has not been significant improvement in learning achievement in reading and mathematics after the FPE interventions. The results show fewer pupils with higher competency in reading and mathematics despite higher level of school instructional materials. However, pupils in good learning environments, high socioeconomic status and urban areas were performing better.

7.3 Policy Recommendations

The findings of the study propose a total of 14 policy recommendations based on the following five themes: Policy review and harmonization for effective learning achievement;

research, monitoring and evaluation; resource mobilization and allocation for school development; Capacity development for enhanced governance and accountability; and coordination, partnerships and collaboration. The recommendations take cognizance of the new constitution, that is, Kenya adopted a county governance system (47 counties as opposed to the 8 provinces), with devolved resources that could have immense impact on education provision.

A. Policy review and harmonization for improved learning achievement

1. Previous policy suggestions from SACMEQ on improving reading culture were not implemented by the Ministry of Education. However, in order to improve the reading competency of the pupils, it is instrumental that the Directorate of Quality Assurance and Standards develops guidelines that give responsibilities to parents, teachers and community library services to stimulate pupil reading culture and improve reading competency skills.
2. The Ministry of Education has developed school instructional manuals that are used at school level to manage teaching and learning resources. However, there are no clear roles on monitoring the acquisition, utilisation and pupils' use of textbooks and reference materials that are adopted by the school management committees, parents and teachers. The Directorate of Basic Education and that of Policy and partnership affairs should review the manuals and incorporate roles of the actors at school level with defined reporting mechanism.

B. Research, monitoring and evaluation

3. It is important that information on school performance be shared at all levels to enhance accountability and citizens' right to information in line with the new constitution. The Directorate of Basic Education needs to establish criteria to develop a school score card on school instruction materials and learning environment as a way of providing feedback on resource procurement and utilisation including pupil achievement.
4. In the past, there have been SACMEQ suggestions for development of a long term plan for infrastructure development but there is no strategic plan developed to provide future expectations in school development. Given, the large number of pupils in poor school learning environment, it is necessary that the Ministry of Education in liaison with the Ministry of Finance undertake a comprehensive review of the pupils' learning

environment for the development plan of a strategic plan for improvement of the primary schools infrastructure.

5. The Directorate of Quality Assurance and Standards needs to carry out an action research to identify reasons for majority of the pupils do not attain advanced competency in reading and mathematics especially for schools with higher instructional materials.
6. In the past SACMEQ policy suggestions were on strengthening the Education Management Information System for accurate data for determining progress in education planning indicators. Similarly, the Ministry of Education should build the capacity of EMIS with the necessary ICT infrastructure and personnel to establish and manage school intuitional materials database especially for textbooks for primary schools to gather information on the status towards optimal maximization of funding to primary schools needs without necessarily reducing funding.

C. Resource mobilization and allocation for school development

7. It is important the education sector has the needs requirement predicted overtime so as to prepare and engage in viable policy options and assumptions. The Ministry of Education in liaison with the Ministry of Finance should establish a unit that projects education financial needs and cost implication especially for primary education and develop feasible financial requirements for effective budget negotiations and support.
8. The education sector is one of the highest beneficiaries of the public financing but resources provided are mainly in operations with capital budget having less support. The Ministry of Education in liaison with the Ministry of Finance needs to come up with financing principles that takes into consideration all the stakeholders to improve on the budgetary levels through active participation of the private sector and development partners in financing education sector for equitable resource mobilization and utilization in and development partners.

D. Capacity development for enhanced governance and accountability

9. In the past, the Ministry of Education has provided capacity building on management committees on financial management, procurement and accountability of school resources. However, due to high turnover, the training has not been effective. There should be continuous capacity building of the managers at school level by empowering the local officials to undertake the trainings and monitor the outcome.

10. The ability of the education officials especially those carrying out curriculum supervision responsibilities have been limited. The Ministry of Education in collaboration with Kenya Education Management Institute (KEMI) should facilitate and train quality assurance and standards officials with relevant skills for routine monitoring and evaluation of curriculum implementation and school resources utilization so as to achieve better learning outcomes.

E. Coordination, partnerships and collaboration

11. Various government departments have complementary role in education provision such as the Kenya National library Services (KNLS). The Ministry needs to have a forum that promotes incorporation of all the stakeholders in the establishment and facilitation of library services in schools and at the community.

12. Despite introduction of Free Primary Education, the role of parents, school management committees, civil society and private sector is still enormous and varied. The Ministry of Education needs to community support and private sector corporate support in improving school learning environment in primary education.

7.4 Further research to be conducted

The study would have revealed more had there been data at the end of KESSP cycle implementation after the year 2010, due to the limitation of data and selection of a few variables based on the study objectives. Therefore, further investigation is proposed on the as follows:

- Using the proposed SACMEQ IV project, further research is required to determine absolute effectiveness of school resource policy interventions in improving quality of primary education as at 2010, that is, end of KESSP implementation.
- SACMEQ IV project should incorporate questions that address the frequency of borrowing of textbooks, loss of textbooks and access of textbooks at home and community resource centres.
- Using the SACMEQ data sets, the extent of influence of other essential factors on standard 6 pupils' performance in reading and mathematics in various years should be evaluated.

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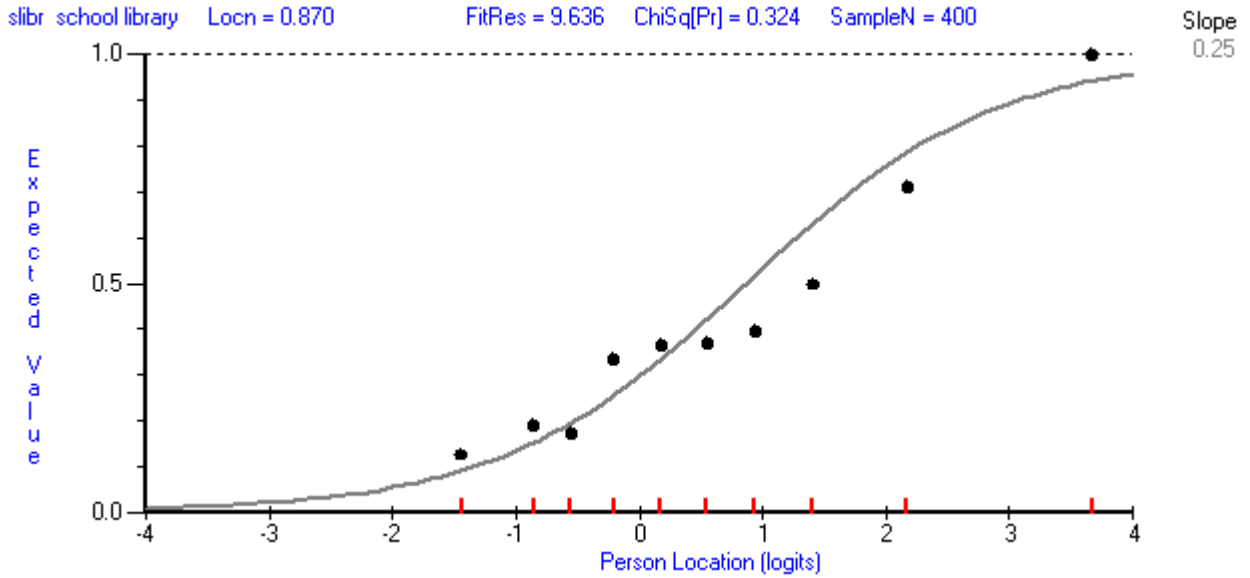
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ANNEXE

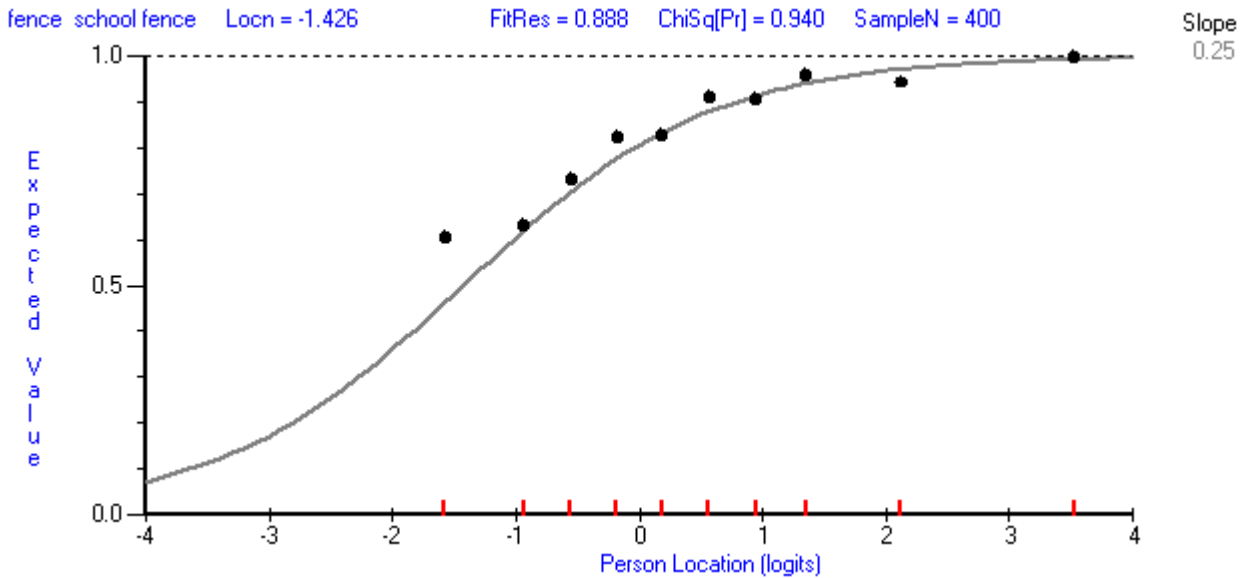
A. Item Distribution

A1 School learning Environment Item calibration

A1.1 Example 1: School Library item calibration

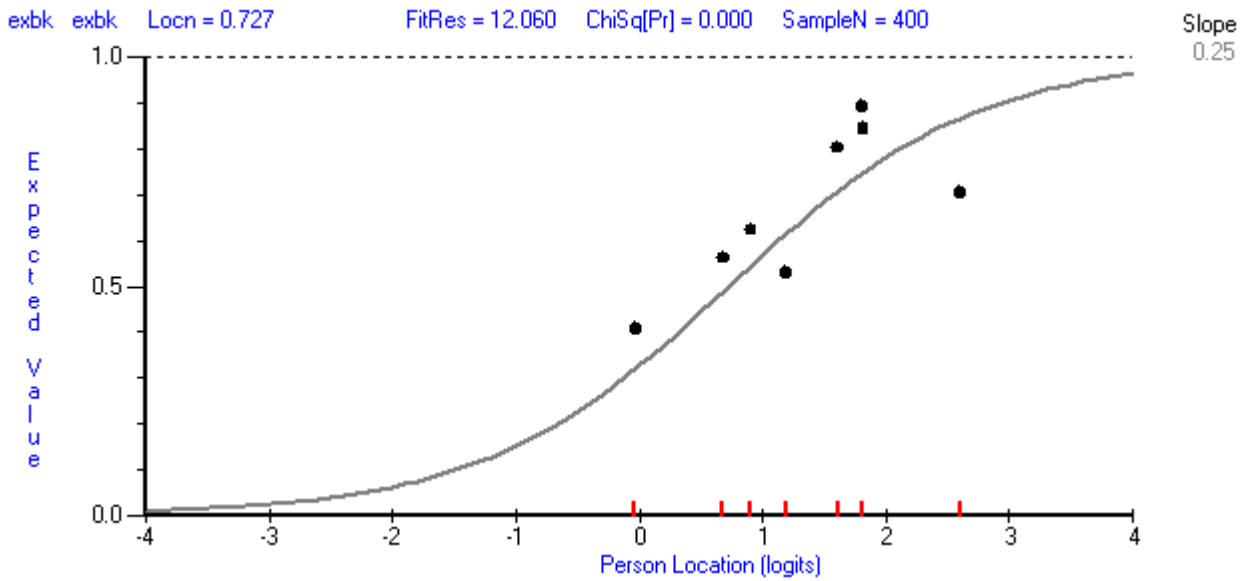


A1.2 Example 2: School Fence Item Calibration

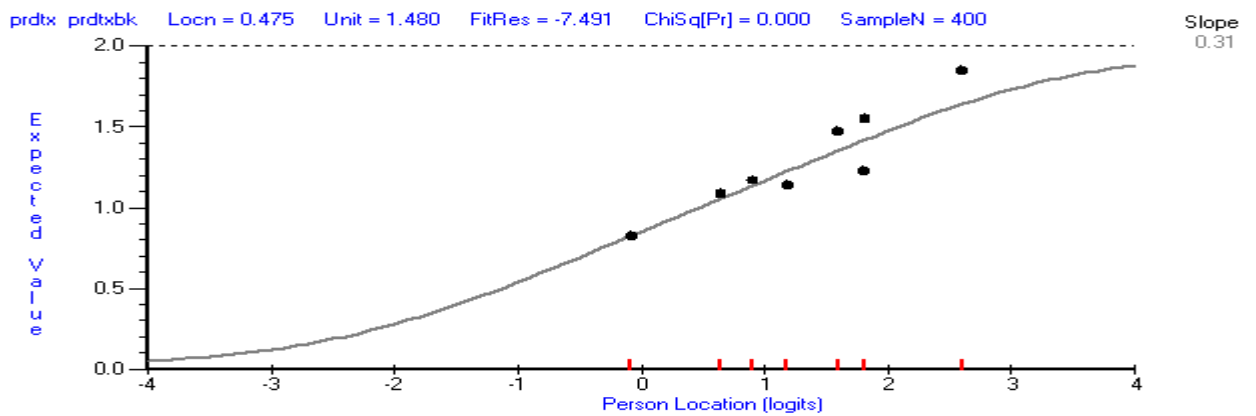


A2. School Instructional materials Item calibration

A2.1 Example 1 : Exercise Book item calibration



A2.2 Example 2 Reading textbook item calibration



A2.3 SLE and SIM Reliability Scale

SLE scale

SUMMARY STATISTICS for Analysis Name RUN2

ITEM - PERSON INTERACTION

| ITEMS | | | PERSONS | | |
|-------------|----------|--------------|-------------|----------|--------------|
| | Location | Fit Residual | | Location | Fit Residual |
| Mean | 0.000 | -1.470 | Mean | 0.370 | -0.244 |
| SD | 2.350 | 9.044 | SD | 1.232 | 0.462 |
| Skewness | | 0.210 | Skewness | | 0.844 |
| Kurtosis | | -0.856 | Kurtosis | | 1.761 |
| Correlation | | 0.000 | Correlation | | 0.136 |

Sum of Squared Std Resid = 359809.40

ITEM - TRAIT INTERACTION

| | |
|-------------------------|-----------|
| Total - Item Chi Square | 6.885.073 |
| degrees of freedom | 171 |
| Chi Square Probability | 0.000000 |

RELIABILITY INDICES

| | |
|-------------------------|-------|
| Person Separation Index | 0.718 |
| Cronbach Alpha | N/A |

[Cronbach alpha not applicable with missing data]

LIKELIHOOD RATIO TEST

| | | |
|----------|------------|-------|
| Analysis | Likelihood | ChiSq |
| anaName1 | | DegF |
| anaName2 | | Prob |

POWER OF TEST-OF-FIT

| | |
|------------|------|
| Excellent | |
| Good | GOOD |
| Reasonable | |
| Low | |
| Too Low | |

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SIM scale

SUMMARY STATISTICS for Analysis Name RUN3

ITEM - PERSON INTERACTION

| ITEMS | | | PERSONS | | |
|-------------|----------|--------------|-------------|----------|--------------|
| | Location | Fit Residual | | Location | Fit Residual |
| Mean | 0.000 | -7.807 | Mean | 2.033 | -0.512 |
| SD | 1.053 | 6.271 | SD | 1.212 | 0.778 |
| Skewness | | 1.183 | Skewness | | 1.001 |
| Kurtosis | | 0.683 | Kurtosis | | 1.238 |
| Correlation | | 0.000 | Correlation | | -0.295 |

Sum of Squared Std Resid = 163962.10

ITEM - TRAIT INTERACTION

| | |
|-------------------------|-----------|
| Total - Item Chi Square | 5,594.228 |
| degrees of freedom | 104 |
| Chi Square Probability | 0.000000 |

RELIABILITY INDICES

| | |
|-------------------------|-------|
| Person Separation Index | 0.539 |
| Cronbach Alpha | N/A |

[Cronbach alpha not applicable with missing data]

LIKELIHOOD RATIO TEST

| | | |
|----------|------------|-------|
| Analysis | Likelihood | ChiSq |
| anaName1 | | DegF |
| anaName2 | | Prob |

POWER OF TEST-OF-FIT

| | |
|------------|------------|
| Excellent | |
| Good | |
| Reasonable | REASONABLE |
| Low | |
| Too Low | |

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B. School Instructional Materials

