SACMEQ Educational Policy Research Series

The SACMEQ II Project in Swaziland: A Study of the Conditions of Schooling and the Quality of Education.

Swaziland
Working Report

by

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Foreword

The origins of the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) date back to 1991, the year when several Ministries of Education in Eastern and Southern Africa started working closely with UNESCO's International Institute for Educational Planning (IIEP) on the implementation of integrated educational policy research and training programmes.

In 1995 these Ministries of Education formalized their collaboration by establishing a network that is widely known as SACMEQ. Fifteen Ministries are now members of SACMEQ: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, Zambia, and Zimbabwe.

SACMEQ is registered in Zimbabwe as an Independent Intergovernmental Non-profit Organization. Its Coordination Centre is located within UNESCO's Harare Cluster Office and is managed by a Director who works under the guidance of a six-member Managing Committee. SACMEQ's Assembly of Ministers meets every two years and provides overall policy guidance concerning SACMEQ's mission and programmes.

The focus of SACMEQ's capacity building programmes has been on building the capacity of Ministries of Education to monitor and evaluate the quality of their basic education systems. SACMEQ employs innovative training approaches that include a combination of face-to-face training, hands-on experience, computer laboratory sessions, and on-line support via the Internet. SACMEQ also encourages a unique form of collaboration among SACMEQ National Research Coordinators in the fifteen member countries as they share and exchange skills and successful experiences.

In September 2004 SACMEQ was awarded the Comenius Medal for its innovative approaches to delivering cross-national educational research and training programmes.

This report provides a description of the results of the SACMEQ II Project - SACMEQ's second major educational policy research project. The results of the SACMEQ I Project were reported in seven national reports for Kenya, Malawi, Mauritius, Namibia, Zambia, Zimbabwe, and Tanzania (Zanzibar).

The SACMEQ Data Archive was launched in June 2004. This valuable information resource contains data, data collection instruments, manuals, technical papers, and related publications from both SACMEQ projects. Copies of the archive may be obtained by completing the registration form on the SACMEQ Website (www.sacmeq.org).

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Chapter 1:
Setting the Scene

Introduction

Swaziland's main priority at Independence in 1968 was to expand its school system. Over the following 20 years there was a major increase in resources made available to all levels of education, and a systematic movement towards the achievement of Universal Primary Education (UPE) in 1985. In recent years the country has been struggling to maintain UPE because of difficulties associated with financial constraints, the HIV/AIDS pandemic, and poverty - which is beginning to manifest itself in the rural areas of the country.

The achievement of UPE encouraged Swaziland to refocus its attention on the quality and relevance of its primary education system. In particular the Government set the following objectives for primary education:

- To expand the existing schools to accommodate the progression of all pupils through the primary education cycle;
- To provide quality teachers and facilities throughout the country;
- To develop an integrated system of education that provides equal opportunities to all pupils; and
- To develop learning/teaching strategies that reduce wastage, repetition, and dropout.

(Ministry of Education, 1999)

Swaziland is one of the smallest countries in Africa. It covers an area of about 17, 500 sq. km and has a population of around one million. Swaziland uses a system of government that it inherited from the British colonial system in conjunction with the traditional system of local councils presided over by the King. There are four administrative districts, Hhohho, Manzini, Shiselweni and Lubombo. Each district has a Ministry of Education office that is headed by a District Education Officer.

Swaziland is classified internationally as a lower middle-income economy. Its Gross Domestic Product (GDP) per capita in 2000 was around US$1300. Despite these promising income levels, there are still many Swazis living in conditions of poverty. In 2000, about 66 percent of the population was living below the poverty line of around about US$70 per month. This was mainly due to the slowdown in economic growth experienced in the latter part of the 1990s.

Social structure and conditions

The social structure of Swaziland operates at two inter-connected levels. The traditional structure is more family and community oriented, and provides social protection for family and community members. The social structure also incorporates western family values, western legislation, and western-style governance. The country has made significant strides towards improving people's quality of life. This is evident in the high literacy rate of around 80 percent and improved access to health facilities – with some 85 percent of health facilities now within 8km of the communities they serve.

Challenges to Education Provision

The Government has always recognised the importance of investing in human resources and therefore a high priority has been given to improving the education system. However, a combination of high population growth and budget restrictions has resulted in overcrowding and understaffing in schools.

The Government provides around 77 percent of total expenditure in primary schools and around 69 percent of total expenditure in secondary/high schools, with the balance being provided by parents/guardians.

The Government covers only the payment of salaries for teachers, and expects parents to pay for most textbooks, learning materials, school uniforms, school management costs, and the construction of classrooms and staff houses.

The costs of sending children to school are high for poor households. It has been estimated that the school fees and other associated costs have reached US $150 to US $200 per child per annum at the primary level. With some poor households failing to receive more than $100 annual income, sending children to school becomes a hard choice for them. Thus many children, especially orphans, find themselves staying out of school because their families cannot afford these expenses.

In 2001 the Government made an important move towards the promise of free education by providing some textbooks free at the primary level. In addition, financial support to vulnerable and destitute children has been offered by some organizations, although their

coverage is very limited. It is evident that the existing social protection systems in Swaziland need to be strengthened in order to deliver effectively on the promise of a quality education for all.

Challenges to health services

Health expenditure per capita was around US$24 in 1998. This represented a reduction of about 66 percent from the high point of US$70 in the 1980s. However, by 1999, up to 85 percent of the population was reported to be living within reasonable distance of a health facility, showing that access to health services had increased considerably.

Figures show the health status of the Swazi people has improved steadily since independence. Life expectancy increased from 44 years in 1966 to 58.8 years in 1997, although this figure is expected to drop in light of the HIV/AIDS pandemic. Improvements have also been observed in the Crude Death Rate (CDR), the Infant Mortality Rate (IMR), and Under-Five Mortality Rate (U5MR). CDR per 1000 population decreased from 20.5 in 1966 to 8.4 in 1991. The IMR per 1000 live births decreased from 156 in 1976 to 72 in 1991. Despite the observed decline in infant mortality, Swaziland's low infant mortality rate still tends to be higher than that of many other Southern African countries.

Unfortunately, affordable and y nutritional foods are often not available for children. This is evident in the numbers of malnourished children and the incidence of low birth weights. The problem of insufficient nutrition is more prevalent among poor households.

Most prominent among the health problems affecting the country is the advent of HIV/AIDS. HIV infection rates among pregnant women who attend antenatal services increased from 4 percent in 1992 to 35 percent in 2000. There were about 8458 AIDS cases reported in the country by March 2001. The implications of this for children, and their health, education, and right to life, are both clear and rather daunting.

How education is structured

The country has five levels of education, as defined in the International Classification of Education (ISCED, 1997). These can be grouped under the overall headings of: early childhood, basic education, upper secondary, post-secondary and tertiary education, and non-formal education.

Early childhood and developmental programmes

The Ministry of Education's policy has moved away from Pre-School Education that caters for children between the ages 3 to 6 in order to also incorporate ages 0 to 3. However, the Ministry has no formal control over this very early level of education because it has not yet been fully integrated into the formal education structure.

Basic education

Swaziland adopted a ten-year basic education programme as part of the Southern Africa Development Community (SADC) Protocol on Education. Seven years of primary education are followed by the three years of lower secondary education. This system faces several challenges that include ensuring the availability of schools and teachers, and the provision of teacher salaries. It is expected that many children will soon be moving into the first three years of secondary education after the elimination of the end of primary school exam. There are widespread concerns that the removal of this exam should be accompanied by the introduction of an effective method of measuring the learning achievements of children.

As mentioned earlier, the country did achieve UPE in 1985 - but has been failing to maintain these initial full enrolment rates. This decline has resulted in the Net Enrolment Ratio (NER) falling from above 90 percent in the 1980s and early 1990s to around 76 percent in 2000. The age specific enrolment rates in basic education in the year 2000 are presented in Table 1.1.

Table 1.1 Age specific enrolment rate in basic education in 2000

Age (Years)	Age specific enrolment rate %	
	Male	Female
6	52	53
7	71	74
8	86	83
9	92	87
10	83	81
11	84	82
12	71	73
13	75	73
14	80	78
15	72	68
16	66	56
17	60	45
18	40	27

At the secondary level the average NER has always been relatively low, about 65 percent, a problem not only of access but also of capacity, which has not improved since the early 1980s.

Upper secondary education

As in many countries in sub-Saharan Africa, Swaziland's school system allows only a few students access to secondary school. The bulk of students drop out at earlier levels. Only about 20 percent of the children who enter primary education reach the end of secondary school. The Government is exploring ways to ensure that graduates at this level possess the skills and knowledge to participate effectively in society. This has led to the development of a prevocational pilot project that aims to give children practical and entrepreneurial skills.

Post-secondary and tertiary education

Teacher training and Nnursing colleges dominate this level. Other institutions include the College of Technology and the University. There has been a slight increase in enrolments, but these have now levelled off due to high costs. Another factor to note is that the Government

sponsors most students at post-secondary level, thus enrolment is dependent on the availability of funds.

Non-formal education

Non-formal education is currently in the hands of non-governmental organizations (NGOs) and parastatal bodies. They mainly address the need for adult literacy and numeracy programmes.

Administration

The education system is still very centralised, with all power and authority located at the national level. There is minimal delegation, and the main task of the District Education Officers is to focus efforts on the implementation of national policies.

The National Ministry of Education manages the curriculum, assessment procedures, and recruitment of teachers. However it should be noted that this is carried out in association with local communities and civil society. Financial planning is controlled by the Ministry of Planning and Development and the Ministry of Finance. That is, the Ministry of Education's financial operations are decided and monitored elsewhere - a situation that offers many challenges for the Ministry of Education.

Financing of education

The financing of education in Swaziland can be looked at from two main perspectives. First there are contributions from private sources, including parents, private organizations, and the donor community. Second there are public contributions made by the Government. A breakdown by source of educational funding includes ::

The local community.

In Swaziland, community help comes in the form of donated land that belongs to the local people, and labour supplied by the community to build schools. Such schools are classified as community or aided schools. In addition to contributing "in kind", local communities contribute to the building fund, school fees, and examination fees. There is, however, no accurate estimate of the magnitude this funding.

Foreign aid

The greatest portion of costs in this category is borne by mission schools that contribute by building schools, providing equipment, and in some cases by paying teacher salaries. Foreign aid also comes from

organizations and donor communities that set up schools in the country or finance children through bursaries and scholarships.. However, this kind of assistance is difficult to budget for because a donor might decide not to finance education in any given year.

Government

Two major financial burdens for the government are the recurrent personnel budget and capital expenditure related to buildings, equipment, and furniture. This allocation has on average been slightly above 20 percent of the national budget.

The Ministry of Education is expected to negotiate for funding derived from public expenditure on education. It negotiates with the Ministry of Finance and the Ministry of Economic Planning and Development for both recurrent and capital expenditures. This means that the Ministry of Education negotiates on behalf of the districts and institutions.

The budgetary process is linked to the fiscal year, which begins from April to the end of March the following year. The budgetary process starts with the preparation of the budget outlook paper by the Ministry of Finance, the Ministry of Economic Planning and Development, and the Ministry of Public Service and Information. These three Ministries form the Public Budgeting Committee (PBC), which is chaired by the Ministry of Finance. The committee determines expenditure ceilings, and therefore the Ministry of Education is required/expected to adjust itself to the funds that are made available to it by the PBC.

Recent policy concerns and reforms

One of the important issues in implementing educational reform is the role that ordinary people play in the process. Swaziland has been very committed to including members of civil society. The new education polices were all drafted in association with a variety of stakeholders and then subjected to scrutiny by a wide cross-section of the public.

A major problem for the education system has been the continuous increase in the number of children who fail and then drop out of school. Coupled with this is the inability of some

parents to pay for their children's education and the government's struggle to cope with the ever-increasing costs of human resources. This has raised a number of policy concerns for the Ministry.

Access to education

Access to education is sometimes a function of the financial resources available to parents. In Swaziland, there are three positive and three negative aspects to access to education. The positive aspects:

a) There is an equitable geographical distribution of primary schools throughout the country. There are a total of around 500 primary schools, with each region having a minimum of 100 schools. The Ministry of Education's goal is to have a primary school within a 5 km radius of all communities.

b) With the advent of poverty and the HIV/AIDS pandemic, the Swaziland government and civil society have created a bursary scheme to assist those children who are poor and vulnerable.

The government has encouraged parents and communities to continue building schools for their children Throughout the country, with the communities contributing the land, labour and management of the school. For its part, the government supports these initiatives by employing teachers and providing central administration for the schools.

The negative aspects:

a) Currently the only government criterion for entry into primary education is for the child to be six years old, but schools are giving preference to children who have completed preschool education. This approach often excludes children whose families cannot afford early and expensive education. In Swaziland the cost of preschool is about three times as much as that of primary school.

b) A number of children from poor communities have been denied access to education due to the inefficient bursary scheme that is too centralised and only captures children who have recently dropped out. There is no system that identifies children who have never been in school.

c) The lack of capacity at secondary and tertiary levels of education has led to large dropout rates at the end of the first part of secondary schooling. This is due to the fact that parents see no need children to have further education if they are "struggling" academically. And the burden is too great when the tertiary institutions take only 15 percent of secondary school graduates.. This means that higher education is reserved exclusively for the "elite classes."

Equitable distribution of education resources

In the past, Swaziland's small size has enabled its centralised planning system to work reasonably well. However this approach has resulted in discrepancies among districts and schools, which are evident from the unequal distribution of resources, teachers, inspectors, and administrators across the four education districts. The main problems are:

a) How to attract qualified teachers to rural schools. The Ministry did explore the introduction of some fringe benefi allowances, but was not very successful as such benefits are negotiated between the unions and government, and the Ministry of Education did not have sufficient control over this matter.

b) Ensuring that the standard of buildings and resources in schools are equivalent. Facilities in well-off communities tend to be better, and this creates inequities in learning environments.

Internal efficiency

The country's education system is very inefficient, with only 65 percent of the pupils who enter Grade 1 ever reaching Grade 7. Studies reveal that at least 56 percent of Grade 6 pupils in the year 2000 had repeated at least once in their school life. These figures raise efficiency concerns for the country.

At least some of this low internal efficiency is a side effect of the prevailing socio-economic and health situation, especially the HIV/AIDS pandemic, as children tend to drop out of school due to ill health and lack of finance.

External efficiency

Swaziland's dependence on the agricultural sector has made it difficult for the country to ensure a good measure of external efficiency. Such workers do not need a great deal of academic training. In any case, the completion of school does not automatically lead to employment. This state of affairs has seen the country producing a lot of graduates that it cannot put into meaningful employment.

In tertiary education the low level of external efficiency is evident from the increasing numbers of graduates (especially in law, education, and humanities) who are still unemployed. This situation is compounded by the fact that the country still seems to be inclined towards a "social demand" approach to educational planning where there is no useful cost benefit analysis of the needs of the economy.

Quality concerns

After achievement of Universal Primary Education in 1985, the country explored ways of improving the quality of education. It has endeavoured to achieve this by improving inputs to the education system in terms of teachers, curriculum, school buildings, resources, and the teaching-learning environment. A number of initiatives were set up to address the question of quality. These include:

(a) Increased recruitment of trained teachers. Swaziland is one of the few countries in the Southern African Development Community that has more qualified teachers than it needs - especially at secondary levels.

(b) Expanding and diversifying the curriculum, especially with respect to an increase in the number of schools doing practical subjects and physical education.

(c) Increasing access to "life skills" education at all levels of education in order to address the impact of the HIV/AIDS pandemic.

(d) Strengthening the In-service Department of the Ministry of Education and establishing new teacher resource centres in the country.

(e) Introducing a programme of continuous assessment that combines a child centred approach to teaching with improved assessment of achievement.

SACMEQ consortium -- perceived importance and benefits

In the 1990s, an extremely successful strategy for capacity building through monitoring and evaluating the quality of education was developed through the establishment of a consortium of fifteen ministries of education (Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zanzibar, and Zimbabwe). This consortium has become widely known as SACMEQ (the Southern Africa Consortium for Monitoring Educational Quality).

SACMEQ's mission is to assist educational planners and researchers to undertake studies of the quality of their education systems by working in a cooperative manner that encourages them to share their experiences and to learn from each other. The role of the IIEP in this initiative has been to coordinate the delivery of intensive training programmes focussed on the requirements of the research, and also to facilitate access to advanced technical knowledge and computer-based techniques. The Governments of Italy and the Netherlands have generously supported these activities over an extended period of time.

The Ministry of Education in Swaziland obtained the national reports that had been prepared by countries in SACMEQ's first educational policy research project. The Minister and the senior staff of the Ministry agreed that these reports provided a comprehensive analysis of the conditions of schooling and the quality of education at the primary school level. The Ministry therefore decided to join SACMEQ's second project (the SACMEQ II Project). It was considered that results of the SACMEQ II Project would provide sound baseline data on inputs and outputs, and that these data could be used in later years to assess changes in the quality of education in Swaziland.

It was also agreed that SACMEQ II would provide information that could be used to revitalise the Quality Working Group that was created by the Ministry and the World Bank in the mid-1990s by touching on areas suitable for further investigation and research. Lastly, and importantly, the SACMEQ II Project provided an opportunity to create a supportive framework for undertaking applied research in order to solve educational policy problems. This offered Swaziland's educational planners and researchers an opportunity to work with, and learn from, other colleagues in the SACMEQ network.

The structure and content of this report

The main aim of this study was to assess the quality of Swaziland's primary education system by examining whether it provided a learning environment that fostered improved pupil educational achievement. The data collection for the study focused on Grade 6 pupils, their teachers, and their school heads. It is expected that the results of the study will provide a rich data bank for informed decision-making and policy formulation in the Ministry of Education.

The report has eight chapters in all. The first two chapters set the scene for the study and how it was conducted. The following chapters have address the following:

Chapter 3: Pupils' personal characteristics (for example, age and gender) and home background characteristics (for example, parental education, regularity of meals, home language,) of Grade 6 pupils that might have implications for monitoring equity, and/or that might impact upon teaching and learning.

Chapter 4: The school context factors experienced by Grade 6 pupils (such as location, absenteeism (regularity and reasons), grade repetition, and homework (frequency, amount, correction, and family involvement) that might impact upon teaching/learning and the general functioning of schools.

Chapter 5: School heads' characteristics and their views on the educational infrastructure, organization and operation of schools, and problems with pupils and staff.

Chapter 6: Equity in the allocation of human and material resources among the districts and among the schools within districts.

Chapter 7: The reading and mathematics achievement levels of pupils and their teachers.

Chapter 8: Conclusion and agenda for action.

Chapter 2

The Conduct of the SACMEQ II Project

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Introduction

There has been a worldwide growth of interest in the application of large-scale scientific survey research techniques to the study of issues related to improving the quality of education. Many developed countries are now applying these techniques to undertake systematic studies of the conditions of schooling and of student achievement levels. In developing countries there have been increased efforts to provide training for educational planners in the technical skills that are required to conduct these kinds of policy research studies.

In 1991 the International Institute for Educational Planning (IIEP) and a number of Ministries of Education in Southern and Eastern Africa began to work together in order to address training and research needs in this area. The focus for this work was on establishing long-term strategies for building the capacity of educational planners to monitor and evaluate the quality of their basic education systems.

In 1993 a proposal was prepared by a group of educational planners (Moyo et al., 1993) that aimed to extend the reach and formal status of this work by creating an association known as the Southern Africa Consortium for Monitoring Educational Quality (SACMEQ). The proposal received a positive reaction from Ministries of Education, and in 1995 SACMEQ was officially launched with the generous assistance of the Governments of Italy and the Netherlands. Fifteen Ministries of Education are now members of SACMEQ: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, Zambia, and Zimbabwe. The IIEP was invited to become a member of the consortium in 1997.

SACMEQ's main mission is to undertake integrated research and training activities that will: (a) expand opportunities for educational planners to gain the technical skills required to monitor and evaluate the general conditions of schooling and the quality of basic education,

and (b) generate information that can be used by decision-makers to plan improvements in their education systems.

The SACMEQ consortium has enabled educational researchers and planners to develop important technical skills related to the design and implementation of large-scale data collections, and to the application of a wide variety of computer-based techniques for the preparation, management, analysis, and reporting of educational planning data. SACMEQ's research programme has resulted in the preparation of research reports that have contributed towards the conduct of informed debates concerned with: equity in the allocation of human and material resources among regions and schools, and literacy and numeracy levels for important sub-groups of pupils defined by gender, socio-economic background, and geographic location.

The first two educational policy research projects undertaken by SACMEQ (widely known as "SACMEQ I" and "SACMEQ II") were designed to provide detailed information that could be used to guide planning decisions aimed at improving the quality of education in primary school systems. During 1995-1998 seven Ministries of Education participated in the SACMEQ I Project and the results of this research were reported in a series of national policy reports (Kulpoo, 1998; Machingaidze et al, 1998; Milner et al, 2001; Nassor and Ali Mohammed, 1998; Nkamba and Kanyika, 1998; Nzomo et al, 2001; Voigts, 1998). Technical information about the sampling, instrument construction, and field work for the SACMEQ I Project may be found in these reports.

The SACMEQ II Project commenced in 1998 and has involved 15 Ministries of Education. Moving from the SACMEQ I Project (covering around 1100 schools and 20,000 pupils) to the SACMEQ II Project (covering around 2500 schools and 45,000 pupils) resulted in a major increase in the scale and complexity of SACMEQ's research and training programmes.

The main purpose of this chapter was to provide a detailed account of the key technical procedures that were involved in the design and implementation of the SACMEQ II Project.

The chapter has been presented in three parts.

Part A: "The Fourteen Main Phases of the SACMEQ II Project"

This part of the chapter has listed the fourteen main phases of the SACMEQ II Project. These commenced with pre-planning and initial planning, and then moved through instrument construction, trial testing, sampling, main data collection, data preparation, data merging and scoring, data analyses, and concluded with the writing of national policy reports.

Part B: "Sample Design Procedures for the SACMEQ Project"

This part of the chapter has provided a detailed explanation of the procedures involved in the selection of samples of schools and pupils for the SACMEQ II Project. The sampling procedures were evaluated through an examination of response rates and the calculation of design effects, effective sample sizes, and standard errors of sampling.

Part C: "The Construction of Tests for the SACMEQ II Project"

This part of the chapter has presented the main steps that were involved in test construction for the SACMEQ II Project, and then has examined the advanced scaling procedures that were used to score the tests and to describe pupil and teacher literacy levels according to increasing "levels of competence". Eight levels of competence were developed for the literacy and numeracy measures, and these represented a departure from "traditional approaches" (based on means and mastery percentages) to describing and comparing the educational performance of groups.

Part A: The Fourteen Main Phases of the SACMEQ II Project

Phase 1: "Pre-Planning" for the SACMEQ II Project

One of the distinguishing features of the SACMEQ Projects has been that their research results have been widely used for policy and planning purposes. This successful outcome has occurred because SACMEQ research reports were designed from the very beginning to address the high-priority policy concerns of decision-makers in Ministries of Education. **This was achieved via a three-step "pre-planning" process (described below for the SACMEQ II Project) that was completed before work commenced on the overall design and implementation of the research.**

Step 1: The SACMEQ II Project commenced by engaging senior decision-makers in Ministries of Education (for example, Ministers, Permanent Secretaries, Heads of Divisions, and Regional Directors) in discussions about high-priority policy concerns associated with their education systems. The SACMEQ National Research Coordinators (NRCs) structured these discussions by asking the decision-makers to identify the main areas where the Ministry needed to review, refine, change, monitor, and/or develop policies that had relevance for the general conditions of schooling and the quality of education. The decision-makers' responses were then analyzed in order to identify groups of **"General Policy Concerns"** that were subsequently used as a foundation for guiding the research design.

For example, decision-makers in most SACMEQ countries were concerned about policy issues linked with: (a) equity in the gender balance and home background profiles of Grade 6 pupils, and (b) the magnitude of the age range of Grade 6 pupils and its implications for teaching and learning. The NRCs summarized these and similar concerns in the form of a single question: "What are the personal characteristics (for example, age and gender) and home background characteristics (for example, books at home and parent education) of Grade 6 pupils that might have implications for monitoring equity, and/or that might impact upon teaching and learning?" This question represented the first General Policy Concern developed by the NRCs for the SACMEQ II Project.

A total of 20 General Policy Concerns were prepared for the SACMEQ II Project. These have been grouped in Figure 2.1 under five "themes" concerned with: pupils' characteristics and

learning environments, teachers' characteristics and viewpoints, school heads' characteristics and viewpoints, equity in the allocation of human and material resources, and the reading and mathematics achievement levels of pupils and their teachers.

Step 2: The NRCs linked each of the 20 SACMEQ II General Policy Concerns to a set of **"Specific Research Questions"** that provided precise guidance concerning the information that was required in order to respond to the General Policy Concerns. That is, the Specific Research Questions were used to decide exactly what should be included in, or excluded from, the data collection instruments.

General Policy Concern 10: What was the availability of classroom furniture (for example, sitting/writing places, teacher table, teacher chair, and bookshelves) and classroom equipment (for example, chalkboard, dictionary, maps, book corner, and teacher guides) in Grade 6 classrooms?

General Policy Concern 11: What professional support (in terms of education resource centres, inspections, advisory visits, and school head inputs) was given to Grade 6 teachers?

General Policy Concern 12: What factors had most impact upon teacher job satisfaction?

Theme C: School Heads' Characteristics and their Viewpoints on Educational Infrastructure, the Organization and Operation of Schools, and Problems with Pupils and Staff

General Policy Concern 13: What were the personal characteristics of school heads (for example, age and gender)?

General Policy Concern 14: What were the professional characteristics of school heads (in terms of academic, professional, experience, and specialized training)?

General Policy Concern 15: What were the school heads' viewpoints on general school infrastructure (for example, electrical and other equipment, water, and basic sanitation) and the condition of school buildings?

General Policy Concern 16: What were the school heads' viewpoints on (a) daily activities (for example, teaching, school-community relations, and monitoring pupil progress), (b) organizational policies (for example school magazine, open days, and formal debates), (c) inspections, (d) community input, (e) problems with pupils and staff (for example, pupil lateness, teacher absenteeism, and lost days of school)?

Theme D: Equity in the Allocation of Human and Material Resources Among Regions and Among Schools Within Regions

General Policy Concern 17: Have human resources (for example, qualified and experienced teachers and school heads) been allocated in an equitable fashion among regions and among schools within regions?

Figure 2.1 (Ctd): SACMEQ II: General Policy Concerns of Ministry Decision-Makers

General Policy Concern 18: Have material resources (for example, classroom teaching materials and school facilities) been allocated in an equitable fashion among regions and among schools within regions?

Theme E: The Reading and Mathematics Achievement Levels of Pupils and Their Teachers

General Policy Concern 19: What were the levels (according to descriptive levels of competence) and variations (among schools and regions) in the achievement levels of Grade 6 pupils and their teachers in reading and mathematics – for my country and for all other SACMEQ countries?

General Policy Concern 20: What were the reading and mathematics achievement levels of important sub-groups of Grade 6 pupils and their teachers (for example, pupils and teachers of different genders, socio-economic levels, and locations)?

Figure 2.1 (Ctd): SACMEQ II: General Policy Concerns of Ministry Decision-Makers

For example, three of the Specific Research Questions linked to the first General Policy Concern were: "What is the age distribution of pupils?" "What is the gender distribution of pupils" and "What is the level of parents' education?" These questions implied that the pupil questionnaire should collect information about pupil age, gender, and the educational level of pupils' parents.

Step 3: The NRCs used the SACMEQ II Specific Research Questions to design **"Dummy Tables"** – which were blank (or empty) data tabulation templates that employed the variables and information layouts that would be used in the final SACMEQ II national policy reports.

The main advantages of producing Dummy Tables were that this process forced the NRCs to (a) check that the data collection instruments covered all information needs, (b) ensure close linkages between the specific research questions and the questions on the data collection instruments, (c) reach agreement on the selection of variables and the types of data analyses to be applied, and (c) design and justify the data tabulation templates to be used in reporting the data analyses.

In Figure 2.2 an example of moving through the above three steps has been presented – starting with the first General Policy Concern developed for the SACMEQ II Project, then moving to a set of Specific Research Questions, and finally arriving at a suitable Dummy Table. The table shown in Figure 2.2 only covers information related to the six Specific Research Questions that have been presented in bold type. A different table was developed for the other six Specific Research Questions.

General Policy Concern 1

What were the personal characteristics (for example, age and gender) and home background characteristics (for example, parent education, regularity of meals, home language, etc.) of Grade 6 pupils that might have implications for monitoring equity, and/or that might impact upon teaching and learning?

↓

Specific Research Questions

What was the age distribution of pupils?
What was the gender distribution of pupils?
How regularly did pupils eat meals?
How far did pupils travel to school?
What percentage of pupils spoke the language of the test at home?
What was the level of the parents' education?
What support did pupils get at home regarding homework and interest in schoolwork?
Did teachers ask parents to sign that homework assignments have been completed?
Where did pupils live during school days, i.e., when school is on?
How many books were there in pupils' homes?
What access to reading materials and electronic media did pupils have in their homes?
What was the socio-economic status of pupils' parents?

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First Dummy Table for General Policy Concern 1

Dummy Table : Grade 6 Pupil Age, Gender, and Home Background Characteristics

Region	**Age** (months)		**Gender** (pupils)		**Books at Home** (books)		**Possessions at Home** (index)		**Meals** (index)		**Parent Education** (index)	
	Mean	SE	%	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Region 1												
Region 2												
Region 3												
Region 4												
Region 5												
Region 6												
Region 7												
Region 8												
Nation												

Variable Names for SACMEQ I = XPAGEMON, XPSEX, XPBOOKSH, XPTOTP, XPREGME, XPFAMOED.
Variable Names for SACMEQ II = ZPAGEMON, ZPSEX, ZPBOOKSH, ZPTOTP, ZPREGME, ZPFAMOED.

Figure 2.2: An Example of Transforming a General Policy Question into Twelve Specific Research Questions and One (of Two) Dummy Tables

The upper section of the Dummy Table in Figure 2.2 was used to name the variables (for example Age, Gender, Books at Home, etc.) and also to provide guidance as to whether the variables were to be based on a single question in the data collection instruments (which was the case for the first three variables), or whether the variables were to be derived from two or more questions to form an "index" (which was the case for the second three variables). In this example, the information in the Dummy Table has been broken down by administrative regions - which was a popular approach because most SACMEQ school systems operated on the basis of some form of regional administration.

Each variable in the table was linked with "statistics" and "units". For example, the Age variable was expressed as a mean and the units were months, the Gender variable was expressed as a percentage and the units were pupils, and Books in the Home was expressed as a mean and the units were books. The statistics for the final three variables were "indices" and therefore the units depended on the procedures used in their construction. Some indices, such as "Possessions at Home", were based on a simple count generated from a checklist of possessions, and therefore this index referred to the counted number of possessions. However, other indices (in other tables) were constructed using principal components analysis, and this resulted in "standardized" units of measurement.

The computer-stored names of each variable were listed in the base of each Dummy Table. It was important to include these so that the person responsible for data processing knew exactly which variables to use in the analyses. In the Dummy Table presented in Figure 2.2 the computer-stored variable names have been given for both SACMEQ Projects – indicating that this table needed to be completed twice for the countries that participated in both projects.

In Appendix A the SACMEQ II General Policy Concerns have been listed in association with Specific Research Questions. This list has also included the sequence numbers of the Dummy Tables prepared using either SACMEQ I or SACMEQ II data, and the relevant question numbers in the data collection instruments that were used to collect the required information. The 20 General Policy Concerns were associated with 75 Specific Research Questions, and these were linked to around 150 Dummy Tables.

For example, the first Specific Research Question for the first General Policy Concern was: "What was the age distribution of pupils? From the first page of Appendix A it may be seen

that this information was to be entered into Dummy Tables 3.1(a) and 3.1(b) for the SACMEQ I and SACMEQ II Projects, respectively. The source question for this information was the second question on the pupil questionnaires for both the SACMEQ I Project (SI: P2) and the SACMEQ II Project (SII: P2).

Phase 2: Moving From Pre-Planning to Instrument Construction

A meeting of National Research Coordinators (NRCs) was held in Durban, South Africa during April 1998 in order to use the Dummy Tables produced during the "Pre-Planning" phase of the SACMEQ II Project to guide the construction of data collection instruments. Three experienced South African teachers also attended the meeting in order to participate in sessions concerned with an analysis of the structure, sequence, and content of curricula across countries. The first major decision taken at the meeting was that the data collection for the SACMEQ II Project should be expanded beyond the SACMEQ I Project to include an assessment of both reading and mathematics performance levels for both pupils and teachers.

The meeting operated as two parallel working groups that focussed on test and questionnaire construction. The test construction group completed a comprehensive analysis of the official curricula, school syllabi, textbooks, and examinations that were used in SACMEQ countries. This analysis was used to construct test blueprints as frameworks for writing a large pool of test items for pupils and teachers in both reading and mathematics. The questionnaire group concentrated on using the Dummy Tables to guide the construction of questionnaires for pupils, teachers, and school heads.

By the end of the meeting the following data collection instruments had been drafted: Pupil Reading and Mathematics Tests, Pupil Questionnaire, Teacher Reading and Mathematics Tests, Teacher Questionnaire, and School Head Questionnaire. In addition draft manuals had been prepared for the NRCs and data collectors.

During the meeting the NRCs were invited to make a presentation to a UNESCO meeting of African Ministers of Education that was being held in Durban at the same time. They also attended a special meeting for SACMEQ Ministers of Education in order to discuss the policy impact of SACMEQ research, and to launch the first five SACMEQ I national reports. These events enabled Ministers to gain a much clearer picture of how the SACMEQ research

programme could be used for the preparation of policies aimed at improving the quality of education.

After the Durban meeting, work proceeded at the IIEP and within the SACMEQ countries to finalize the overall SACMEQ II Project research design and to complete "try-out" versions of data collection instruments and manuals. These materials were circulated among the NRCs via the Internet and, on the basis of further NRC inputs, edited and then re-circulated for further comment and improvement.

Phase 3: "Small-Scale Trial Testing" of Instruments and Manuals

When the first drafts of the SACMEQ II data collection instruments and manuals had been completed it was agreed to hold a combined planning and training meeting for NRCs and their Deputies in Harare, Zimbabwe during February 1999.

The main purpose of the meeting was to undertake a small-scale "try-out" of the draft data collection materials. To achieve this, a field test was conducted in 10 schools located in a variety of social and geographic situations within a 50 km radius of Harare. The data gathered during this exercise were entered into computers by the NRCs, and then analysed to provide information about the quality of the data collection instruments and the field procedures. On the basis of these analyses further improvements were made to the tests, questionnaires, and manuals.

An important benefit of the "try-out" exercise was that the NRCs were required to act as both data collectors and data entry staff. This gave them first hand experience of the complexities of these two tasks, and also provided them with a sound foundation for training their own research teams for the trial testing and the main data collection.

In the period March to May 1999, the data collection materials tested at the Harare meeting were shared and edited via the Internet. IIEP staff coordinated this "virtual workgroup" approach and arranged inputs from external consultants.

Phase 4: "Large-Scale Trial Testing" of Instruments and Manuals

The "large-scale trial test" versions of the SACMEQ II data collection instruments were distributed in electronic format via the Internet in June 1999. Paper copies were also distributed to several countries because some NRCs had experienced difficulties with downloading documents in a manner that preserved the integrity of graphical figures and special fonts contained within the tests and questionnaires.

Each NRC was provided with specialized software that could be used to transform the trial test data into computer-readable files. In Lesotho, Malawi, and Swaziland difficulties were experienced in loading and using this software on Ministry of Education computers. An IIEP staff member visited these countries during September 1999 in order to reconfigure the software so that it would operate properly on the available computers. During these visits the NRCs and other Ministry staff were provided with training in computer-based data entry and data cleaning techniques.

The trial testing of the data collection instruments and manuals took place during August-September 1999. More than 400 schools and 8000 pupils were involved in the data collection. During September 1999 these data were entered into computers under the supervision of NRCs and then transmitted via the Internet to the IIEP where they were checked and merged into a single database. At the IIEP a number of validity checks were undertaken on the data, and any errors and/or omissions that emerged were corrected and/or clarified by email communication with the NRCs.

Phase 5: Finalization of Instruments and Manuals for the Main Data Collection

A meeting of SACMEQ II NRCs and their Deputies was held at the IIEP in October 1999 in order to analyze the trial test data. This meeting was held at the same time as the biennial meeting of the SACMEQ Assembly of Ministers, and the NRCs took advantage of this coincidence by presenting a "Policy Forum" for the Ministers.

The meeting concentrated on analyzing the trial test data that had been collected on reading and mathematics performance from pupils and their teachers. The aim was to select the best possible sets of test items for the main data collection by reducing the two forms of the trial tests for pupils and teachers to single forms.

At the close of the meeting another "virtual workgroup" was established in order to use the Internet during the period October 1999 to May 2000 to finalize the preparation of tests, questionnaires, and manuals. The IIEP agreed to prepare final forms of the data collection instruments and to distribute these in "camera-ready" electronic and paper formats that would be suitable for immediate printing.

The preparation of the final forms of the data collection instruments and manuals proved to be a massive task because of the different notations used in different countries. For example, changes were made in order to address the use of: (a) a comma or a full stop for decimals, (b) a comma, a full stop, or a space for “separating” digits in numbers greater than or equal to 1000, (c) different currency units, (d) different nomenclature for grade levels, (e) different methods for expressing dates, and (f) 12 hour or 24 hour clocks for time. Since no two countries used exactly the same conventions for items (a) to (f), it was necessary to prepare a unique set of data collection instruments and manuals for each country.

An extra complexity for several countries at this stage was the need to translate the SACMEQ II tests, questionnaires, and manuals into local languages. Mozambique translated the materials into Portuguese, while Tanzania and Zanzibar translated the materials into Kiswahili. In order to ensure high quality translations for the reading and mathematics tests, each item was translated into the local language and then back translated. The back translations were compared with the original (English) versions of the tests in order to check for omissions, additions, unwanted changes in meaning, or other problems.

Phase 6: Sample Design, Sample Selection, and Sample Evaluation

The sample designs used in the SACMEQ II Project were selected so as to meet the standards set down by the International Association for the Evaluation of Educational Achievement. These standards required that sample estimates of important pupil population parameters should have sampling accuracy that was at least equivalent to a simple random sample of 400 pupils (thereby guaranteeing 95 percent confidence limits for sample means of plus or minus one tenth of a pupil standard deviation unit). Detailed descriptions of the sample design, sample selection, and sample evaluation procedures have been presented in Part B of this chapter.

Phase 7: Preparations for Computer-Based Entry of Data

After the completion of the SACMEQ II data collection instruments and manuals, work commenced on the preparation of data entry structure files for the full data collection. These computer files provided a complete specification of the nature of the data that were to be entered into computers. Separate structure files were prepared for each country as follows: four tests (pupil and teacher reading and mathematics tests), three questionnaires (pupil, teacher, and school head), and two "tracking forms" (used to gather supplementary data about sample schools and sample pupils).

The SACMEQ II structure files were tested extensively throughout August-September 2000 so as to make sure that they contained the correct specifications for linking each variable with specific questionnaire and test items. This process included the specification of valid ranges for each variable so that "wild-codes" (that is, variable values that fall outside realistic ranges) could be intercepted as part of the on-going process of data entry.

Separate sets of structure files had to be prepared for each country – even though the same data collection instruments were employed in all countries. This occurred because each country had its own specific valid code ranges, and because some teacher information used for the identification of subject specialities and classes was country-specific.

The validated structure files and copies of the WINDEM data entry and data cleaning software were sent to NRCs during September 2000. These materials were accompanied by instructions on how to load the software and how to access the structure files. Where problems were encountered, the IIEP provided tutorial support via the Internet. By early October 2000 the NRCs had installed and tested all of these materials.

When the WINDEM software and associated structure files were fully operational, each NRC selected and trained a data entry team. This training was provided "on the job" whereby the data enterers were given completed data collection instruments to enter into computers. After the data enterers had completed data entry for the first 100 pupils their work was checked and discussed during a group meeting so as to clarify all instructions and to ensure that everybody was working carefully and accurately. At regular intervals, similar pauses were made in the data entry work in order to monitor progress and to ensure that standards of work were kept at the highest possible level. If a data enterer submitted poor quality work then that person was given extra training or, in occasional cases, was removed from the data entry team.

Phase 8: Preparations for the Main Data Collection

For the main SACMEQ II data collections each NRC was required to organize at least three days of intensive training for the data collectors. This was conducted for most SACMEQ countries in the period July-September 2000 – just prior to the commencement of the main data collection.

Between 15 and 50 data collectors were trained in most countries. On the first day of training the NRC presented a "simulated" data collection exercise in which he/she acted as a data collector and the trainees took the roles of pupils, teachers, and school heads. The second day involved an intensive study of the Manual for Data Collectors. This document set down, in sequential order, all of the actions to be taken by the data collector from the time of receiving packages of data collection instruments from the Ministry of Education to the time when the data collector had completed the data collection and was preparing all materials for return. The third day involved a second "simulated" data collection whereby the trainees supervised a full-fledged data collection in several schools that were not involved in the main data collection. The experiences gathered during these exercises were shared and discussed during a later meeting so that all data collectors understood the procedures to be completed within schools.

A special effort was made to ensure that the data collections were conducted according to explicit and fully-scripted steps so that the same verbal instructions were used (for pupils, teachers, and school heads) by the data collectors in all sample schools in all countries for each aspect of the data collection. This was a very important feature of the study because the validity of cross-national comparisons arising from the data analyses depended, in large part, on achieving carefully structured and standardized data collection environments.

Two other important matters related to preparing for the main data collection were to obtain formal permission to visit sample schools, and to manage the printing and packaging of a complete set of data collection instruments for each sample school. The arrangement of permission to visit sample schools was a straightforward procedure because all Ministers had previously approved the implementation of the SACMEQ II Project.

In some cases the NRCs arranged printing through the Government Printing Office and in other cases through private printers. Some of the NRCs had difficulty in finding the resources

required for these tasks and therefore needed to obtain assistance from the IIEP in order to search for supplementary funding. When all instruments were printed, the NRCs conducted a "hand check" of all materials so as to verify that there were no missing pages or misprints or omissions. All work related to the printing and packaging of the data collection instruments was undertaken under strict security arrangements – so that there was no possibility of a "leakage" of information about the content of the pupil and teacher reading and mathematics tests.

The final task for this phase was to have NRCs establish expert committees with the mission of selecting subsets of "essential" pupil reading and mathematics test items that were central to the core curriculum in their country. These subsets of "essential" test items were designated for use at a later stage when the scoring of pupils would be undertaken on both the total test and the essential items (after they had been scaled appropriately using Rasch procedures). This task was completed before the main data collection because there was a need for decisions concerning the selection of essential items to be taken without being influenced by a knowledge of pupil performance on these items. The selection of "essential" reading and mathematics test items for the SACMEQ II Project has been summarized in Appendix B and Appendix C, respectively.

Phase 9: Implementation of the Main Data Collection

The main SACMEQ II data collection occurred for 12 of the 15 SACMEQ Ministries of Education in the period September to December 2000, the Mauritius data collection was completed in July 2001, and the Malawi data collection in September 2002.

The numbers of schools involved in the data collection for each school system ranged from 24 in the Seychelles (where the whole target population of schools and Grade 6 pupils were involved), to 275 in Namibia (where the known magnitude of the coefficient of intraclass correlation and the requirement to gather data in "new" administrative regions added substantially to the required number of schools). The average number of schools per country for the designed samples was around 165.

In smaller countries it was possible to assemble the whole data collection team at the head office of the Ministry of Education and then travel out to sample schools. However, the management of transportation represented a major undertaking for NRCs in larger countries

such as Kenya, Namibia, and Mozambique - where much greater distances had to be travelled, and sample schools were sometimes located in extremely remote and difficult-to-find locations. For these countries, the NRCs enlisted the assistance of Regional and District Education Offices.

Two days of data collection were required for each sample school. On the first day pupils were given the pupil questionnaire and the pupil reading test, and on the second day they were given the mathematics test. The teachers (who completed a questionnaire and one of, or both of, the reading and mathematics tests) and school heads (who completed a questionnaire) were asked to respond on the first day. These arrangements made it possible for the data collectors to check all completed questionnaires (pupil, teacher, and school head) during the evening of the first day and then, if necessary, obtain any missing or incomplete information on the second day.

The data collection for teachers was in three parts: questionnaire, reading test, and mathematics test. Where sample teachers taught both reading and mathematics, they took both tests. Where they taught only one of these subjects, they were given the relevant test.

The manual used by the data collectors contained detailed instructions concerning the random selection of 20 sample pupils and up to 6 sample teachers within schools. The data collectors were given intensive prior training in the strict application of these procedures. It was necessary to do this because the validity of the whole SACMEQ II data collection could have been seriously damaged if “outside influences” had been applied to selecting respondents. A further measure that was applied in order to avoid the inclusion of unknown biases into the data collection was to absolutely forbid the replacement of absent pupils.

The data collectors were provided with a 40-point checklist in order to ensure that they completed all important tasks that were required before, during, and after their visits to schools. Each task was cross-referenced to specific pages of instructions in the data collectors’ manual.

Phase 10: Data Checking, Data Entry, and Data Cleaning

(a) Data Checking and Data Entry

Data preparation commenced soon after the main data collection was completed. The NRCs had to organize the safe return of all materials to the Ministry of Education where the data collection instruments could be checked, entered into computers, and then "cleaned" to remove errors prior to data analysis. The data-checking involved the "hand editing" of data collection instruments by a team of trained staff. They were required to check that: (i) all questionnaires, tests, and forms had arrived back from the sample schools, (ii) the identification numbers on all instruments were complete and accurate, and (iii) certain logical linkages between questions made sense (for example, the two questions to school heads concerning "Do you have a school library?" and "How many books do you have in your school library?").

The next step was the entry of data into computers using the WINDEM software. A team of 5-10 staff normally undertook this work. In some cases the data were "double entered" in order to monitor accuracy.

The numbers of keystrokes required to enter one copy of each data collection instrument were as follows: pupil questionnaire: 150; pupil reading test: 85; pupil mathematics test: 65; teacher questionnaire: 587; teacher reading test: 51; teacher mathematics test: 43; school head questionnaire: 319; school form: 58; and pupil name form: 51.

This information can be re-expressed to give the total number of keystrokes for the whole body of data for one country by multiplying the above figures by the number of instruments in the final data collection. In the case of Namibia the total number of keystrokes was as follows: pupil questionnaire: 762,600; pupil reading test: 429,080; pupil mathematics test: 328,250; teacher questionnaire: 358,657; teacher reading test: 15,504; teacher mathematics test: 14,061; school head questionnaire: 86,130; school form: 39,150; and pupil name form: 259,284. That is, a total of 2,292,716 keystrokes were required to enter all of the data for Namibia.

An experienced keyboard operator can work at a rate of 25 keystrokes per minute (working from multi-paged questionnaires and stopping occasionally to clarify individual questionnaire entries with the supervisor). Assuming that this kind of work rate could be sustained for, say,

around a maximum of six hours per day, then the whole data entry operation for Namibia was estimated to amount to around 255 person days of data entry work This implied an estimated five weeks of work for the 10 person data entry team that operated in Namibia.

The Seychelles data collection was much smaller than Namibia's – with an estimated total of only 68 person days of data entry required. However, this implied an estimated seven weeks of work because the Seychelles only had access to a two-person data entry team.

There was a great deal of variation in the delivery dates for the initial versions of the computer-stored SACMEQ II data files. This occurred because of different testing dates and also because of different amounts of time required to complete entry of data into computers. The dates associated with the initial delivery of SACMEQ II data for cleaning have been presented in the second column of Table 2.1. The first data files were delivered by Botswana and the Seychelles in February 2001, and the last were delivered by Malawi in December 2002.

Table 2.1: Number of Cycles and Amount of Time Required for the The Completion of SACMEQ II Data Cleaning.

School System	Date When Data Arrived	Date When Cleaning Finished	Number of Cleaning Cycles	Number of Months
Botswana	8-Feb-01	5-Dec-01	15	10
Kenya	20-Jun-01	23-Oct-02	24	16
Lesotho	20-Mar-01	25-Jan-02	15	10
Malawi	15-Dec-02	5-May-03	13	5
Mauritius	9-Oct-01	15-Apr-03	11	18
Mozambique	8-Feb-01	27-Jan-03	23	24
Namibia	2-May-01	25-Jan-02	9	9
Seychelles	15-Feb-01	13-Jun-01	5	4
South Africa	9-Mar-01	26-Aug-02	22	18
Swaziland	7-Jun-01	27-Sep-02	14	16
Tanzania	26-Mar-01	19-Nov-02	25	20
Uganda	26-Feb-01	22-Jan-03	31	23
Zambia	23-Jan-01	29-Nov-02	25	22
Zanzibar	15-Jun-01	23-Apr-03	27	22

(b) Data Cleaning

The NRCs received written instructions and follow-up support from IIEP staff in the basic steps of data cleaning using the WINDEM software. This permitted the NRCs to (i) identify major errors in the sequence of identification numbers, (ii) cross-check identification numbers across files (for example, to ensure that all pupils were linked with their own reading and mathematics teachers), (iii) ensure that all schools listed on the original sampling frame also had valid data collection instruments and vice-versa, (iv) check for "wild codes" that occurred when some variables had values that fell outside pre-specified reasonable limits, and (v) validate that variables used as linkage devices in later file merges were available and accurate.

A second phase of data preparation directed efforts towards the identification and correction of "wild codes" (which refer to data values that that fall outside credible limits), and "inconsistencies" (which refer to different responses to the same, or related, questions). There were also some errors in the identification codes for teachers that needed to be corrected before data could be merged.

During 2002 a supplementary training programme was prepared and delivered to all countries via the Internet. This training led each SACMEQ Research Team step-by-step through the required data cleaning procedures – with the NRCs supervising "hands-on" data cleaning activities and IIEP staff occasionally using advanced software systems to validate the quality of the work involved in each data-cleaning step.

This resulted in a "cyclical" process whereby data files were cleaned by the NRC and then emailed to the IIEP for checking and then emailed back to the NRC for further cleaning. The figures presented in the final two columns of Table 2.1 show the number of cleaning "cycles" (that is the number of times that SACMEQ II data were sent from a country to the IIEP for detailed checking and then returned to the country for further cleaning) and the total amount of time in months required to complete the data cleaning for each country.

The number of cycles required to complete all of the data cleaning ranged from lows of 5 and 9 cycles in the Seychelles and Namibia, respectively, to highs of 27 and 31 cycles in Zanzibar and Uganda, respectively. The time required to complete the all of the data cleaning took from lows of 4 and 9 months in the Seychelles and Namibia, respectively, to highs of 23 and 24 months in Uganda and Mozambique, respectively.

Phase 11: Merging and Weighting

As each NRC finalized the cleaning of the SACMEQ II data for his/her country, the data from all sources within a country were merged and weighted.

The merging process required the construction of a single data file for each school system in which pupils were the units of analysis. This was achieved by "disaggregating" the teacher and school head data over the pupil data. That is, each record of the final data file for a country consisted of the following four components: (a) the questionnaire and test data for an individual pupil, (b) the questionnaire and test data for his/her mathematics and reading teacher, (c) the questionnaire data for his/her school head, and (d) school and pupil "tracking forms" that were required for data cleaning purposes.

The merged file enabled linkages to be made among pupils, teachers, and school heads at the "between-pupil" level of analysis. To illustrate, with the merged file it was possible to examine questions of the following kind: "What are the average reading and mathematics test

scores (based on information taken from the pupil tests) for groups of pupils who attend urban or rural schools (based on information taken from the school head questionnaire), and who are taught by male or female teachers (based on information taken from the teacher questionnaire)?"

The calculation of sampling weights could only be conducted after all files had been cleaned and merged. Sampling weights were used to adjust for missing data and for variations in probabilities of selection that arose from the application of stratified multi-stage sample designs. There were also certain country-specific aspects of the sampling procedures, and these had to be reflected in the calculation of sampling weights.

Two forms of sampling weights were prepared for the SACMEQ II Project. The first sampling weight (RF2) was the inverse of the probability of selecting a pupil into the sample. These "raising factors" were equal to the number of pupils in the defined target population that were "represented by a single pupil" in the sample. The second sampling weight (pweight2) was obtained by multiplying the raising factors by a constant so that the sum of the sampling weights was equal to the achieved sample size.

Phase 12: "Scoring" Literacy and Numeracy Levels

A particularly innovative aspect of the SACMEQ II Project was its approach to presenting the literacy and numeracy performance of pupils in a manner that provided descriptive accounts of increasing levels of competence. This was made possible through the use of the Rasch scaling procedures - which permitted, for each test, the performance of pupils to be aligned along a single dimension that could be broken into groups or levels – each being named according to the skills required to successfully complete the items within each group. This method of defining reading and mathematics performance moved far beyond the traditional approach of assigning scores based on the number of correct test items.

The traditional approach to describing test performance is of limited use concerning the identification of specific strategies that can be understood by teachers who would like to plan either remediation programmes or performance improvement for their pupils. In contrast, the levels of competence approach provides meaningful descriptive information about the tasks that pupils can currently manage, and the knowledge and skills that pupils require if they are to move to higher levels of competence.

Four main steps were used in the SACMEQ II Project to define levels of competence. First, Rasch Item Response Theory was used to establish the difficulty value for each test item. Second, the NRCs subjected each test item to an intensive "skills audit" (in order to identify the required problem-solving mechanisms for each item "through a Grade 6 pupil's eyes"). Third, the items were clustered into eight groups or "levels" that had similar difficulties and that required similar skills. Finally, the NRCs wrote descriptive accounts of the competencies associated with each cluster of test items by using terminology that was familiar to ordinary classroom teachers. These four steps have been described in detail in Part C of this chapter.

The work undertaken to define the descriptive levels of competence was commenced at a meeting of NRCs and their Deputies in the Seychelles during June 2001. This work continued via the Internet and was eventually finalized at another follow-up meeting of the same participants that was held in Mauritius during December 2002. The major delay in finalizing this aspect of the work was due to the problem that the scaling of test scores using the Rasch technique required all countries to have completed their data cleaning.

When all data were available, it was possible to transform the Rasch scores to an international mean and standard deviation of 500 and 100, respectively. These two figures were established by using a special sampling weight that treated the samples in each country as if they were the same size.

Phase 13: Analysing the Data

The data analyses for the SACMEQ II Project were very clearly defined because they were focussed specifically on generating results that could be used to "fill in the blank entries" in the Dummy Tables described above. There were two main tasks in this area. First, the SPSS software system was used to construct new variables (often referred to as "indices") or to recode existing variables. For example, an index of "socioeconomic level" was constructed by combining recoded variables that described the educational level of the pupils' parents, the materials used in the construction of pupils' homes, and the number of possessions in pupils' homes. Second, the IIEP's specialized data analysis software, IIEPJACK, was used to "fill" the Dummy Tables with appropriate statistics along with their correct measures of sampling error.

Phase 14: Writing the SACMEQ II Policy Reports

The NRCs commenced the process of drafting their national educational policy reports during early 2003. Two workshops (in Mauritius in December 2002 and in Paris during September 2003) were organized to support the NRCs in this work. These workshops permitted the NRCs to work together and exchange ideas concerning the policy implications of the research results.

Some sections of the national reports were written as "group tasks" because they described aspects of the SACMEQ II Project research programme that were common across countries. However, the tasks of reporting and interpreting the research results were undertaken on a country-by-country basis.

The general structure of the national reports was common across all SACMEQ countries. The 5 "themes" listed in Figure 2.1 were used as chapter titles, the 20 "General Policy Concerns" listed in Figure 2.1 were used within the chapters as main headings, and the 75 "Specific Research Questions" listed in Appendix A were used as sub-headings.

Throughout each national report the NRCs introduced "policy suggestions" based on the research results. In the final chapter these policy suggestions were drawn together into an "agenda for action" that grouped the suggestions according to timeframe and estimated costs. These ranged from low cost and easy to implement actions (for example: adapting the established School Census Questionnaire to include some questions on the availability of certain school and classroom resources) up to long-term expensive investments (for example: the implementation of a nationwide programme of in-service training for teachers).

Part B: Sample Design Procedures for the SACMEQ II Project

This part of the chapter has described the sample design procedures that were employed for the SACMEQ II Project. First, a detailed description has been presented of the step-by-step procedures involved in the design of the samples, the selection of the samples, and the construction of sampling weights. Second, information has been presented on the "evaluation" of the SACMEQ II sampling procedures - in terms of the calculation of response rates, design effects, effective sample sizes, and standard errors of sampling.

Some Constraints on Sample Design

Sample designs in the field of education are usually prepared amid a network of competing constraints. These designs need to adhere to established survey sampling theory and, at the same time, give due recognition to the financial, administrative, and socio-political settings in which they are to be applied. The "best" sample design for a particular project is one that provides levels of sampling accuracy that are acceptable in terms of the main aims of the project, while simultaneously limiting cost, logistic, and procedural demands to manageable levels. The major constraints that were established prior to the preparation of the sample designs for the SACMEQ II Project have been listed below.

Target Population: The target population definitions should focus on Grade 6 pupils attending registered mainstream government or non-government schools. In addition, the defined target population should be constructed by excluding no more than 5 percent of pupils from the desired target population.

Bias Control: The sampling should conform to the accepted rules of scientific probability sampling. That is, the members of the defined target population should have a known and non-zero probability of selection into the sample so that any potential for bias in sample estimates due to variations from "epsem sampling" (equal probability of selection method) may be addressed through the use of appropriate sampling weights (Kish, 1965).

Sampling Errors: The sample estimates for the main criterion variables should conform to the sampling accuracy requirements set down by the International Association for the Evaluation of Educational Achievement (Ross, 1991). That is, the standard error of sampling

for the pupil tests should be of a magnitude that is equal to, or smaller than, what would be achieved by employing a simple random sample of 400 pupils (Ross, 1985).

Response Rates: Each SACMEQ country should aim to achieve an overall response rate for pupils of 80 percent. This figure was based on the wish to achieve or exceed a response rate of 90 percent for schools and a response rate of 90 percent for pupils within schools.

Administrative and Financial Costs: The number of schools selected in each country should recognize limitations in the administrative and financial resources available for data collection.

Other Constraints: The number of pupils selected to participate in the data collection in each selected school should be set at a level that will maximize validity of the within-school data collection for the pupil reading and mathematics tests.

The Specification of the Target Population

The target population for both the SACMEQ I and SACMEQ II Projects was focussed on the Grade 6 level for three main reasons.

First, Grade 6 identified a point near the end of primary schooling where school participation rates were reasonably high for most of the seven countries that participated in the SACMEQ I data collection during 1995-1997, and also reasonably high for most of the fourteen countries that participated in the SACMEQ II collection during 2000-2002. For this reason, Grade 6 represented a point that was suitable for making an assessment of the contribution of primary schooling towards the literacy and numeracy levels of a broad cross-section of society.

(Note: The Net and Gross Enrolment Ratios for the period 1995 to 2003 have been presented for the SACMEQ countries in Table 2.2. The NRCs used official statistical reports to prepare these values. In some Ministries these data were collected and collated in a format that permitted the construction of ratios for either Grades 1-6 or Grades 1-7. In other countries it was necessary for the National Research Coordinator to calculate the ratios from available raw data. In Uganda some of the estimated Net Enrolment Ratios were greater than 100 – a result that was theoretically not possible and probably arose from inaccuracies in estimating the numbers of pupils in the relevant age cohort between Population Censuses).

Second, the NRCs considered that testing pupils at grade levels lower than Grade 6 was problematic – because in some SACMEQ countries the lower grades were too close to the transition point between the use of local and national languages by teachers in the classroom. This transition point generally occurred at around Grade 3 level – but in some rural areas of some countries it was thought to be as high as Grade 4 level.

Third, the NRCs were of the opinion that the collection of home background information from pupils at grade levels lower than Grade 6 was likely to lack validity for certain key "explanatory" variables. For example, the NRCs felt that children at lower grade levels did not know how many years of education that their parents had received, and they also had difficulty in accurately describing the socioeconomic environment of their own homes (for example, the number of books at home).

(a) Desired Target Population

The desired target population definition for the SACMEQ II Project was exactly the same (except for the year) as was employed for the SACMEQ I Project. This consistency was maintained in order to be able to make valid cross-national and cross-time estimates of "change" in the conditions of schooling and the quality of education.

The desired target population definition for the SACMEQ II Project was as follows.

"All pupils at Grade 6 level in 2000 (at the first week of the eighth month of the school year) who were attending registered mainstream primary schools."

Note that the year dates for this definition were varied for two countries (Mauritius in 2001, and Malawi in 2002) in order to coincide with delayed data collections.

Table 2.2: Net Enrolment Ratios and Gross Enrolment Ratios for the SACMEQ Countries

School System	1995		1996		1997		1998		1999		2000		2001		2002		2003		
	NER	GER	NER	GER	NER	GER	NER	GER	NER	GER	NER	GER	NER	GER	NER	GER	NER	GER	Grades
BOT	96.5*	118.7*	97.6*	120.7*	85.8*	120.1*	87.9*	119.9*	88.3*	119.1*	87.6*	117.9*	87.5*	117.3*	n/a	115.4*	n/a	111.9*	1 to 6
KEN	n/a	107.0	n/a	104.6	n/a	102.4	n/a	103.4	93.4	98.1	86.5	96.3	89.0	96.2	86.9	95.3	94.8	112.3	1 to 6
LES	63.9*	94.8*	71#	89.4*	69#	97.7*	64#	83.2*	61#	80.9*	83#	91.8*	84#	92.7*	85#	93.1*	n/a	n/a	*1 to 6/ #1 to 7
MAL	n/a	n/a	n/a	n/a	94.8*	106.5*	87.8*	97.5*	89.4*	102.6*	91.6*	109.9*	95.0*	114.3*	97.7*	128.0*	n/a	n/a	1 to 6
MAU	98	107	99	107	98	106	98	105	97	105	97	104	97	103	96	103	97	102	1 to 6
MOZ	n/a	n/a	n/a	n/a	44.0	76.2	45.5	79.2	50.1	85.3	54.7	92.1	61.1	101.2	64.1	106.5	69.4	112.7	1 to 5
NAM	95.2	136.2	92.9	144.5	94.9	131.8	93.4	127.2	92.9	123.4	91.3	119.4	94*	114.9	n/a	n/a	n/a	n/a	1 to 7
SEY	100	100.4	99.5	100.5	100	101.1	100	101.2	99.9	100.8	100	101	100	99.5	99.9	100	n/a	n/a	1 to 6
SOU	n/a	n/a	n/a	n/a	n/a	n/a	n/a	N/a	96	106	97	99	97	117	n/a	n/a	n/a	n/a	1 to 7
SWA	n/a	n/a	n/a	n/a	80.7*	105.3*	67.9*	103.8*	76.7*	102.9*	76.1*	100.5*	72.7*	95.4*	n/a	n/a	n/a	n/a	1 to 6
TAN-ML	55.4	77.6	56.3	77.8	56.7	77.9	57.0	76.0	57.1	77.1	58.8	77.6	65.2	82.7	79.3	96.1	88.5	105.3	1 to 7
TAN-ZAN	65.1	80.5	65.5	81.2	66.5	81.2	66.5	82.2	68.6	85.4	71	92.2	76	94.6	n/a	98.1	n/a	99.1	1 to 7
UGA	n/a	n/a	n/a	n/a	84.0	n/a	n/a	N/a	84.0	n/a	110.7	128.3	117.5	129.9	99.8	126.3	100.8	127.5	1 to 7
ZAM	n/a	n/a	70.4	85	69	82.6	68.2	80.8	66.2	78.5	65.6	77.9	n/a	n/a	n/a	n/a	n/a	n/a	1 to 7
ZIM	81.9*	105.4*	n/a	n/a	n/a	104.4*	84.7*	105.2*	89.2*	107.4*	92.5*	110.3*	97.2*	108.1*	92.6*	108.8*	n/a	n/a	1 to 7

Note: the figures in the table were extracted by the SACMEQ National Research Coordinators (NRCs) from official Ministry of Education reports. In some cases (marked with an asterisk (*)) the figures were estimated by the NRCs from raw data, in other cases data were "not available" (denoted as n/a).

The desired target population definition for both SACMEQ Projects was based on a grade-based description (and not an age-based description) of pupils. This decision was taken because an age-based description (for example, a definition focussed on "12 year-old pupils") may have required the collection of data across many grade levels due to the high incidence of "late starters" and grade repetition. The NRCs also decided that the calculation of "average" descriptions of the quality of education and the conditions of schooling across many grade levels would lack meaning when used for comparative purposes.

It is important to note that while the emphasis in the definition of the desired target population was placed on pupils, the two SACMEQ Projects were also concerned with reporting estimates that described schools and teachers. When the data files were prepared for analysis, the information collected about schools and teachers was disaggregated over pupils - so as to provide estimates of teacher and school characteristics "for the average pupil" – rather than estimates for teachers and schools as distinct target populations in themselves.

(b) Excluded and Defined Target Populations

The use of the word "mainstream" in the definition of the desired target population automatically indicated that special schools for the handicapped should be excluded from the SACMEQ II data collection.

In addition, a decision was taken to exclude small schools – based on the definition of having less than either 15 or 20 pupils in the desired target population. Small schools were excluded because it was known that they represented a very small component of the total population of pupils, and were known to be mostly located in very isolated areas that were associated with high data collections costs. That is, it was understood that the allocation of these small schools to the excluded population had the potential to reduce data collection costs – without the risk of leading to major distortions in the study population.

The exclusion rules that were applied in each country have been listed below.

- Botswana: Schools with less than 20 Grade 6 pupils and special schools.
- Kenya: Schools with less than 15 Grade 6 pupils and special schools.
- Lesotho: Schools with less than 10 Grade 6 pupils and special schools.

- Malawi: Schools with less than 15 Grade 6 pupils, private schools, special schools, and "inaccessible" schools.
- Mauritius: Schools with less than 15 Grade 6 pupils and special schools.
- Mozambique: Schools with less than 20 Grade 6 pupils and special schools.
- Namibia: Schools with less than 15 Grade 6 pupils, "inaccessible" schools, and special schools.
- Seychelles: Schools with less than 10 Grade 6 pupils and special schools.
- South Africa: Schools with less than 20 Grade 6 pupils and special schools.
- Swaziland: Schools with less than 15 Grade 6 pupils and special schools.
- Tanzania: Schools with less than 20 Grade 6 pupils and special schools.
- Uganda: Schools with less than 20 Grade 6 pupils, schools in areas affected by serious military conflicts, and special schools.
- Zambia: Schools with less than 15 Grade 6 pupils and special schools.
- Zanzibar: Schools with less than 20 pupils and special schools.

The "defined target population" was constructed by removing the "excluded target population" from the "desired target population". In Table 2.3 the numbers of schools and pupils in the desired, defined and excluded populations for the SACMEQ II Project have been presented.

The final column of figures in Table 2.3 summarized the percentage of the SACMEQ II pupil desired target population in each country that had been excluded in order to form the defined target population. In all cases the percentages excluded were less than 5 percent - which satisfied the technical requirements that had been set down for the SACMEQ sampling procedures.

The Stratification Procedures

The stratification procedures adopted for the study employed explicit and implicit strata. The explicit stratification variable, "Region", was applied by separating each sampling frame into separate regional lists of schools prior to undertaking the sampling. The implicit stratification variable was "School Size" – as measured by the number of Grade 6 pupils.

The main reason for choosing Region as the explicit stratification variable was that the SACMEQ Ministries of Education wanted to have education administration regions as "domains" for the study. That is, the Ministries wanted to have reasonably accurate sample estimates of population characteristics for each region.

There were two other reasons for selecting Region as the main stratification variable. First, this was expected to provide an increment in sampling precision due to known between-region differences in the educational achievement of pupils – especially between predominantly urban and predominantly rural regions. Second, this approach provided a broad geographical coverage for the sample – which was necessary in order to spread the fieldwork across each country in a manner that prevented the occurrence of excessive administrative demands in particular regions.

The use of School Size as an implicit stratification variable within regions also offered increased sampling precision because it provided a way of sorting the schools from "mostly rural" (small schools) to "mostly urban" (large schools). It was known that this kind of sorting was linked to the main criterion variables for the study – with urban schools likely to have higher resource levels and better pupil achievement scores than rural schools.

Sample Design Framework

The SACMEQ II sample designs were prepared by using a specialized software system (SAMDEM) that enabled the high-speed generation of a range of sampling options which satisfied the statistical accuracy constraints set down for the project, and at the same time also addressed the logistical and financial realities of each country.

In order to establish the number of schools and pupils that were required to satisfy SACMEQ's sampling accuracy standards, it was necessary to know the magnitude of (a) the minimum cluster size, and (b) the coefficient of intraclass correlation.

Table 2.3: Desired, Defined, and Excluded Populations for the SACMEQ II Project

School System	Desired		Defined		Excluded		
	Schools	Pupils	Schools	Pupils	Schools	Pupils	Pupils %
Botswana	720	41408	589	39773	131	1635	3.9
Kenya	15439	631544	13313	607900	2126	23644	3.7
Lesotho	1170	40493	947	39212	223	1281	3.2
Malawi	3663	219945	3368	212046	295	7899	3.6
Mauritius	277	26510	274	26481	3	29	0.1
Mozambique	509	112279	500	112173	9	106	0.1
Namibia	849	48567	767	47683	82	884	1.8
Seychelles	25	1577	24	1571	1	6	0.4
South Africa	17073	962350	11997	920020	5076	42330	4.4
Swaziland	498	19940	458	19541	40	399	2.0
Tanzania	10786	529296	9516	511354	1270	17942	3.4
Uganda	9688	517861	8425	499127	1263	18734	3.6
Zambia	3858	180584	3090	176336	768	4248	2.4
Zanzibar	161	22179	151	22041	10	138	0.6
Total	64716	3354533	53419	3235258	11297	119275	3.6

(a) Minimum Cluster Size

The value of the minimum cluster size referred to the smallest number of pupils within a school that would be included in the data collection. It was important that this was set at a level that permitted test administration within schools to be carried out in an environment that ensured that: (i) the test administrator was able to conduct the testing according to the standardized procedures specified for the study, (ii) the sample members were comfortable and unlikely to be distracted, (iii) the sample members responded carefully and independently to the tests and questionnaires, and (iv) the testing did not place an excessive administrative burden on schools.

After a consideration of these four constraints the SACMEQ National Research Coordinators decided to limit the sample in each selected school to a simple random sample of 20 pupils.

(b) Coefficient of Intraclass Correlation

The coefficient of intraclass correlation (rho) referred to a measure of the tendency of pupil characteristics to be more homogeneous within schools than would be the case if pupils were assigned to schools at random. The estimated size of rho may be calculated from previous

surveys that have employed similar target populations, similar sample designs, and similar criterion variables.

The values of rho for educational achievement measures are usually higher for education systems where pupils are allocated differentially to schools on the basis of performance – either administratively through some form of "streaming", or structurally through socio-economic differentiation among school catchment zones. In general terms, a relatively large value of rho means that, for a fixed total number of sample members (pupils in this study), a larger number of primary sampling units (schools in this study) needs to be ***selected in order*** to obtain the same sampling precision as would be obtained for a relatively lower value of rho. That is, higher values of rho normally require larger numbers of schools to be selected into the sample.

The following formula may be used for estimating the value of rho in situations where two-stage cluster sampling is employed using (approximately) equal sized clusters (Ross, 1985).

$$\textit{estimated rho} = (b.\ s(a)^2 - s^2) / (b - 1)s^2$$

where s(a)2 is the variance of cluster means, s2 is the variance of the element values, and b is the cluster size.

Following a consideration of the results of the SACMEQ I Project, it was decided to use rho values in the range of 0.3 to 0.4 as an estimate of the value of the coefficient of intraclass correlation for most of the countries involved in the SACMEQ II Project. An exception to this was made for Namibia – where calculations based on SACMEQ I data indicated that a value of rho = 0.6 should be used.

(c) Sample Design Tables

In Appendix D of this chapter, a set of Sample Design Tables has been presented for various values of the minimum cluster size, and various values of the coefficient of intraclass correlation. The construction of these tables has been described by Ross (1987). It is important to remember that the tables refer specifically to two-stage sample designs that employ simple random sampling of equal-sized clusters.

The Sample Design Tables do not allow for (a) gains in sampling precision that are associated with effective choice of strata, and (b) losses in sampling precision arising from the use of sampling weights. Nevertheless, they provide a good starting point for estimating the number of schools and pupils that are required in order to meet the sample design standards specified for many educational research studies.

To illustrate the use of these tables, the fourth and fifth columns of the tables list a variety of two-stage samples that would result in an effective sample size of 400. That is, these columns describe sample designs that would provide 95 percent confidence limits of ±0.1s for means and ±5 percent for percentages (where s is the value of the pupil standard deviation). In the tables, the symbol "a" has been used to describe the number of schools, "b" has been used to describe the minimum cluster size, and "n" has been used to describe the total sample size.

For example, consider the intersection of the fourth and fifth columns of figures with the sixth row of figures in the tables when rho = 0.1. The pair of values a=58 and n=1160 indicate that if rho is equal to 0.1 and the minimum cluster size, b, is equal to 20, then the two-stage cluster sample design with an effective sample size of 400 would be 20 pupils selected from each of 58 schools – which would result in a total sample size of 1160 pupils. The effect of a different value of rho, for the same minimum cluster size, may be examined by considering the corresponding rows of the table for rho=0.2, 0.3, etc. in the tables.

The rows of the tables that correspond to a minimum cluster size of 1 refer to the "effective sample size". That is, they describe the size of a simple random sample that has equivalent accuracy. Therefore, the pairs of figures in the fourth and fifth columns in the table all refer to sample designs that have equivalent accuracy to a simple random sample of size 400. The second and third columns refer to an equivalent sample size of 1,600, and the final two pairs of columns refer to equivalent sample sizes of 178 and 100, respectively.

(d) The Numbers of Schools and Pupils Required for this Study

Using values of rho=0.3 (Botswana, Malawi, Mauritius, Swaziland, Uganda) and rho=0.4 (Kenya, Lesotho, Mozambique, South Africa, Tanzania, Zambia) in association with a minimum cluster size of 20 pupils indicated that there was a need to select (at least) 134 and 172 schools for these two groups of countries, respectively, in order to meet the SACMEQ II

Project sampling requirements. In fact, additional schools were selected in most countries with the aim of achieving reasonably stable sample estimates within Regions.

Exceptions to this approach were made for Namibia, the Seychelles, and Zanzibar. In Namibia, some calculations made using SACMEQ I data indicated that a value of rho = 0.6 should be used to plan the sample. As a result, at least 248 schools were required in Namibia. In the Seychelles and Zanzibar it was decided to include all schools in the defined target population.

Construction of Sampling Frames

The defined target population definition was used to guide the construction of sampling frames from which the samples of schools were selected. The sampling frames were based on national lists of schools that included information about: school identification numbers, enrolment for the target population of Grade 6 pupils, and school regional location. The information used to construct the sampling frames was based on data that had been collected by the SACMEQ Ministries of Education for the most recent School Census.

The sampling frame for each country provided a "listing" of the pupils in the defined target population without actually creating a physical list consisting of an entry for each and every pupil. For this study, the sampling frame needed to provide a complete coverage of the defined target population without being contaminated with incorrect entries, duplicate entries, or entries that referred to elements that were not part of the defined target population.

Work commenced on the construction of SACMEQ II sampling frames in January 2000. For countries with high quality Educational Management Information Systems (EMIS) this task was very easy and was completed within a week. Other countries took up to six months to complete their sampling frames because of (a) major errors in EMIS data files, (b) difficulties in communicating information requirements to the Ministry staff responsible for EMIS functions, (c) difficulties in combining regional databases to form a single national sampling frame, (d) problems with inconsistent school numbering systems, and (e) changes in the geographical boundaries of regions during the time period between the implementations of the SACMEQ I and SACMEQ II Projects.

The Selection of Schools

In educational survey research the primary sampling units that are most often employed (schools) are rarely equal in size. This variation in size causes difficulties with respect to the control of the total sample size when schools are selected with equal probability at the first stage of a multi-stage sample design.

For example, consider a two-stage sample design in which a simple random sample of "a" schools is selected from a list of "A" schools, and then a fixed fraction of pupils, say 1/k, is selected from each selected school. This design would provide an epsem, or "equal probability of selection method" (Kish, 1965, p. 21), sample of pupils because the probability of selecting a pupil is a/Ak, which is constant for all pupils in the population. However, the total size of the sample would depend upon the size of the schools that were selected.

One method of obtaining greater control over the total sample size is to stratify the schools according to size and then select samples of schools within each stratum. A more widely applied alternative is to employ probability proportional to size (PPS) sampling of schools within strata followed by the selection of a simple random sample of a fixed number of pupils within selected schools. This approach provides control over the sample size and results in epsem sampling of pupils within strata.

The lottery method of PPS selection was implemented in the SACMEQ II Project with the assistance of the SAMDEM software (Sylla et al, 2003). The steps taken in selecting schools using this method have been described in the hypothetical example presented below.

Probability proportional to size (PPS) sampling is often applied via the "lottery method". For example, consider a situation where two schools are to be selected with probability proportional to size from each stratum of the hypothetical population of 600 pupils described in Table 2.4. The application of the lottery method of PPS selection commences with the allocation, to each school, of a number of lottery tickets equal to the number of pupils in the defined target population.

To illustrate, the first school listed in Table 2.4 has 45 pupils and therefore it is allocated tickets numbered 1 to 45, and the second school has 60 pupils and therefore it is allocated

tickets numbered 46 to 105. And so on. Since a PPS sample of two schools is to be selected from the first stratum, there are two “winning tickets” required.

In the first stratum, the ratio of the number of tickets to the number of winning tickets, known as the “sampling interval”, is 200/2 = 100. That is, each ticket in the first stratum has a 1 in 100 chance of being drawn as a winning ticket. Note that the sampling interval is 400/2 = 200 for the second stratum.

The winning tickets for the first stratum may be drawn by using a “random start-constant interval” procedure whereby a random number in the interval 1 to 100 is selected as the first winning ticket and the second ticket is selected by adding an increment of 100 to this number.

Table 2.4: Hypothetical Population for the Illustration of Probability Proportional to Size Selection

Stratum	School	Class	No. Pupils		Cumulative	"Tickets"
			School	Class		
1	1	1	45	20	20	1-45
		2		25	45	
	2	3	60	15	60	46-105
		4		20	80	
		5		25	105	
	3	6	95	25	130	
		7		30	160	106-200
		8		25	185	
		9		15	200	
Sub-total	3	9	200			
2	4	10	45	10	10	1-45
		11		15	25	
		12		20	45	
	5	13	110	20	65	46-155
		14		25	90	
		15		30	120	
		16		35	155	
	6	17	120	35	190	156-275
		18		40	230	
		19		45	275	
	7	20	125	50	325	276-400
		21		75	400	
Sub-total	4	12	400			
Total	7	21	600			

With a random start of 65, the winning ticket numbers would be 65 and 165. This would result in the selection of School 2 (which holds tickets 46-105) and School 3 (which holds tickets 106-200). Using this approach the chance of selecting any school would be proportional to the number of tickets held and therefore each of these schools is selected with probability proportional to the number of pupils in the defined target population. The winning

tickets for the second stratum are similarly selected using a random start-constant interval approach in which the random start is a random number between 1 and 200, and the constant interval is 200.

The Selection of Pupils within Schools

A critical component of the sample design for the SACMEQ II Project was concerned with the selection of pupils within selected schools. It was decided that these selections should be placed under the control of trained data collectors – after they were provided with materials that would ensure that a simple random sample of pupils was selected in each selected school. The data collectors were informed that it was not acceptable to permit school principals or classroom teachers to have any influence over the sampling procedures within schools. These groups of people may have had a vested interest in selecting particular kinds of pupils, and this may have resulted in major distortions of sample estimates (Brickell, 1974).

In the two SACMEQ Projects the data collectors initially explained to School Heads in selected schools that a "mechanical procedure" would be used to select the sample of 20 pupils. The data collectors then applied the following set of instructions in order to ensure that a simple random sample of pupils was selected.

Step 1: Obtain Grade 6 register(s) of attendance.

These registers were obtained for all Grade 6 pupils that attended normal (not "special") classes. In multiple session schools, both morning and afternoon registers were obtained.

Step 2: Assign sequential numbers to all Grade 6 pupils.

A sequential number was then placed beside the name of each Grade 6 pupil. For example: Consider a school with one session and a total of 48 pupils in Grade 6. Commence by placing the number "1" beside the first pupil on the Register; than place the number "2" beside the second pupil on the Register; …etc. …; finally, place the number "48" beside the last pupil on the Register.

Another example: Consider a school with 42 pupils in the morning session and 48 pupils in the afternoon session of Grade 5. Commence by placing the number "1" beside the first pupil on the morning register; … etc. …; then place a "42" beside the last pupil on the morning

register; then place a "43" beside the first pupil on the afternoon register; … etc. …; finally place a "90" beside the last pupil on the afternoon register.

Step 3: Locate the appropriate set of selection numbers.
In Appendix E sets of "selection numbers" have been listed for a variety of school sizes. (Note that only the sets relevant for school sizes in the range 21 to 245 have been presented.) For example, if a school had 48 pupils in Grade 6, then the appropriate set of selection numbers was listed under the "R48" heading. Similarly, if a school had 90 Grade 5 pupils then the appropriate set of selection numbers was listed under the "R90" heading.

Step 4: Use the appropriate set of selection numbers.
After locating the appropriate set of selection numbers, these were used to select the sample of 20 pupils. The first selection number was used to locate the Grade 6 pupil with the same sequential number on the Register(s). The second selection number was used to locate the Grade 6 pupil with the same sequential number on the Register(s). This process was repeated in order to select 20 pupils
For example: From Appendix E we see that in a school with a total of 50 pupils in Grade 5 the first pupil selected has sequential number "2"; the second pupil selected has sequential number "4"; … etc. …; the twentieth pupil selected has sequential number "50".

The Calculation of Sampling Weights

The following discussion is based on the use of two-stage sampling procedures in which the first stage of sampling consists of the PPS selection of schools followed by the selection of a simple random sample of pupils in selected schools.

Consider a population of pupils that may be described according to the notation presented in Table 2.5. From stratum h of the population select ah schools with PPS, and then select a simple random sample of nhi pupils within each selected school.

For this sample design, the probability of selecting pupil k in class j from school i within stratum h would be the product of the probability of selecting the pupil's school at the first stage and the probability of selecting pupil k within school i at the second stage.

$$p = (a_h \times N_{hi} / N_h) \times (n_{hi} / N_{hi}) = (a_h \times n_{hi}) / N_h$$

This application of PPS sampling removes the influence of school size, Nhi, from the calculation of the probability of selecting pupil k. Note that, if the value of nhi is constant within strata, then the numerator of the above equation is constant and equal to nh within strata. In this special case, p = nh / Nh is a constant for all pupils within a particular stratum.

The calculation of sampling weights for both SACMEQ Projects followed the classical procedure of assigning each pupil a weight that was proportional to the reciprocal of the probability of including a pupil in the sample.

The reciprocals of these probabilities are sometimes referred to as "raising factors" because they refer to the number of elements in the population that are "represented" by the various sample elements.

$$\textit{raising factor} = (N_h / (a_h \times n_{hi})$$

These raising factors are often multiplied by a constant so that the "weighted sample size" is equal to the achieved sample size. In this case the constant would be n/N and the sampling weight for pupil k would be as follows.

$$\textit{weight} = (N_h \times n) / (a_h \times n_{hi} \times N)$$

Table 2.5: Notation used in Discussion of Sample Designs

Coverage of units	*Units*					
	Schools		*Classes*		*Pupils*	
	Total	*Sample*	*Total*	*Sample*	*Total*	*Sample*
Population	***A***	***A***	***B***	***B***	***N***	***n***
Stratum h	A_h	a_h	***Bh***	b_h	N_h	n_h
School i (Stratum h)	-	-	B_{hi}	b_{hi}	N_{hi}	n_{hi}
Class j (School i in Stratum h)	-	-	-	-	N_{hij}	n_{hij}

Note: 1. The notation conventions for sample designs described in this manual have been listed in the above table. The table entries describe the number of "units" (schools, classes, or pupils) associated with each of four levels of "coverage" (population, stratum h, school i, or class j).

Note: 2. For example, the symbol A has been used to refer to the total number of schools ("units") in the population ("coverage"), whereas the symbol A_h has been used to describe the total number of schools ("units") in stratum h ("coverage"). Similarly, the symbol n has been used to refer to the number of pupils in the sample, whereas the symbol n_{hij} has been used to refer to the number of pupils in the sample associated with class j (situated in school i within stratum h).

In most "real" school system sampling situations, the number of pupils in the defined target population within each school listed on the sampling frame is different from the actual number of pupils.

This occurs because sampling frames are usually developed from data collected at some earlier time – often a year prior to the selection of the sample of schools. That is, rather than finding N_{hi} pupils in school i within stratum h, we often find that there are N_{hi} (actual) pupils.

In addition, due to occasional absenteeism on the day of data collection, instead of being able to test n_{hi} pupils in a sample school we often only manage to collect data from n_{hi} (actual) pupils. Given these two deviations, the actual probability (assuming random loss of data) of selecting a pupil in school i within stratum h may be written as follows.

Table 2.6: Planned and Achieved Samples for SACMEQ I and SACMEQ II Projects

School System	SACMEQ I				SACMEQ II			
	Schools		Pupils		Schools		Pupils	
	Planned	Achieved	Planned	Achieved	Planned	Achieved	Planned	Achieved
Botswana	N/A	N/A	N/A	N/A	170	170	3400	3322
Kenya	185	184	3700	3233	185	185	3700	3299
Lesotho	N/A	N/A	N/A	N/A	180	177	3600	3155
Malawi	155	148	3100	1983	140	140	2800	2333
Mauritius	159	158	3180	2919	159	159	3180	2945
Mozambique	N/A	N/A	N/A	N/A	180	176	3600	3177
Namibia	160	160	4940	4457	275	275	5500	5048
Seychelles	N/A	N/A	N/A	N/A	24	24	1546	1484
SouthAfrica	N/A	N/A	N/A	N/A	185	169	3700	3163
Swaziland	N/A	N/A	N/A	N/A	170	168	3400	3139
Tanzania	N/A	N/A	N/A	N/A	185	181	3700	2854
Uganda	N/A	N/A	N/A	N/A	164	163	3280	2642
Zambia	165	157	3300	2558	175	173	3500	2611
Zanzibar	128	128	2560	2286	151	145	3020	2514
Zimbabwe	150	150	3000	2697	N/A	N/A	N/A	N/A
Total	**1102**	**1086**	**23780**	**20133**	**2343**	**2305**	**47926**	**41686**

$$p = (a_h \times N_{hi} / N_h) \times (n_{hi}\ (actual) / N_{hi}\ (actual))$$

$$= (a_h \times N_{hi} \times n_{hi}\ (actual)) / (N_h \times N_{hi}\ (actual))$$

In this case we have:

"revised raising factor" = $(N_h \times N_{hi}\ (actual)) / (a_h \times N_{hi} \times n_{hi}\ (actual))$

In order to obtain the "revised weights", the revised raising factor may be multiplied by a constant equal to the achieved total sample size divided by the sum of the values of the revised raising factor across all pupils in the achieved sample.

In the SACMEQ Projects the revised weights were referred to as "pweight2" on the data files. The raising factor linked to this sampling weight, labelled RF2 on the data file, provided a mechanism for estimating population totals for different important independent variables. For example, by using RF2 it was possible to make estimates such as the total numbers of pupils in the defined target population who were attending isolated, rural, and urban schools; or the total number of pupils in the defined target population who had their own reader, were sharing a reader, or were without a reader.

Some Background Comments on the Calculation of Sampling Errors

The sample designs employed in the SACMEQ Projects departed markedly from the usual "textbook model" of simple random sampling. This departure demanded that special steps be taken in order to calculate "sampling errors" (that is, measures of the stability of sample estimates of population characteristics). In the following discussion, a brief overview has been presented of various aspects of the general concept of "sampling error". This has included a discussion of notions of "design effect", "the effective sample size", and the "Jackknife procedure" for estimating sampling errors.

(a) Bias, Sampling Error, and Mean Square Error

Consider a probability sample of n elements that is used to calculate the sample mean, $\bar{x}$, as an estimate of the population mean, $\bar{X}$. If an infinite set of samples of size n were drawn independently from this population and the sample mean calculated for each of these samples, then the average of the resulting sampling distribution of sample means, the expected value of $\bar{x}$, could be denoted by $E(\bar{x})$.

The accuracy of the sample statistic, $\bar{x}$, as an estimator of the population parameter, $\bar{X}$, may be summarized in terms of the mean square error (MSE). The MSE is defined as the average of the squares of the deviations of all possible sample estimates from the value being estimated (Hansen, et al, 1953).

$$
\begin{aligned}
\textbf{\textit{MSE}}(\bar{x}) &= E(\bar{x} - \bar{X})^2 \\
&= E(\bar{x} - E(\bar{x}))^2 + (E(\bar{x}) - \bar{X})^2 \\
&= \textit{variance of } \bar{x} + \textit{(bias of } \bar{x})^2
\end{aligned}
$$

A sample design is unbiased if $E(\bar{x}) = \bar{X}$. It is important to remember that "bias" is not a property of a single sample, but of the entire sampling distribution, and that it belongs neither to the selection nor the estimation procedure alone, but to both jointly.

For most well designed samples in survey research, the bias is usually very small – tending towards zero with increasing sample size. The accuracy of sample estimates is therefore generally assessed in terms of the variance of $\bar{x}$, denoted $var(\bar{x})$, which quantifies the sampling stability of the values of $\bar{x}$ around their expected value $E(\bar{x})$

(b) The Accuracy of Individual Sample Estimates

In educational settings the researcher is usually dealing with a single sample of data and not with all possible samples from a population. The variance of sample estimates therefore cannot be calculated in the manner described above. However, for many sample designs based on strict probability sampling methods, statistical theory may be used to provide estimates of the variance based on the internal evidence of a single sample of data.

In the case of a simple random sample of n elements drawn without replacement from a population of N elements, the variance of the sample mean may be estimated from a single sample of data by using the following formula:

$$var(x) = (N - n) / N \, . \, s^2/n$$

where s2 is the usual sample estimate of the variance of the element values in the population, (Kish, 1965 p. 41).

For sufficiently large values of N, the value of the "finite population correction", (N - n)/N, tends toward unity. The variance of the sample mean in this situation may therefore be estimated by s2/n.

The sampling distribution of the sample mean is approximately normally distributed for many survey research situations. The approximation improves with increased sample size – even though the distribution of elements in the parent population may be far from normal. This characteristic of sampling distributions is known as the Central Limit Theorem and it occurs not only for the sample mean but also for most estimators commonly used to describe survey research results (Kish, 1965).

From a knowledge of the properties of the normal distribution we know that we can be "68 percent confident" that the range $\bar{x} \pm se(\bar{x})$ includes the population mean, where $\bar{x}$ is the sample mean obtained from a single sample and $se(\bar{x})$, often called the standard error, is the square root of $var(\bar{x})$. Similarly the range $\bar{x} \pm 1.96 \; se(\bar{x})$ will include the population mean with 95 percent confidence.

While the above discussion has concentrated on sample means derived from simple random samples, the same approach may be used to establish confidence limits for many other statistics derived from various types of sample designs. For example, confidence limits may be calculated for complex statistics such as correlation coefficients, regression coefficients, and multiple correlation coefficients (Ross, 1978).

(c) Comparison of the Accuracy of Probability Samples

The accuracy of probability samples is usually considered by examining the variance associated with a particular sample estimate for a given sample size. This approach to the evaluation of sampling accuracy has generally been based on the recommendation put forward by Kish (1965) that the simple random sample design should be used as a standard for quantifying the accuracy of sample designs that incorporate such complexities as stratification and clustering. Kish introduced the term "deff" (design effect) to describe the ratio of the variance of the sample mean for a complex sample design (denoted c) to the variance of the sample mean for a simple random sample (denoted srs) of the same size.

$$\textit{That is, deff} = \mathrm{var}(\bar{x}_c) / \mathrm{var}(\bar{x}_{srs})$$

For the kinds of complex sample designs that are commonly used in educational research, the values of deff for many statistics are often greater than unity. Consequently, the accuracy of sample estimates may be grossly overestimated if formulae based on simple random sampling assumptions are used to calculate sampling errors. The potential for arriving at false conclusions by using incorrect sampling error calculations has been illustrated in a study carried out by Ross (1976).

An alternative approach to comparing the accuracy of probability samples is to calculate the "effective sample size". For a given complex sample design (with a sample size of nc), the effective sample size for a particular statistic (denoted n* below) is equal the size of a simple random sample that has the same variance. By using a little algebra (Ross and Rust, 1997) the above equation may be transformed into an expression that relates the size of the complex sample, the design effect, and the effective sample size.

$$n^* = n_c / deff$$

(d) Error estimation for complex probability samples

The computational formulae required to estimate the variance of descriptive statistics, such as sample means, are available for some probability sample designs which incorporate complexities such as stratification and cluster sampling. However, for many commonly-employed statistics, the required formulae are not readily available for sample designs which depart markedly from the model of simple random sampling. These formulae are either enormously complicated or, ultimately, they prove resistant to mathematical analysis (Frankel, 1971). In the absence of suitable formulae, a variety of empirical techniques have emerged in recent years which provide "approximate variances that appear satisfactory for practical purposes" (Kish, 1978 p. 20). The most frequently applied empirical techniques may be divided into two broad categories: Subsample Replication and Taylor's Series Approximation.

In Subsample Replication a total sample of data is used to construct two or more subsamples and then a distribution of parameter estimates is generated by using each subsample. The subsample results are analysed to obtain an estimate of the parameter, as well as a confidence assessment for that estimate (Finifter, 1972 p. 114). The main approaches in using this technique have been Independent Replication (Deming, 1960), Jackknifing (Tukey, 1958), Balanced Repeated Replication (McCarthy, 1966).

In the SACMEQ II Project it was decided calculate sampling errors by using the IIEPJACK software. This software was based on the Jackknife procedure, and its capacity to interface with the SPSS software system made it possible to quickly and easily prepare tabulations and associated sampling errors for all summary statistics employed in the research.

Evaluation of the SACMEQ Sample Designs

(a) Response Rates

In Table 2.6 the size of the planned and achieved samples have been presented for both the SACMEQ I and SACMEQ II Projects. The value of the achieved sample size as a percentage of the planned sample size represents the "response rate". The response rate percentages for pupils and schools have been presented for the SACMEQ I Project in Table 2.7(a) and for the SACMEQ II Project in Table 2.7(b). The technical requirement for the SACMEQ research programme was that all countries should seek to achieve overall response rates of 90 percent

for schools and 80 percent for pupils.

From the first two columns of Table 2.7(a) it may be seen that for the SACMEQ I Project all countries achieved the required response rate for schools - however Malawi and Zambia experienced major losses of pupil data within responding schools and as a result achieved pupil response rates of only 64 percent and 78 percent, respectively. The SACMEQ II response rates presented in Table 2.7(b) showed that all countries satisfied the required response rate for schools – however both Tanzania and Zambia experienced considerable loss of data within schools. The pupil response rates for these countries were 77 percent and 75 percent, respectively, - which were fairly close to the goal of an 80 percent response rate.

Table 2.7(a): Response Rates, Design Effects, Effective Sample Sizes for SACMEQ I

School System	Response Rate (%)		Design Effect	Effective Sample Size
	Schools	Pupils	Reading	Reading
Kenya	99	87	10.1	322
Malawi	95	64	4.3	456
Mauritius	99	92	6.1	476
Namibia	100	90	13.3	335
Zambia	95	78	4.9	519
Zanzibar	100	89	1.6	1424
Zimbabwe	100	90	5.2	519

Table 2.7(b): Response Rates, Design Effects, Effective Sample Sizes for SACMEQ II

School System	Response Rate (%)		Design Effect		Effective Sample Size	
	Schools	Pupils	Reading	Math	Reading	Math
Botswana	100	98	5.1	4.9	649	682
Kenya	100	89	10.3	9.3	320	355
Lesotho	98	88	8.1	9.1	391	346
Malawi	100	83	5.3	3.7	442	621
Mauritius	96	93	5.9	5.8	496	495
Mozambique	98	88	4.0	4.2	800	740
Namibia	98	92	6.6	6.2	767	810
Seychelles	100	96	0.9	0.9	1603	1602
South Africa	91	85	17.1	13.6	185	230
Swaziland	99	92	9.4	8.1	333	389
Tanzania	98	77	8.9	6.7	321	423
Uganda	99	81	11.9	14.9	222	176
Zambia	99	75	7.3	6.1	359	424
Zanzibar	96	83	1.1	1.0	2234	2470

Table 2.8 : Values of the Coefficient of Intraclass Correlation for the Tests used in the SACMEQ I and SACMEQ II Projects

School System	SACMEQ I	SACMEQ II	
	Reading	Reading	Mathematics
	roh	roh	roh
Botswana	N/A	26	22
Kenya	42	45	38
Lesotho	N/A	39	30
Malawi	24	29	15
Mauritius	25	26	25
Mozambique	N/A	30	21
Namibia	65	60	53
Seychelles	N/A	8	8
South Africa	N/A	70	64
Swaziland	N/A	37	26
Tanzania	N/A	34	26
Uganda	N/A	57	65
Zambia	27	32	22
Zanzibar	17	25	33
Zimbabwe	27	N/A	N/A
SACMEQ II	33	37	32

(b) Intraclass Correlations

The coefficient of intraclass correlation may be used to measure the proportion of variance in pupil test scores that may be attributed to variation among schools. The coefficient is functionally related to the design effect such that a high value of the coefficient results in a high value of the design effect.

This linkage between the coefficient of intraclass correlation and the design effect implies that more sample schools are required in a country where the coefficient takes a high value than are required in a country where the coefficient takes a low value (in order to reach the same level of sampling accuracy). In Table 2.8 the values of the coefficient of intraclass correlation have been presented for the pupil tests used in the SACMEQ I and SACMEQ II Projects.

For both the reading and mathematics tests used in the SACMEQ II Project, the lowest values of the coefficient occurred for the Seychelles (0.08), Botswana and Mauritius (both around 0.25). In contrast, values in the range 0.50 to 0.70 occurred for Namibia, South Africa., and Uganda. The high values for Namibia were known prior to the completion of the SACMEQ II sample designs because they were calculated to be around 0.65 for the SACMEQ I reading test, and therefore a much larger sample of Namibian schools (275) was selected.

Unfortunately, the high values for South Africa and Uganda were not known beforehand, and the sample designs for these countries were based on "guesstimates" that the value of the intraclass correlation for each country was around 0.4. As a result the number of schools in the sample designs for these two countries was too small – which resulted in a shortfall in the effective sample sizes for these countries.

(c) Design Effects and Effective Sample Sizes

The design effect (Kish, 1965) provides an indicator of the increase in sampling variance that occurs for a complex sample in comparison with a simple random sample of the same size. The effective sample size (Ross, 1987) for a complex sample represents the size of a simple random that would have the same sampling accuracy as the complex sample. In the final columns of Table 2.7(b) and Table 2.7(b) the "design effect" and the "effective sample size" have been presented for the SACMEQ I reading test and the SACMEQ II reading and mathematics tests.

In the SACMEQ I Project two countries (Kenya and Namibia) had effective sample sizes that fell below the target value of 400 pupils; whereas in the SACMEQ II Project five countries (Kenya, Namibia, South Africa, Swaziland, and Seychelles) fell below the target value.

In the SACMEQ II Project, two school systems, South Africa and Uganda, fell far below the required target of an effective sample size of 400 pupils. In South Africa the values were 185 and 230 for reading and mathematics, respectively, and in Uganda the values were 222 and 176 for reading and mathematics, respectively.

The values of the "design effect" and the "effective sample size" have also been presented for various variables and a single country (Botswana) in Tables 2.9(a) and 2.9(b). To illustrate,

consider the design effect and effective sample size values in Table 2.9(a) for the pupil average reading score for Botswana overall. The design effect for this variable was 5.12, which indicated that the variance of the sample estimate of the variance of pupil reading scores for Botswana was 5.12 times larger than would be expected for a simple random sample of the same size (3322 pupils). The effective sample size for this variable indicated that the complex sample of 3322 pupils had a sampling variance that was the same as would have been obtained by employing a simple random sample of 649 pupils.

In Table 2.9(a) and Table 2.9(b) values of the design effect and the effective sample size have been presented for a selection of variables at different "levels" (pupil, teacher, and school head). The word "levels" here refers to the structure of the basic data file for the SACMEQ I and SACMEQ II Projects – in which the units of analysis were pupils – with teacher and school head data being disaggregated over pupils. This disaggregation of teacher and school head data in order to construct a "between-pupils" data file resulted in effective sample sizes for teacher variables that approached the total number of teachers, and effective sample sizes for school head variables that approached the total number of schools.

To illustrate, for Botswana overall the effective sample size for the "teacher academic education" variable was 311 (close to the total number of teachers in the survey), and for the "pupil-toilet ratio" variable was 171 (close to the total number of schools in the survey).

Table 2.9(a). Botswana overall: Sampling errors (SE), design effects, and actual/effective sample sizes for selected variables at the pupil, teacher, and school head levels

Variable	Mean	%	SE	Design Effect	Sample Size	
					Actual	Effective
At pupil level						
Pupil speaking English at home		74.0	1.34	3.08	3322	1077
Pupil being given reading homework		40.1	1.47	2.99	3322	1111
Reading pupil scores	521.1		3.47	5.12	3322	649
Mathematics pupil scores	512.9		3.15	4.87	3321	682
Average				3.38	3322	2141
At reading teacher level				12.39	3312 (393)	273
Teacher academic education	2.56		0.05	10.69	3322 (393)	311
Total classroom resources	6.43		0.12	14.59	3322 (393)	228
Available classroom library		81.2	2.50	13.65	3322 (393)	243
Sex of teacher		66.7	2.68	10.61	3282 (391)	309
Average				12.39	3312 (393)	273
At school head level						
Pupil-toilet ratio	44.43		2.15	19.43	3322 (170)	171
Total school resources	9.81		0.24	18.93	3322 (170)	176
Available school staff room		74.8	3.43	20.79	3322 (170)	160
Sex of school head		53.4	3.89	20.25	3322 (170)	164
Average				19.85	3322 (170)	168

Table 2.9 (b) Botswana Central Region: Sampling errors (SE), design effects, and actual/effective sample sizes for selected variables at the pupil, teacher, and school head levels

Variable	Mean	%	SE	Design Effect	Sample Size	
					Actual	Effective
At pupil level						
Pupil speaking English at home		66.7	3.55	2.80	493	176
Pupil being given reading homework		40.4	3.71	2.81	493	175
Reading pupil scores	506.1		6.56	3.51	493	140
Mathematics pupil scores	506.2		5.57	2.65	493	186
Average				2.46	493	268
At reading teacher level						
Teacher academic education	2.6		0.13	7.41	493 (64)	67
Total classroom resources	6.1		0.33	14.06	493 (64)	35
Available classroom library		81.7	6.59	14.28	493 (64)	35
Sex of teacher		71.5	7.45	13.45	493 (64)	37
Average				12.30	493 (64)	44
At school head level						
Pupil-toilet ratio	40.6		4.56	20.62	493 (25)	24
Total school resources	10.4		0.66	19.31	493 (25)	26
Available school staff room		72.1	9.89	23.98	493 (25)	21
Sex of school head		52.1	10.49	21.75	493 (25)	23
Average				21.42	493 (25)	24

(d) Sampling Errors

The calculation of sampling errors for the SACMEQ Projects needed to acknowledge that the samples were not simple random samples - but rather complex two-stage cluster samples that included weighting adjustments to compensate for variations in selection probabilities. The IIEP's specialized sampling software (IIEPJACK) was used to make these calculations.

In the SACMEQ I and SACMEQ II national policy reports the sampling errors were calculated for each summary statistic, and they were labelled "SE" in the completed Dummy Tables. For example, consider the statistics reported for Botswana overall in Table 2.9(a) and the Central Region of Botswana in Table 2.9(b).

In Table 2.9(a) the pupil average reading score for Botswana overall was 521.1 and the standard error of sampling was 3.47. These figures indicated that one could be 95 percent confident that the population average for pupils in Botswana on the reading test was within the following limits: $521.1 \pm 2(3.47)$. That is, between 514.2 and 528.0. Similarly, in Table 2.9(b) the pupil average reading score for the Central Region in Botswana was 506.1 and the standard error of sampling was 6.56. These figures indicated that one could be 95 percent confident that the population value for pupils in Botswana's Central Region was within the following limits: $506.1 \pm 2(6.56)$. That is, between 493.0 and 519.2.

When data are collected using multi-stage sample designs from sources at different levels of aggregation (pupil, teacher, school) a great deal of care needs to be taken in interpreting the stability of sample estimates of population characteristics. For the SACMEQ Projects, the data analyses were undertaken at the between-pupils level. That is, data collected from teachers and school heads were disaggregated across the pupil data files before the data analyses were undertaken.

The interaction of sample design and level of data analysis required that extra caution be used in interpreting estimates obtained by using information from teachers or school heads. The sampling errors of estimates derived from these two "disaggregated sources" were far larger than figures generated by using standard statistical software packages.

Part C: The Construction of Tests for the SACMEQ II Project

The Main Steps in Test Construction

The following discussion provides information about the construction of the SACMEQ II reading and mathematics tests for pupils and teachers, and the scaling procedures that were used to calibrate test items and to permit pupil and teacher performance to be described in terms of hierarchies of competencies. The procedures used to construct the SACMEQ I reading test for pupils have already been presented in the national policy reports prepared for the seven countries that completed this project (Kulpoo, 1998; Machingaidze et al, 1998; Milner et al, 2001; Nassor and Ali Mohammed, 1998; Nkamba and Kanyika, 1998; Nzomo et al, 2001; Voigts, 1998). The testing undertaken for the SACMEQ II Project was far more extensive than for the SACMEQ I Project – with both Grade 6 pupils and their teachers being given both reading and mathematics tests.

The test construction for both projects was undertaken carefully so as to ensure that the structure of the pupil tests was congruent with the content (domains) and behaviours (skills) derived from detailed analyses of the curricula, syllabi, exams, and textbooks used in the SACMEQ countries.

The SACMEQ II tests for pupils and teachers included "overlapping" test items selected from five earlier studies: the Zimbabwe Indicators of the Quality of Education Study (Ross, 1995), the SACMEQ I and SACMEQ II Projects, the IEA's Third International Mathematics and Science Study (TIMSS) (Mullis et al, 2001), and the IEA's International Study of Reading Literacy (IRL) (Elley, 1992). These "overlaps", when combined with Rasch item analysis and test scoring techniques, made it possible to make valid comparisons among the following groups of respondents: pupils with teachers in the SACMEQ II Project, pupils in the SACMEQ I Project with pupils in the SACMEQ II Project, and pupils in both SACMEQ Projects with pupils in the IEA's TIMSS and IRL studies. In Appendix F and Appendix G the overlaps of test items across all of these studies have been presented in tabular form. For example, the 66th reading test item listed in Appendix F was located in the SACMEQ I pupil test ("ptembo05"), the SACMEQ II pupil test ("pread17"), the SACMEQ II teacher test

("tread04"), and the pupil test used in the Zimbabwe Indicators of the Quality of Education Study ("tembo05").

In Figure 2.3 the key steps involved in constructing the SACMEQ II tests have been presented in diagrammatic form. The main aim of this process was to ensure high levels of face validity and construct validity by achieving congruence between the test blueprint (prepared as a framework for test construction) and the descriptions of increasing levels of competence generated from a Rasch analysis of the item difficulty levels in combination with a skills audit of test items.

The selection of teacher test items had to cover the full range of pupil item difficulties – but did not contain too many easy pupil test items. In addition, in order not to antagonize teachers with an extended testing session, the teacher tests had a much smaller number of test items than the pupil tests.

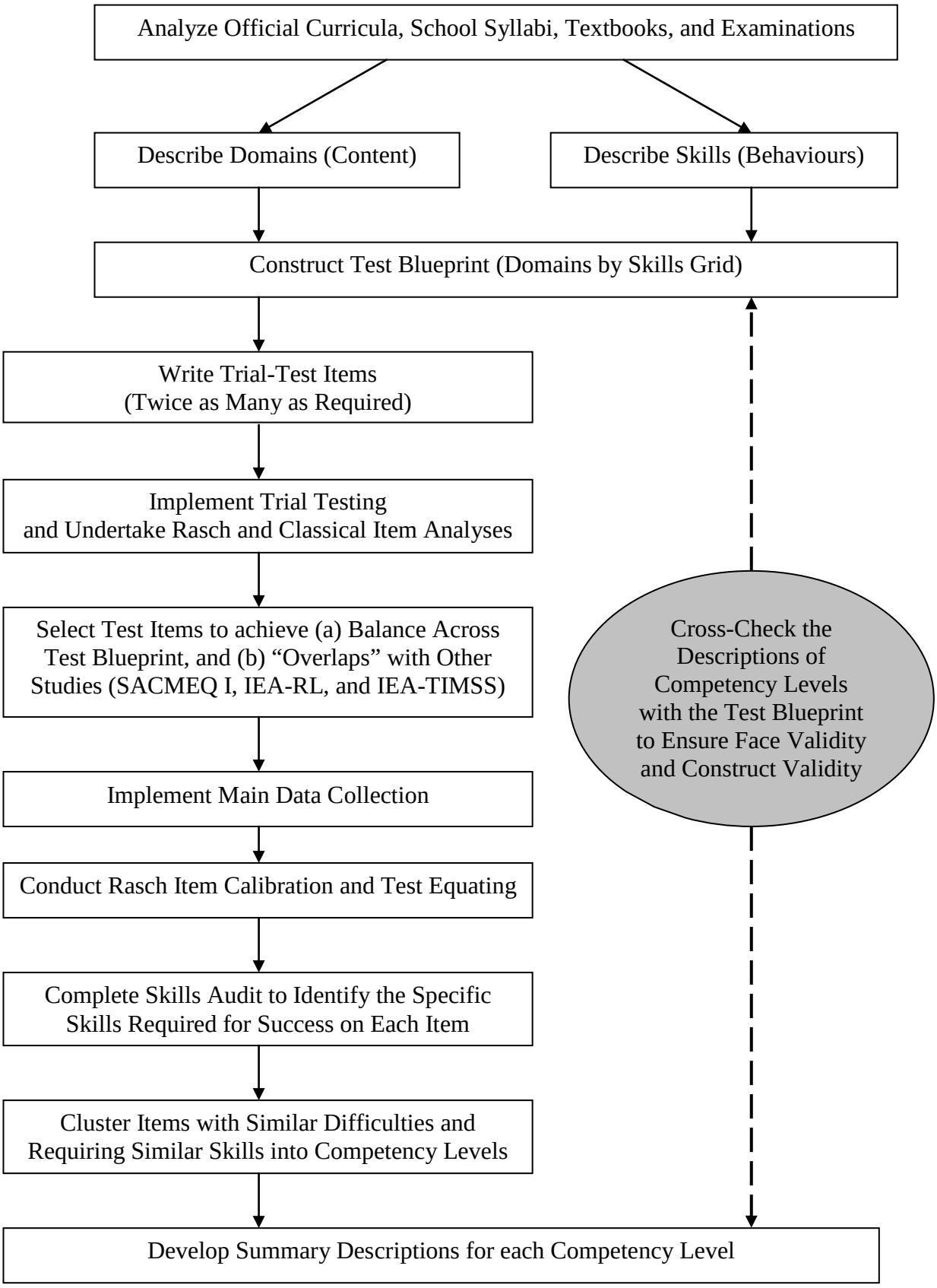

Figure 2.3: Main Steps Involved in Test Construction for the SACMEQ II Project

The Structure of the SACMEQ II Reading Tests

(a) The Definition of "Reading Literacy"

In the SACMEQ II Project "reading literacy" was defined as " the ability to understand and use those written language forms required by society and/or valued by the individual."

This was the agreed definition that was used by the 35 countries that participated in the International Reading Literacy Study that was conducted by the International Association for the Evaluation of Educational Achievement (Elley, 1992). It was also the general definition accepted by the SACMEQ National Research Coordinators (NRCs) for the SACMEQ I Project. The NRCs found this definition to be general enough to accommodate the diversity of traditions and languages represented in the SACMEQ countries, and yet still sufficiently specific to provide guidance for test construction.

(b) The Three Reading Domains

In both SACMEQ Projects there was an initial detailed curriculum analysis undertaken across all countries in order to define – after exhaustive discussion of the most important skills contained within the reading curricula at Grade 6 level - the reading skills that were considered by all countries to be the most important. The NRCs invested a great deal of time in this process because they wanted to enhance the validity of the tests by ensuring that they provided a balanced coverage of the main reading domains and the required reading skills. The NRCs decided to accept the three broad content domains for reading literacy (presented in Figure 2.4) that had been adopted for the International Reading Literacy Study, and also previously applied by the NRCs in the SACMEQ I Project.

Narrative prose: Continuous texts in which the writer aims to tell a story – whether this be fact or fiction.

Expository prose: Continuous text in which the writer aims to describe, explain, or otherwise convey factual information or opinion to the reader.

Documents: Structured information organized by the writer in a manner that requires the reader to search, locate, and process selected facts, rather than to read every word of a continuous text.

Figure 2.4: The Three Domains for the SACMEQ II Reading Test

(c) A "Proposed" Hierarchy of Reading Skills

It was decided that the construction of the SACMEQ II test should draw upon advanced psychometric procedures that would enable the establishment of a meaningful dimension of increasing competence that could be applied to both the SACMEQ I and II reading tests. This outcome was highly desirable because it permitted valid comparisons to be made of the reading performance of countries across the two projects.

Level 1: Pupils at this level should be able to link words and pictures where the pictures depict common objects of a "concrete" nature.

Level 2: Pupils at this level should be able to link words to more abstract concepts such as propositions of place and direction, and, perhaps, ideas and concepts such as comparatives and superlatives (happiest, biggest, below, etc.)

Level 3: Pupils at this level should be able to link words (such as a phrase or short sentence) from one setting to words in another setting where there is a word match between the two settings.

Level 4: Pupils at this level should be able to deal with longer passages of text that contain a sequence of ideas and content, and that require understanding derived from an accumulation of information gathered by reading forward.

Level 5: Pupils at this level should be able to read forwards or backwards through a text in order to: confirm understanding, or link new information with a piece of information encountered previously, or link ideas from separate parts of a text, or demonstrate the capacity to infer an author's intention.

Figure 2.5: The "Proposed" Skill Levels for the SACMEQ II Reading Test

The first step in achieving this result was to undertake an intensive examination of curricula in order identify descriptive skill levels that would define a recognizable and meaningful dimension. This dimension, taken in combination with the three domains of reading, formed a framework (or blueprint) for the construction of suitable test items. Five reading skill levels were identified as shown in Figure 2.5. This step may be described as building a "proposed" hierarchy of reading skills.

(d) Constructing the Test Blueprint by Combining Domains with Skill Levels

The NRCs recognized that each of the skill levels specified in Figure 2.5 needed to be carefully interpreted within the context of the kind of text (or reading domain) that was being encountered by pupils. That is, for any single level, the description of the skills

had to be refined in order to more closely reflect whether the reader was dealing with, for example, a fictional story (narrative), a factual account (expository), or a graph, chart, or diagram (document). The NRCs deliberated on this matter for some time and then proceeded to examine the intersections of the three reading domains (Figure 2.4) with the five skill levels (Figure 2.5) in order to form the test blueprint (Figure 2.6).

The skill descriptions in each cell of the blueprint showed how reading behaviour increased in complexity through each of the five skill levels for each of the three domains. The numbers of items in the cells in Figure 2.6 were approximately in proportion to the time spent on parts of the reading curriculum in the SACMEQ countries, and they reflected the advice received from national curriculum experts.

Skill Level	Reading Domain			
	Narrative	**Expository**	**Documents**	
Level 1	Word/picture association involving positional or directional prepositions requiring the linkage of a picture to a position or a direction in order to answer the question	Word/picture association involving positional or directional prepositions requiring the linkage of a picture to a position or a direction in order to answer the question	Word/picture association involving positional or directional prepositions requiring the linkage of a picture to a position or a direction in order to answer the question	
Items	2	2	2	6
Level 2	Recognising the meaning of a single word and being able to express it as a synonym in order to answer the question	Recognising the meaning of a single word and being able to express it as a synonym in order to answer the question	Linking simple piece of information to item or instruction	
Items	7	6	9	22
Level 3	Linking information portrayed in sequences of ideas and content, when reading forward	Linking information portrayed in sequences of ideas and content, when reading forward	Systematic search for information when reading forward	
Items	8	10	8	26
Level 4	Seeking and confirming information when reading backwards through text	Seeking and confirming information when reading backwards through text	Linking more than one piece of information in different parts of a document	
Items	9	5	4	18
Level 5	Linking ideas from different parts of text. Making inferences from text or beyond text, to infer author's values and beliefs	Linking ideas from different parts of text. Making inferences from text or beyond text.	Use of embedded lists and even subtle advertisements where the message is not explicitly stated	
Items	6	3	2	11
Total Items	32	26	25	83

Figure 2.6: The Test Blueprint for the SACMEQ II Pupil Reading Test

In the final version of the SACMEQ II reading test there was a total of 83 test items, with (a) 32, 26, and 25 items allocated to the narrative, expository, and documents domains, respectively; and (b) 6, 22, 26, 18, and 11 items set at skill levels 1 to 5, respectively.

The Structure of the SACMEQ II Mathematics Tests

(a) The Definition of "Mathematics Literacy"

In the SACMEQ II Project "mathematics literacy" was defined as "the capacity to understand and apply mathematical procedures and make related judgements as an individual and as a member of the wider society."

This broad interpretation – with an emphasis on both understanding and decision-making – was prepared to ensure that the mathematics tests were not overly concentrated on mechanical rules and calculations. It was derived by the NRCs following an analysis of the mathematics content domains specified by the International Association for the Evaluation of Educational Achievement (IEA) (Mullis et al., 2001) and the Organization for Economic Cooperation and Development (OECD, 2000). These two frameworks were constructed with widespread participation and reviews by educators around the world – and took into consideration the intended (school system) curriculum, the implemented (school level) curriculum, and the attained curriculum. The IEA identified five mathematics domains: number, algebra (which at the primary school level was called "patterns, equations, and relationships"), measurement, geometry, and data. In contrast the OECD focussed on what their research teams referred to as the "big ideas" in primary school: "change and growth" and "space and shape".

(b) The Three Mathematics Domains

Unlike the OECD study - which focussed on more generic skills, the SACMEQ II Project was concerned with skills related to the school curriculum. The SACMEQ NRCs therefore used the slightly more detailed IEA domains as a beginning point for an extensive investigation of curricula, textbooks, and examinations for Grade 6 pupils within SACMEQ school systems. On the basis of this work the IEA framework was modified in order to bring it into alignment with what was actually being taught in SACMEQ classrooms in Southern and Eastern Africa. The first IEA domain, "number", was retained. The second, "algebra", was not seen as being relevant at the Grade 6 level in African schools, and was therefore removed. The third, "measurement", was retained. The fourth, "geometry", was re-expressed by the NRCs

as "space" and then combined with the IEA's fifth domain of "data" to form a domain of "space-data".

The final domains selected by the NRCs for the SACMEQ II mathematics tests were focussed on the three areas listed in Figure 2.7.

Number: Operations and number line, square roots, rounding and place value, significant figures, fractions, percentages, and ratios.

Measurement: Measurements related to distance, length, area, capacity, money, and time.

Space-Data: Geometric shapes, charts (bar, pie, and line), and tables of data.

Figure 2.7: The Three Domains for the SACMEQ II Mathematics Test

(c) A "Proposed" Hierarchy of Mathematics Skills

A detailed investigation of the tasks given to pupils (problems, exercises, test questions, exam questions, etc.) across curricula for the 15 SACMEQ school systems enabled the NRCs to specify a set of descriptive skill levels that defined a recognizable and meaningful dimension of mathematics performance. A total of five mathematics skill levels were identified as shown in Figure 2.8. This step may be described as

Level 1: Pupils at this level should be able to identify simple shapes and link simple patterns and shapes to simple digits, to recognize units of measurement, to name basic shapes, and to undertake simple single operations using up to two-digit numbers.

Level 2: Pupils at this level should be able to recognize simple fractions in both numerical and graphical forms, to identify data presented in tables, to make basic calculations using simple measurement units, and to understand numeration with simple computations.

Level 3: Pupils at this level should be able to extend and complete number patterns, to translate shapes and patterns, and to convert measurement units when making simple single-step calculations.

Level 4: Pupils at this level should be able to combine operations in order to link information from tables and charts in performing calculations, to apply two or three-step number operations applied to measurement and conversion problems, and to identify and use appropriate information in the subsequent steps of a calculation.

Level 5: Pupils at this level should be able to make calculations and interpretations linking data from tables and graphs, and to make computations involving several steps and a mixture of operations using fractions, decimals, and whole numbers.

Figure 2.8: The "Proposed" Skill Levels for the SACMEQ II Mathematics Test

building a “proposed” hierarchy of mathematics skills.

(d) Constructing a Mathematics Test Blueprint by Combining Domains with Skill Levels

The NRCs followed the approach used for the construction of the reading tests by combining the mathematics skill levels with mathematics domains to develop a test blueprint. For each skill level this provided a tighter definition of competencies by linking mathematical content to mathematical skills. The level of complexity and skill required also increased within each domain from level to level.

Following extensive discussions and consultations with mathematics education specialists, the NRCs produced Figure 2.9 – which linked domains with skills and gave guidance for the numbers of test items that were required. There were fewer test questions for the mathematics test because each item represented an individual separate task – whereas the reading test was actually based on single passages of text – each of which was attached to sets of items. In the final version of the SACMEQ II pupil mathematics test there was a total of 63 test items, with 27, 18, and 18 items allocated to the number, measurement, and space-data domains, respectively, and 6, 20, 17, 12, and 8 items set at skill levels 1 to 5, respectively.

Skill Level	Mathematics Domain			
	Number	**Measurement**	**Space-Data**	
Level 1	Recognize numbers. Link patterns to numbers.			
Items	6	0	0	6
Level 2	Apply single operations to two digit numbers or simple fractions.	Recognize units of measurement. Apply basic calculations using simple measurement units.	Link patterns and graphs to single digits. Recognize and name basic shapes.	
Items	8	8	4	20
Level 3	Extend and complete number patterns.	Convert measurement units when undertaking one-step operations.	Translate shapes and patterns. Identify data in tabular form.	
Items	6	4	7	17
Level 4	Combine arithmetic operations in order to link information from tables and charts when performing calculations.	Apply two and three-step arithmetic operations to numbers. Use and convert measurement units.	Combine arithmetic operations in order to link information from tables and charts.	
Items	4	4	4	12
Level 5	Combine operations in order to make calculations involving several steps and a mixture of operations using combinations of fractions, decimals, and whole numbers.	Combine operations in order to make calculations involving several steps and a mixture of operations using a translation of units.	Link data from tables and graphs in order to make calculations involving several steps and a mixture of operations.	
Items	3	2	3	8
Total Items	27	18	18	63

Figure 2.9: The Test Blueprint for the SACMEQ II Pupil Mathematics Test

Constructing "Overlapped Tests" to Use in Scaling

When the NRCs had completed the reading and mathematics test blueprints, they worked in teams to either select or write all of the required test items for the SACMEQ II tests. As items were prepared they were classified according to the cells in the test blueprints. For each cell twice as many items as required were prepared so that the rejection of poor items after the trial testing did not result in a shortage of items in some cells. Most test items were in multiple-choice format with four options per item. The item pools were then sent to all countries for review by panels of curriculum specialists. This resulted in editorial changes to the items and recommendations for additional items by the panel members who made sure that the items met the requirements of the respective national curricula.

The data from the trial-testing phase were subjected to Rasch and Classical item analyses in order to detect items that did not "fit" the relevant scales, or that were "behaving differently" across subgroups of respondents defined by gender and country. The poor quality test items were rejected – keeping in mind the need to prepare a "balanced" test across skill levels and domains.

In the case of the measurement of reading performance, there were three groups of respondents: the SACMEQ I pupils, the SACMEQ II pupils, and the SACMEQ II teachers. Each group completed a reading test that was "different but overlapped". That is, each group completed a reading test that contained some unique test items and some items that also appeared on one or both of the other two tests. In the case of numeracy measurement, the tests were also "different but overlapped", however there were only two groups of respondents: the SACMEQ II pupils and SACMEQ II teachers. The various overlaps of test items have been presented in diagrammatic form in Figures 2.10 and 2.11.

Although data were gathered at different time points for the SACMEQ I (1995-1997) and SACMEQ II (2000-2002) projects, Figures 2.10 and 2.11 suggest that it is possible to think of the reading and mathematics tests used in the projects as two "artificial" or "composite" tests of 148 different reading items and 91 mathematics items, respectively. This conceptualisation of the tests implies that the three sets of reading test respondents and the two sets of mathematics test respondents can each represent a

single group of respondents for the purposes of undertaking “concurrent” scaling of the tests using the Rasch Model.

For the 148-item “composite” reading test described in Figure 2.10 there were 36 items that came only from the SACMEQ I pupil reading test (part g of the diagram), 52 test items that came only from the SACMEQ II pupil reading test (part a of the diagram), and 26 items that came only from the SACMEQ II teacher reading test (part e of the diagram). An additional 34 items were located in more than one test (parts b, c, d, f of the diagram), with 9 of these items being located in all three tests (part c of the diagram), and 3 sets of items (parts b, d, and f of the diagram) associated with pairs of tests. For the 91-item “composite” mathematics test described in Figure 2.11 there were 50 items that came only from the SACMEQ II pupil mathematics test (part a of the diagram), and 28 items that came only from the SACMEQ II teacher mathematics test (part c of the diagram). An additional 13 items were located in both tests (part b of the diagram).

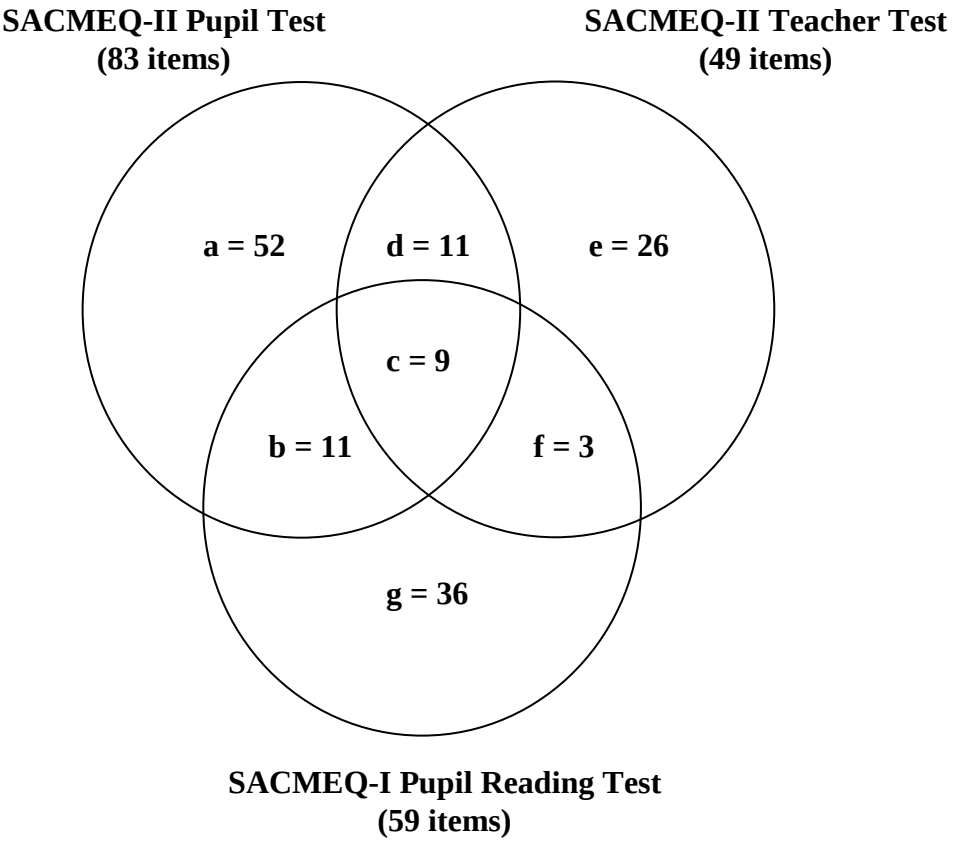

Figure 2.10: The 148 Reading Items for Three Groups of Respondents Taking "Different but Overlapped" SACMEQ Reading Tests

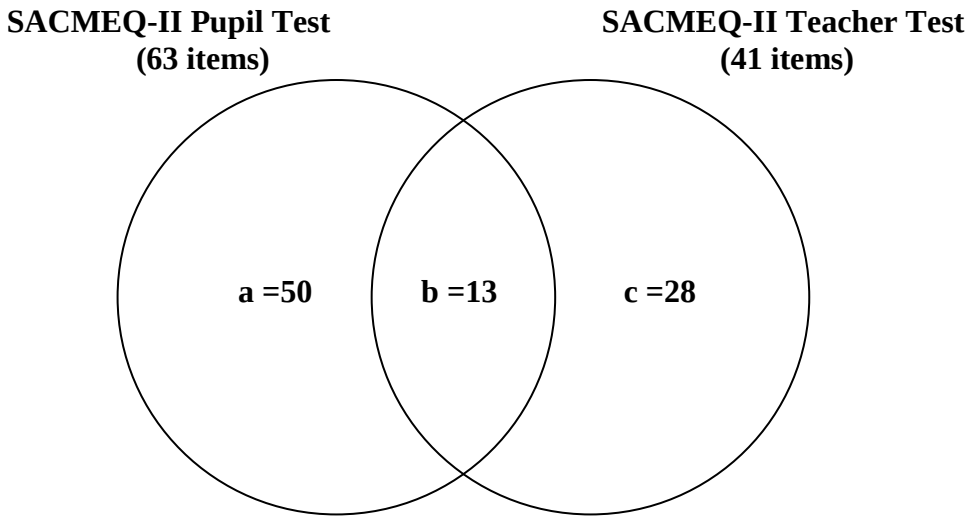

Figure 2.11: The 91 Mathematics Items for Two Groups of Respondents Taking "Different but Overlapped" SACMEQ Maths Tests

SACMEQ-II Pupils	a 52 items	b 11 items	c 9 items	d 11 items	e --	f --	g --
SACMEQ-II Teachers	a --	b --	c 9 items	d 11 items	e 26 items	f 3 items	g --
SACMEQ-I Pupils	a --	b 11 items	c 9 items	d --	e --	f 3 items	g 36 items

Figure 2.12: The Data Matrix Developed for Scaling the 148 Reading Items Contained within the SACMEQ Reading Tests

SACMEQ-II Pupils	a 50 items	b 13 items	c --
SACMEQ-II Teachers	a --	b 13 items	c 28 items

Figure 2.13: The Data Matrix Developed for Scaling the 91 Items Contained within the SACMEQ Mathematics Tests

The data matrices used in the Rasch analyses have been presented in diagrammatic form in Figures 2.12 and 2.13. The blank areas of the diagram (denoted by "—") refer to items not given to respondents. For example, the SACMEQ II pupils received blocks of reading test items that have been labelled in Figure 2.12 as a, b, c, and d. These pupils did not receive the blocks of reading test items in Figure 2.12 that have been denoted by "—" and labelled e, f, and g.

The data matrix used in the Rasch analyses to scale the 148 reading items was constructed by combining data from the three groups of respondents – with valid response codes in the matrix columns referring to each group's own test, and "missing data" codes in the matrix columns referring to items only found in either or both of the other two tests.

Similarly, the data matrix used to scale the 91 mathematics items was constructed by combining data from two groups of respondents – with valid response codes in the matrix columns referring to each group's own test, and "missing data" codes in the

matrix columns referring to items only found in the other test. While the computer software treated these columns as "missing data", in fact these items were not actually given to these respondents.

The two data matrices were analysed using computer software that applied the Rasch Model of measurement (Andrich and Luo, 2000). The first step was to calibrate the test items by calculating the Rasch difficulty values for each item within the 148-item reading test and the 91-item mathematics test. This step was conducted by using an input data file constructed from a simple random sample of pupils and teachers from each school system. The results of the calibration were then used to calculate reading and mathematics scores for all pupils.

Construction of Test Items for the Teacher Tests

The main challenge in the construction of the reading and mathematics tests for teachers was to "fine-tune" the difficulty range of test items so that it would suit the higher levels of competence that were expected of teachers. At the same time it was necessary to ensure that there was sufficient "item overlap" with the pupil tests to permit the performance of teachers and pupils to be measured on the same scale.

In the reading test for teachers, several passages were selected because of the more subtle nature of the messages that they conveyed, and the less-visible underlying assumptions of the writers. For example, one passage on the topic of "smoking" required the teachers to identify the unstated values and beliefs of the writer. Another passage on the topic of "effective thinking" required the teachers to identify assumptions made by the writer about the readers and their knowledge of the topic. These kinds of skills were far beyond the competencies that had been identified from the analyses of Grade 6 curricula.

The "extra" reading and mathematics items for teachers were expected to assess the higher competence levels of teachers – but not to be so difficult that the teachers would be daunted by the challenge. In addition, the selection of easier test items that "overlapped" with the pupil tests had to be made with extreme care because the teachers may have felt insulted if these items were ridiculously easy or if they were concerned with issues that would only interest young children.

In the teacher reading test the extended levels of competence mainly focussed on expository texts – rather than on documents or narratives. It was felt that the use of narratives and documents at this level would have required very complex and long texts that would have generally extended the time required to complete the test.

In the teacher mathematics test the extended levels of competence mainly emphasized problem solving strategies that required the extraction of information from verbal, graphic, or tabular presentations. For these items, the teachers were expected follow three steps: to identify the nature of the problem, to transform the problem into mathematical language, and to solve the problem. In some cases this required the rearrangement of information, and in others it meant translating the problem into one or more equations and then solving the equations.

Using a "Skills Audit" to Identify "Derived" Competence Levels

The SACMEQ tests had been prepared according to systematically-generated test blueprints that described "proposed" levels of competence in reading and mathematics. The results of the Rasch analyses provided a means of assessing whether the levels proposed in the test blueprints in Figures 2.6 and 2.9 were congruent with a detailed examination of the actual test items located at different difficulty levels along the dimensions that had been generated. The descriptions that were obtained after the NRCs had conducted the skills audit were called "derived" levels of competence. The skills audit analyses focussed on the matter of whether the NRCs had actually been able to write test items that were aligned along the five increasing skill levels proposed in the test blueprints.

To address this issue the NRCs examined the 148 items in the "hypothetical" reading test in Figure 2.10 and the set of 91 items in the "hypothetical" mathematics test in Figure 2.11. The two sets of items were first arranged in order of difficulty, and then examined item-by-item in order to describe the specific skills required to provide correct responses. When items had been linked to specific skills they were placed into groups of test items such that the items in each group had similar difficulty values and shared a common "theme" with respect to the underpinning competencies required to provide correct responses.

The three tasks of defining specific skills for each test item, identifying groups of items with similar difficulties, and then naming the "theme" (or competency level) linked to each group were extremely difficult because it required the NRCs to first reach agreement on how the respondents arrived at correct solutions, and to then name the competency required. This required the NRCs to use their practical knowledge of the ways in which pupils solve problems, and then to portray this with a meaningful description of the thought processes that had been applied. The next step was to compare the "proposed" levels of competence to the "derived" levels of competence in order to check the accuracy of the item writers' skills and the validity of the test.

Reading and Mathematics Competencies Generated from the Skills Audit

The skills audit for the reading and mathematics tests resulted in the identification of eight levels of competence for each test. This was more than had been proposed in the test blueprints.

For both tests there was a strong correspondence between the descriptions of the five blueprint levels and most of the derived levels arising from the skills audit – which suggested that the three "extra" levels were defining more detail on the same reading and mathematics scales. That is, the overall dimensions remained substantially the same, but the skills audit meant that the empirically-generated (or "derived") dimensions of reading and mathematics were, as expected, somewhat more detailed than the subjectively described (or "proposed") dimensions used to stimulate test and item development.

Level 1: Pre Reading (Linked with Level 1 in the Test Blueprint)

(a) Skills: Matches words and pictures involving concrete concepts and everyday objects. Follows short simple written instructions.

(b) Example Test Items

- locate familiar words in a short (one line) text
- match words to pictures
- follow short and familiar instructions

Level 2: Emergent Reading (Linked with Level 2 in the Test Blueprint)

(a) Skills: **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 on.**

(b) Example Test Items

- read familiar words and identify some new words
- use simple and familiar prepositions and verbs to interpret new words
- match words and very simple phrases

Level 3: Basic Reading (Linked with Level 3 in the Test Blueprint)

(a) Skills: Interprets meaning (by matching words and phrases, completing a sentence, or matching adjacent words) in a short and simple text by reading on or reading back.

(b) Example Test Items

- use context and simple sentence structure to match words and short phrases
- use phrases within sentences as units of meaning
- locate adjacent words and information in a sentence

Level 4: Reading for Meaning (Linked with Level 4 in the Test Blueprint)

(a) Skills: Reads on or reads back in order to link and interpret information located in various parts of the text.

(b) Example Test Items

- interpret sentence and paragraph level texts
- match phrases across sentences
- read forwards and backwards in order to locate information in longer texts

Figure 2.14: Levels of Reading Competency Generated from Skills Audit

Level 5: Interpretive Reading (Linked with Level 5 in the Test Blueprint)
(a) Skills: Reads on and reads back 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 contextualizes meaning.
(b) Example Test Items

- locate, interpret, and read forward to join two pieces of adjacent information
- use multiple pieces of information to interpret general purpose of a document
- paraphrase and interpret a single non-adjacent piece of information

Level 6: Inferential Reading (Linked with Level 5 in the Test Blueprint)
(a) Skills: Reads on and reads back through longer texts (narrative, document or expository) in order to combine information from various parts of the text so as to infer the writer's purpose.
(b) Example Test Items

- **i**nterpret, and make inferences from, different types of texts by reading backwards and forwards to confirm links between widely separated information pieces
- extract information from a non-traditional (left to right) document
- make judgments about an author's intentions or purpose beyond the text content

Level 7: Analytical Reading (Linked with Level 5 in the Test Blueprint)
(a) Skills: Locates information in longer texts (narrative, document or expository) by reading on and reading back 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).
(b) Example Test Items

- combine several pieces of information from a range of locations in complex and lexically dense text or documents
- analyse detailed text or extended documents for an underlying message
- identify meaning from different styles of writing

Level 8: Critical Reading (A New Level Generated from the Skills Audit)
(a) Skills: Locates information in a longer texts (narrative, document or expository) by reading on and reading back 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).
(b) Example Test Items

- use text structure and organisation to identify an author's assumptions and purposes
- identify an author's motives, biases, beliefs in order to understand the main theme
- link text to establish multiple meanings including analogy and allegory

Figure 2.14 (Ctd.): Levels of Reading Competency Generated from Skills Audit

Level 1: Pre Numeracy (Linked with Level 1 in the Test Blueprint)
(a) Skills: Applies single step addition or subtraction operations. Recognizes simple shapes. Matches numbers and pictures. Counts in whole numbers.
(b) Example Test Items

- count illustrated objects
- recognise basic numbers and shapes
- carry out simple single operations of addition and subtraction

Level 2: Emergent Numeracy (Linked with Level 1 in the Test Blueprint)
(a) Skills: 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.
(b) Example Test Items

- link simple verbal, graphic, and number forms with single arithmetic operations on whole numbers up to four digits
- recognise common shapes or figures in two dimensions
- estimate accurately lengths of simple shapes

Level 3: Basic Numeracy (Linked with Level 2 in the Test Blueprint)
(a) Skills: 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.
(b) Example Test Items

- recognise three-dimensional shapes and number units
- use a single arithmetic operation in two or more steps
- convert in single step units using division

Level 4: Beginning Numeracy (Linked with Level 3 in the Test Blueprint)
(a) Skills: 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.
(b) Example Test Items

- convert units in two steps and count tabulated data
- analyse a visual prompt and interpret triangular shapes
- translate verbal to arithmetic form using two operations on fractions

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Figure 2.15: Levels of Mathematics Competency Generated from Skills Audit

Level 5: Competent Numeracy (Linked with Level 3 in the Test Blueprint)
(a) Skills: 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 measurement and/or whole and mixed numbers. Converts basic measurement units from one level of measurement to another (for example, metres to centimetres).
(b) Example Test Items

- convert basic measurement units
- understand the order of magnitude of simple fractions
- conduct multiple steps with a range of basic operations in a strict sequence using an analysis of a short verbal or visual prompt

Level 6: Mathematically Skilled (Linked with Level 4 in the Test Blueprint)
(a) Skills: 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).
(b) Example Test Items

- perform complex and detailed mathematical tasks (involving considerable abstraction of verbal, visual, and tabular information into symbolic forms and algebraic solutions) using knowledge not supplied with the task
- use of an extended verbal or graphic prompt (involving an analysis of steps) to identify the correct sequence of calculations
- convert, and operate on, units of measurement (time, distance, and weight)

Level 7: Concrete Problem Solving (Linked with Level 5 in the Test Blueprint)
(a) Skills: Extracts and converts (for example, with respect to measurement units) information from tables, charts, visual and symbolic presentations in order to identify, and then solves multi-step problems.
(b) Example Test Items

- use multiple verbal order of steps with conversion of time units
- translate verbal to arithmetic form, apply units conversion with long division
- convert from mixed number fractions to decimals

Level 8: Abstract Problem Solving (A New Level Generated from the Skills Audit)
(a) Skills: Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information, and then translate this into symbolic, algebraic, or equation form in order to solve the problem.
(b) Example Test Items

- identify the nature of a problem, translate the information given into a mathematical approach, and then identify the correct mathematical strategies to obtain a solution

Figure 2.15 (Ctd.): Levels of Mathematics Competency Generated from Skills Audit

The results of the skills audit have been presented in Figures 2.14 and 2.15. The NRCs decided to add a name to each of the levels – in order to summarize the competencies associated with each group. The first three competency levels in reading and mathematics employed the same prefixes ("Pre", "Emergent", and "Basic") in order to reflect the mostly mechanical nature of the most elementary competencies. From the fourth level upwards the prefixes of the summary names were different and tended to reflect deeper levels of understanding of subject specific competencies.

The NRCs considered that the use of a skills audit to generate the eight levels presented in Figures 2.14 and 2.15 was important because the competencies provide a more concrete analysis of what pupils and teachers can actually do, and they also suggest instructional strategies relevant to pupils who are learning at each level of competence. Such descriptions are of great assistance for the construction of textbooks, the design of teacher in-service training programmes, and the development of general classroom teaching strategies - because all of these activities require a sound knowledge of the skills already acquired and the higher order skills that should be aimed at in order to transfer to the next stage of learning.

New levels were identified and derived through the skills audit, but as can be seen in Figures 2.14 and 2.15, the match between the "proposed" and "derived" levels in the dimensions of reading and mathematics competency were strikingly similar. This indicated that the NRCs had been quite successful in designing tests according to specifications as set out in the original test blueprints. It is also provided clear evidence of the content and construct validity of the reading and mathematics tests.

Some examples of test items for each of the eight competency levels in the reading and mathematics tests have been presented in Appendix H and Appendix I, respectively.

The Score Ranges for the Competency Levels

The software used to generate the Rasch reading and mathematics scores automatically adjusted the scores to a scale with an arbitrary zero point and a standard deviation of one. This meant that many pupils were assigned negative scores. Most educationalists are not comfortable with score patterns of this kind. Therefore it was decided to undertake a linear transformation of the reading and mathematics scores that would

result in the mean and standard deviation of pupil scores for the SACMEQ II tests being 500 and 100, respectively (for the pooled data with equal weight given to each country). As a result a score of 500 was equal to the average of all SACMEQ II country mean scores. The transformed scores have been referred to below as "500 Scores".

The Rasch analysis made it possible for the ability of the pupils to be matched to the difficulty of the test items – which allowed pupils and items to be mapped onto the same scale. This meant that the pupils could also be grouped in the same "ability" or "difficulty" range as the items that had similar difficulty values. In Tables 2.10 and 2.11 the ranges of the "500 Scores" that define the eight reading and mathematics competency levels, respectively, have been presented. The two tables also contain the percentages of pupils and teachers that were located at each competency level.

Table 2.10: Reading Competency Levels Cut-off Points and Frequency Distributions

Reading Competency	Rasch Score Range	500 Score Range	Percentage at Competency Level (SE)		
			Pupils		Teachers
			SACMEQ I	SACMEQ II	SACMEQ II
1 : Pre Reading	Lte -1.765	Lte 373	3.2	6.7	0.1
2 : Emergent Reading	Gt-1.765- -1.332	Gt 73- 414	7.1	14.9	0.2
3: Basic Reading	Gt-1.332- -0.881	Gt414- 457	22.2	18.4	0.1
4: Reading for Meaning	Gt-0.881- -0.334	Gt457- 509	28.7	20.2	1.4
5: Interpretive Reading	Gt-0.334- 0.232	Gt509- 563	19.1	16.8	1.0
6: Inferential Reading	Gt 0.232- 0.807	Gt563- 618	9.3	10.7	4.1
7: Analytical Reading	Gt 0.807- 1.692	Gt618- 703	7.2	8.4	28.1
8: Critical Reading	Gt 1.692	Gt703-	3.3	3.8	65.0

Table 2.11 : Mathematics Competency Levels Cut-off Points and Frequency Distributions

Mathematics Competency	Rasch Score Range	500 Score Range	Percentage at Competency Level (SE)	
			Pupils	Teachers
			SACMEQ II	SACMEQ II
1 : Pre Numeracy	Lte –2.199	Lte364	6.2	0.0
2 : Emergent Numeracy	Gt-2.199- -1.325	Gt364- 462	34.3	0.0
3: Basic Numeracy	Gt-1.325- -0.709	Gt462- 532	29.8	0.9
4: Beginning Numeracy	Gt-0.709- -0.213	Gt532- 587	14.6	2.0
5: Competent Numeracy	Gt-0.213- 0.293	Gt587- 644	7.5	6.0
6: Mathematically Skilled	Gt 0.293- 0.962	Gt644- 720	4.6	16.7
7: Concrete Problem Solving	Gt 0.962- 1.728	Gt720- 806	2.2	36.0
8: Abstract Problem Solving	Gt 1.728	Gt806	0.9	38.5

Conclusion

The aim of this chapter was to describe the research procedures that were applied for the execution of the SACMEQ II Project. The chapter was prepared in three parts that covered the fourteen main phases of the research, the sample design procedures, and the construction of the reading and mathematics tests for pupils and their teachers.

The first part of the chapter described how the SACMEQ II Project commenced with an innovative "pre-planning" phase that underpinned the whole research design. During this phase key decision-makers in Ministries of Education were consulted concerning their "General Policy Concerns" – which were then collated across countries, grouped into five themes, and used as a foundation for the design of the whole data collection and the research reporting procedures.

One of the important messages that emerged from this part of the chapter was that the speed at which a cross-national research project proceeds is strongly influenced by the speed with which the slowest country can complete all aspects of its data collection and data preparation.

The second part of the chapter on sampling included an evaluation of the sampling procedures. The evaluation showed that nine countries satisfied the sampling accuracy requirements that had been set down for the SACMEQ II Project – by achieving equivalent sample sizes for the pupil tests that were in excess of 400 pupils. A further three countries (Kenya, Lesotho, and Swaziland) almost reached this standard by achieving equivalent sample sizes in the range of 350 to 390.

Unfortunately, the accuracy of the sampling in two countries (South Africa and Uganda) fell far below the 400 target – with South Africa and Uganda achieving equivalent sample sizes of only 230 and 176, respectively. These results indicated that care should be exercised in interpreting the reading and mathematics achievement levels that were obtained for these two countries, and also that even more care should be taken when examining within-country regional differences.

The third part of the chapter provided a detailed description of how the SACMEQ II Project moved away from traditional approaches to the calculation of test scores (based on numbers of correct responses to test items) towards the use of Modern Item Response Theory to generate descriptions of "levels of increasing pupil competence". This approach to describing pupil reading and mathematics achievement offered a mechanism for describing the performance of pupils in a manner that was more meaningful within a teaching and learning context.

References

Andrich, D., and Luo, G. (2003). *Getting started: RUMM 2010.* Perth: The RUMM Laboratory.

Brickell, J.L. (1974). Nominated samples from public schools and statistical bias. *American Educational Research Journal*, 11(4), 333-341.

Chimombo, J., Dlamini, E., Kulpoo, D., Moyo, G., Murimba, S., Nassor, S. M., and Nkamba, M. (1994). *A project plan for the Southern Africa Consortium for Monitoring Educational Quality. (Vols. I and II).* Paris: International Institute for Educational Planning.

Deming, W.E. (1960). *Sample design in business research*. New York: Wiley.

Elley, W. (1992). *How in the world do students read?* The Hague: International Association for the Evaluation of Educational Achievement.

Finifter, B.M. (1972). The generation of confidence: Evaluating research findings by random subsample replication. In H.L. Costner (Ed.), *Sociological Methodology*. San Francisco: Jossey-Bass.

Frankel, M.R. (1971). *Inference from survey samples*. Ann Arbor, Michigan: Institute for Social Research.

Kish, L. (1965). *Survey sampling*. New York: Wiley.

Kish L. (1978). On the future of survey sampling. In N.K. Namboordi (Ed.), Survey sampling and measurement. New York: Academic Press.

Kulpoo, D. (1998). *The quality of education: Some policy suggestions based on a survey of schools in Mauritius.* Paris: International Institute for Educational Planning.

Machingaidze, T., Pfukani, P., and Shumba, S. (1998). *The quality of education: Some policy suggestions based on a survey of schools in Zimbabwe*. Paris: International Institute for Educational Planning.

McCarthy, P.J. (1966). *Replication: An approach to the analysis of data from complex surveys*. Washington: United States National Center for Health Statistics.

Milner, G., Chimombo, J., Banda, T., and Mchikoma, C. (2001). *The quality of education: Some policy suggestions based on a survey of schools in Malawi.* Paris: International Institute for Educational Planning.

Moyo, G., Murimba, S., Nassor, S. M., Dlamini, E., Nkamba, M., and Chimombo, J. (1993). *SADC proposal for monitoring progress toward attaining the goals of the EFA Jomtien Conference concerning the quality of education*. Harare: Ministry of Education and Culture.

Mullis, I. V. S., Martin, M. O., Smiith, T. A., Garden, R. A., Gregory, K. D., Gonzalez, E. J., Chrostowski, S. J., and O'Connor, K. M. (2001). *TIMSS assessment frameworks and specifications 2003*. Chestnut Hill, MA: Boston College.

Nassor, S and Ali Mohammed, K. (1998). *The quality of education: Some policy suggestions based on a survey of schools in Zanzibar*. Paris: International Institute for Educational Planning.

Nkamba, M. and Kanyika, J. (1998). *The quality of education: Some policy suggestions based on a survey of schools in Zambia*. Paris: International Institute for Educational Planning.

Nzomo, J., Kariuki, M., and Guantai, L. (2001). *The quality of education: Some policy suggestions based on a survey of schools in Kenya*. Paris: International Institute for Educational Planning.

Organization for Economic Cooperation and Development (OECD) (2000). *Measuring student knowledge and skills: The PISA 2000 assessment of reading, mathematical, and scientific literacy*. Paris: OECD.

Ross, K.N. (1976). *Searching for uncertainty: Sampling errors in educational survey research*. Hawthorn, Victoria: Australian Council for Educational Research.

Ross, K.N. (1978). Sample design for educational survey research. *Evaluation in Education*, 2, 105-195.

Ross, K.N. (1985). Sampling . In T. Husen & T.N. Postlethwaite (Eds.), *The International Encyclopedia of Education* (pp. 4370-4381). New York: Pergamon.

Ross, K.N. (1987). Sample design. *International Journal of Educational Research*, 11(1), pp. 57-75.

Ross, K.N. (1991). *Sampling manual for the IEA International Study of Reading Literacy*. Hamburg: International Association for the Evaluation of Educational Achievement.

Ross, K. N. (1995). From educational research to educational policy: An example from Zimbabwe. *International Journal of Educational Research* 23(4), pp. 301-403.

Ross, K. N., Saito, M., Dolata, S., and Ikeda, M. (2004). *The SACMEQ Data Archive (Version 1.2).* Paris: International Institute for Educational Planning.

Sylla, K., Saito, M., Ross, K. (2003). *SAMDEM (Sample Design Manager Software).* Paris: International Institute for Educational Planning.

Tukey, J.W. (1958). Bias and confidence in not-quite large samples (Abstract). *Annals of Mathematical Statistics*, 29, 614.

Voigts, F. (1998). The quality of education: Some policy suggestions based on a survey of schools in Namibia. International Institute for Educational Planning (UNESCO): Paris.

Appendix A

General Policy Concerns, Specific Research Questions, and Dummy Tables for the Design of the SACMEQ II Project

General Policy Concern 1: What were the personal characteristics (for example, age and gender) and home background characteristics (for example, parent education, regularity of meals, home language, etc.) of Grade 6 pupils that might have implications for monitoring equity, and/or that might impact upon teaching and learning?

Specific Research Questions

- What was the age distribution of pupils?
  Questionnaire: SI: P2; SII: P2
  Dummy Table: 3.1(a), 3.1(b)
- What was the gender distribution of pupils?
  Questionnaire: SI: P3 ; SII: P3
  Dummy Table: 3.1(a), 3.1(b)
- What was the level of the parents' education?
  Questionnaire: SI: P9, P10; SII: P11, P12
  Dummy Table: 3.1(a), 3.1(b), 11.17(a), 11.17(b)
- How regularly did pupils eat meals?
  Questionnaire: SI: P18; SII: P10
  Dummy Table: 3.1(a), 3.1(b)
- What percentage of pupils spoke the language of the test at home?
  Questionnaire: SI: P4; SII: P4
  Dummy Table: 3.2(a), 3.2(b)
- Where did pupils live during the school week?
  Questionnaire: SI: P5; SII: P5
  Dummy Table: 3.3(a), 3.3(b)
- How many books were there in pupils' homes?
  Questionnaire: SI: P6; SII: P6
  Dummy Table: 3.1(a), 3.1(b)
- What other reading materials and electronic media did pupils have at home?
  Questionnaire: SI: P8.01, P8.02, P8.03, P8.04, P8.05, P8.06, P8.07 ; SII: P7.01, P7.02, P7.03, P7.04, P7.05, P07.06, P7.07
  Dummy Table: 3.1(a), 3.1(b)
- What was the socio-economic status of pupils' parents in terms of possessions, housing conditions (lighting, floor, wall, roof), and livestock?
  Questionnaire: SI: P8 ; SII: P7, P8, P9, P13, P14, P15
  Dummy Table: 3.1(a), 3.1(b), 3.4(a), 3.4(b), 3.4(c), 3.4(d), 3.4(e), 3.5

General Policy Concern 2: What were the school context factors experienced by Grade 6 pupils (such as location, absenteeism (regularity and reasons), grade repetition, and homework (frequency, amount, correction, and family involvement)) that might impact upon teaching/learning and the general functioning of schools?

Specific Research Questions

- What was the location of the school?

Appendix A (Ctd.)

Questionnaire: SI: S11, S12; SII: S13, S14
Dummy Table: 7.2

- How many days were pupils absent in the previous month, and what were the reasons for these absences?
  Questionnaire: SI: P19; SII: P16, P17
  Dummy Table: 3.2(a), 3.2(b), 3.2(c)
- How many pupils had repeated a grade, and were they currently repeating Grade 6?
  Questionnaire: SI: P23; SII: P18
  Dummy Table: 3.2(a), 3.2(b)
- How frequently did pupils receive homework in reading and mathematics?
  Questionnaire: SI: P11; SII: P33, P36
  Dummy Table: 8.4(a)
- Did the teachers correct assigned homework?
  Questionnaire: SII: P34, P37
  Dummy Table: 8.4(b), 8.4(c)
- Did family members monitor, assist with, request demonstrations, ask questions about, and/or look at, pupils' homework?
  Questionnaire: : SI: P12, P13, P14, P15, P16; SII: P24, P25, P26, P27, P28, P29, P30
  Dummy Table: 9.7(a), 9.7(b), 9.7(c)

General Policy Concern 3: Did Grade 6 pupils have sufficient access to classroom materials (for example, textbooks, readers, and stationery) in order to participate fully in their lessons?

Specific Research Questions

- What percentage of students had reading and mathematics textbooks?
  Questionnaire: : SI: P20; SII: P35, P38
  Dummy Table: 6.4
- What percentage of pupils had adequate basic classroom supplies for writing, ruling, erasing, etc.?
  Questionnaire: : SI: P22; SII: P21
  Dummy Table: 6.5(a), 6.5(b)

General Policy Concern 4: Did Grade 6 pupils have access to library books within their schools, and (if they did have access) was the use of these books being maximized by allowing pupils to take them home to read?

Specific Research Questions

- What percentage of pupils had access to (school and classroom) library facilities?
  Questionnaire: : SI: T10.9, S31.01; SII: T12.6, S38.01
  Dummy Table: 6.1, 7.3
- Were pupils permitted to take library books home? (This question to be crosschecked from pupil and school head questionnaires.)

Appendix A (Ctd.)

Questionnaire: : SI: P21, S34; SII: P20, S39
Dummy Table: 11.1

General Policy Concern 5: Has the practice of Grade 6 pupils receiving extra lessons in school subjects outside school hours become widespread, and have these been paid lessons?

Specific Research Questions

- What percentage of pupils received extra tuition?
  Questionnaire: : SI: P17; SII: P31
  Dummy Table: 8.3(a)
- Was payment made for receiving extra tuition?
  Questionnaire: : SII: P32
  Dummy Table: 8.3(b)

General Policy Concern 6: What were the personal characteristics of Grade 6 teachers (for example, age, gender, and socio-economic level), and what was the condition of their housing?

Specific Research Questions

- What was the age distribution of teachers?
  Questionnaire: SI: T3; SII: T3
  Dummy Table: 4.1(a), 4.1(b)
- What was the gender distribution of teachers?
  Questionnaire: SI: T2; SII: T2
  Dummy Table: 4.1(a), 4.1(b)
- What was the socio-economic status of teachers in terms of possessions and livestock?
  Questionnaire: SI: T28; SII: T27, T28
  Dummy Table: 4.1(a), 4.1(b), 11.2(a), 11.2(b)
- What was the general condition (repair status and lighting) of teacher housing?
  Questionnaire: SI: T31; SII: T29, T30,
  Dummy Table: 4.5, 11.3(a), 11.3(b)

General Policy Concern 7: What were the professional characteristics of Grade 6 teachers (in terms of academic, professional, and in-service training), and did they consider in-service training to be effective in improving their teaching?

Specific Research Questions

- How many years of academic education had teachers completed?
  Questionnaire: SI: T4; SII: T4
  Dummy Table: 4.3(a), 4.3(b), 4.3(c)
- How many years of teacher training had teachers completed?
  Questionnaire: SI: T5; SII: T5
  Dummy Table: 4.2(a), 4.2(b)

Appendix A (Ctd.)

- How many years of teaching experience had teachers completed?
  Questionnaire: SI: T6; SII: T6
  Dummy Table: 4.2(a), 4.2(b)
- How much in-service training had teachers completed?
  Questionnaire: SI: T7; SII: T7, T8
  Dummy Table: 4.4(a), 4.4(b)
- Did teachers consider that in-service training improved their teaching?
  Questionnaire: SII: T9
  Dummy Table: 9.8

General Policy Concern 8: How did Grade 6 teachers allocate their time among responsibilities concerned with teaching, preparing lessons, and marking?

Specific Research Questions

- How many periods did teachers teach and how long were these periods?
  Questionnaire: SI: T11, T12; SII: T14, T15
  Dummy Table: 11.4
- How many hours per week did teachers spend in lesson preparation and marking?
  Questionnaire: SI: T13; SII: T16
  Dummy Table: 8.5

General Policy Concern 9: What were Grade 6 teachers' viewpoints on (a) pupil activities within the classroom (for example, reading aloud, pronouncing, etc.), (b) teaching goals (for example, making learning enjoyable, word attack skills, etc.) (c) teaching approaches/strategies (for example, questioning, whole class teaching, etc.), (d) assessment procedures, and (e) meeting and communicating with parents?

Specific Research Questions

- What did teachers consider to be the most important pupil activities for teaching reading and mathematics?
  Questionnaire: SI: T15; SII: T33, T41
  Dummy Table: 8.1(a)(i), 8.1(b)(i)
- What did teachers consider to be the most important teaching goals in reading and mathematics?
  Questionnaire: SI: T18; SII: T36, T44
  Dummy Table: 8.1(a)(ii), 8.1(b)(ii)
- What teaching approaches/strategies were used most frequently by reading and mathematics teachers?
  Questionnaire: SI: T19; SII: T37, T45
  Dummy Table: 8.1(a)(iii), 8.1(b)(iii)
- How often did teachers give written tests in reading and mathematics?
  Questionnaire: SI: T20; SII: T38, T46
  Dummy Table: 8.1(a)(iv), 8.1(b)(iv)

Appendix A (Ctd.)

- Was there a specific section in pupil school reports for reading and mathematics?
  Questionnaire: SI: T22; SII: T31, T39
  Dummy Table: 11.5
- How often did teachers meet with parents each year?
  Questionnaire: SI: T21; SII: T17
  Dummy Table: 9.3
- What percentage of parents met with teachers each year?
  Questionnaire: SII: T18
  Dummy Table: 11.6
- Did teachers ask parents to sign homework assignments?
  Questionnaire: SI: T16; SII: T34, T42
  Dummy Table: 11.7

General Policy Concern 10: What was the availability of classroom furniture (for example, sitting/writing places, teacher table, teacher chair, and bookshelves) and classroom equipment (for example, chalkboard, dictionary, maps, book corner, and teacher guides) in Grade 6 classrooms?

Specific Research Questions

- What percentages of pupils were in classrooms with adequate sitting and writing places?
  Questionnaire: SI: P24, P25; SII: P22, P23
  Dummy Table: 6.3
- What percentages of pupils were in classrooms with adequate classroom furniture and equipment (for example, a teacher table, teacher chair, bookshelves, and chalkboard)?
  Questionnaire: SI: T10; SII: T12
  Dummy Table: 6.1, 6.2
- How many books did teachers have in their classroom library or book corner?
  Questionnaire: SI: T8; SII: T10
  Dummy Table: 11.8
- Did teachers have teaching aids (for example, a map, dictionary, geometrical instruments, and teachers' guides)?
  Questionnaire: SII: T13.1, T13.2, T13.3, T13.4, T13.5
  Dummy Table: 11.9(a), 11.9(b)

General Policy Concern 11: What professional support (in terms of education resource centres, inspections, advisory visits, and school head inputs) was given to Grade 6 teachers?

Specific Research Questions

- Did teachers use education resource centres?
  Questionnaire: SII: T24

Dummy Table: 8.6

- How did teachers use education resource centres?

Appendix A (Ctd.)

Questionnaire: SII: T24, T24.1, T24.2, T24.3, T24.4, T24.5, T24.6
Dummy Table: 11.10(a), 11.10(b)

- What support did Advisors or Inspectors give to teachers in terms of administrative, professional, and pedagogical matters?
  Questionnaire: SII: T20, T21
  Dummy Table: 9.9
- Did school heads advise teachers on their teaching?
  Questionnaire: SI: T25; SII: T22
  Dummy Table: 9.2

General Policy Concern 12: What factors had most impact upon teacher job satisfaction?

Specific Research Questions

- What factors (for example, living conditions, school facilities/equipment, staff relationships, career advancement, salaries, etc.) had most impact upon teachers' job satisfaction?
  Questionnaire: SI: T26; SII: T25
  Dummy Table: 9.1
- What did teachers rate as the most important factor?
  Questionnaire: SI: T27; SII: T26
  Dummy Table: 11.11

General Policy Concern 13: What were the personal characteristics of school heads (for example, age and gender)?

Specific Research Questions

- What was the age distribution of school heads?
  Questionnaire: SI: S2; SII: S2
  Dummy Table: 5.1
- What was the gender distribution of school heads?
  Questionnaire: SI: S1; SII: S1
  Dummy Table: 5.1

General Policy Concern 14: What were the professional characteristics of school heads (in terms of academic, professional, experience, and specialized training)?

Specific Research Questions

- How many years of academic education had school heads completed?
  Questionnaire: SI: S3; SII: S3
  Dummy Table: 11.12(a), 11.12(b)
- How many years of teacher training had school heads completed?
  Questionnaire: SI: S4; SII: S4

Dummy Table: 5.2

- How many years of teaching experience had school heads completed?

Appendix A (Ctd.)

Questionnaire: SI: S5; SII: S6
Dummy Table: 5.2

- How many years of experience had school heads had either as a school head or an acting school head – in the current school and all together?
  Questionnaire: SI: S8, S9; SII: S9, S10
  Dummy Table: 11.13
- Have school heads received specialized training in school management?
  Questionnaire: SII: S5
  Dummy Table: 5.2

General Policy Concern 15: What were the school heads' viewpoints on general school infrastructure (for example, electrical and other equipment, water, and basic sanitation) and the condition of school buildings?

Specific Research Questions

- What items of equipment (telephone, fax, photocopier) and general facilities (library, staff room, store room) did schools have?
  Questionnaire: SI: S31; SII: S38
  Dummy Table: 7.3
- What kind of water supply did schools have?
  Questionnaire: SI: S31.10; SII: S38.08
  Dummy Table: 7.3
- What was the nature and provision of toilet facilities in schools?
  Questionnaire: SI: S30; SII: S37
  Dummy Table: 7.1
- What was the general condition of school buildings?
  Questionnaire: SI: S29; SII: S36
  Dummy Table: 7.1

General Policy Concern 16: What were the school heads' viewpoints on (a) daily activities (for example, teaching, school-community relations, and monitoring pupil progress), (b) organizational policies (for example school magazine, open days, and formal debates), (c) inspections, (d) community input, (e) problems with pupils and staff (for example, pupil lateness, teacher absenteeism, and lost days of school)?

Specific Research Questions

- What amount of teaching did school heads undertake?
  Questionnaire: SI: S7; SII: S7, S8
  Dummy Table: 5.3
- What level of importance did school heads attach to activities such as community contacts, monitoring pupil progress, administrative tasks, etc.?
  Questionnaire: SI: S22; SII: S28
  Dummy Table: 9.4

- What was the incidence of school activities such as a school magazine, public speaking day, "open days, etc.?

Appendix A (Ctd.)

Questionnaire: SI: S24; SII: S30
Dummy Table: 8.2

- How many school days were lost in the last school year due to non-school events?

Questionnaire: SI: S26; SII: S33
Dummy Table: 7.4

- What were the purposes and frequency of school inspections?

Questionnaire: SII: S24, S25
Dummy Table: 8.7, 11.14

- What was the contribution of the school community (in terms of time and resources for maintaining the school and for providing supplementary funding)?

Questionnaire: SII: S40
Dummy Table: 9.10

- What were the main behavioural problems of pupils?

Questionnaire: SI: S25; SII: S31
Dummy Table: 9.5(a), 9.5(b)

- What were the main behavioural problems of teachers?

Questionnaire: SI: S25; SII: S32
Dummy Table: 9.6(a), 9.6(b)

General Policy Concern 17: Have human resources (for example, qualified and experienced teachers and school heads) been allocated in an equitable fashion among regions and among schools within regions?

Specific Research Questions

- Were qualified and experienced Grade 6 teachers and school heads distributed equitably among regions and among schools within regions?

Questionnaire: SI: T4, T5, T6, T23, S3, S4, S5, S13, S18; SII: T4, T5, T6, T19, S3, S4, S6, S15, S18
Dummy Table: 11.15(a), 11.15(b)

General Policy Concern 18: Have material resources (for example, classroom teaching materials and school facilities) been allocated in an equitable fashion among regions and among schools within regions?

Specific Research Questions

- Were (a) general school infrastructure, (b) classroom equipment, and (c) classroom teaching materials distributed equitably among regions and among schools within regions?

Questionnaire: SI: T10, T31, S20, S28, S30, S31; SII: T12, T30, S22, S35, S37, S38
Dummy Table: 11.16(a), 11.16(b)

Appendix A (Ctd.)

General Policy Concern 19: What were the levels (according to Rasch scores and descriptive levels of competence) and variations (among schools and regions) in the achievement levels of Grade 6 pupils and their teachers in reading and mathematics – for my country and for all other SACMEQ countries?

Specific Research Questions

- What were the overall mean Rasch scores of pupils and their teachers in reading and mathematics across the SACMEQ countries?
  Questionnaire: SI: PRT; SII: PRT, PMT, TRT, TMT
  Dummy Table: 11.18(a), 11.18(b)
- What were the percentages of between and within school variance associated with pupil Rasch scores in reading and mathematics across the SACMEQ countries?
  Questionnaire: SI: PRT; SII: PRT, PMT, TRT, TMT
  Dummy Table: 11.19(a), 11.19(b)
- What were the overall percentages of pupils and their teachers across the various levels of competence in reading and mathematics across the SACMEQ countries?
  Questionnaire: SI: PRT; SII: PRT, PMT, TRT, TMT
  Dummy Table: 11.20(a), 11.20(b)

General Policy Concern 20: What were the reading and mathematics achievement levels of important sub-groups of Grade 6 pupils and their teachers (for example, pupils and teachers of different genders, socio-economic levels, and locations)?

Specific Research Questions

- What were the gender differences in reading and mathematics achievement for pupils and teachers?
  Questionnaire: SI: PRT, P3; SII: PRT, PMT, TRT, TMT, P3, T2
  Dummy Table: 11.21
- What were the school location differences in reading and mathematics achievement for pupils and teachers?
  Questionnaire: SI: PRT, S12; SII: PRT, PMT, TRT, TMT, S14
  Dummy Table: 11.22
- What were the socioeconomic differences in reading and mathematics achievement for pupils and teachers?
  Questionnaire: SI: PRT, P8; SII: PRT, PMT, TRT, TMT, P7, T27
  Dummy Table: 11.23

Appendix B

Reading Test Items Considered to be Central to the Core Curriculum in Each Country)

item #	Type	BOT	KEN	LES	MAL	MAU	MOZ	NAM	SEY	SOU	SWA	TAN	UGA	ZAM	ZAN
1	Word recognition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
2		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
3		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
4		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes
5		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
6		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes	Yes	Yes
7	Sentence completion with a word	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
11			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	
12	Sentence completion with a phrase	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14			Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18	Document	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
20		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
22	Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
23		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
24		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
26	Document	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
27		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
28		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
29	Expository	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
31				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
32		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
33	Document	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
34		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
35	Document	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
37		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
39		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
40		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix B (Ctd.)

Item #	Type	BOT	KEN	LES	MAL	MAU	MOZ	NAM	SEY	SOU	SWA	TAN	UGA	ZAM	ZAN
41	Expository	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
42		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		Yes
44		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
45	Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
46		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
47		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
48		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
49		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
50	Expository	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
53		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
54	Documents	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes
55		Yes	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	Yes
56		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
57		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
58	Expository	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
59		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
61	Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
62		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
63		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
64		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
65	Expository	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
66		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
67		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
68				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
69		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
70	Expository	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
71		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
72		Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
73	Document	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
74		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
75		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
76		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
77	Expository	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
78							Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
79		Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
80	Expository						Yes			Yes	Yes	Yes	Yes		Yes
81							Yes			Yes	Yes	Yes	Yes		Yes
82		Yes					Yes			Yes	Yes	Yes	Yes		Yes
83							Yes			Yes	Yes	Yes	Yes		Yes

Note: The shaded items were excluded from the final analyses because they failed a Rasch "differential item functioning" test across three groups: SACMEQ I pupils, SACMEQ II pupils, and SACMEQ II teachers.

Appendix C

Mathematics Test Items Considered to be Central to the Core Curriculum in Each Country)

Item #	Type	BOT	KEN	LES	MAL	MAU	MOZ	NAM	SEY	SOU	SWA	TAN	UGA	ZAM	ZAN
1	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
2	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
3	Number	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
4	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	Space/Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Space/Data	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
7	Space/Data	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
8	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	Number	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
11	Number	Yes	Yes	Yes			Yes	Yes		Yes	Yes	Yes	Yes	Yes	
12	Number	Yes	Yes	Yes	Yes			Yes		Yes	Yes	Yes	Yes	Yes	Yes
13	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
14	Number	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	Measurement	Yes	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	Yes
16	Measurement	Yes	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	Yes
17	Measurement	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
18	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
19	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
20	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
21	Space/Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
22	Number	Yes	Yes	Yes	Yes			Yes		Yes	Yes	Yes	Yes	Yes	Yes
23	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
24	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25	Space/Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
26	Space/Data	Yes		Yes		Yes		Yes		Yes	Yes	Yes	Yes		
27	Number	Yes	Yes				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
28	Number	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
29	Number	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
30	Space/Data	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
31	Measurement	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
32	Space/Data	Yes	Yes		Yes	Yes	Yes			Yes		Yes	Yes		
33	Space/Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
34	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
35	Number	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes
36	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
37	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38	Number	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
39	Space/Data	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
40	Space/Data	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes		

Appendix C (Ctd.)

item #	Type	BOT	KEN	LES	MAL	MAU	MOZ	NAM	SEY	SOU	SWA	TAN	UGA	ZAM	ZAN
41	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
42	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43	Number	Yes			Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44	Measurement	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	
45	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
46	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47	Measurement	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
48	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
49	Measurement	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
50	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
51	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52	Space/Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
53	Space/Data	Yes	Yes		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	
54	Measurement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
55	Measurement	Yes				Yes	Yes			Yes	Yes	Yes	Yes		
56	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
57	Number	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
58	Space/Data	Yes		Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	
59	Number	Yes	Yes		Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
60	Number	Yes	Yes		Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
61	Number	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
62	Number	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
63	Measurement	Yes				Yes	Yes			Yes	Yes	Yes	Yes	Yes	

Note: The shaded items were excluded from the final analyses because they failed a Rasch "differential item functioning" test across three groups: SACMEQ I pupils, SACMEQ II pupils, and SACMEQ II teachers.

Appendix D

Sample Design Tables for rho = 0.1, 0.2, 0.3

Cluster Size	95% Confidence Limits for Means/Percentages							
	±0.05s/±2.5%		±0.1s/±5.0%		±0.15s/±7.5%		±0.2s/±10.0%	
b	a	n	a	n	a	n	a	n
roh = 0.1								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	880	1760	220	440	98	196	55	110
5	448	2240	112	560	50	250	28	140
10	304	3040	76	760	34	340	19	190
15	256	3840	64	960	29	435	16	240
20	232	4640	58	1160	26	520	15	300
30	208	6240	52	1560	24	720	13	390
40	196	7840	49	1960	22	880	13	520
50	189	9450	48	2400	21	1050	12	600
roh = 0.2								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	960	1920	240	480	107	214	60	120
5	576	2880	144	720	65	325	36	180
10	448	4480	112	1120	50	500	28	280
15	406	6090	102	1530	46	690	26	390
20	384	7680	96	1920	43	860	24	480
30	363	10890	91	2730	41	1230	23	690
40	352	14080	88	3520	40	1600	22	880
50	346	17300	87	4350	39	1950	22	1100
roh = 0.3								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1040	2080	260	520	116	232	65	130
5	704	3520	176	880	79	395	44	220
10	592	5920	148	1480	66	660	37	370
15	555	8325	139	2085	62	930	35	525
20	536	10720	134	2680	60	1200	34	680
30	518	15540	130	3900	58	1740	33	990
40	508	20320	127	5080	57	2280	32	1280
50	503	25150	126	6300	56	2800	32	1600

Appendix D (Ctd.)

Sample Design Tables for rho = 0.4, 0.5, 0.6

Cluster Size	95% Confidence Limits for Means/Percentages							
	±0.05s/±2.5%		±0.1s/±5.0%		±0.15s/±7.5%		±0.2s/±10.0%	
b	a	n	a	n	a	n	a	n
roh = 0.4								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1120	2240	280	560	125	250	70	140
5	832	4160	208	1040	93	465	52	260
10	736	7360	184	1840	82	820	46	460
15	704	10560	176	2640	79	1185	44	660
20	688	13760	172	3440	77	1540	43	860
30	672	20160	168	5040	75	2250	42	1260
40	664	26560	166	6640	74	2960	42	1680
50	660	33000	165	8250	74	3700	42	2100
roh = 0.5								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1200	2400	300	600	134	268	75	150
5	960	4800	240	1200	107	535	60	300
10	880	8800	220	2200	98	980	55	550
15	854	12810	214	3210	95	1425	54	810
20	840	16800	210	4200	94	1880	53	1060
30	827	24810	207	6210	92	2760	52	1560
40	820	32800	205	8200	92	3680	52	2080
50	816	40800	204	10200	91	4550	51	2550
roh = 0.6								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1280	2560	320	640	143	286	80	160
5	1088	5440	272	1360	122	610	68	340
10	1024	10240	256	2560	114	1140	64	640
15	1003	15045	251	3765	112	1680	63	945
20	992	19840	248	4960	111	2220	62	1240
30	982	29460	246	7380	110	3300	62	1860
40	976	39040	244	9760	109	4360	61	2440
50	973	48650	244	12200	109	5450	61	3050

Appendix D (Ctd.)

Sample Design Tables for rho = 0.7, 0.8, 0.9

Cluster Size	95% Confidence Limits for Means/Percentages							
	±0.05s/±2.5%		±0.1s/±5.0%		±0.15s/±7.5%		±0.2s/±10.0%	
b	a	n	a	n	a	n	a	n
roh = 0.7								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1360	2720	340	680	152	304	85	170
5	1216	6080	304	1520	136	680	76	380
10	1168	11680	292	2920	130	1300	73	730
15	1152	17280	288	4320	129	1935	72	1080
20	1144	22880	286	5720	128	2560	72	1440
30	1136	34080	284	8520	127	3810	71	2130
40	1132	45280	283	11320	126	5040	71	2840
50	1130	56500	283	14150	126	6300	71	3550
roh = 0.8								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1440	2880	360	720	161	322	90	180
5	1344	6720	336	1680	150	750	84	420
10	1312	13120	328	3280	146	1460	82	820
15	1302	19530	326	4890	145	2175	82	1230
20	1296	25920	324	6480	145	2900	81	1620
30	1291	38730	323	9690	144	4320	81	2430
40	1288	51520	322	12880	144	5760	81	3240
50	1287	64350	322	16100	144	7200	81	4050
roh = 0.9								
1 (SRS)	1600	1600	400	400	178	178	100	100
2	1520	3040	380	760	170	340	95	190
5	1472	7360	368	1840	164	820	92	460
10	1456	14560	364	3640	162	1620	91	910
15	1451	21765	363	5445	162	2430	91	1365
20	1448	28960	362	7240	162	3240	91	1820
30	1446	43380	362	10860	161	4830	91	2730
40	1444	57760	361	14440	161	6440	91	3640
50	1444	72200	361	18050	161	8050	91	4550

Appendix E

Random Number Tables for the Selection of 20 Grade 6 Students within each Selected School

Case#	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35
1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1
2	2	2	2	2	2	2	2	2	3	3	3	2	3	3	3
3	3	3	3	3	3	3	3	3	4	4	6	3	4	4	4
4	4	4	4	4	4	5	4	6	5	7	7	5	5	6	6
5	5	5	5	5	5	6	5	7	6	8	8	7	7	9	7
6	6	6	6	6	6	7	6	8	7	9	9	8	9	12	12
7	7	7	7	7	7	8	7	11	8	10	11	9	11	14	13
8	8	8	8	8	8	10	8	12	9	11	12	10	12	15	15
9	9	9	9	9	12	11	9	13	10	13	13	11	14	17	16
10	10	10	11	11	13	13	10	14	12	14	14	13	15	18	17
11	11	11	12	12	14	14	11	15	13	15	17	14	16	19	20
12	13	13	13	15	15	15	12	16	16	17	18	16	17	21	21
13	14	14	15	17	16	16	16	17	19	18	20	17	19	23	22
14	15	15	16	18	17	17	18	19	20	19	22	20	21	27	23
15	16	16	17	19	18	20	19	20	22	20	24	23	22	28	24
16	17	18	18	20	19	21	20	21	24	22	26	25	24	29	25
17	18	19	20	21	20	22	22	22	25	23	27	27	27	30	28
18	19	20	21	22	21	23	23	23	26	24	28	29	30	31	32
19	20	21	22	23	23	24	25	24	27	25	29	30	32	32	33
20	21	22	23	24	24	25	26	25	29	27	31	31	33	34	34

Case#	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50
1	1	1	3	1	1	1	1	3	4	2	1	1	2	1	2
2	5	2	5	6	2	2	5	4	5	5	2	2	3	2	4
3	6	3	6	7	4	6	6	6	6	6	3	6	5	6	5
4	8	4	7	8	7	7	8	10	13	8	4	11	7	9	6
5	10	7	10	11	10	8	11	12	15	9	10	12	8	10	8
6	11	8	11	13	11	10	13	13	16	10	11	13	10	13	9
7	13	9	12	15	14	11	14	15	19	12	15	17	13	15	14
8	14	12	16	17	16	12	17	16	22	13	19	18	17	16	21
9	17	14	17	18	17	13	18	20	23	15	20	20	18	17	22
10	18	15	24	19	18	15	20	26	26	17	21	21	19	23	23
11	19	16	25	21	21	17	22	28	28	22	26	27	20	32	24
12	23	17	26	23	22	19	23	32	33	23	30	28	21	33	25
13	24	19	27	26	23	22	24	33	34	25	31	29	25	34	27
14	25	20	29	28	24	23	25	34	35	27	33	30	28	35	29
15	26	24	30	31	30	26	29	35	36	29	35	35	30	36	31
16	30	28	31	33	32	28	30	36	37	30	37	43	32	38	33
17	31	30	32	34	34	29	31	38	38	34	38	44	34	41	34
18	33	31	33	35	35	31	33	39	39	36	40	45	39	45	40
19	35	32	35	36	37	38	34	42	40	41	44	46	44	48	43
20	36	35	38	39	39	41	35	43	41	44	45	47	48	49	50

Case#	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65
1	1	2	3	3	1	6	2	1	1	1	2	4	8	2	3
2	3	3	4	5	8	7	5	3	3	2	5	6	15	6	6
3	4	5	5	6	9	8	9	6	5	15	10	8	18	7	8
4	10	6	8	15	10	12	13	9	7	16	11	11	20	8	14
5	15	12	12	16	11	14	15	10	8	17	21	12	21	9	15
6	18	16	17	17	13	16	20	12	12	18	22	19	23	13	17
7	19	18	21	18	21	19	22	23	16	19	23	25	26	14	21
8	23	21	27	20	24	20	25	25	21	20	24	29	33	18	22
9	24	24	29	21	25	21	31	27	24	24	27	33	35	23	25
10	28	26	30	23	26	24	33	32	28	25	28	34	36	26	29
11	29	27	31	25	27	25	36	33	29	26	31	35	37	28	33
12	33	29	32	27	31	26	38	38	31	31	32	36	40	29	35
13	35	32	33	34	32	30	39	40	36	35	35	41	43	31	36
14	37	33	37	36	34	39	42	43	42	38	40	42	45	33	40
15	39	35	38	39	36	41	43	45	45	39	45	46	46	36	41
16	42	37	40	41	38	43	44	46	49	41	49	48	49	45	53
17	43	39	41	46	39	47	45	48	52	49	55	56	50	54	55
18	45	44	43	49	40	49	51	51	53	55	57	57	55	58	61
19	47	46	45	51	42	53	54	53	54	56	59	58	60	61	62
20	51	48	48	53	51	56	56	55	56	60	61	61	63	64	63

Case#	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77	R78	R79	R80
1	4	1	4	1	4	3	6	1	2	1	1	4	3	7	6
2	10	6	6	7	9	5	8	3	7	3	5	7	4	8	12
3	11	9	7	10	10	9	10	4	8	21	7	12	13	11	13
4	12	15	9	20	14	12	13	9	10	23	17	15	14	13	14
5	16	19	10	21	15	14	14	13	14	28	18	18	16	28	27
6	19	22	11	25	18	17	16	14	19	30	19	19	20	29	28
7	26	23	13	29	20	22	22	17	23	34	23	20	32	39	30
8	27	26	15	30	21	25	23	18	26	37	26	21	34	40	31
9	28	30	17	32	27	28	24	19	36	41	28	25	41	41	33
10	31	36	25	33	38	29	27	22	38	42	29	26	42	42	35
11	34	41	32	35	39	38	30	24	41	44	33	32	48	51	36
12	44	48	33	38	43	41	31	29	45	45	41	34	53	53	40
13	45	50	35	41	46	46	35	33	47	46	45	41	55	55	45
14	46	54	38	47	47	49	38	38	56	50	51	47	56	60	48
15	48	60	39	51	51	54	39	39	58	52	52	57	63	62	55
16	53	61	47	54	57	55	40	45	62	53	57	60	67	68	58
17	55	62	53	55	59	57	43	58	63	56	64	64	70	71	66
18	57	63	60	60	60	61	47	64	68	71	65	70	72	73	67
19	58	66	65	63	61	70	61	69	70	72	68	74	73	74	73
20	59	67	67	68	66	71	71	70	71	73	71	75	75	76	75

Appendix E (Ctd.)

Random Number Tables for the Selection of 20 Grade 6 Students within each Selected School

Case#	R81	R82	R83	R84	R85	R86	R87	R88	R89	R90	R91	R92	R93	R94	R95
1	2	1	4	8	7	13	2	3	2	2	3	4	3	4	6
2	3	3	10	10	11	16	3	5	7	4	4	6	6	11	11
3	6	4	11	11	13	17	10	11	14	5	6	7	8	14	20
4	8	5	14	12	15	19	18	12	16	12	9	10	12	19	22
5	12	10	15	13	20	20	21	18	19	15	10	15	31	20	23
6	13	13	25	18	21	21	22	19	31	16	14	19	36	21	27
7	16	17	28	24	24	30	29	22	32	19	16	20	45	32	32
8	22	24	29	30	30	43	30	28	33	23	22	27	48	35	34
9	24	26	30	35	32	50	32	31	40	28	29	34	51	36	36
10	33	32	33	42	34	53	33	39	45	31	31	35	53	43	37
11	41	42	34	43	36	54	34	41	49	36	37	41	54	44	49
12	43	47	39	55	47	65	35	48	50	37	49	50	57	46	52
13	44	52	48	56	52	67	46	50	58	48	50	58	67	47	57
14	54	54	53	58	56	72	48	52	61	52	53	62	70	48	66
15	59	60	60	62	58	76	56	53	62	58	56	66	73	55	69
16	60	64	64	64	60	79	57	55	64	59	68	75	74	61	73
17	65	65	67	69	63	80	61	72	73	64	73	81	78	74	74
18	66	68	68	70	74	81	65	77	77	70	76	84	82	80	77
19	79	69	70	75	77	83	68	78	79	78	84	90	86	86	86
20	80	82	75	77	84	85	75	79	82	81	88	92	88	94	93

Case#	R96	R97	R98	R99	R100
1	6	7	4	1	2
2	7	11	9	2	5
3	9	13	15	3	6
4	13	15	32	6	7
5	17	16	38	9	30
6	26	25	39	11	33
7	35	29	42	15	42
8	41	33	51	16	47
9	45	37	53	36	51
10	56	41	54	39	53
11	65	43	57	47	57
12	66	50	61	53	64
13	68	60	78	73	65
14	73	62	82	78	67
15	76	65	86	81	78
16	82	72	91	82	79
17	83	76	92	85	81
18	84	77	93	89	87
19	89	80	96	91	93
20	95	96	98	93	96

Case#	R101	R102	R103	R104	R105	R106	R107	R108	R109	R110	R111	R112	R113	R114	R115
1	10	5	4	6	2	4	12	1	1	3	2	6	10	3	2
2	11	16	7	8	10	5	21	9	7	4	8	23	13	13	6
3	18	22	11	13	16	6	26	10	11	6	10	32	14	15	17
4	19	31	25	20	25	8	28	12	13	13	12	54	18	17	25
5	25	37	26	28	27	13	37	17	14	20	13	55	22	20	28
6	26	42	28	33	39	14	41	25	19	26	18	59	25	25	29
7	29	43	38	37	46	15	43	40	21	35	30	66	26	29	39
8	45	46	40	42	51	17	44	43	29	44	38	69	30	55	42
9	47	51	45	44	52	33	53	44	32	48	48	74	41	56	52
10	62	54	49	57	61	40	60	48	34	49	50	78	44	57	62
11	65	58	57	62	65	50	61	56	41	50	52	89	47	62	64
12	72	61	60	68	68	61	68	59	42	51	56	90	49	74	66
13	79	64	67	80	69	63	73	62	47	54	64	98	50	78	79
14	88	70	68	85	70	73	74	64	64	66	66	99	64	90	81
15	93	73	69	86	77	80	75	68	65	70	81	100	66	92	86
16	95	82	72	87	78	85	81	78	71	75	84	104	69	93	87
17	***96***	***93***	***78***	***88***	***82***	***93***	***88***	***81***	***79***	***78***	***86***	***105***	***73***	***97***	***94***
18	99	94	97	97	90	95	93	87	86	79	91	109	82	99	96
19	100	98	101	98	96	96	104	91	97	89	105	110	103	102	103
20	101	102	102	102	104	97	105	102	98	108	109	111	107	104	115

Case#	R116	R117	R118	R119	R120	R121	R122	R123	R124	R125	R126	R127	R128	R129	R130
1	3	4	3	3	20	7	7	12	8	9	2	1	27	1	6
2	5	7	12	6	23	13	17	32	10	12	14	8	28	6	15
3	6	12	15	8	26	21	18	35	11	18	17	10	30	17	24
4	10	19	23	16	38	22	19	38	16	20	20	12	43	20	25
5	15	20	27	17	39	27	24	42	26	23	25	24	47	26	28
6	19	22	28	22	41	30	29	49	38	25	37	31	48	41	33
7	23	28	42	25	43	36	33	68	46	27	41	35	55	50	35
8	27	30	53	28	45	41	35	76	47	28	47	43	63	51	36
9	33	33	54	44	49	69	37	86	57	36	67	53	65	53	37
10	35	39	55	45	61	89	46	90	60	45	71	62	67	68	38
11	41	46	60	47	64	92	56	92	65	57	75	65	71	70	41
12	52	48	62	52	67	99	65	95	69	59	79	68	79	84	42
13	53	54	63	74	71	104	71	96	70	80	88	73	80	88	57
14	56	57	73	77	75	105	75	101	81	86	89	79	96	92	67
15	57	97	84	78	80	109	78	102	87	92	100	92	103	96	71
16	61	99	90	98	83	111	97	106	88	95	101	98	107	115	83
17	64	102	105	106	89	114	102	108	94	100	109	99	108	119	85
18	83	110	108	107	110	116	115	114	95	106	117	100	112	125	102
19	95	113	109	114	115	117	117	121	116	113	119	117	113	126	106
20	113	115	111	119	119	119	121	123	119	115	124	119	125	129	122

Appendix E (Ctd,)

Random Number Tables for the Selection of 20 Grade 6 Students within each Selected School

Case#	R131	R132	R133	R134	R135	R136	R137	R138	R139	R140	R141	R142	R143	R144	R145
1	4	5	2	3	3	5	20	35	15	1	1	10	9	3	1
2	8	8	6	10	17	7	22	36	18	2	7	12	12	12	5
3	39	11	13	13	30	12	34	37	24	8	11	34	17	15	27
4	43	26	36	33	31	13	37	53	26	14	27	37	20	16	31
5	46	33	38	38	55	15	41	73	28	15	28	38	34	21	39
6	54	49	42	55	56	23	51	75	29	18	42	39	37	43	46
7	71	62	44	57	70	32	52	78	30	34	45	60	52	48	49
8	85	64	51	58	92	42	64	83	38	46	49	61	69	68	52
9	86	73	58	59	96	51	70	89	53	49	58	67	72	80	62
10	100	78	65	61	102	53	74	90	64	58	59	82	85	93	74
11	**101**	**79**	**67**	**62**	**103**	**59**	**75**	**93**	**65**	**71**	**67**	**85**	**86**	**96**	**76**
12	104	86	77	66	105	62	76	96	77	81	71	86	90	97	82
13	106	88	90	73	107	66	78	105	85	96	77	95	93	106	86
14	107	90	99	79	108	92	83	115	86	106	79	97	100	115	111
15	108	97	100	86	109	94	85	116	96	114	84	107	105	120	114
16	113	115	117	98	110	105	93	117	102	116	101	112	106	127	115
17	117	119	118	99	113	107	96	121	107	120	126	118	115	133	118
18	127	120	119	112	120	115	99	124	114	122	129	124	122	134	132
19	129	129	121	113	129	120	105	130	127	123	136	129	131	142	141
20	130	131	133	121	131	125	122	137	137	125	138	135	142	143	142

Case#	R146	R147	R148	R149	R150	R151	R152	R153	R154	R155	R156	R157	R158	R159	R160
1	5	3	6	3	12	4	6	6	6	10	1	1	9	9	8
2	6	12	10	7	18	13	9	10	16	13	15	2	18	19	31
3	10	21	13	17	25	15	15	18	25	30	17	11	19	30	33
4	14	34	14	29	30	19	19	21	26	40	21	38	25	51	35
5	15	35	17	41	33	29	20	22	32	56	22	44	26	64	38
6	16	43	20	46	41	30	21	26	39	73	25	49	30	67	57
7	17	51	40	50	45	36	22	34	49	74	29	50	36	69	60
8	29	62	42	52	51	39	34	40	51	75	47	83	39	81	62
9	44	68	45	64	53	46	39	44	52	82	55	89	46	89	72
10	54	73	53	69	54	51	43	46	54	83	63	104	51	94	74
11	55	75	59	71	58	58	65	51	57	90	72	105	52	100	97
12	69	83	60	80	60	62	76	55	63	103	80	107	66	101	123
13	76	101	71	87	64	77	82	56	73	108	81	108	70	106	124
14	84	103	83	93	102	82	91	60	90	110	86	122	75	109	127
15	104	107	92	98	103	98	100	67	102	121	93	125	87	124	128
16	108	125	102	107	110	103	105	85	104	125	97	142	94	133	149
17	111	128	108	110	117	109	113	90	125	129	103	145	119	142	154
18	130	130	135	131	127	111	114	94	133	130	128	148	138	149	155
19	133	143	136	134	140	112	132	109	134	140	154	149	145	151	156
20	140	145	146	139	150	139	147	149	142	153	155	157	152	154	158

Case#	R161	R162	R163	R164	R165	R166	R167	R168	R169	R170	R171	R172	R173	R174	R175
1	1	10	16	14	3	13	10	7	2	5	1	7	2	19	8
2	2	31	21	27	5	15	29	21	6	18	8	9	6	31	11
3	4	52	28	36	16	19	35	23	28	40	14	19	24	38	21
4	10	54	29	46	33	42	39	36	41	58	23	27	28	44	44
5	39	64	41	51	35	46	53	69	48	64	38	59	37	48	48
6	56	66	42	54	42	49	54	90	70	86	39	75	53	51	49
7	58	69	46	57	49	64	66	91	74	87	43	77	62	62	59
8	63	71	49	62	55	67	81	95	84	105	49	89	71	71	64
9	64	75	62	72	61	73	103	107	88	109	59	90	91	77	67
10	77	77	70	79	63	104	106	115	101	112	72	93	103	79	70
11	84	84	75	89	65	107	117	124	106	125	82	94	119	108	72
12	85	87	78	98	78	113	122	128	115	126	87	96	127	111	79
13	87	91	79	99	105	115	130	133	117	131	95	113	128	113	94
14	97	92	111	119	107	116	134	134	121	134	106	123	129	117	122
15	107	93	117	128	119	127	136	138	126	139	127	125	133	131	123
16	111	96	146	134	131	146	139	142	137	141	137	134	140	142	131
17	115	126	147	142	134	148	147	152	158	152	142	141	146	149	132
18	125	128	156	147	143	159	152	153	160	159	143	143	151	153	146
19	128	153	157	156	161	164	157	161	163	162	146	159	154	156	159
20	155	155	161	162	162	165	162	164	168	163	147	172	163	157	163

Case#	R176	R177	R178	R179	R180	R181	R182	R183	R184	R185	R186	R187	R188	R189	R190
1	5	2	2	1	1	15	1	2	8	12	6	15	1	5	4
2	19	15	5	2	15	17	8	4	9	17	10	17	6	10	10
3	20	25	9	21	17	35	15	38	16	38	15	18	13	14	27
4	22	31	11	29	27	41	19	44	17	39	28	33	15	16	33
5	29	37	13	42	37	45	28	52	26	45	39	40	30	20	37
6	45	47	22	44	40	55	52	59	54	51	53	52	44	21	45
7	67	62	52	46	58	64	65	74	66	57	88	62	61	38	49
8	68	67	69	53	73	70	72	88	73	59	91	68	63	44	56
9	73	86	76	64	78	80	73	93	75	60	92	78	82	52	71
10	80	87	80	70	104	111	74	97	82	61	97	80	85	69	82
11	91	96	81	75	116	114	78	115	85	72	112	107	91	81	119
12	99	103	88	76	117	115	80	116	90	73	116	109	104	86	122
13	110	109	94	82	118	117	98	123	120	76	126	116	119	105	128
14	126	117	101	90	119	119	99	124	133	87	130	124	120	109	134
15	129	119	106	129	142	127	120	130	148	96	151	132	123	113	139
16	133	124	114	141	144	134	122	149	151	126	153	133	138	114	146
17	137	146	133	151	163	140	143	155	167	129	159	155	143	131	148
18	140	162	136	159	164	159	163	161	168	146	167	157	148	143	164
19	154	164	142	167	167	176	164	164	175	151	168	159	153	171	167
20	155	173	154	168	176	178	171	170	180	157	182	167	160	184	187

Appendix E (Ctd.)

Random Number Tables for the Selection of 20 Grade 6 Students within each Selected School

Case#	R191	R192	R193	R194	R195	R196	R197	R198	R199	R200
1	12	5	9	11	21	2	4	4	7	4
2	22	10	12	14	22	6	14	8	9	16
3	24	13	30	17	35	12	40	27	13	38
4	45	15	42	25	39	13	53	28	32	41
5	49	23	46	32	45	18	54	41	64	43
6	55	26	56	35	54	25	78	49	66	54
7	59	35	70	37	75	42	84	77	88	56
8	60	52	73	67	79	44	85	80	117	61
9	76	57	78	70	100	58	106	89	119	68
10	109	84	88	71	109	61	111	94	130	94
11	116	86	90	72	111	65	113	95	133	96
12	120	105	92	74	113	98	122	104	139	100
13	123	123	102	83	115	111	142	105	144	105
14	148	126	104	105	132	116	172	111	146	124
15	149	132	113	117	144	133	181	151	151	130
16	150	140	118	123	154	134	182	154	170	150
17	162	152	130	128	156	160	185	166	172	151
18	169	154	152	130	162	168	194	175	174	169
19	170	160	153	135	167	173	195	196	177	172
20	184	166	173	156	173	174	196	198	182	198

Case#	R201	R202	R203	R204	R205	R206	R207	R208	R209	R210	R211	R212	R213	R214	R215
1	7	1	7	16	4	11	5	9	8	2	17	1	6	1	5
2	17	16	8	30	40	15	23	10	15	16	19	26	11	8	9
3	21	28	21	63	47	37	38	12	19	20	25	40	14	31	25
4	56	29	22	72	55	41	43	21	29	39	34	42	25	39	31
5	62	38	31	75	96	46	58	34	69	50	41	65	36	45	32
6	66	44	32	76	105	49	67	41	72	67	44	69	37	52	38
7	78	58	44	88	120	50	70	45	84	92	62	73	42	54	39
8	80	70	57	89	123	52	79	84	90	104	67	75	47	60	55
9	106	96	59	94	124	70	81	110	95	106	73	110	70	65	58
10	122	98	71	126	138	73	118	120	114	114	87	113	91	73	60
11	124	102	78	135	142	94	121	125	117	118	113	114	94	75	71
12	125	121	86	139	143	121	126	129	118	135	132	158	99	90	79
13	126	123	87	147	149	139	131	133	124	137	143	159	133	96	92
14	132	124	90	153	152	142	151	138	148	142	148	163	139	107	93
15	150	155	146	160	153	151	165	139	149	148	153	164	141	129	107
16	163	163	147	173	163	155	166	150	152	156	159	177	182	173	115
17	166	172	164	179	164	166	178	160	155	159	165	187	199	174	118
18	170	182	172	184	165	179	179	191	176	185	168	191	201	186	160
19	192	185	178	190	171	201	185	201	198	190	200	208	202	189	210
20	194	190	180	193	198	204	189	202	199	203	206	211	206	198	213

Case#	R216	R217	R218	R219	R220	R221	R222	R223	R224	R225	R226	R227	R228	R229	R230
1	10	21	14	1	2	1	10	1	5	1	10	35	2	6	3
2	12	31	31	7	5	12	18	3	13	12	14	40	5	12	7
3	16	37	32	8	11	13	20	4	35	19	47	70	36	49	24
4	20	48	34	12	15	25	24	18	41	29	66	77	44	60	28
5	23	71	37	22	68	51	25	37	46	32	71	78	55	78	33
6	43	79	46	86	75	54	29	54	54	50	78	79	56	85	75
7	51	102	54	87	83	60	31	57	55	70	102	137	57	100	88
8	53	109	65	91	94	86	72	77	64	101	108	138	65	110	121
9	72	125	69	108	98	98	75	81	81	126	111	139	79	114	126
10	87	127	79	122	108	103	82	101	120	135	120	152	82	121	131
11	120	147	92	124	124	139	104	115	126	152	125	166	83	123	136
12	124	158	104	152	132	158	116	122	141	164	132	172	92	126	137
13	140	163	116	157	147	175	118	128	155	167	135	173	109	144	139
14	142	164	119	164	150	184	122	144	156	173	142	176	126	151	143
15	146	170	135	169	159	185	131	152	159	179	147	179	152	162	148
16	169	185	137	178	160	186	143	182	171	187	171	184	166	163	182
17	171	188	139	180	168	188	148	196	183	210	189	196	173	177	201
18	176	199	145	205	171	193	167	199	193	213	203	200	179	178	209
19	186	203	159	206	197	217	174	207	205	214	218	214	203	217	218
20	199	214	165	219	209	219	210	216	216	225	219	219	205	224	221

Case#	R231	R232	R233	R234	R235	R236	R237	R238	R239	R240	R241	R242	R243	R244	R245
1	22	3	14	19	4	43	21	2	1	15	24	4	4	24	12
2	24	7	35	31	22	46	24	8	5	36	27	8	67	28	30
3	36	23	39	44	28	48	55	31	11	49	30	16	77	38	61
4	38	65	55	58	38	55	56	35	42	76	42	30	85	49	62
5	54	103	66	62	39	62	66	40	45	79	61	41	109	52	74
6	72	106	98	65	46	65	79	45	49	84	79	44	110	56	77
7	77	107	112	79	58	66	88	56	68	88	93	45	116	57	89
8	94	143	115	80	61	75	89	59	70	120	96	46	122	67	91
9	95	144	121	82	77	86	93	63	79	126	101	49	129	70	96
10	137	153	126	87	79	87	112	64	116	141	112	96	133	107	101
11	149	154	133	89	99	101	117	87	118	143	124	156	138	163	102
12	170	155	137	92	103	107	134	99	143	159	171	162	139	177	104
13	177	175	141	151	127	145	135	105	145	165	173	163	160	185	114
14	180	179	151	159	133	170	145	122	186	172	174	174	163	188	128
15	185	180	160	181	168	190	155	143	200	201	184	178	170	191	150
16	186	184	174	184	182	196	183	178	207	206	197	191	197	207	190
17	201	195	180	189	191	199	202	187	208	208	201	209	199	209	196
18	209	208	210	213	203	222	210	204	213	218	223	220	200	221	198
19	217	216	217	218	217	227	211	225	221	222	229	229	219	232	235
20	228	223	228	233	230	230	236	229	228	240	241	241	228	243	240

Appendix F

The 148 Test Items (and their Sources) that were Used in the "Hypothetical Test" for Calibrating the Reading Test Items

Section	RUMM VarName	SPSS VarName	KEY	S2P	S2T	S1P	Zim91	IEA Pop1	IEA Pop2
Section A	I0001	RA01XXXX	2	pread01					
	I0002	RA02XXXX	2	pread02					
	I0003	RA03XXXX	3	pread03					
	I0004	RA04XXXX	1	pread04					
	I0005	RA05XXXX	2	pread05					
	I0006	RA06XXXX	1	pread06					
	I0007	RA07XXXX	2	pread07					
	I0008	RA08XXXX	2	pread08					
	I0009	RA09XXXX	2	pread09					
	I0010	RA10XXXX	3	pread10					
	I0011	RA11XXXX	2	pread11					
	I0012	RA12XXXX	2	pread12					
	I0013	RA13XXXX	4	pread13					
	I0014	RA14XXXX	4	pread14					
	I0015	RA22XXXX	3	pread22					
	I0016	RA23XXXX	3	pread23					
	I0017	RA24XXXX	1	pread24					
	I0018	RA25XXXX	1	pread25					
	I0019	RA26XXXX	4	pread26					
	I0020	RA27XXXX	2	pread27					
	I0021	RA28XXXX	2	pread28					
	I0022	RA33XXXX	2	pread33					
	I0023	RA34XXXX	1	pread34					
	I0024	RA35XXXX	1	pread35					
	I0025	RA36XXXX	2	pread36					
	I0026	RA37XXXX	2	pread37					
	I0027	RA38XXXX	2	pread38					
	I0028	RA39XXXX	2	pread39					
	I0029	RA40XXXX	1	pread40					
	I0030	RA41XXXX	1	pread41					
	I0031	RA42XXXX	4	pread42					
	I0032	RA43XXXX	1	pread43					
	I0033	RA44XXXX	1	pread44					
	I0034	RA45XXXX	3	pread45					
	I0035	RA46XXXX	1	pread46					
	I0036	RA58XXXX	1	pread58					
	I0037	RA59XXXX	2	pread59					
	I0038	RA61XXXX	2	pread61					
	I0039	RA62XXXX	2	pread62					
	I0040	RA63XXXX	4	pread63					
	I0041	RA64XXXX	1	pread64					
	I0042	RA70XXXX	1	pread70					
	I0043	RA71XXXX	4	pread71					

Section	RUMM VarName	SPSS VarName	KEY	S2P	S2T	S1P	Zim91	IEA Pop1	IEA Pop2
	I0044	RA72XXXX	2	pread72					
	I0045	RA73XXXX	4	pread73					
	I0046	RA74XXXX	3	pread74					
	I0047	RA75XXXX	3	pread75					
	I0048	RA76XXXX	2	pread76					
	I0049	RA80XXXX	4	pread80					yes
	I0050	RA81XXXX	2	pread81					yes
	I0051	RA82XXXX	4	pread82					yes
	I0052	RA83XXXX	4	pread83					yes
	I0053	RA29XX20	4	pread29		porange1			
	I0054	RA30XX21	1	pread30		porange2			
	I0055	RA31XX22	3	pread31		porange3			
	I0056	RA32XX23	4	pread32		porange4			
	I0057	RA47XX08	4	pread47		pbird3	bird3	yes	
Section B	I0058	RA48XX10	2	pread48		pbird5	bird5	yes	
	I0059	RA49XX06	3	pread49		pbird1	bird1	yes	
	I0060	RA54XX12	3	pread54		pisland2	island2	yes	
	I0061	RA55XX11	1	pread55		pisland1	island1	yes	
	I0062	RA56XX14	4	pread56		pisland4	island4	yes	
	I0063	RA57XX13	2	pread57		pisland3	island3	yes	
	I0064	RA160304	2	pread16	tread03	ptembo4	tembo4		
	I0065	RA170405	2	pread17	tread04	ptembo5	tembo5		
	I0066	RA180524	1	pread18	tread05	pmaria1	maria1	yes	
	I0067	RA190625	2	pread19	tread06	pmaria2	maria2	yes	
Section C	I0068	RA200726	4	pread20	tread07	pmaria3	maria3	yes	
	I0069	RA651456	1	pread65	tread14	ptree1	tree1	yes	
	I0070	RA661557	1	pread66	tread15	ptree2	tree2	yes	
	I0071	RA671658	1	pread67	tread16	ptree3	tree3	yes	
	I0072	RA691860	2	pread69	tread18	ptree5	tree5	yes	
	I0073	RA1501XX	2	pread15	tread01				
	I0074	RA2108XX	3	pread21	tread08				
	I0075	RA5031XX	1	pread50	tread31				
	I0076	RA5132XX	3	pread51	tread32				
	I0077	RA5233XX	3	pread52	tread33				
Section D	I0078	RA5334XX	1	pread53	tread34				
	I0079	RA6035XX	2	pread60	tread35			yes	
	I0080	RA6817XX	3	pread68	tread17				
	I0081	RA7741XX	4	pread77	tread41				
	I0082	RA7843XX	1	pread78	tread43				
	I0083	RA7944XX	2	pread79	tread44				
	I0084	RAXX02XX	3		tread02				
	I0085	RAXX09XX	4		tread09				
	I0086	RAXX13XX	1		tread13				
	I0087	RAXX19XX	2		tread19				yes
Section E	I0088	RAXX20XX	3		tread20				yes
	I0089	RAXX21XX	2		tread21				yes
	I0090	RAXX22XX	2		tread22				yes
	I0091	RAXX23XX	2		tread23				
	I0092	RAXX24XX	3		tread24				yes

Section	RUMM VarName	SPSS VarName	KEY	S2P	S2T	S1P	Zim91	IEA Pop1	IEA Pop2
	I0093	RAXX25XX	1		tread25				
	I0094	RAXX26XX	4		tread26				
	I0095	RAXX27XX	2		tread27				
	I0096	RAXX28XX	2		tread28				
	I0097	RAXX29XX	2		tread29				
	I0098	RAXX30XX	1		tread30				
	I0099	RAXX36XX	3		tread36			yes	
	I0100	RAXX37XX	2		tread37			yes	
	I0101	RAXX38XX	4		tread38				
	I0102	RAXX39XX	3		tread39				
	I0103	RAXX40XX	3		tread40				
	I0104	RAXX42XX	2		tread42				
	I0105	RAXX45XX	3		tread45				
	I0106	RAXX46XX	1		tread46				
	I0107	RAXX47XX	1		tread47				
	I0108	RAXX48XX	1		tread48				
	I0109	RAXX49XX	3		tread49				
	I0110	RAXX1027	1		tread10	pquick1	quick1	yes	
Section F	I0111	RAXX1128	4		tread11	pquick2	quick2	yes	
	I0112	RAXX1229	3		tread12	pquick3	quick3	yes	
	I0113	RAXXXX01	4			ptembo1			
	I0114	RAXXXX02	3			ptembo2			
	I0115	RAXXXX03	4			ptembo3			
	I0116	RAXXXX07	3			pbird2		yes	
	I0117	RAXXXX09	3			pbird4		yes	
	I0118	RAXXXX15	4			pjoseph1	joseph1		
	I0119	RAXXXX16	4			pjoseph2	joseph2		
	I0120	RAXXXX17	1			pjoseph3	joseph3		
	I0121	RAXXXX18	2			pjoseph4	joseph4		
	I0122	RAXXXX19	4			pjoseph5			
	I0123	RAXXXX30	4			pempty1	bottles1	yes	
	I0124	RAXXXX31	3			pempty2	bottles2	yes	
	I0125	RAXXXX32	4			pempty3	bottles3	yes	
	I0126	RAXXXX33	1			pempty4	bottles4	yes	
Section G	I0127	RAXXXX34	3			pcarrot1	carrots1		
	I0128	RAXXXX35	4			pcarrot2	carrots2		
	I0129	RAXXXX36	1			pcarrot3	carrots3		
	I0130	RAXXXX37	1			pcarrot4	carrots4		
	I0131	RAXXXX38	4			pcarrot5	carrots5		
	I0132	RAXXXX39	2			ptempra1	temper1		
	I0133	RAXXXX41	2			ptempra3	temper3		
	I0134	RAXXXX42	4			ptempra4	temper4		
	I0135	RAXXXX43	2			ptempra5	temper5		
	I0136	RAXXXX44	3			pmaize1			
	I0137	RAXXXX45	3			pmaize2			
	I0138	RAXXXX46	3			pmaize3			
	I0139	RAXXXX47	2			pmaize4			
	I0140	RAXXXX48	3			pmaize5			
	I0141	RAXXXX49	1			pmaize6			

Section	RUMM VarName	SPSS VarName	KEY	S2P	S2T	S1P	Zim91	IEA Pop1	IEA Pop2
	I0142	RAXXXX50	3			pgrandp1			
	I0143	RAXXXX51	4			pgrandp2			
	I0144	RAXXXX52	2			pgrandp3			
	I0145	RAXXXX53	3			pgrandp4			
	I0146	RAXXXX54	4			pgrandp5			
	I0147	RAXXXX55	3			pgrandp6			
	I0148	RAXXXX59	1			ptree4			

Appendix G

The 91 Test Items (and their Sources) that were Used in the "Hypothetical Test" for Calibrating the Mathematics Test Items

Section	RUMM VarName	SPSS VarName	KEY	S2P	S2T	TIMSS Pop1	TIMSS Pop2
Section A	I0001	MA01XX	2	pmath01			
	I0002	MA02XX	2	pmath02			
	I0003	MA03XX	3	pmath03			
	I0004	MA04XX	2	pmath04			
	I0005	MA05XX	2	pmath05			
	I0006	MA06XX	3	pmath06			
	I0007	MA07XX	4	pmath07			
	I0008	MA08XX	2	pmath08			
	I0009	MA09XX	2	pmath09			
	I0010	MA10XX	4	pmath10			
	I0011	MA11XX	1	pmath11			
	I0012	MA12XX	3	pmath12			
	I0013	MA13XX	2	pmath13			
	I0014	MA14XX	4	pmath14			
	I0015	MA15XX	3	pmath15			
	I0016	MA16XX	2	pmath16			
	I0017	MA17XX	2	pmath17			
	I0018	MA18XX	2	pmath18			
	I0019	MA19XX	1	pmath19			
	I0020	MA20XX	1	pmath20			
	I0021	MA21XX	2	pmath21			
	I0022	MA22XX	1	pmath22			
	I0023	MA23XX	3	pmath23			
	I0024	MA24XX	2	pmath24			
	I0025	MA25XX	2	pmath25			
	I0026	MA31XX	2	pmath31			
	I0027	MA34XX	3	pmath34			
	I0028	MA35XX	2	pmath35			
	I0029	MA36XX	2	pmath36			
	I0030	MA37XX	2	pmath37			
	I0031	MA38XX	1	pmath38			
	I0032	MA39XX	3	pmath39			
	I0033	MA40XX	2	pmath40			
	I0034	MA41XX	4	pmath41			
	I0035	MA42XX	1	pmath42			
	I0036	MA43XX	4	pmath43			
	I0037	MA45XX	3	pmath45			
	I0038	MA46XX	3	pmath46			
	I0039	MA47XX	2	pmath47			L-10
	I0040	MA48XX	2	pmath48			
	I0041	MA49XX	1	pmath49			
	I0042	MA50XX	2	pmath50			P-17
	I0043	MA51XX	3	pmath51			

S

Section	RUMM VarName	SPSS VarName	KEY	S2P	S2T	TIMSS Pop1	TIMSS Pop2
	I0044	MA52XX	3	pmath52			
	I0045	MA53XX	2	pmath53			
	I0046	MA54XX	3	pmath54			
	I0047	MA59XX	1	pmath59			
	I0048	MA60XX	2	pmath60			
	I0049	MA61XX	3	pmath61			
	I0050	MA62XX	1	pmath62			
	I0051	MA2616	2	pmath26	tmath16		
	I0052	MA2701	4	pmath27	tmath01	I-3	
	I0053	MA2803	1	pmath28	tmath03	I-8	
	I0054	MA2905	3	pmath29	tmath05	K-6	
	I0055	MA3007	3	pmath30	tmath07	L-5	
	I0056	MA3212	3	pmath32	tmath12		
Section B	I0057	MA3315	2	pmath33	tmath15		
	I0058	MA4411	2	pmath44	tmath11		
	I0059	MA5514	2	pmath55	tmath14		
	I0060	MA5602	4	pmath56	tmath02	I-7	
	I0061	MA5706	3	pmath57	tmath06	K-9	
	I0062	MA5833	1	pmath58	tmath33		
	I0063	MA6328	1	pmath63	tmath28		N-17
	I0064	MAXX04	2		tmath04	I-9	R-12
	I0065	MAXX08	3		tmath08		
	I0066	MAXX09	4		tmath09		P-8
	I0067	MAXX10	4		tmath10		
	I0068	MAXX13	3		tmath13		
	I0069	MAXX17	3		tmath17		I-8
	I0070	MAXX18	4		tmath18		J-14
	I0071	MAXX19	2		tmath19		J-18
	I0072	MAXX20	2		tmath20		K-4
	I0073	MAXX21	2		tmath21		
	I0074	MAXX22	2		tmath22		K-6
	I0075	MAXX23	3		tmath23		L-11
	I0076	MAXX24	2		tmath24		K-8
	I0077	MAXX25	1		tmath25		L-14
Section C	I0078	MAXX26	2		tmath26		L-17
	I0079	MAXX27	3		tmath27		M-6
	I0080	MAXX29	2		tmath29		Q-1
	I0081	MAXX30	2		tmath30		R-7
	I0082	MAXX31	4		tmath31		R-9
	I0083	MAXX32	3		tmath32		S-2
	I0084	MAXX34	3		tmath34		V-3
	I0085	MAXX35	3		tmath35		
	I0086	MAXX36	3		tmath36		
	I0087	MAXX37	3		tmath37		
	I0088	MAXX38	3		tmath38		
	I0089	MAXX39	2		tmath39		
	I0090	MAXX40	3		tmath40		
	I0091	MAXX41	3		tmath41		

Appendix H

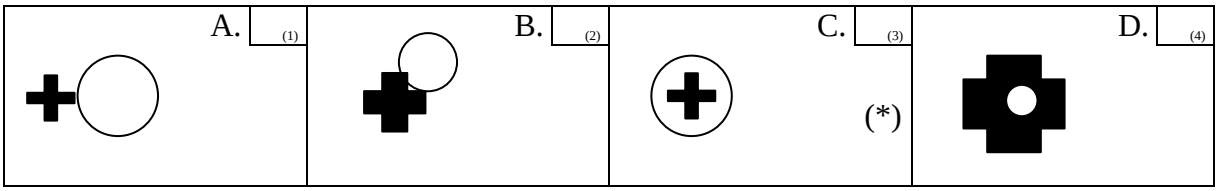
Example Test Items for Each Level of Competence in Reading

Level 1: Pre Reading (Linked with Level 1 in the Test Blueprint)
(a) Skills: Matches words and pictures involving concrete concepts and everyday objects. Follows short simple written instructions.
(b) Example Test Items

- locate familiar words in a short (one line) text
- match words to pictures
- follow short and familiar instructions

In the questions on this page, choose the diagram that matches the word or sentences.

2. This cross is inside the circle.



Source: SACMEQ II Pupil Test.

Rasch Difficulty: -1.895

Comment: In this item the pupil needs to match the words "cross" and "circle" with the two items in each diagram – and then match the word "inside" with the diagram that illustrates the meaning of the word.

Appendix H (Ctd.)

Level 2: Emergent Reading (Linked with Level 2 in the Test Blueprint)

(a) Skills: **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 on.**

(b) Example Test Items

- read familiar words and identify some new words
- use simple and familiar prepositions and verbs to interpret new words
- match words and very simple phrases

The Indian Tailor Bird

One of the most interesting birds I have seen is the Indian Tailor Bird. It is a small olive green bird that doesn't look at all unusual, yet it has a most unusual way of making its nest. The birds work together in pairs. First they find a leaf, the right size, and make holes along the edges with their beaks. Through these holes they thread grass. One bird pushes the thread from the outside, while the other bird sits in the nest and pushes it back until the edges of the leaf are sewn together to make a kind of bag, still hanging on the tree, in which the Tailor Bird lays its eggs.

50. What does the Tailor Bird use in place of thread?

A. ☐ (1) Grass (*)

B. ☐ (2) String

C. ☐ (3) Spider web

D. ☐ (4) Thorns

Source: SACMEQ II Pupil Test and SACMEQ II Teacher Test.

Rasch Difficulty: -1.634

Comment: In this item the words "thread" and "grass" are adjacent in both the question and in the text. The pupil needs to match a word in the question to a word in the text and then use the text immediately adjacent to it by reading on - but only within a very restricted range of text. The skill involved is essentially a word matching skill.

Appendix H (Ctd.)

Level 3: Basic Reading (Linked with Level 3 in the Test Blueprint)

(a) Skills: Interprets meaning (by matching words and phrases, completing a sentence, or matching adjacent words) in a short and simple text by reading on or reading back.

(b) Example Test Items

- use context and simple sentence structure to match words and short phrases
- use phrases within sentences as units of meaning
- locate adjacent words and information in a sentence

The Bird And The Elephant

A large tree grew in the middle of the jungle. At the top, a small bird had made a nest for her family of three baby birds. One day, an elephant came by. He leaned against the trunk, and scratched his back. The tree started to crack and sway. The baby birds, full of fear, huddled against their mother. She stuck the tip of her beak out of the nest, and said: "Hey, big animal, there are many trees around here! Why shake this one? My children are afraid, and could fall out of their nest."

The elephant said nothing, but he looked at the bird with his small eye, flapped his large ears in the wind, and left.

The next day, the elephant returned and scratched against the trunk once more. The tree began to sway. The frightened baby birds once again huddled against their mother's wings. Now Mother Bird was angry. "I order you to stop shaking our tree," she cried, "or I will teach you a lesson!"

"What could you do to a giant like me?" laughed the elephant. "If I wanted to, I could give such a push to this tree that your nest and your children would be flung far and wide."

The mother bird said nothing.

The next day, the elephant returned and scratched again. Quick as a flash, the mother bird flew into one of the elephant's enormous ears, and there, tickled the elephant by scratching him with her feet. The elephant shook his head … nothing happened. So he begged the bird to leave and promised to stop scratching against the trunk.

The bird then left the elephant's ear and returned to her nest, beside her children.

Never again did the elephant return to scratch his back.

45. Where exactly did the large tree grow?

A. ☐ (1) In the thick jungle

B. ☐ (2) In the forest

C. ☐ (3) In the middle of the jungle (*)

D. ☐ In the garden

Source: SACMEQ II Pupil Test.

Rasch Difficulty: -1.049

Comment: This item is similar to those in the previous level - but in this instance the pupil needs to first match phrases, and then locate the adjacent phrase by reading on in the text.

Appendix H (Ctd.)

Level 4: Reading for Meaning (Linked with Level 4 in the Test Blueprint)
(a) Skills: Reads on or reads back in order to link and interpret information located in various parts of the text.
(b) Example Test Items

- interpret sentence and paragraph level texts
- match phrases across sentences
- read forwards and backwards in order to locate information in longer texts

Grandpa

Once upon a time, there was a very old man. His eyes had become weak. His ears were deaf, and his knees would shake. When he sat at the table, he was hardly able to hold the spoon. He spilled soup on the tablecloth, and he often slobbered.

He lived with his son and daughter-in-law. They also had a small boy who was four years old, so the old man was a grandfather.

His son and his son's wife found it disgusting to see him spilling food at the table. And so they finally ordered him to sit in a corner behind the stove. Here, they served him his food on a small earthenware plate. Now, Grandpa didn't even get enough to satisfy his hunger. He sat there feeling sad. He looked at the table, where the others were eating, and his eyes filled with tears.

Then, one day his shaking hands could not even hold the plate. It fell to the floor, and was broken into many pieces. The young wife scolded him. But the old grandfather said nothing. He just sighed. Then the young wife bought him a very cheap wooden bowl. Now he had to eat from that.

One day, while they were having dinner, the grandchild sat on the floor, and was very busy with some small pieces of wood.

"What are you doing?" asked his father.

"I am making a bowl," the boy answered.

"What is it for?"

"It is for my father and mother to eat from when I grow up."

The man and wife looked at each other for a long time. Then, they started crying. At once, they asked the old grandpa back to the table, and from then on he always ate with them. After that, even if he sometimes spilt his food, they never said a word about it.

54. How did grandfather feel when he sat by the stove?

A. ☐ (1) Bored.

B. ☐ (2) Tired.

C. ☐ (3) Pleased.

D. ☐ Unhappy (*)

Source: SACMEQ I Pupil Test

Rasch Difficulty: -0.544

Comment: In this item the pupil needs to be able to read on and read back once the key idea is located in the text. The pupil needs to read for meaning and then to link and interpret information from various parts of the text - not simply adjacent to the central idea of the task.

Appendix H (Ctd.)

Level 5: Interpretive Reading (Linked with Level 5 in the Test Blueprint)
(a) Skills: Reads on and reads back 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 contextualizes meaning.
(b) Example Test Items

- locate, interpret, and read forward to join two pieces of adjacent information
- use multiple pieces of information to interpret general purpose of a document
- paraphrase and interpret a single non-adjacent piece of information

Read the following passage and then answer the questions below.

What Is Quicksand?

Quicksand is a special kind of sand. Quicksand can swallow a pig, or a human, or an elephant.

Quicksand often looks like plain wet sand. But it is really soupy sand with so much water between the grains that you can't stand on it.

If you step onto quicksand, you will slowly sink up to your knees. If you thrash and squirm, you will sink deeper and deeper. But, if you lie flat on your back with your arms stretched out, you can float on the sand, as you can float in water.

Watch out for quicksand on sand bars, on the bottom of streams, or along sandy seacoasts.

You can test for quicksand by poking it with a long stick or pole. If the sand shakes and quakes, don't try to walk on it! It may be quicksand.

10. What is the main purpose of the passage?

A. ☐ (1) ***To tell people how to avoid the dangers of quicksand. (*)***

B. ☐ (2) ***To encourage people to protect the beauty of nature.***

C. ☐ (3) ***To describe how people and animals have been swallowed by quicksand.***

D. ☐ (4) ***To explain how quicksand got its name.***

Source: SACMEQ I Pupil Test and SACMEQ II Teacher Test.

Rasch Difficulty: 0.073

Comment: The pupils need to read on and read back in order to combine and interpret information from different parts of the text – and then use this to interpret the general purpose of the document.

Appendix H (Ctd.)

Level 6: Inferential Reading (Linked with Level 5 in the Test Blueprint)
(a) Skills: Reads on and reads back through longer texts (narrative, document or expository) in order to combine information from various parts of the text so as to infer the writer's purpose.
(b) Example Test Items

- **i**nterpret, and make inferences from, different types of texts by reading backwards and forwards to confirm links between widely separated information pieces
- extract information from a non-traditional (left to right) document
- make judgments about an author's intentions or purpose beyond the text content

Photography

Read the comic strip and then answer the questions below.

72. Why should you take the lens cap off?

A. ☐ (1) To let a lot of light into the camera.

B. ☐ (2) So that it doesn't get in the way of the aperture. (*)

C. ☐ (3) To move the camera closer to you.

D. ☐ So the camera will be quiet.

Source: SACMEQ II Pupil Test.

Rasch Difficulty: 0.453

Comment: The pupil needs to examine and interpret information related to different pictures and words in a non-traditional (comic strip) instructional document, and then make a judgement about the purpose of a particular instruction made by the author.

Appendix H (Ctd.)

Level 7: Analytical Reading (Linked with Level 5 in the Test Blueprint)
(a) Skills: locates information in longer texts (narrative, document or expository) by reading on and reading back 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).
(b) Example Test Items

- combine several pieces of information from a range of locations in complex and lexically dense text or documents
- analyse detailed text or extended documents for an underlying message
- identify meaning from different styles of writing

Vacancy

Read the following advertisement and then answer the questions below.

Vacancy - Job opportunity
Post - Clerical Assistant

A vacancy exists for the post of a clerical assistant in a large farm located in Mbwewe.

Qualifications:

The applicant,

- Should be a female of between 20 and 25 years of age;
- Must have successfully completed Primary 6;
- Should be fluent in either of the following languages: Kiswahili, English, or Portuguese;
- She must have a minimum work experience of three years in clerical duties.

Application should be sent to:
The General Manager
Mbwewe Farm
P.O. Box 70
Mbwewe

The deadline for application is 15 October 1999.

50. The job opportunity is for …

A. (1) a female clerk.

B. (2) the general manager.

C. (3) a large pineapple farm.

D. (4) a clerical assistant. (*)

Source: SACMEQ II Teacher Test.

Rasch Difficulty: 1.348

Comment: In this item the pupil needs to read on and read back in order to combine information from various parts of a document, and then to decide upon the kind of person that the writer has in mind for the position.

Appendix H (Ctd.)

Level 8: Critical Reading (A New Level Generated from the Skills Audit)
(a) Skills: Locates information in a longer texts (narrative, document or expository) by reading on and reading back 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).
(b) Example Test Items

- use text structure and organisation to identify an author's assumptions and purposes
- identify an author's motives, biases, beliefs in order to understand the main theme
- link text to establish multiple meanings including analogy and allegory

Effective Thinking

Effective thinking, while starting with logic, goes further so as to include broad mental skills. It includes the understanding of complex and fluid situations, in dealing with which logical methods are inadequate as mental tools. Of course, thinking must never violate the rules of logic, but it may use techniques beyond those of exact mathematical reasoning. In the fields of social study and history, and in the problems of daily life, there are large areas where evidence is incomplete and may never be completed. Sometimes the evidence may also be untrustworthy; but if the situation is practical, a decision must be made. The scientist has been habituated to deal with properties which can be abstracted from their total background and with variables which are few and well defined. Consequently, where the facts are unique and unpredictable, where the variables are numerous and their interactions too complicated for precise calculation, the scientist is apt to throw up his hands in despair and perhaps turn the situation over to the sentimentalists or the mystics. But surely he would be wrong to ignore both this type of problem and this type of thinking; for the methods of logical thinking do not exhaust the resources of reason. In coping with complex and fluid situations we need thinking which is relational and which searches for cross bearings between areas; this is thinking in a context. By its use it is possible to reach an understanding of historical and social materials and of human relations, although not with the same degree of precision as in the case of simpler materials and recurring events. As Aristotle says, "It is the mark of an educated man to expect no more exactness than the subject permits."

46. The author believes scientists should widen their field of work by undertaking problems that are …

A. ☐ (1) less specific and less precise. (*)
B. ☐ (2) more exact.
C. ☐ (3) more abstract.
D. ☐ (4) less complex and fluid.

Source: SACMEQ II Teacher Test

Rasch Difficulty: 3.372

Comment: In this task the pupil needs to read through the entire passage, to locate information relevant to scientists' thinking processes, and to distinguish this from alternative thinking styles. Then the pupil needs to identify the beliefs of the author by inference.

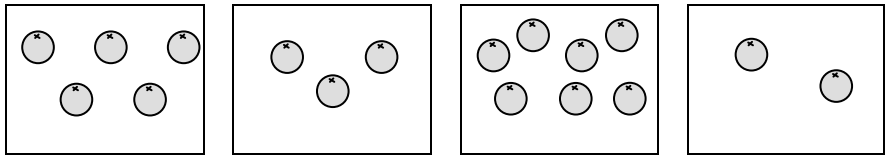
Appendix I

Example Test Items for Each Level of Competence in Mathematics

Level 1: Pre Numeracy (Linked with Level 1 in the Test Blueprint)
(a) Skills: Applies single step addition or subtraction operations. Recognizes simple shapes. Matches numbers and pictures. Counts in whole numbers.
(b) Example Test Items

- count illustrated objects
- recognise basic numbers and shapes
- carry out simple single operations of addition and subtraction

1. Which box has 7 oranges? Tick the correct box.



A. ☐ (1) B. ☐ (2) C. ☐ (3) (*) D. ☐ (4)

3. 73 + 27 =

A. ☐ (1) 46
B. ☐ (2) 90
C. ☐ (3) 100 (*)
D. ☐ (4) 110

Source: Both from SACMEQ II Pupil Test.

Rasch Difficulty: -4.584 and -2.717

Comment: In the first item the pupil needs to match the numeral with the picture representing the same number. This skill represents the ability to count and recognise numerical representations. In the second item the pupil needs to demonstrate the ability to perform a simple single arithmetic operation.

Appendix I (Ctd.)

Level 2: Emergent Numeracy (Linked with Level 1 in the Test Blueprint)
(a) Skills: 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.
(b) Example Test Items

- link simple verbal, graphic, and number forms with single arithmetic operations on whole numbers up to four digits
- recognise common shapes or figures in two dimensions
- estimate accurately lengths of simple shapes

4. Subtract …

$$\begin{array}{rr} & 6{,}000 \\ - & 2{,}369 \\ \hline & \\ \hline \end{array}$$

A. [ ] (1) 3,531
B. [ ] (2) 3,631 (*)
C. [ ] (3) 3,742
D. [ ] (4) 4,369

Source: SACMEQ II Pupil Test and SACMEQ II Teacher Test.

Rasch Difficulty: -2.043

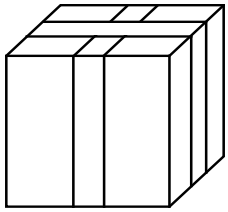
Comment: The pupil needs to perform the task of subtraction - with carrying.

Appendix I (Ctd.)

Level 3: Basic Numeracy (Linked with Level 2 in the Test Blueprint)
(a) Skills: 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.
(b) Example Test Items

- recognise three-dimensional shapes and number units
- use a single arithmetic operation in two or more steps
- convert in single step units using division

40. What shape is this present?



A. ☐ (1) sphere
B. ☐ (2) cube (*)
C. ☐ (3) cylinder
D. ☐ pyramid

Source: SACMEQ II Pupil Test.

Rasch Difficulty: -1.26

Comment: The pupil needs to know the names of 3 dimensional regular shaped objects, and then to be able to link them to everyday objects (for example, gifts).

Appendix I (Ctd.)

Level 4: Beginning Numeracy (Linked with Level 3 in the Test Blueprint)
(a) Skills: 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.
(b) Example Test Items

- convert units in two steps and count tabulated data
- analyse a visual prompt and interpret triangular shapes
- translate verbal to arithmetic form using two operations on fractions

11. A cake was shared among four pupils as follows: John gets $\frac{1}{2}$, Peter gets $\frac{1}{8}$, Sarah gets $\frac{1}{4}$ and Janet gets $\frac{1}{16}$. Who gets the largest share?

A. ☐ (1) ***John (*)***
B. ☐ (2) ***Janet***
C. ☐ (3) ***Sarah***
D. ☐ (4) ***Peter***

Source: SACMEQ II Pupil Test

Rasch Difficulty: -0.356

Comment: The pupil needs to translate the verbal description of a problem into an arithmetic problem – and then use several operations with fractions to obtain an answer.

Appendix I (Ctd.)

Level 5: Competent Numeracy (Linked with Level 3 in the Test Blueprint)
(a) Skills: 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 measurement and/or whole and mixed numbers. Converts basic measurement units from one level of measurement to another (for example, metres to centimetres).
(b) Example Test Items

- convert basic measurement units
- understand the order of magnitude of simple fractions
- conduct multiple steps with a range of basic operations in a strict sequence using an analysis of a short verbal or visual prompt

37. On a trip a bus driver keeps a record of how far he travels each day and the time taken. Here is the first part of his record. How far did the driver most likely travel on Day 3?

Day	Distance travelled (km)	Time taken (hours)
1	42	6
2	63	9
3		8
4	49	7

A. ☐ (1) 23 km
B. ☐ (2) 56 km (*)
C. ☐ (3) 64 km
D. ☐ (4) 84 km

Source: SACMEQ II Pupil Test and SACMEQ II Teacher Test.

Rasch Difficulty: -0.024

Comment: The pupil needs to translate tabular information into an arithmetic form and then solve the problem using multiple steps and multiple arithmetic operations in the correct sequence.

Appendix I (Ctd.)

Level 6: Mathematically Skilled (Linked with Level 4 in the Test Blueprint)
(a) Skills: 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).
(b) Example Test Items

- perform complex and detailed mathematical tasks (involving considerable abstraction of verbal, visual, and tabular information into symbolic forms and algebraic solutions) using knowledge not supplied with the task
- use of an extended verbal or graphic prompt (involving an analysis of steps) to identify the correct sequence of calculations
- convert, and operate on, units of measurement (time, distance, and weight)

The chart below shows some temperature readings made at different times on four days. Use the chart to answer questions 47 to 50.

	6 a.m.	9 a.m.	12 noon	3 p.m.	8 p.m.
Monday	15°C	17°C	20°C	21°C	19°C
Tuesday	15°C	15°C	15°C	10°C	9°C
Wednesday	8°C	10°C	14°C	13°C	15°C
Thursday	8°C	11°C	14°C	17°C	20°C

49. What was the average temperature on Wednesday?

A. ☐ (1) 12° C (*)
B. ☐ (2) 13° C
C. ☐ (3) 14° C
D. ☐ (4) 15° C

Source: SACMEQ II Pupil Test.

Rasch Difficulty: 0.710

Comment: The pupil needs to identify appropriate information expressed as temperatures in tabular form, and then to convert this into numbers, and then translate these into an arithmetic form in order to solve a problem.

Appendix I (Ctd.)

Level 7: Concrete Problem Solving (Linked with Level 5 in the Test Blueprint)
(a) Skills: Extracts and converts (for example, with respect to measurement units) information from tables, charts, visual and symbolic presentations in order to identify, and then solves multi-step problems.
(b) Example Test Items

- use multiple verbal order of steps with conversion of time units
- translate verbal to arithmetic form, apply units conversion with long division
- convert from mixed number fractions to decimals

24. The table shows the values of ***x*** and ***y***, where ***x*** is proportional to ***y***. What are the values of ***P*** and ***Q***?

x	3	6	**P**
y	7	**Q**	35

A. ☐ (1) ***P***=15 and ***Q***=14 (*)
B. ☐ (2) ***P***=14 and ***Q***=31
C. ☐ (3) ***P***=10 and ***Q***=14
D. ☐ (4) ***P***=14 and ***Q***=15

Source: SACMEQ II Teacher Test.

Rasch Difficulty: 1.573

Comment: The pupil needs to extract information from several places in a table of figures and then apply proportionate calculations in order to solve a multi-step problem involving fractions and conversions into whole numbers.

Appendix I (Ctd.)

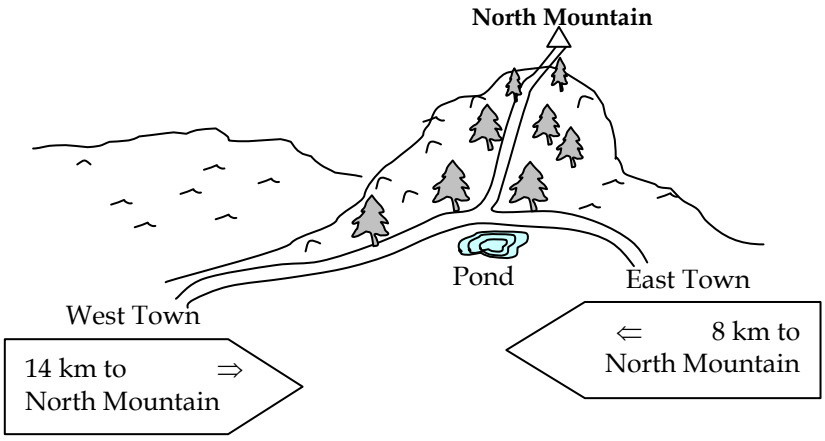
Level 8: Abstract Problem Solving (A New Level Generated from the Skills Audit)

(a) Skills: Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information, and then translate this into symbolic, algebraic, or equation form in order to solve the problem.

(b) Example Test Items

- identify the nature of a problem, translate the information given into a mathematical approach, and then identify the correct mathematical strategies to obtain a solution a solution

35. There are two ways to go to North Mountain. One is from East Town and the other is from West Town. The distance from East Town to the pond in the map below is $\frac{1}{3}$ of the distance from West Town to the pond. What is the distance from West Town to the pond?



A. (1) 7 km

B. (2) 8 km

C. (3) 9 km (*)

D. (4) 10 km

Source: SACMEQ II Teachers Test.

Rasch Difficulty: 1.934

Comment: The pupil needs to translate the information given into a form of mathematical thinking and then search for a solution strategy. The pupil needs to link the unknown distances to variables and then solve simultaneous equations. The key skills are the identification of the problem, its translation into a symbolic form, and the solution of the equations.

Chapter 3:

The pupils and their learning environment

Introduction

This chapter presents and discusses data related to the personal characteristics of pupils, and also examines various aspects of their home and school environments that could have impact upon learning outcomes.

These data provide a context for analyses presented later in this report. They also provide baseline information" - so that when Swaziland undertakes a similar Grade 6 study in future it will be possible to compare changes over time.

Note on the interpretation of the data

Before presenting the results, two points should be stressed. The first is that the variables presented in this chapter and later chapters represent a small subset of a larger number of variables for which data were collected. At some later stage the Ministry will prepare a separate publication containing statistics for all variables in the study.

The second point is that it is very important to interpret each statistic in association with its sampling error. It will be recalled from the previous chapter that the sample was drawn in order to yield standard errors of sampling for pupils in Grade 6 in Swaziland, such that a sample estimate of a population percentage would have a standard error of 2.5 percent. For this level of sampling accuracy we can be sure 19 times out of 20 that the population value of a percentage lies within plus or minus 5 percent of the estimate derived from the sample. This is the same level of accuracy as would be expected from a simple random sample of 400 pupils. The sampling errors for means are also given in the tables; the aim was also to have standard errors that were equal to or less than a simple random sample of 400 pupils.

Where a percentage or a mean is presented for a sub-group of pupils (such as for districts) then the standard error will be greater than for the sample as a whole. This occurs, in part, because the sample sizes for sub-groups are smaller than the total sample size. Had

smaller standard errors for districts been required, this would have increased the size of the total sample and also of the budget required to undertake a much larger field data collection.

For example, consider the first column of entries in Table 3.1. The average age of pupils in months at the time of data collection is presented separately for each district and for Swaziland overall. The standard error (SE) of each average is also presented. For the first district, Hhohho, the average Grade 6 pupil's age was 166.6 months at the time of data collection, and the standard error for this estimate was 1.37 months. That is, there were 19 chances in 20 that the average age of the population of Grade 6 pupils in the Hhohho district was 166.6, plus or minus 2 X (1.37). In other words we can be 95 percent confident that the population value for age in Hhohho district was between 163.9 months and 169.3 months.

It is important to note that the value of the standard error for each estimate changed from district to district. The variation was caused by two main factors: differences in the distribution of pupils among schools within districts, and the structure of the sample design within each district. The smallest standard error of 0.60 months occurred for the sample estimate of average age for the whole population of Grade 6 pupils in Swaziland. This result was to be expected because overall sample estimates were based on a much larger sample of schools and pupils than the corresponding estimate for any single district.

In interpreting the values in Table 3.1 and other tables throughout this report, it is important to remember that the percentages and means are presented in terms of pupils. That is, pupils are the units of analysis - even though some variables in this report refer to teachers or schools. Where a percentage for a variable that described teachers is presented, this percentage should be interpreted as "the stated percentage of pupils were in schools with teachers having the particular characteristic". Similarly, a percentage for a variable that describes schools should be interpreted as "the stated percentages of pupils were in schools with the particular characteristic".

Note on the presentation of results

In Chapter 2 detailed information was presented to describe the method used to identify 20 "General Policy Concerns" of decision makers and then link these with seventy-five "Specific Research Questions" and "Dummy (blank) Tables".

In Chapters 3 to 7, the discussion of research results has been presented by employing each "general policy concern" as a major heading of the research results and the "Specific Research Questions" as guidelines for the preparation of minor headings.

General policy concern 1:
What were the personal characteristics and home background characteristics of Grade 6 pupils that might have implications for monitoring equity, and/or that might impact upon teaching and learning?

(a) Age and Gender of Grade 6 Pupils

According to the Ministry's guidelines all children should be 6 years old by the time they enter primary education. However, it has been a challenge for the both the Ministry and parents to describe specifically what age 6 means. For example, does it mean a child who is 6 years or older in January, or a child who will be 6 during the first school term, or a child who has reached age 6 on the first day of school. These grey areas have often resulted in some children entering school after 6 years, thus slightly over-aged. Some have even managed to enter school under-aged. The study explored the ages of average grade 6 pupils with the assumption that a normal child who entered the system aged 6 years should have been 139 months on the day of the data collection for the study.

Table 3.1: Means, percentages, and sampling errors for the pupils' age, sex, and home-related characteristics

District	Age (months)		Sex (female)		Books at home (number)		Possessions at home (index)		Meals (index)		Parent education (index)	
	Mean	SE	%	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Hhohho	166.6	1.37	47.1	1.11	26.1	4.50	5.8	0.29	10.9	0.20	7.0	0.27
Lubombo	167.9	0.99	53.8	2.04	20.1	2.74	5.7	0.28	10.9	0.13	7.0	0.21
Manzini	165.2	1.11	53.3	2.11	16.1	2.14	6.1	0.28	11.1	0.10	7.7	0.22
Shiselweni	166.3	1.16	53.6	1.45	13.1	1.33	5.0	0.21	10.9	0.13	6.9	0.21
Swaziland	166.4	0.60	51.6	0.86	19.1	1.62	5.7	0.14	11.0	0.07	7.2	0.12

The first column of figures in Table 3.1 shows that the mean age for the average Grade 6 pupil in 2000 was 166.4 months. If all pupils entered school at the official age of 6 years and there had been no grade repeating, then their average ages would have been 139 months when the data were collected. From the figures presented in the table, the average Grade 6 pupil in Swaziland was over-aged by 27.4 monthsthat is, by more than two years. Another feature of these figures was the wide range of ages – with many over-aged and under-aged pupils. A more detailed analysis shows that the youngest pupil was 119 months (almost 2 years underage) whilst the oldest was 258 months (almost ten years over aged). Analysis of average age by gender showed that male pupils tended to be of a higher average age – with the average boy being aged 171.0 months and the average girl only 162.1 months. That is, the average boy was 32 months over-aged – or two and half years. The higher average age of boys could have been caused by the fact that boys were more likely to repeat at primary school level than girls.

In Swaziland many children start school later than the age of 6 because of parental decisions based on:

(i) **Distance to s school**. Parents were often concerned about whether their children were old enough to cope with walking long distances to school. This was particularly true in the Lubombo district where some of the communities were isolated by big farms, and therefore pupils had to either walk for long distances around the farms or take buses to school. In Lubombo many roads are situated on farmland and many communities live just behind the farms – with the result that they often do not have good access to transport.

(ii) **Feeding programmes**. Not all primary schools in Swaziland offered feeding programmes and many poor parents could not afford a lunch box for their children every day. These families were often reluctant to send their children to school when it was likely that they would be hungry during the school day. In addition, the Lubombo and Shiselweni districts were prone to annual drought and food shortages, and therefore sending a young, hungry child to school might have been a risk that parents did not want to take.

(iii) **Financial problems**. Not all parents had enough money to ensure that their children could always attend school. In some cases families needed to wait for the harvest in order to sell enough produce to obtain money for school fees.

Policy suggestion 3.1 The Research and Planning Unit should establish a school mapping programme that will seek to reduce the distances between pupils' homes and their schools – especially in areas where there are many over-aged pupils.

(b) Gender distribution of Grade 6 pupils

The second set of information in Table 3.1 describes the percentage of females amongst the Grade 6 pupils. The national level of 51.6 percent girls indicates a fairly equal representation of both girls and boys for the three districts. However, the representation of girls in Hhohho was 4.5 percent below this national figure.

Policy suggestion 3.2 The Research and Planning Unit should speak with school heads in the Hhohho district and also examine the school census information in order to explain why the participation of female pupils in this district was so low.

(c) Socio-economic profile of pupils' homes

The study looked at various elements. One concerned the wealth of the home in monetary terms. It was impossible to obtain valid data from children about what parents earn because most Swazi rural parents were in some kind of self-employment or were subsistence farmers. As such, payment may not be monetary, but in kind such as food and livestock. Therefore a proxy, or indirect method, of assessing the wealth of a home had to be used. One approach designed for this study was to assess the wealth of a pupil's home by examining home possessions. A second approach was to characterise the intellectual milieu by the education of the parents and the number of books in the home.

(i) Number of possessions in pupils' homes.

The fourth set of figures presented in Table 3.1 is the number of possessions that pupils stated were in their homes. The pupil questionnaire asked about thirteen possessions that they might possess at home: daily newspaper, weekly or monthly magazine, radio, television set, video cassette recorder, cassette player, telephone, car, motorcycle, bicycle, piped water, electricity (mains, generator, solar), and a table to write on. The number of possessions in the home was summed for each pupil. The lowest score possible was zero and the highest was thirteen. The average possession level for Swaziland overall was 5.7 possessions.

There was only a small degree of variation among the districts. The lowest average was 5.0 possessions in Shiselweni, and the highest was 5.8 possessions in Hhohho. It should be noted here that several of the possessions referred to items \requiring access to electricity – which is available in urban areas but often not in rural ones. Thus the degree of access to possessions tended to be influenced both by the wealth of the families and the location of their homes.

(ii) Parents' level of education

The pupil questionnaire asked about the educational level of the parents. This information was coded as follows: 1=no school, 2=some primary, 3=completed primary, 4=some secondary, 5=completed secondary and 6=post-secondary. The answers for each Grade 6 pupil's mother and father were then added together and it was this index that was used to generate the information in Table 3.1. The national average for Swaziland was 7.2, and the highest district average was 7.7 for Manzini district. This result was expected since Manzini is the commercial and industrial centre of the country.

(iii) Number of books in the home where the pupil lives

The third set of figures in Table 3.1 indicates that the average Grade 6 Swazi pupil lives in a home with around 19 books. There were major differences across the districts – varying from a low of 13.1 books in Shiselweni to a high of 26.1 books in Hhohho. This difference probably reflects the fact that Hhohho is wealthier and more urban than Shiselweni, which is a largely rural district. Given importance of reading at home for pupils to perform well in school (Elley, 1992), it was disappointing to learn that there were so few books in homes in Swaziland.

The Ministry should try to overcome this deficit by ensuring that children can take school library books home to read. One solution would be for the Ministry to provide mobile libraries that visit villages - especially isolated homesteads - at least once per month. To achieve this outcome the Ministry would need to strengthen its cooperation with the National Library Services and Fundza, a non-governmental Organization that supplies learning resource centres with reading material to ensure that children in all parts of the country have access to books.

Policy Suggestion 3.3 The National Library and Fundza should cooperate to ensure that there is equitable distribution of learning resource centres throughout the country, especially in rural primary schools.

(d) Regularity of meals

There have been studies (for example, Pollitt, 1990) that have documented the relationships between children's nutritional status and school indicators such as age at enrolment, absenteeism, achievement, and concentration in the classroom. In this study the pupils were asked about pupils having a morning, a midday, and an evening meal, and how many times a week they ate each meal. A score of 3 meant that they did not eat at all, while a score of 12 indicated that they ate every meal each day.

The average national score of 11 indicated that the average pupil ate most meals, however it did not indicate the quality of the meal and how satisfying it was. There was almost no variation in this measure across the districts.

(e) Residence during the school week

Parental involvement in their child's education may be influenced by whether or not children stay with their parents during the school week. With the emerging HIV/AIDS crisis, some children have found themselves living alone or with relatives, and this might have an impact on the support they get at home.

The figures presented in Table 3.2 indicate that the majority of Grade 6 pupils (85.2%) stay with their parents or guardians during the school week. A small number of pupils (12.0%) live with relatives. Very few stay in school hostels or by themselves or with other children.

Table 3.2: Place where pupils stay during the school week

District	Place where pupils stay during the school week							
	Parent/Guardian		Relatives/Family		Hostel/Board		Self/Children	
	%	SE	%	SE	%	SE	%	SE
Hhohho	88.2	1.64	9.9	1.43	0.3	0.19	1.6	1.00
Lubombo	84.2	2.12	12.7	1.49	0.4	0.22	2.7	1.16
Manzini	84.0	1.67	13.8	1.64	0.2	0.16	2.1	0.60
Shiselweni	83.6	1.81	12.0	1.70	2.5	1.44	2.0	0.72
Swaziland	85.2	0.88	12.0	0.78	0.8	0.37	2.0	0.43

General policy concern 2:
What were the school context factors experienced by Grade 6 pupils that might impact upon teaching/learning and the general functioning of schools?

(a) Location of primary schools

The Ministry's Research and Planning Unit has a school map system that has operated with assistance from the Ministry of Natural Resources. However, school mapping as a planning principle has never been effectively applied in systematic fashion across the whole country.

The percentages of pupils in schools that their school heads describe as being in an "urban" area are presented in Table 3.3. There were large variations between districts with 41.6 percent of pupils located in "urban" settings in Manzini, and only 15.6 percent of the pupils located in "urban" settings in Shiselweni.

The SACMEQ II Project created an index by measuring the average distance to social service centres such as clinics, post office and secondary schools. This was to give an indicator of how isolated the schools were. In Table 3.3 it may be seen that the average distance to social service centres nationally was 18.9 km, and there was a major difference between the urban districts and rural areas. This distance was more

than 22 km for the more rural Lubombo and Shiselweni districts, whilst in the more urbanised districts of Hhohho and Manzini it was only about 15km.

Policy Suggestion 3.4 The Research and Planning Unit in collaboration with the Principal Secretary should monitor and coordinate the opening of new schools in consultation with the District Education Offices and the National Regional Development Teams, to ensure that the distances between schools and other social services are reasonable that is, within a 5 km radius.

Table 3.3: School location and average travelling distance

District	SACMEQ II			
	Urban		Distance (km)	
	%	SE	Mean	SE
Hhohho	30.7	7.31	15.6	1.72
Lubombo	27.2	8.27	22.3	4.65
Manzini	41.6	8.27	15.1	2.40
Shiselweni	15.6	6.00	24.8	5.43
Swaziland	29.5	3.86	18.9	1.80

(b) Language at home

The official languages in Swaziland are English and Siswati, but most instruction at Grade 6 level is in English. Although there has been no major study in the country to explore the relationship between the educational level of parents and speaking English at home, it has been an accepted fact that families where the parents are educated do speak English more often in their homes.

The information presented in Table 3.4 shows that 63.8 percent of Grade 6 pupils speak some English at home. There is very little variation in the percentages speaking English across three districts: Hhohho (66.0%), Lubombo (67.8%), and Manzini (65.6%). However the figure for Shiselweni is considerably lower (55.5%).

Table 3.4: Percentages, means, and sampling errors for pupil language, days absent, and repetition

District	Speak English		Days absent		Repetition	
	%	SE	Mean	SE	%	SE
Hhohho	66.0	3.85	0.8	0.10	55.2	3.21
Lubombo	67.8	3.95	0.8	0.08	59.9	2.66
Manzini	65.6	4.85	1.0	0.13	64.0	2.63
Shiselweni	55.5	4.46	0.6	0.07	58.6	2.28
Swaziland	63.8	2.14	0.8	0.05	59.3	1.39

(c) Pupil absenteeism

The pupils were asked to indicate the number of days they were absent during the month prior to the data collection. This information was validated during the data collection by comparing pupil responses with class registers. It was clear from the figures in Table 3.4 that there were no serious problems with absenteeism at either the national level or district levels.

Table 3.5: Percentages and sampling errors for reasons of pupils absenteeism

District	Illness		Family reasons		Fees		Work	
	%	SE	%	SE	%	SE	%	SE
Hhohho	19.0	2.08	3.6	0.79	5.9	1.47	1.8	0.56
Lubombo	18.7	1.97	3.6	1.04	5.0	1.06	4.1	0.95
Manzini	21.9	3.16	4.3	0.75	5.3	1.29	4.0	1.01
Shiselweni	18.2	2.63	8.3	2.14	2.5	0.68	0.7	0.35
Swaziland	19.5	1.29	4.9	0.67	4.8	0.61	2.6	0.39

The study also investigated the reasons why the pupils were absent. Information about this is given in Table 3.5. About a fifth of the Grade 6 pupils claimed to have been absent due to illness. Further research is required to explore the specific nature of these illnesses so as to check whether the illnesses were simple problems such as a common cold, or whether they were something more serious that might need urgent attention by the government. A small percentage of the pupils were absent due to

family reasons (4.9%), school fees (4.8%), and work (2.6%). The percentage of pupils excluded because of fees was small – but this is a concern because no children should be excluded from school because of poverty.

Policy Suggestion 3.5 The School Health Programme, in conjunction with school nurses from the Ministry of Health and Social Welfare who are attached to the Ministry of Education, should strengthen the health monitoring aspects of their service – especially with respect to illnesses that could provide warning signs of the spread of HIV/AIDS.

(d) Grade repetition

Although Swaziland does not have a serious problem with absenteeism at Grade 6 level, it has a surprisingly high repetition rate. The information presented in Table 3.4 shows that at national level 59.3 percent of Grade 6 pupils have repeated at least one grade. Grade repetition was is highest in Manzini district where 64 percent of Grade 6 pupils have repeated at least one grade. The result for Manzini is very surprising because it is mostly an urban setting, and thus internal efficiency was expected to be higher than in the Lubombo and Shiselweni districts that are known to serve poorer communities.

Policy Suggestion 3.6 The Manzini District Education Office should conduct a study to explore why there is so much grade repetition in its primary schools.

(e) Homework given and corrected

Giving homework is part of the normal teaching/learning process and most educators would argue that it is also important that pupils be given homework that is marked and then returned to them. In Swaziland the Ministry encourages having parents or guardians sign that homework has been completed at home. This simple strategy is known to be very effective in encouraging parents to take more interest in their own child's schoolwork. The percentage of pupils with teachers who required parents to sign that they had completed their homework is presented in Table 3.6.

Table 3.6: Percentages and sampling errors of teachers asking parents to sign homework

District	Sign reading homework		Sign mathematics homework	
	%	SE	%	SE
Hhohho	15.3	6.02	15.2	5.72
Lubombo	1.9	1.89	23.1	8.86
Manzini	6.7	3.81	22.8	7.23
Shiselweni	9.0	4.70	11.4	5.48
Swaziland	8.8	2.34	18.0	3.39

The figures presented in Table 3.6 provide some surprising results. Only 8.8 percent and 18.0 percent of pupils had teachers who required their parents to sign their reading and mathematics homework, respectively. These very low figures show that not all teachers were adhering to the agreed policy of having parents and guardians sign that they had seen their children's homework.

Policy suggestion 3.7 The District Education Officers should inform school heads that it is Ministry policy for all teachers to require pupils to have their homework each time it is given.

Table 3.7: Percentages and sampling errors for the frequency of homework given most days

District	SACMEQ II			
	Reading homework		Mathematics homework	
	%	SE	%	SE
Hhohho	35.0	5.89	47.6	6.45
Lubombo	32.2	7.17	37.2	7.38
Manzini	27.1	5.50	45.4	6.20
Shiselweni	27.3	6.07	40.6	8.46
Swaziland	30.4	3.03	43.3	3.49

In Table 3.7 the percentages of Grade 6 pupils receiving regular (on most days) reading and mathematics homework is presented. The highest figures for both reading (35.0%) and mathematics (47.6%) homework were found in Hhohho; the lowest figures were found in Manzini (27.1%) in reading and Lubombo (37.2%) in mathematics. At the national level 30.4 percent of pupils and 43.3 percent of pupils received homework most days of the week for reading and mathematics, respectively. These results were generally very disappointing because all pupils at Grade 6 level should be receiving regular reading and mathematics homework.

Giving homework is but one aspect of the homework process. The study also looked at whether the teachers marked homework that was given. The results are given in Table 3.8.

Table 3.8: Percentages and sampling errors for the frequency of reading Homework being corrected by teacher

District	No homework given		Never corrected		Sometimes corrected		Mostly/always corrected	
	%	SE	%	SE	%	SE	%	SE
Hhohho	18.9	5.32	4.1	1.48	15.0	3.58	61.9	5.67
Lubombo	7.9	3.30	1.7	0.63	24.0	4.57	66.3	5.34
Manzini	14.4	4.91	2.1	0.69	24.8	5.21	58.8	5.96
Shiselweni	15.5	5.29	1.8	0.68	22.4	8.95	60.4	8.44
Swaziland	14.7	2.48	2.5	0.52	21.2	2.82	61.5	3.19

The figures presented in Table 3.8 suggest that a surprisingly high percentage, 14.7 percent, of the Grade 6 pupils were never given reading homework. In addition, 23.7 percent of the Grade 6 pupils indicated that their homework was either "never corrected" or "sometimes corrected". These figures were disappointing and it is clear that teachers in Swaziland need to be reminded of two points. First, to give regular homework and second, that it is important to correct the homework that is given.

Table 3.9: Percentages and sampling errors for the frequency of Mathematics Homework being corrected by teacher

Region	No homework given		Never corrected		Sometimes corrected		Mostly/always corrected	
	%	SE	%	SE	%	SE	%	SE
Hhohho	7.5	4.04	2.3	0.90	11.8	3.15	78.3	4.82
Lubombo	2.7	1.63	1.5	0.56	13.0	2.82	82.8	3.38
Manzini	3.2	1.89	2.1	0.91	21.6	4.13	73.1	4.56
Shiselweni	2.4	1.72	1.72	0.65	14.6	5.38	81.5	5.88
Swaziland	4.2	1.40	1.40	0.40	15.4	1.94	78.5	2.35

The situation for mathematics homework is presented in Table 3.9. Mathematics homework was "mostly" or "always" corrected for almost 80 percent of the Grade 6 pupils – a much better outcome than for reading.

The reasons for the differences in reading and mathematics results cannot be identified from the SACMEQ data, and therefore it would be useful to conduct a research study to identify why the above patterns have emerged. For example, it could be the case that lack of inspection at this Grade level might have contributed to laxity in teaching approaches. In this case there a need for the Chief Inspector (Primary) to empower school heads with inspection roles over the teachers. This could perhaps also be supported by more in-service courses for teachers at this level of education.

Policy Suggestion 3.8 The Research and Planning Unit should design and conduct a study in order to identify why pupils are not receiving regular homework, and why a large percentage of pupils do not have their reading homework corrected.

(f) Assistance with homework

The Grade 6 pupils were asked to indicate whether they received assistance at home with doing homework. The results are presented in Table 3.10. The figures are disappointing: they indicate that less than a third (31.2%) of Grade 6 pupils in Swaziland have someone at home who ensures that they do their homework. Further, only 21.7 percent pupils claim to have received help with homework and only 25.8 percent had someone to check their homework when it was done. These results may have occurred because less educated parents were less able to assist their children with homework tasks. For example, they might not have had the basic knowledge, or they could be working in demanding jobs that leave them too tired to assist their children after work. Nevertheless even less educated parents can be encouraged to show interest in their child's schooling and to ensure that all homework is completed.

Table 3.10: Home assistance with school related work

District	Home assistance 'most of the time' with school work					
	SACMEQ I I					
	Ensure homework done		Help with the homework		Look at school work done	
	%	SE	%	SE	%	SE
Hhohho	34.8	4.04	22.9	2.95	26.7	2.40
Lubombo	30.1	3.80	21.9	2.64	25.5	2.48
Manzini	29.8	1.94	22.4	2.41	25.7	2.47
Shiselweni	29.0	3.51	19.1	2.14	24.9	2.37
Swaziland	31.2	1.69	21.7	1.30	25.8	1.22

Policy Suggestion 3.9 School heads should be asked to communicate with pupils' parents in order to convey the importance of their showing interest in homework and making sure it is completed.

General policy concern 3:
Did Grade 6 pupils have sufficient access to classroom materials in order to participate fully in their lessons?

(a) Access to reading and mathematics textbooks

For the past decade Swaziland has been operating a book rental scheme aimed at ensuring that every pupil has a textbook for each lesson. Primary pupils are required to pay a rental fee of only 25 percent of the actual cost of the book, which remains government property. For several years the country boasted a 1:1 student to book ratio, however, in recent years, this achievement has been gradually eroded.

Table 3.11: Percentages and sampling errors for pupils having own reading textbook

District	SACMEQ II			
	Own reading textbook		Own mathematics textbook	
	%	SE	%	SE
Hhohho	77.6	4.55	85.1	4.30
Lubombo	67.6	6.54	66.2	6.89
Manzini	69.4	6.77	68.1	6.58
Shiselweni	81.5	4.74	76.7	10.32
Swaziland	74.3	2.87	74.7	3.40

The study gathered data on textbook availability and these are presented in Table 3.11. The figures indicate that almost three quarters of Grade 6 pupils had textbooks for reading and mathematics in 2000. However, what was shocking was "the other side of the coin" because this result implied that around 1 in 4 Grade 6 pupils did not have their own textbooks for the two subjects. For Manzini and Lubombo districts this figure rose to 1 in 3 pupils with no textbooks. The figures suggested that the book rental programme was not working quite as well as Ministry staff might have assumed. The lack of textbooks in the Manzini district was surprising, given that it was not one of those economically disadvantaged.. One possible explanation for the lack of textbooks might be distribution problems. Another possible explanation could be confusion related to the interpretation of "ownership" in the Swaziland context. That is, some pupils knew that the textbooks were rented and therefore could have claimed that they did not own the textbooks.

These results need to be looked at more closely with greater interest after the introduction of "free textbooks" for all primary school pupils beginning in 2001. It will be interesting to note any changes and the possible impact of this policy innovation.

Policy suggestion 3.10 The Research and Planning Unit should implement a research study to (a) find out why around one quarter of Grade 6 pupils reported that they did not have their own textbooks, and (b) provide baseline data for monitoring the impact of the Government's "free textbooks" programme

Policy suggestion 3.11 The Chief Inspector, Primary and the Research and Planning Unit should review mechanisms by which textbooks are distributed, and also develop some criteria for the allocation of books to those schools with the greatest needs.

Table 3.12 Percentage and sampling errors for shortages of basic classroom materials: exercise books, notebook and pencils.

District	SACMEQ II					
	Exercise books		Notebook		Pencil	
	%	SE	%	SE	%	SE
Hhohho	1.3	0.60	5.4	1.87	7.0	2.22
Lubombo	2.5	1.52	11.4	3.75	9.2	2.02
Manzini	0.4	0.20	10.1	4.53	6.6	1.55
Shiselweni	0.5	0.27	9.1	3.59	11.7	4.82
Swaziland	1.1	0.36	8.7	1.74	8.4	1.42

(b) Basic classroom supplies

The percentages of pupils indicating that they lacked certain basic classroom materials is given in Table 3.12. The figure for exercise books (1.1%) is very low; however, the higher figures for notebooks (8.7%) and pencils (8.4%) is worrying. It should, however, be mentioned that the results may have been caused by confusion about exercise books and notebooks. Most schools use workbooks provided by the National Curriculum Centre and pupils might be using those for note taking, or for both note and work exercises. The 8.4 percent figure for pencils deserves further investigation – because every pupil is expected to have a pencil.

General policy concern 4:

Did Grade 6 pupils have access to library books within their classroom/schools, and was the use of these books being maximized by allowing pupils to take them home to read?

(a) Access to school and classroom library facilities

School heads were asked about the availability of a school library. A number of schools have some form of classroom libraries. These are usually in the form of a small box or a cupboard in the classroom, which are used to keep books and other learning materials. The results are presented in Table 3.13. It was discovered that less than half (about 45.6 %) of the Grade 6 pupils had access to this important learning resource.

Table 3.13: Percentages and sampling errors for availability of classroom resources for the teachers

Resource	Availability of classroom resources			
	SACMEQ II			
	Reading teacher		Mathematics teacher	
	%	SE	%	SE
A usable writing board	98.1	1.07	97.5	1.28
Chalk	99.6	0.42	98.2	1.08
A wall chart of any kind	79.3	3.55	78.4	3.56
A cupboard	54.4	4.43	55.9	4.42
One or more bookshelves	33.6	4.12	35.8	4.44
A classroom library or book corner	45.6	4.43	46.3	4.50
A teacher table	84.9	2.90	87.8	2.62
A teacher chair	87.9	2.62	85.7	3.77

Further analysis of the SACMEQ data shows that around one third of the pupils were in schools that had neither a classroom library nor a school library. This result is

surprising because in the late 1990s most primary schools received class library books through a special project. It is possible that some of these books are being kept in a storeroom or the school heads' office under lock and key, and perhaps the teachers in these schools might not be aware that the books actually exist. Further there might be a need to explore the impact of book distribution initiatives (such as the Fundza) because some schools may have not been able to benefit from these activities.

(b)Taking library books home

In those schools where pupils indicated the presence of school or classroom libraries, the pupils were asked to indicate whether they were allowed to take books home for reading. The results show that about half of the Grade 6 pupils were in schools where they were actually allowed to borrow books to take home for reading.

Table 3.14: Percentages and sampling errors for pupil and school head responses to whether pupils are permitted to borrow books from a classroom or a school library

District	Pupil		School head	
	%	SE	%	SE
Hhohho	52.2	10.77	85.1	10.91
Lubombo	48.3	15.01	91.0	9.97
Manzini	43.2	12.70	47.6	16.00
Shiselweni	59.9	11.88	78.4	25.33
Swaziland	50.6	5.99	72.5	7.86

One can only speculate why pupils in schools with libraries were not allowed to borrow books. Perhaps some schools did not allow pupils to take the books home for fear of losing them. That is, some teachers and/or school heads may have only permitted pupils to read library books during the school day. This finding is very disappointing because schools need to give pupils maximum access to available resources.

Policy suggestion 3.12 The Chief Inspector Primary should work with the Head Teachers Association to encourage school heads (in schools where libraries exist) to permit pupils to borrow books to read at home.

General policy concern 5:
Has the practice of Grade 6 pupils receiving extra lessons in school subjects outside school hours become widespread, and have these been paid lesson?

(a)Extra tuition

Taking a book home might suggest that a pupil does get assistance at home on reading and general schoolwork. In some homes this is encouraged, and some homes have even gone a step further by ensuring that their children get extra assistance in addition to their schoolwork. Although this is an emerging phenomenon in Swaziland, there is some private tutoring taking place: parents want to ensure that their children get good grades at Grade 7 to enable them to get places in prestigious secondary schools. Pupils were asked to indicate whether they attended any private tutoring classes in school subjects after school hours. The study did not explore who provided the tutoring. Pupils were also asked to indicate whether this extra tutoring/coaching was paid for.

Table 3.15: Percentages and sampling errors for the extra tuition taken by pupils outside school hours

District	Extra tuition on any subject	
	SACMEQ II	
	%	SE
Hhohho	39.0	7.49
Lubombo	34.0	7.14
Manzini	37.3	7.52
Shiselweni	33.5	8.14
Swaziland	36.3	3.81

In Table 3.15 the percentages of Grade 6 pupils receiving extra tuition outside school hours is presented. The overall result of 36.3 percent shows that this practice is now widespread in Swaziland. The percentage of pupils receiving tuition was similar across the districts, which demonstrated that this is not exclusively an urban phenomenon. It is widely known in Swaziland that wealthier families arrange extra

tuition for senior secondary school students. However, the surprising aspect of these results is that they reveal extra tuition also to be operating widely in primary schools.

It is worth noting that the Ministry does not encourage private tuition during or after school hours. It is the Ministry's belief that all teachers should be working to ensure "equal opportunities" for all children and thus they are expected to offer the core curriculum to all children during the school day. Teachers are also not expected to offer extra paid tuition to their students after school hours because this might be construed to be ethically wrong.

(b) Payment made for extra tuition

The pupils who indicated that they were receiving extra tuition were also asked about payments. The results are presented in Table 3.16. Extra tuition is, in most cases, an agreement between the parents of the child and the teacher, thus many pupils who receive tuition may not know whether it was paid for or not. Therefore the large (68.2%) percentage of pupils indicating "there is no payment" is probably an overestimate.

Table 3.16 : Percentages and sampling errors for the payment of extra tuition taken by pupils outside school hours

District	There is payment		There is no payment		Don't know	
	%	SE	%	SE	%	SE
Hhohho	13.2	3.81	56.9	7.53	29.9	7.20
Lubombo	10.0	4.43	73.0	8.72	16.9	5.32
Manzini	9.5	3.63	70.4	8.24	20.2	7.37
Shiselweni	6.7	2.06	77.9	9.06	15.4	8.66
Swaziland	10.2	1.77	68.2	4.18	21.6	3.72

For those pupils receiving extra tuition in Swaziland, around 10 percent indicated that payment was involved and twice this percentage indicated that they did not know whether payment was made. The percentage of pupils that indicated there was no payment needs to be assessed carefully for the reasons outlined above. In

Swaziland,the practice of providing extra tuition in school subjects outside school hours came about due to the demand for places at the country's only university. This saw the mushrooming of extra tuition academies that were run by teachers. As the demand for better education increases, this trend is gradually creeping down into primary education. This development isa cause for concern, as children might no longer have the chance or the time to be children, because they are forced into a very competitive world at a young age.

Policy Suggestion 3.13 The Research and Planning Unit should undertake a research study to obtain more accurate information about extra tuition at the primary school level in Swaziland.

Policy Suggestion 3.14 The Director of Education should establish measures in consultation with the Teachers' Union and other education stakeholders, to ensure that extra tuition does not become a problem that disadvantages those pupils who cannot afford it, and that tempts some teacher to give "preference" to paying pupils.

Conclusion.

The study reveals that the average Grade 6 pupil in Swaziland is more than two years older than the expected age, of 139 months, and that there is a large variation in the age of Grade 6 pupils. This indicates that some children entered the education system late, or that they repeated along the way. This problem certainly needs to be explored further because it is very difficult for teachers to prepare and manage a class that has pupils at very different stages of development.

An issue needing further investigation is that of grade repetition. The repetition rate is high and the causes should be identified, especially in the Manzini district. It could be that pupils have been made to repeat for reasons other than failure in their academic work. Perhaps pupils are made to repeat to ensure that they perform well in the End of Primary Examination in grade 7, so as to get admission to the best secondary schools in Manzini.

Another observation is that the average Grade 6 pupil does not receive much support with homework. Only 31.2 percent of Grade 6 pupils received assistance with homework. Not all teachers gave homework. In cases where it was given, not all of it was marked. This situation was aggravated by the fact that a number of Grade 6 pupils claimed that they were not permitted to borrow reading materials from school. Even some of those schools that had libraries did not encourage the "taking home" of books.

Tuition given outside school hours is an emerging issue. Over one third of Grade 6 pupils have indicated they were taking extra classes. This should be of concern to the Ministry: either parents are not entirely satisfied with the performance of their children, or secondary schools are demanding that pupils have higher entrance scores. Either way, it is a sign of a system under stress, and unfortunately it is the pupils that have to endure the long hours of work needed to make acceptable grades. A major reason for concern is that it may be only the pupils who can afford the extra tuition who have been receiving it – thus giving them an advantage over pupils from poorer families.

Chapter 4

Teachers

Introduction

This chapter explores teachers' personal characteristics, socio-economic background, training, and approaches to teaching. In the SACMEQ research framework teachers were considered educational inputs - thus the chapter will explore the quality of inputs the Ministry has allocated to different districts. There has been a general perception that urban schools benefit from better trained and qualified teachers, and better access to furniture and teaching materials. The main aim of this chapter is to present and discuss data related to these perceptions for Grade 6 teachers in Swaziland.

General policy concern 6:
What were the personal characteristics of Grade 6 teachers, and what was the condition of their housing?

(a) Age, Gender, and socio-economic level of Grade 6 teachers

The figures presented in Table 4.1 provided information about the personal characteristics of Grade 6 teachers in Swaziland. The information is presented separately for mathematics and reading teachers and it describes Grade 6 teachers in terms of their average age, gender, socio-economic circumstances as assessed by the number of possessions they had at home).

Table 4.1: Means, percentages, and sampling errors for age gender, and economic background of reading and mathematics teachers

District	Reading teacher						Mathematics teacher					
	Age (years)		**Gender** (female)		**Possessions at home** (index)		**Age** (years)		**Gender** (female)		**Possessions at home** (index)	
	Mean	SE	%	SE	Mean	SE	Mean	SE	%	SE	Mean	SE
Hhohho	34.8	1.21	70.6	7.88	6.6	0.37	34.6	1.09	52.7	8.49	6.3	0.42
Lubombo	34.4	1.72	61.3	8.47	6.5	0.42	33.9	1.50	45.0	9.49	6.9	0.53
Manzini	33.4	1.14	67.4	8.27	7.3	0.40	33.9	1.16	51.8	8.27	7.4	0.48
Shiselweni	36.4	1.12	73.0	8.10	5.3	0.36	33.6	1.00	55.9	10.75	6.1	0.39
Swaziland	34.7	0.64	68.5	4.06	6.5	0.20	34.0	0.59	51.7	4.48	6.7	0.23

(i)Age

The age of Grade 6 teachers is described in the first and seventh columns of Table 4.1. The average Grade 6 pupil had reading and mathematics teachers about 34 to 35 years old. The averages were similar across the districts, which indicates that the Teaching Service Commission has achieved quite a good balance..

(ii) Gender

The gender information in Table 4.1 shows that over two thirds of Grade 6 pupils had reading teachers who were female, while around one half had female mathematics teachers. Some deviations from the national figures are evident across districts. The Shiselweni district has the highest concentrations of both female reading teachers (73.0%) and female mathematics teachers (55.9%). In contrast, the Lubombo district has the lowest percentage of both female reading teachers (61.3%) and female mathematics teachers (45.0%).

(iii) Socio-economic level

In Swaziland some teachers travel to school daily, whilst others are housed within school compounds. In rare cases they might be housed in the community, or a rented room close to the school. The study explored the socio-economic status of the teachers by looking at their home possessions.. The possessions included items like

television, radio, video cassette players and magazines. There is a total of thirteen items that were counted and averaged across the districts

The figures in Table 4.1 indicate that the average Grade 6 pupil had reading and mathematics teachers with 6.5 and 6.7 possessions, respectively. There are some variations across districts with the "wealthier" teachers being located in Manzini (7.3 and 7.3 possessions) and the "poorer" teachers being located in Shiselweni (5.3 and 6.1 possessions).

(b) The general condition of teacher housing

A number of studies have indicated that convenient teacher housing contributes to the motivation and preparedness of the teacher. In cases where teachers prefer commuting as an alternative to school accommodation there are increased chances of their arriving late and leaving early so as to arrive at their homes at reasonable hours.

The Grade 6 teachers were asked to indicate the repair status of their housing. The results are presented in Table 4.2. The purpose in collecting these data was to explore the status of teacher housing with the hope of helping the government decide in which districts to focus teacher housing programmes.

The overall percentages show that slightly less than one half of the teachers reported that their housing was either in "good condition" or needed "minor repairs". That is, slightly more than half of the teachers reported that their housing needed "major repairs" or was "generally in a poor state". The worst district was Shiselweni where less than a third of reading and mathematics teachers considered their housing to be in an "acceptable condition". This clearly indicates a need for government intervention in housing in this district.

Policy suggestion 4.1 Starting in the Shiselweni district, the Research and Planning Unit and the Ministry of Works should undertake a national audit of the repair status of teacher housing, and then develop a prioritised list for a housing repairs programme.

Table 4.2: Percentages and sampling errors for teacher housing in acceptable conditions

District	Teacher housing in acceptable conditions			
	SACMEQ II			
	Reading teacher		Mathematics teacher	
	%	SE	%	SE
Hhohho	57.3	8.86	61.3	8.68
Lubombo	30.6	7.92	48.7	9.45
Manzini	48.3	8.21	42.2	8.17
Shiselweni	31.0	8.53	32.4	8.58
Swaziland	43.4	4.27	46.7	4.35

General policy concern 7:

What were the professional characteristics of Grade 6 teachers and did they consider in-service training to be effective in improving their teaching?

(a) Academic level of Grade 6 teachers

In Swaziland, teachers' qualifications are assessed along two dimensions: academic and professional. It is somewhat difficult to analyse the former because the requirements for entry into the teaching profession have changed over the years. In the early 1970s one could qualify to be a teacher with a Standard 6 Certificate. This later changed to a Junior Secondary Certificate (JC), then to an O-level Certificate, and finally increased to a very good O-level Certificate. The highest academic qualification for teachers was a university degree with a professional teaching certificate. In Swaziland, a professional teaching certificate is a qualification obtained by completing a teacher-training programme at tertiary level, where an individual is exposed to training in pedagogy. Teachers were asked their highest academic qualification and their responses were checked against their Teaching Service File and Ministry's EMIS system for verification. The results are presented in Tables 4.3 and 4.4.

Table 4.3: Academic education of reading teachers

District	Primary		Junior secondary		Senior secondary		A-level		Tertiary	
	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	16.4	6.37	2.9	2.89	14.2	6.24	49.1	8.66	17.5	8.08
Lubombo	4.0	2.87	3.7	2.61	6.5	3.79	79.1	6.59	6.7	4.15
Manzini	6.6	5.11	3.8	2.83	17.0	6.46	58.0	8.33	14.6	6.02
Shiselweni	10.1	5.14	1.9	1.87	14.3	5.77	63.7	9.12	10.0	5.19
Swaziland	9.7	2.66	3.1	1.33	13.5	2.97	60.9	4.34	12.8	3.23

Table 4.4: Academic education of mathematics teachers

District	Primary		Junior secondary		Senior secondary		A-level		Tertiary	
	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	14.3	5.75	1.7	1.71	16.0	8.34	55.2	8.72	12.8	5.20
Lubombo	4.0	2.83	1.8	1.83	22.3	8.43	66.0	8.90	6.0	3.48
Manzini	5.1	3.71	0.6	0.58	15.0	5.48	62.8	7.91	16.5	6.21
Shiselweni	10.5	4.78	0.0	0.00	22.6	7.36	63.0	9.02	3.9	2.90
Swaziland	8.8	2.31	1.0	0.63	18.5	3.63	61.3	4.32	10.4	2.50

For the purposes of this study it was assumed that teachers who had completed a diploma programme could be treated as having achieved a qualification similar to A-levels. A large number of the Grade 6 teachers (over 60%) indicated that they had an A-level qualification. These were teachers who had pursued a Primary Teachers' Diploma (PTD) at college.

Those teachers that were classified with a senior secondary qualification included those who did the 2-year certificate course (PTC) after O-levels. Teachers who entered at lower levels (junior secondary and standard 6) have been gradually disappearing from the system. Those with tertiary level included graduate primary teachers and some non-teacher graduates who were engaged temporarily, especially in rural areas where permanent teachers did not want to teach. The distribution of

teachers with A-levels or equivalent education is fairly evenly distributed across districts for mathematics teachers, with the lower figure for Hhohho (49.1%) and higher figure for Lubombo (79.1%). However, for reading teachers the distribution is very uneven (in the range of 49% to 79%). The distribution of both kinds of teachers with higher education is also distributed in uneven fashion across the districts. The Lubombo districts has the lowest concentrations of tertiary-educated reading and mathematics teachers.

Policy suggestion 4.2 The Teaching Service Commission should review procedures for assigning well-qualified teachers across the four districts with the aim of achieving a more equitable distribution of teachers that have reached higher academic levels.

(b) Professional Training and Experience of Grade 6 Teachers

It was expected that the average amount of professional training for teachers would not exceed 3 years because most teachers do not have degrees. The figures in Table 4.5 show that this is the case – with averages at the national and district levels being in the range of 2.4 to 2.7 years.

Table 4. 5: Means and sampling errors for experience and training of reading and mathematics teachers

District	Reading teacher				Mathematics teacher			
	Experience (years)		Training (years)		Experience (years)		Training (years)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Hhohho	9.8	1.00	2.9	0.15	10.1	1.06	2.5	0.12
Lubombo	10.4	1.58	2.6	0.15	9.6	1.37	2.4	0.18
Manzini	8.8	1.04	2.5	0.17	10.2	1.21	2.4	0.12
Shiselweni	11.4	1.10	2.7	0.11	8.8	0.98	2.5	0.15
Swaziland	10.1	0.58	2.7	0.07	9.7	0.58	2.5	0.07

The average pupil had reading and mathematics teachers with around 10 years of teaching experience. There is very little variation in the figures across the four districts.

It has been argued that teacher in-service training can improve the quality of education by updating the knowledge base of teachers and increasing their level of motivation. The teachers in the study were asked to indicate the number of in-service courses they had attended in a three-year period and whether they thought the training was effective.

The figures presented in Table 4.6 indicate that although the national mean was about 11 days, there was a great deal of variation across districts. The averages for the reading teachers in Hhohho and mathematics teachers in Shiselweni were much lower at 6.3 days and 8.2 days, respectively. In contrast the reading teachers in Manzini and the mathematics teachers in Hhohho had received 16.6 days and 14.3 days respectively of in-service training.

Policy suggestion 4.3 The Research and Planning Unit should undertake a study of the amount of in-service education that is being offered across the districts – and then prepare a training programme that will result in a more even distribution of access to in-service courses.

Table 4.6: Means and sampling errors for teacher in-service courses and days attended between 1997 and 2000 by Grade 6 teachers.

District	Reading teacher				Mathematics teacher			
	In-services courses		Days		In-services courses		Days	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Hhohho	2.3	0.44	6.3	1.21	2.4	0.46	14.3	4.52
Lubombo	4.3	1.42	15.7	7.53	3.1	0.73	10.0	3.52
Manzini	3.2	0.75	16.6	6.93	1.9	0.50	10.8	5.04
Shiselweni	1.9	0.47	7.2	1.49	2.1	0.75	8.2	3.36
Swaziland	2.9	0.39	11.3	2.49	2.3	0.30	11.1	2.17

One factor that could explain the variations in attendance at in-service workshops is value in terms of usefulness that teachers attach to attending them. Another factor, of course, are the opportunity costs involved, especially if going to a workshop impinged

on time spent at school, the costs of travelling, and the general well-being of the teachers. If teachers are not treated well, or feel well treated at these workshops, then they might not see the value of attending them.

Table 4.7: Percentages and sampling errors for the teachers' perception of effectiveness of reading and mathematics in-service courses

District	Effectiveness of the in-service courses			
	Reading in-service courses		Mathematics in-service courses	
	%	SE	%	SE
Hhohho	44.5	8.57	47.0	8.65
Lubombo	37.2	9.51	42.8	9.57
Manzini	40.4	8.08	32.7	7.70
Shiselweni	44.6	10.91	21.5	7.14
Swaziland	41.9	4.52	36.1	4.24

In Table 4.7 the percentages of Grade 6 pupils with teachers who considered that their in-service training was either "effective" or "very effective" are given. The figures indicate that only around 40 percent of teachers thought that their in-service training was "effective". That is, a substantial majority were not impressed with the in-service training they had received. Only 37.2 percent of reading teachers in Lubombo and 21.5 percent of mathematics teachers in Shiselweni indicated that their in-service training was either effective or very effective. These very low satisfaction rates are cause for concern and seem to indicate that a major review and improvement of the content and delivery of in-service training is required.

Policy suggestion 4.4 The Director of Education should establish a committee of inspectors and teachers to review the content and delivery of in-service training programmes and to bring forward suggestions for making them more effective.

General policy concern 8:
How did Grade 6 teachers allocate their time among responsibilities concerned with teaching, preparing lessons and marking?

All teachers are expected to prepare for their lessons and to put this in their "special prep-books". The school head on a weekly basis was expected to check these prep-books. The amount of time that teachers spent on lesson preparation for their lessons is examined in Table 4.8.

Teachers spent about 13 to 15 hours per week in lesson preparation. Teachers in Manzini appeared to be spending slightly less time preparing for lessons, while teachers in Shiselweni district were spending slightly more time.

Policy suggestion 4.5 The Manzini District Education Office should speak with teachers and school heads to find out why teachers are spending less time preparing lessons compared with teachers in other districts.

Table 4.8: Means and sampling errors for the teacher time spent on lesson preparation

District	Reading lesson (hours)		Mathematics lesson (hours)	
	%	SE	%	SE
Hhohho	13.5	1.52	15.0	2.39
Lubombo	14.4	1.43	15.7	1.71
Manzini	11.6	1.18	13.3	1.66
Shiselweni	15.3	3.59	16.1	3.41
Swaziland	13.5	1.01	14.9	1.19

General policy concern 9:
What were the Grade 6 teachers' Views on (a) pupil activities within the classroom (b) teaching goals (c) teaching approaches/strategies, assessment procedures, and (e) meeting and communicating with parents?

Swaziland introduced individualised teaching and learning strategies into primary schools in the late 1990s and this has resulted in a general shift away from a traditional "chalk and talk" style of instruction to pupil-centred learning. There were some pedagogical and administrative problems associated with these changes that still need to be addressed. SACMEQ did not assess the implementation of this programme, but was interested to know how many teachers had adopted strategies that could be construed to mean that teachers were indeed following the guidelines under this initiative

(a) Teachers' views on important pupil activities

The results in Table 4.9 indicate that the average Grade 6 pupil had a reading teacher who viewed "reading for comprehension" as "the most important activity" in the classroom. To a lesser extent reading teachers considered "learning new vocabulary" as "most important". Other issues such as, "listening to reading", "silent reading", "reading at home" and "reading aloud" were rated as much less important. Another issue of concern in these results is that teachers view listening to reading and taking books home to read as less important. This result is disappointed given the known positive impact of such activities on the reading skills of pupils.

Table 4.9: Percentages and sampling errors for the activities of teaching reading

Activity	Activity rated as 'most important'	
	SACMEQ II	
	%	SE
Reading for comprehension	40.7	4.32
Learning new vocabulary	26.4	3.91
Sounding words	14.1	3.85
Taking books home to read	5.7	1.86
Listening to reading	4.9	1.83
Silent reading	4.0	1.57
Reading materials in home	2.8	1.25
Reading aloud in class	1.4	0.84

The activities that mathematics teachers viewed as "most important" are examined in Table 4.10. Around one third of the mathematics teachers view "working in pairs or groups" as the "most important" class activity. To a lesser extent they also view "using practical equipment" and "quizzes, tests and examinations" as important activities.

The staff of the Swaziland Teacher Training Colleges should examine the results presented in the two tables; they give important insights into how teachers view different teaching methods. These data should be examined with respect to the efforts now underway to re-orient classroom teaching away from traditional teacher centred methods towards student centred learning.

Table 4.10: Percentages and sampling errors for the activities of teaching mathematics

Activity	Activity rated as 'most important'	
	%	SE
Working in pairs or groups	33.3	4.58
Quizzes, tests, examinations, etc.	23.0	3.53
Using practical equipment	18.0	3.08
Working alone	10.3	2.47
Preparing projects to be shown to the class	8.3	2.18
Homework assignments	4.7	1.60
Reciting tables, formulae, etc.	2.4	1.19
Studying and interpreting graphs	0.0	0.00

The figures in Table 4.10 suggests that mathematics teachers do not consider studying and interpreting graphs, reciting tables, and homework as important activities in teaching mathematics. It is surprising that homework is not considered an important teaching activity. It would be interesting for the Senior Inspector of Mathematics to investigate the reasons behind this view. The limited interest in graphs could probably be attributed to the fact that the curriculum does not cover this topic at Grade 6 level.

Policy Suggestion 4.6 The heads of reading and mathematics departments in Swaziland's teacher training colleges should share and discuss teachers' views about "the most important teaching activities" with their staff as part of their own in-service training.

(b) Teachers' views on the most important teaching goals

Teachers' responses concerning "goals" are summarised in Tables 4.11 and 4.12. The results for reading suggest that the average Grade 6 pupil had a teacher who believes that the two most important goals of reading are to "extend vocabulary" and to "develop a lasting interest in reading". The teachers did not view "improving word attack skills" as an important goal.

Table 4.11: Percentages and sampling errors for the goals of teaching reading

Goal	Goal rated as 'most important'	
	SACMEQ II	
	%	SE
Developing a lasting interest	23.7	3.48
Extending vocabulary	22.0	4.38
Improving reading comprehension	16.1	2.97
Opening up career opportunities	14.6	3.36
Developing of life skills	14.2	2.83
Improving word attack skills	5.0	1.73
Making reading enjoyable	4.3	1.56

Policy Suggestion 4.7 The senior inspectors for languages should examine the important teaching goals as identified by teachers in order to check their alignment with the "official goals" presented in the official curriculum.

Table 4.12: Percentages and sampling errors for the goals of teaching mathematics

Goal	Goal rated as 'most important'	
	%	SE
Problem solving	33.5	3.91
Different ways of thinking	24.7	4.18
Opening up career opportunities	15.2	2.96
Confidence in solving problems	13.9	2.88
Developing of life skills	7.0	2.10
Basic numeracy skills	5.2	1.83
Satisfaction from doing mathematics	0.5	0.51

The average Grade 6 pupil had a mathematics teacher who viewed the two most important goals of their subject as “practical problem solving” and “different ways of thinking”. The mathematics teachers give very low importance ratings to goals associated with “basic numeracy skills”, “satisfaction,” and “developing life skills”.

It is rather worrying to see that the two groups of teachers give the very lowest rankings to “making reading enjoyable” (4.3%) and “satisfaction from doing mathematics”(0.5%). These results suggest that teachers in Swaziland might not appreciate the importance of the “affective domain” in their teaching.

(c) Teachers views on teaching strategies

The reading and mathematics teachers were asked to prioritise teaching strategies they “often used” in the classroom. The main responses are summarised in Table 4.13 and Table 4.14.

The average Grade 6 pupil had a reading teacher who gave high priority to using questions to “test comprehension” (81.0%) and to “deepen understanding” (78.0%). To a lesser extent they also used “reading aloud” (65.2%) and “positive feedback” (65.6%). It appears that reading teachers rarely used their own teacher-made materials (18.2%).

Table 4.13: Percentages and sampling errors for strategies for teaching reading

Approach	Percentage indicating ‘often used’	
	SACMEQ II	
	%	SE
Asking questions to test comprehension	81.0	3.49
Asking questions to deepen understanding	78.0	3.59
Giving positive feedback	69.6	4.37
Reading aloud to the class	65.2	3.99
Introducing passage before reading	43.6	4.36
Using materials made by teacher	18.2	3.10

There is a very interesting contradiction in the reading teachers' responses to "important pupil strategies" in Table 4.9 and "often used teaching strategies" in Table 4.13. In Table 4.9 they indicate that "reading aloud by pupils" is not important (1.4%) – whereas in the second table, Table 4.13 they indicate that they have used this teaching strategy often (65.2%). This contradiction needs to be pointed out to both teachers and teacher training institutions.

The results for the teaching strategies used by mathematics teachers is presented in Table 4.14. The mathematics teachers indicate a very low use of "teaching individually" (13.6%) or "teaching in small groups"(14.1%). In contrast they rate "teaching the whole class as a group" as the strategy they use most often (74.7%). What is interesting here is that in Table 4.10 the same teachers accord very high importance having their pupils "working in pairs or groups" (33.3%).

Table 4.14: Percentages and sampling errors for the strategies of teaching mathematics

Approach	Percentage indicating 'often used'	
	%	SE
Teaching the whole class as a group	74.7	3.83
Using available local materials	74.5	3.68
Explaining mathematical processes	72.3	4.20
Relating to everyday life situations	68.8	3.87
Giving positive feedback	61.5	4.33
Teaching through question and answer technique	56.6	4.48
Using everyday problems	51.3	4.41
Basic skills training	46.9	4.41
Teaching in a small group	14.1	3.11
Teaching individually	13.6	2.77

These contradictory results from both reading and mathematics teachers suggesta mismatch between what teachers perceive to be effective teaching and what pupil activities they actually encourage in their teaching.

The interesting findings given under "activities", "goals", and "strategies" above warrant further discussion by the Inspectorate within the Ministry of Education– so they gain better understanding of teachers' opinions.

Policy suggestion 4.8 The Chief Inspector Primary should organize an in-service training course for the inspectors so that they can examine the research results related to teacher activities, goals, and strategies.

(d) Frequency of giving written tests

Swaziland has three school terms in each academic year, and at the end of every term schools normally understake an assessment. In most cases this forms the core reporting to parents, but with the advent of the Continuous Assessment Programme, some schools have moved to continuously assessing pupils, and as such were expected to have used tests more often.

Table 4.15: Percentages and sampling errors for the frequency of reading tests

District	Frequency of reading tests					
	SACMEQ II					
	Less often		2/3 per month		1 + per week	
	%	SE	%	SE	%	SE
Hhohho	35.4	8.98	31.4	7.68	33.2	7.63
Lubombo	21.6	6.69	32.6	8.23	45.8	9.62
Manzini	26.4	7.50	39.3	8.07	34.3	7.54
Shiselweni	24.1	7.60	28.9	8.03	47.0	10.73
Swaziland	27.5	4.05	33.3	4.03	39.2	4.45

The results presented in Tables 4.15 and Table 4.16 indicate substantial differences in the frequency of using tests between reading and mathematics teachers. For example, at the national level, 39.2 percent of pupils had reading teachers that gave at least a test a week. In contrast, only 9.8 percent had mathematics teachers that tested with this frequency.

The patterns in the data suggest a general reluctance on the part of many Grade 6 teachers, especially the mathematics teachers, to employ regular assessment as part of their teaching. This outcome suggest that the Ministry's messages about the importance of "continuous assessment" might not have reached the teachers.

Table 4.16: Percentages and sampling errors for frequency of mathematics tests

District	Frequency of mathematics tests					
	Less often		2/3 per month		1 + per week	
	%	SE	%	SE	%	SE
Hhohho	44.1	8.64	44.9	8.42	10.9	4.87
Lubombo	33.4	8.38	48.0	9.36	18.5	8.66
Manzini	48.6	8.24	46.2	8.10	5.2	2.96
Shiselweni	45.1	10.69	48.1	10.11	6.8	3.65
Swaziland	43.5	4.50	46.6	4.40	9.8	2.53

Policy Suggestion 4.9 The Chief Primary Inspector should further clarify with teachers, curriculum developers, and inspectors the concept of "continuous assessment," and should ensure that the guidelines on the recommended frequency for using classroom tests are adhered to.

Policy Suggestion 4.10 The Research and Planning Unit should undertake a research study on classroom assessment practices in order to gain more detailed information about this important area of teaching.

(e) Frequency of meeting with parents

The Grade 6 teachers were asked how frequently they met with the parents of their pupils. The results are presented in Table 4.17.

Table 4.17: Percentages and sampling errors of teachers meeting parents each year

Region	Reading teacher meet Parents		Mathematics teacher meet Parents	
	%	SE	%	SE
Hhohho	57.4	5.22	45.7	5.93
Lubombo	40.0	5.00	34.2	4.71
Manzini	55.4	6.28	51.2	5.68
Shiselweni	35.1	7.34	38.2	6.96
Swaziland	48.2	3.21	43.2	3.02

Swaziland has an open door policy when it comes to parents going to school to discuss the performance of their children with teachers. It is common practice that at least once a term parents go to school to collect pupils' reports. These reports contain specific sections devoted to reading and mathematics. The form of reporting introduced for the continuous assessment programme requires teachers to list the "specific areas" that pupils have mastered, and those that need improvement.

The figures in Table 4.17 indicate that less than half of the Grade 6 pupils had parents who met with their reading or mathematics teachers each year. The figures for Lubombo and Shiselweni districts are particularly poor with 40 percent or fewer Grade 6 pupils with parents who met with teachers each year. Both of these districts are poor and families rely on subsistence farming; they might not have had enough time to travel to school. Also many parents in these districts are less educated and may be too shy or frightened to meet with teachers. Whatever the reasons, the Ministry needs to take action to ensure that the parents of all Grade 6 pupils meet with their teachers each year.

Policy Suggestion 4.11 The Director of Education should set up some mechanism to ensure that the parents of Grade 6 pupils meet with teachers at least once a year.

General policy concern 10:
What was the availability of classroom furniture and classroom equipment in Grade 6 classrooms?

(a) Availability of classroom furniture

In Swaziland local communities generally construct their own schools, while the government provides teachers, furniture, and equipment. This trend has often led to the community's expects that the Ministry would provide desks, chairs, and basic educational aids once the classroom was finished. The study investigated the proportion of Grade 6 pupils who had sitting and writing places. The results are presented in Table 4.18.

Table 4.18: Percentages and sampling errors for pupils having sitting and writing places

District	SACMEQ II			
	% having sitting place		% having writing place	
	%	SE	%	SE
Hhohho	98.6	0.60	98.0	0.65
Lubombo	96.1	1.77	97.4	0.92
Manzini	98.9	0.45	97.9	0.76
Shiselweni	99.0	0.38	98.6	0.53
Swaziland	98.3	0.42	98.0	0.36

The results reveal that 98 percent of Grade 6 pupils in Swaziland had both sitting and writing places. However, this outcome does not imply that the Ministry need not botherabout the few cases where there is no pupil furniture.

(b) Availability of classroom equipment for teachers

In Table 4.19 information has been presented concerning the availability of classroom equipment. The figures show that almost all Grade 6 pupils were in reading and mathematics classrooms with a writing board and chalk. However, it is clear there

was a shortage of cupboards (around 55%) and bookshelves (around 35%), and classroom library/book corners (45.6%). The figures for storage areas are disappointing because cupboards and shelves are important for protecting equipment. In addition, the figures for classroom libraries are very low given the effort of the Fundza programme. The figures for teachers' tables and chairs are fairly high (at around 85% to 88%), however they should have been close to 100 percent because one cannot expect a teacher to be standing all day long without having a suitable sitting and writing place in order to prepare lessons and correct notebooks.

Policy suggestion 4.12 The Director of Education and Fundza should devise mechanisms to increase the number of schools having school/classroom libraries and also ensure that there are good storage facilities for books and equipment.

A classroom resources index was calculated by adding together the total number of items in Grade 6 classrooms from the eight listed in Table 4.19 The mean for each district was calculated and is presented in Table 4.20.

Table 4.19: Percentages and sampling errors for availability of classroom resources for the teachers

Resource	Availability of classroom resources			
	SACMEQ II			
	Reading teacher		Mathematics teacher	
	%	SE	%	SE
Chalk	99.6	0.42	98.2	1.08
A usable writing board	98.1	1.07	97.5	1.28
A teacher chair	87.9	2.62	85.7	3.77
A teacher table	84.9	2.90	87.8	2.62
A wall chart of any kind	79.3	3.55	78.4	3.56
A cupboard	54.4	4.43	55.9	4.42
A classroom library or book corner	45.6	4.43	46.3	4.50
One or more bookshelves	33.6	4.12	35.8	4.44

Table 4.20: Means and sampling errors for the classroom resources index

District	Classroom resources index			
	SACMEQ II			
	Reading teacher		Mathematics teacher	
	Mean	SE	Mean	SE
Hhohho	6.0	0.22	6.0	0.26
Lubombo	5.8	0.25	6.0	0.31
Manzini	5.9	0.23	5.8	0.26
Shiselweni	5.5	0.21	5.7	0.18
Swaziland	5.8	0.12	5.9	0.13

Shiselweni was the most poorly resourced district with averages of 5.5 and 5.8, respectively. It is interesting to note that Manzini did not fair well either, with averages of 5.9 and 5.8, respectively. In general there is only small variation across the districts in terms of availability of classroom resources.

Policy suggestion 4.13 The Research and Planning Unit and the Ministry should use the SACMEQ list of classroom resources as a starting point for building a more comprehensive checklist of "essential classroom resources" that can be used to study the allocation of resources among schools and districts.

General policy concern 11:
What professional support was given to Grade 6 teachers?

(a) Teacher use of education resource centres

Swaziland has eight Teacher Innovation and Development Centres (TIDCs), with two in each district. These are used as educational support centres to provide in-service training for teachers, and a source of professional assistance from on-site advisors who are called Teacher Leaders. Such centres are important for supporting poorly trained teachers who need to be monitored closely, especially in rural primary schools. The SACMEQ study investigated whether teachers had access to these centres, and whether they were used effectively.

From the figures in Table 4.21 it appears that only 30.9 percent of reading teachers and 40.6 percent of mathematics teachers had ever used an Education Resource Centre. In fact almost half of the teachers had never visited one – even when they were available.

Table 4.21: Percentages and sampling errors for the availability of education resource centres for teachers

District	Reading teacher						Mathematics teacher					
	None available		Have not visited		Have used		None available		Have not visited		Have used	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	26.4	8.66	49.8	8.69	23.9	6.98	15.9	5.90	48.5	8.61	35.5	8.08
Lubombo	23.7	7.98	44.6	9.52	31.7	8.11	19.5	7.66	38.3	8.88	42.2	9.39
Manzini	15.9	6.22	48.2	8.23	35.9	7.94	16.9	6.42	45.9	8.18	37.3	8.05
Shiselweni	21.6	12.70	45.5	10.06	32.9	8.52	5.1	3.78	45.5	9.86	49.5	10.31
Swaziland	21.8	4.38	47.3	4.46	30.9	3.90	14.3	3.02	45.1	4.40	40.6	4.46

Another interesting phenomenon is that even though the Education Resource Centres are located in towns, many Grade 6 teachers from urban districts did not use them a great deal. Thus it might be that teachers have other reasons than access for not using these facilities.

Policy suggestion 4.14 The Director of Education should clearly define the role of the Teacher Innovation and Development Centres and develop an organizational structure and resources for them. Their work should be clearly identified and coordinated, and the Teacher Leaders stationed there should have a clear role to play in enabling teachers to appreciate their usefulness.

(b) Purpose and use of use f Education Resource Centres

The study also investigated the reasons why teachers used the teacher centres. The results are presented in Table 4.22 for reading teachers and Table 4.23 for mathematics teachers.

The figures presented in Table 4.22 and Table 4.23 indicate that around 50 to 60 percent of he reading and mathematics teachers do not use Education Resource Centres on a regular basis.

Table 4.22: Percentages and sampling errors of reading teacher's purposes for using the resource centre

District	Reading teacher									
	Don't use		Borrow material		Make material		Training		Speak with teachers/staff	
	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	67.6	8.79	10.5	5.20	9.3	5.21	16.4	6.15	10.1	4.74
Lubombo	58.4	10.35	5.8	4.26	12.7	5.70	18.5	6.34	22.0	7.04
Manzini	57.3	8.92	15.7	6.43	11.9	5.66	24.0	7.17	21.3	6.83
Shiselweni	58.1	8.65	18.7	6.51	10.6	4.90	19.8	6.53	20.8	6.63
Swaziland	60.5	4.53	13.0	2.88	11.0	2.69	19.7	3.32	18.1	3.11

One of the reasons why teachers tended not to use the resource centres for pedagogical assistance could be that Teacher Leaders do not have expertise across the range of school subjects offered at primary level. There may be a case of having Teacher Leaders offer administrative support to the district education office. The most popular uses given by reading and mathematics teachers are for training (19.7% and 27.2%, respectively) and speaking with staff (18.1% and 31.3%, respectively). These latter figures probably arise from use of the centre for in-service training programmes.

Table 4.23: Percentages and sampling errors of reading teachers' purposes for using the resource centre

District	Mathematics teacher									
	Don't use		Borrow material		Make material		Training		Speak with teachers/staff	
	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	57.7	9.32	11.7	5.04	14.8	5.73	31.8	7.89	28.5	7.59
Lubombo	47.6	10.41	15.0	8.57	22.9	9.04	18.3	6.52	30.5	9.23
Manzini	55.2	9.02	14.4	5.78	18.7	6.35	21.5	7.14	28.4	7.65
Shiselweni	47.9	10.48	18.9	6.52	14.6	5.99	35.4	11.34	38.7	11.10
Swaziland	52.6	4.87	14.8	3.09	17.4	3.31	27.2	4.24	31.3	4.39

Policy suggestion 4.15 The Coordinator of in-service training should commission a study to find out why teachers seem not to be making full use of the centres, even when they are available and within travelling distance to schools.

(c) Teachers' views on the roles of inspectors and teacher leaders

The study also looked at what the Grade 6 teachers consider to be the role of inspectors and teacher leaders. The Grade 6 teachers were asked to rate the performance of the inspectors and teacher leaders with respect to three dimensions: "pedagogical role", "critical versus advisory role," and "professional development role". The results are given in Table 4.24 and they present a somewhat gloomy picture of inspectors and teacher leaders.

Table 4.24: Teachers' descriptions of the actions of the inspector and teacher leaders

Description of the actions	Percentage of teachers agreeing							
	Reading teacher				Mathematics teacher			
	Inspector		Teacher Leader		Inspector		Teacher Leader	
	%	SE	%	SE	%	SE	%	SE
Pedagogical role								
Bring new ideas	68.8	6.82	43.1	10.03	78.4	5.26	70.0	8.19
Clarify educational objectives	55.5	6.62	41.4	9.84	70.3	5.69	56.7	8.65
Recommend new teaching materials	52.5	6.70	44.1	10.19	73.7	5.46	60.6	8.61
Contribution to my classroom teaching	21.3	5.13	7.3	3.84	36.8	6.27	28.1	7.91
Explain curriculum content	41.2	6.38	36.9	9.49	49.4	6.59	36.6	7.96
Suggest improving teaching methods	61.7	6.70	42.9	10.07	71.9	5.58	73.3	7.68
Critical versus advisory role								
Comes to advise	69.8	6.76	47.0	10.47	70.7	6.72	71.0	7.76
Comes to criticise	18.6	4.58	18.5	6.74	31.8	6.66	25.4	7.39
Finds faults and report them to the employer	12.9	3.91	5.2	3.80	19.0	4.94	12.4	5.62
Professional development role								
Provides information for teacher self-development	40.7	6.38	40.9	9.91	54.9	6.42	50.3	8.66
Encourage professional contacts with other teachers	41.1	6.29	34.7	9.09	52.9	6.46	58.1	8.47
Provides in-service training to teachers	31.5	5.59	16.4	6.54	48.4	6.60	46.7	8.67

In terms of "pedagogical role", the mathematics teachers rated the inspectors and teacher leaders slightly more positively than the reading teachers. However, the overall rating of both groups of teachers was not very positive. For example only 21.3 percent and 36.8 percent of reading and mathematics teachers, respectively, indicate that inspectors contributed to their classroom teaching. In addition, only 7.3 percent

and 28.1 percent of reading and mathematics teachers, respectively, indicate that their teacher leaders contributed to their classroom teaching. Large numbers of teachers consider that the roles of inspectors and teacher leaders are problematic with respect to clarifying objectives, recommending new teaching activities, explaining curriculum content, and suggesting improved teaching methods.

One question asked whether inspectors and teacher leaders came to "advise or criticize". On average, teachers appeared to believe that both groups concentrated more on advice than on criticism. However, it is interesting that around 25 to 30 percent of mathematics teachers believe that inspectors and teacher leaders did come to criticize.

On the matter of the way in which inspectors and teacher leaders contribute to the "professional development" of teachers, the mathematics teachers have a consistently more favourable view of their roles. For example, 54.9 percent and 50.5 percent of mathematics teachers indicate that they received information for self-development from Inspectors and teacher leaders respectively. The corresponding figures for reading teachers are only 40.7 percent and 40.9 percent, respectively.

In summary, the whole pattern of results shown in Table 4.24 reveal a lack of confidence in the professional performance of both inspectors and teacher leaders. Perhaps teachers are simply not entirely clear about the roles of these professionals. This situation needs to be addressed by the Ministry through a major review of the functions of inspectors and teacher leaders. The exercise should begin with teacher interviews in order to identify and clarify the areas where changes might need to be made. The review should be undertaken by an independent body so that issues can be discussed in a non-threatening way that is more likely to identify effective solutions.

Policy Suggestion 4.16 The principal secretary should establish an independent enquiry into the roles and performances of inspectors and teacher leaders – with a view of bringing forward proposals aimed at developing productive cooperation between the two groups and the teachers.

General policy concern 12:
What factors had the most impact upon teacher job satisfaction?

(a) Teachers' job satisfaction.

Teacher job satisfaction is critical in ensuring that the children are in a good learning environment and receiving a quality education. The Grade 6 teachers were asked whether various aspects of their jobs had a "very important" impact on job satisfaction. Twelve aspects were grouped under five main headings: living conditions, school facilities, relationships with others, career advancement, and educational outcomes of pupils. The teachers' responses aresummarised in Table 4.25.

From the figures in Table 4.25 it is clear that both reading and mathematics teachers consider that seeing their pupils learn has the greatest impact upon their job satisfaction. Some of the other factors that both groups of teachers rated as "very important" for job satisfaction are availability of teacher housing (92.3% and 94.1%), the quality of school management and administration (91.4% and 93.6%), and amicable relationships with staff (90.0% and 91.5%). Of somewhat lesser importance to job satisfaction is the quality of school buildings (71.5% and 74.6%), and the quality of classroom furniture (68.4% and 70.3%). The least important is expanded opportunities for promotion (38.4% and 51.6%).

Table 4.25: Percentages and sampling errors for sources of teacher job satisfaction

Source of satisfaction	Percentage of teachers indicating reason as 'very important'			
	SACMEQ II			
	Reading teacher		Mathematics teacher	
	%	SE	%	SE
Living conditions				
Travel distance to school	80.8	3.46	68.4	4.35
Availability of teacher Housing	92.3	2.39	94.1	1.86
Quality of teacher housing	81.8	3.30	80.8	3.23
School facilities/equipment				
Quality of school buildings	71.5	4.28	74.6	3.93
Quality of classroom furniture	68.4	4.39	70.3	3.88
Relationships with others				
Quality of school management and administration	91.4	2.60	93.6	1.83
Amicable relations with staff	90.9	2.35	91.5	2.20
Good relation with community	80.3	3.28	75.0	4.15
Career advancement				
Expanded opportunities for promotion	38.4	4.22	51.6	4.42
Opportunities for professional development	87.0	3.55	95.4	1.64
Level of teacher salary	91.0	2.33	83.7	3.12
Educational outcomes of pupils				
Seeing pupils learn	95.6	3.10	97.2	1.28

Conclusion

The Grade 6 teachers were relatively young, with an average age of around 34 years. This indicates that the average Grade 6 teacher should be in the system for another twenty to thirty years. The study also revealed that teachers are generally not very well off – they have about half of the listed possessions. In addition to not being well off the teachers also indicated that they are not entirely pleased with the condition of school buildings.

On pedagogical issues it is worrying to note the contradictory responses that were given by teachers. Most teachers identified "individualised learning" as a good approach to teaching but when asked what method they used in their classes they rated working in whole-class groups as the most common. This is a concern because the continuous assessment programme followed in primary schools advocates individualised learning. The finding suggests that the Ministry might have either to conduct intensive workshops, in-service training, and pre-service training or generally make the recommended approach more attractive and effective for teaching.

Another concern is the fact that about one third of teachers have the view that inspectors and teacher leaders come to school to criticize them. As a way forward the Ministry could begin by defining specific roles to be played by the teacher training institutions, the inspectors, the teacher leaders and the in-service department. This could also clarify the differences between the various offices and enable teachers to know where to go when they need specific types of help.

Chapter 5

School Heads' Characteristics and their Views on the Educational Infrastructure, Organization and Operation of Schools, and Problems with Pupils and Staff.

Introduction.

As education is given increasing importance for its role in national economic development, school systems have had to change. The role of the school head has changed from that of pedagogical leader to that of managing an organization called the school. In addition to monitoring the day-to-day activities of teachers, school heads now have many other extra duties to perform.,

Some authors have likened the school heads' role to that of an orchestra conductor (Hernes, 1999) because of the need to harmonise the efforts of the many actors that are involved in the process of schooling. For this reason a mere assessment of physical inputs into education is not enough to assess the quality of education. Rather, it is necessary to look how the inputs are put to work to create an enabling environment through effective leadership and management. The performance of the school head depends on certain personal characteristics, which include qualifications, experience, and management style, and the way she or he relates to the staff and the community. A large proportion of schools in Swaziland are community built and maintained, thus effective management includes good, positive working relationships with both the school and the surrounding community.

General policy concern 13:

What were the personal characteristics of school heads?

The recruitment of school heads is based on both professional and academic qualifications. In addition to these two main criteria the individual should have enough teaching experience and must have attended some management workshops that are held annually by the Ministry of Education's In-service Department. The age and gender of the school heads involved in the study are presented in Table 5.1.

(a) Age distribution and gender of school heads

The average Grade 6 pupil attended a school where the school head was 48.3 years old. There was little variation in this measure across the districts. In contrast ,there was some variation in gender across districts, with around 60 percent of the school heads being male. The figures indicate that Manzini had the lowest number of female school heads (32.9%), and Lubombo had the highest percentage of female school heads (46.8%).

Table 5.1: Means, percentages, and sampling errors for school head age and gender

District	SACMEQ II			
	Age (years)		Gender (female)	
	Mean	SE	%	SE
Hhohho	48.4	1.01	40.8	8.22
Lubombo	47.7	1.17	46.8	9.33
Manzini	47.9	1.06	32.9	7.95
Shiselweni	49.0	1.22	42.1	11.00
Swaziland	48.3	0.55	40.1	4.47

Policy suggestion 5.1 The Research and Planning Unit should monitor the gender balance among school heads across districts and provide this information to the Teaching Service Commission with the aim of appointing more female school heads - especially in the Manzini district.

General policy concern 14:

What were the professional characteristics of school heads?

(a) The professional characteristics of school heads

The issue of training for school heads in Swaziland is an important matter since their roles have changed tremendously over the past two decades. Primary education in the country is largely a shared responsibility of communities and parents. This has led to the expectation that school heads need to be more than teachers; they are also required to demonstrate entrepreneurial and management skills.

Although the Ministry has introduced some additional training programmes related to school management, it does appear from Table 5.2 that the average Grade 6 pupil is in a school where the school head has had only eight weeks of specialised training in addition to professional development as a teacher. The variations in the amounts of specialised training across the districts are very large. In Shiselweni the training averaged only 4.7 weeks, while in Manzini it was 10.3 weeks. The average overall figure for the teacher training received by school heads is 2.4 years. This indicates that quite a number of school heads had less than 3 years' teacher training. That is, a number of school heads had less teacher training than some of the teachers they lead.

With the advent of partnerships related to programmes such as Education for All (EFA), Poverty Alleviation, and the HIV/AIDS pandemic, there is a need for school heads to have specialised training to foster an environment of preparedness in the schools. The average Grade 6 school head in 2000 had only eight weeks of specialised training. This seems rather low considering the extended roles they areS expected to perform.

Policy suggestion 5.2 The Ministry's In-service Department Unit should take immediate action to provide more specialised training for school heads - especially in the Shiselweni district.

Table 5.2: **Means and sampling errors for the teaching experience and training of the school heads.**

District	SACMEQ II					
	Experience (years)		**Teacher training** (years)		**Specialised training** (weeks)	
	Mean	SE	Mean	SE	Mean	SE
Hhohho	24.0	1.26	2.3	0.12	8.6	1.60
Lubombo	21.6	1.17	2.5	0.16	9.0	2.11
Manzini	22.2	0.98	2.3	0.15	10.3	2.90
Shiselweni	22.1	1.19	2.4	0.25	4.7	0.62
Swaziland	22.6	0.59	2.4	0.08	8.2	1.01

The figures presented in Table 5.2 indicate that the average Grade 6 pupil was in a school where the experience of school heads is about twice that of the Grade 6 teachers. In contrast, school heads appear to have spent fewer years in teacher training than their teachers. This result was caused by the fact that many school heads were older and therefor held a Primary Teaching Certificate, which required only two years of training. The Diploma, which younger teachers posess, requires three years of training.

Policy suggestion 5.3 The Director of Education should establish a working committee to look into all aspects of professional training for school heads – especially those areas that will equip school heads to address the emerging professional demands related to Education for All, Poverty Alleviation, the HIV/AIDS pandemic, and the movement towards school based management.

The study also asked school heads about their experience in administration, both in the schools they were currently heading and also in previous positions. The results are presented in Table 5.3

Table 5.3: Means and sampling errors based on years of experience as a school head

District	This school		Altogether	
	Mean	SE	Mean	SE
Hhohho	9.4	1.25	11.4	1.32
Lubombo	7.9	1.13	11.0	1.16
Manzini	7.6	0.90	11.5	1.16
Shiselweni	9.3	1.01	13.3	1.26
Swaziland	8.6	0.55	11.8	0.63

Head teachers from Shiselweni were on average more experienced than the rest of the country. What was impressive with the figures was the rather high averages for the number of years spent in the current school. These results also indicatethat the Teaching Service Commission had achieved some success in avoiding the frequent movements of school heads around the school system.

General policy concern 15:
What were the school heads' views on general school infrastructure and the condition of school buildings?

In Swaziland the government supplies the basic infrastructure for schools such as buildings, water connection, furniture, and electricity. But some schools have to finance these projects due to a lack of funding, and this may lead to variations among schools with respect to resources.

School heads were asked to comment on the general infrastructure of their schools. Their responses are presented in Table 5.4. The figures indicate that more than half of the Grade 6 pupils (53.0%) were in schools that did not have electricity, thus it was not surprising to find that many schools did not have electricity-dependent items as: photocopiers, fax machines, televisions, radios, and computers. Some of the schools that have managed to purchase computers had, in addition, hired secretaries to type both administrative and teaching documents. This initiative has created employment opportunities for the community, but has also added to extra school costs for parents.

Table 5.4 shows that there are resource problems in Swaziland schools. The study revealed that certain essential items -- such as a school library (21.0%), storeroom (10.1%), and a first-aid kit (53.6%) -- were in short supply School libraries are the foundation of all successful learning programmes and therefore greater efforts are required to establish them in all schools. Storerooms are always needed to protect and store books, examination papers, and other learning materials. In addition, a first-aid kit is vital for attending to pupil injuries.

There were gaps in certain items where 100 percent coverage was expected. Some examples are school head office (76.8%), sports and playgrounds (81.2%), water (83.5%), and typewriters (71.4%).

Policy guggestion 5.4 The Research and Planning Unit should undertake a national audit of school resources and then use this to prepare a priority list of schools that are most in need of assistance.

Table 5.4: Percentages and sampling errors for schools with general facilities

Facility	Percentage with facility	
	SACMEQ II	
	%	SE
School buildings		
School library	21.0	3.35
School hall	29.4	4.01
Staff room	55.9	4.28
School head's office	76.8	3.47
Store room	56.2	4.37
Cafeteria	10.1	2.56
School grounds		
Sports area/ playground	81.2	3.29
School garden	72.9	3.72
General services		
Piped water/ well or bore-hole	83.5	3.08
Electricity	47.0	4.36
Telephone	56.2	4.43
Equipment		
First-aid kit	53.6	4.25
Fax machine	5.0	1.99
Typewriter	71.4	3.79
Duplicator	64.9	4.05
Radio	11.0	3.15
Tape recorder	4.8	1.63
Television set	6.4	1.85
Video-cassette recorder	4.0	1.82
Photocopier	27.3	3.74
Computer	11.0	2.75

A major concern was the low coverage of schools reported to have First Aid Kits. Many schools are far from local clinics, and with the advent of HIV/AIDS schools should be prepared to deal with accidents.

Policy suggestion 5.5 The Chief Inspector Primary, in consultation with the Guidance and Counselling unit, should establish a national policy on the requirements of all schools to have well stocked First Aid Kits, and immediate steps should be taken to implement this policy.

Table 5.5: General condition of buildings and toilet facilities

District	SACMEQ II			
	Need repair		Toilet provision	
	%	SE	Mean	SE
Hhohho	48.3	8.49	83.9	9.35
Lubombo	37.9	8.69	82.2	8.59
Manzini	52.3	8.23	73.0	8.19
Shiselweni	52.7	10.54	146.0	37.33
Swaziland	48.4	4.41	94.7	9.95

In Table 5.5 the school heads' assessments of school buildings and toilet provision are summarised. The figures in this table indicate that school heads are not very satisfied with their condition. At national level 48.4 percent of Grade 6 pupils were in schools where the school heads indicated that the school needed "major repairs" or "complete rebuilding". The districts with major problems were Manzini (52.3%) and Shiselweni (52.7%).

Policy suggestion 5.6 The Research and Planning Unit should expand the Annual School Census data collection in order to conduct a comprehensive audit of the condition of all school buildings in the country – and then use this information to identify schools that are in most need of assistance.

In Table 5.5 the number of pupils per toilet is also presented. At national level these figures suggest that the average Grade 6 pupil is in a school where there were around

95 pupils per toilet. This figure implies that there are many schools where the figure exceed 100 pupils per toilet. This result is clearly much too high and the Ministry should take immediate action by arranging with communities and other stakeholders to contribute to the construction of extra toilets. The situation in Shiselweni is particularly bad with 146 pupils per toilet.

Policy suggestion 5.7 The Permanent Secretary should establish a working group with representation from the Ministry of Health and Social Welfare to define a national benchmark for the quantity and quality of toilet provision in primary schools and then communicate this information to school heads and communities.

General policy concern 16:

What were the school heads' Viewss on (a) daily activities, (b) organizational policies, (c) inspections, (d) community input, (e) problems with pupils and staff?

(a) Amount of teaching by school heads

The Ministry's guidelines state that a primary school head should teach for fourteen 30-minute periods a week, or about 420 minutes per week. However, it is widely known that some school heads do not teach at all. In Table 5.6 information is provided about the number of minutes per week that school heads spend on classroom teaching.

Table 5.6: Means and sampling errors for amount of school head teaching per week

District	School head teaching minutes per week	
	SACMEQ II	
	Mean	SE
Hhohho	374.5	62.94
Lubombo	480.0	101.23
Manzini	464.8	93.17
Shiselweni	390.9	41.03
Swaziland	423.9	38.34

For Swaziland overall the average Grade 6 pupil was in a school where the school head taught for 423.9 minutes per week. This is an average of around 7 hours a week. That is, the school heads were, on average, complying with the regulation described above. However, there was considerable variation between districts and between schools within districts. The lowest average district figure was 374.5 minutes per week from the Hhohho district – which was 45 minutes below the stipulated average.

It would appear the individual schools have decided on the amount of teaching to be undertaken by school heads. The large variations indicate the possibility that some school heads did not teach at all, or had very little teaching time. The highest amount of teaching by school heads occurs in the Lubombo district and might be due to the fact that their schools are smaller and thus school heads have more time for teaching because they do less administrative work.

Policy suggestion 5.9 The Director of Education should provide a forum to debate the role of the primary school heads in the new millennium, and to consider the appropriate allocation of their time among the many roles they are required to take (accountants, managers, leaders, supervisors, inspectors, and teachers).

(b) Activities undertaken by school heads.

The school heads were also asked to rate the importance of various tasks they areresponsible for at school. The responses are summarised in Table 5.7.

Table 5.7: The importance of various school head tasks

Task	Percentage rating as 'very important'	
	SACMEQ II	
	%	SE
Professional development (school heads)	94.9	2.02
Monitoring pupils progress	94.5	1.72
Administrative tasks	91.8	2.08
Professional development (teachers)	83.3	3.08
Discuss educational objectives with the teaching staff	76.3	4.10
Contact with community	69.5	4.24

Most of the school heads rate management tasks such as monitoring (94.5%), administration (91.8%), and professional development of teachers (83.3%) and school heads (94.9%) as "very important". Whereas tasks more linked with pedagogy, such as discussion of educational objectives (76.3%) and contacts with the community (65.5%), receive lower importance ratings. Perhaps these results suggest a re-positioning of the school head's work away from the classroom and community and towards managerial and administrative tasks?

(c) Pupil behavioural problems

In Tables 5.8 and 5.9 the responses of school heads about behavioural problems among pupils and teachers are summarised. The figures in the tables represent percentages reporting the problem never occurred. That is, a low figure in the tables indicates that the "problem" is a matter of concern.

Table 5.8: Pupil Behavioural Problems

Frequency of pupil behavioural problem	Indicating 'never' occurs	
	%	SE
Physical injury to staff	93.8	1.77
Sexual harassment of teachers	91.9	2.14
Alcohol abuse	77.4	3.77
Drug abuse	76.0	3.78
Intimidation of teachers/staff	68.7	4.00
Sexual harassment of pupils	66.4	4.18
Vandalism	49.9	4.41
Classroom disturbance	46.2	4.36
Skipping classes	32.6	3.99
Use of abusive language	25.1	4.03
Cheating	21.5	3.93
Intimidation of pupils	21.0	3.25
Theft	19.9	3.88
Fights	10.4	3.46
Dropping out of school	7.1	2.06
Health problems	2.9	1.32
Arriving late at school	0.9	0.67

There is a cluster of important problems involving both pupils and teachers: arriving late, skipping classes, dropping out (pupils only), absenteeism (teacher only), and health problems. It would seem reasonable to suggest that some of these problems might be linked to the rapid spread of the HIV/AIDS pandemic in Swaziland.

Policy suggestion 5.10 The Research and Planning Unit, in consultation with other HIV/AIDS support groups, should design a research study that will investigate the impact of HIV/AIDS or the functioning of schools and the behaviour of pupils.

The results presented in Table 5.8 suggest there are also other sources of concern with respect to behavioural problems likely to disrupt schools: theft, intimidation of pupils, cheating, use of abusive language and vandalism.

(d) Teacher behavioural problems

School heads were also asked to identify the main teacher behavioural problems. The results for what school heads viewed as teacher problems are presented in Table 5.9.

Table 5.9: Teacher behavioural problems

Frequency of teacher behavioural problem	Indicating 'never' occurs	
	%	SE
Sexual harassment of teachers	96.5	1.41
Sexual harassment of pupils	95.9	1.39
Drug abuse	89.0	2.56
Alcohol abuse	79.9	3.57
Use of abusive language	69.2	4.05
Intimidation or bullying of pupils	64.8	3.98
Skipping classes	64.4	4.13
Absenteeism	39.3	4.42
Arriving late at school	13.9	2.79
Health problems	7.7	2.13

The figures in Table 5.9 are more indicative of some very serious problems in Swaziland's primary schools. For example, schools heads report that they have problems with late arrival of teachers (86.1%) and absenteeism of teachers (61.7%). Another concern is the incidence of "intimidation or bullying of pupils" (35.2%.) and the use of "abusive language" (30.8%).

Conclusion

The study reveals there is very little variation among the districts with respect to age, experience, and training of school heads. However, there is cause for alarm when the issue of specialised training is considered because there is a degree of inequity across school districts. The study shows that Shiselweni district is the worst off, and the Ministry clearly needs to consider extra training programmes for this district.

It is imperative that school heads should be given training to cope with demands put on the system by poverty and HIV/AIDS. A strong in-service programme is required to keep school heads up to date on these challenges. The Ministry cannot constantly add responsibilities to the job of school heads without also providing them with appropriate training.

The results also indicate that school heads have spent quite some time in the schools they are heading. This probably helps provide stability in the schools.

School heads are not happy with the general condition of their school buildings, and the Ministry needs to undertake an intensive audit of all its schools with the aim of creating a priority list of schools to receive repairs.

Chapter 6

Equity in the allocation of human and material resources among the regions and among the schools within regions.

Introduction

This chapter explores whether there was an "equitable" distribution of inputs among Swaziland's education districts and among schools within districts. One of the aims of education is to ensure that all children get a quality education - which includes ensuring that all children have an equal opportunity to learn. The chapter examines whether there are variations in resource inputs among the four districts, and whether there are variations among schools within each district.

The results presented here provide a framework for planning for the provision of supplementary resources and facilities that will help achieve a more equitable distribution. In recent years, the model has been used to guide resource allocations among schools in Swaziland was based on three factors

(a) Differences in school size/enrolment: The tendency has been to provide the big schools with more teachers and more subjects in the curriculum. For example, only large double-stream primary schools teach practical subjects like agriculture and home economics. Since many of the large schools are located in urban centres this has sometimes resulted in inequities with respect to the educational opportunities available to pupils in rural communities.

(b) The quality of existing school infrastructure: Some schools have difficult access roads, no water supply, no teacher housing, not enough classroom teaching aids, and toilets that make the school environment less favourable. In some schools the classroom is not very safe and might not even be conducive to learning. The Ministry has usually targeted such schools in the hope of making them safer and better-resourced learning centres.

(c) Variations in the existing human resources: For historical reasons some schools in the country do not have enough books, teachers, and furniture – sometimes caused by

unplanned for changes in the school environment. For example, some schools have experienced rapid growth in enrolments that have not been addressed by adjusted staffing allocations.

These factors are important in themselves, but in combination they can have a dramatic negative effects on equity, especially if the school is big, has poor infrastructure, and is poorly staffed. In some cases major inequities arise due to an inherent pattern of inequality among districts where development is unequal (Ngoc Chau, 1966).

Measuring equity

(a) Variation among districts

This study used a statistic called the coefficient of intraclass correlation (rho) to divide the variation in resource inputs among schools into two components: (a) among districts and (b) among schools within districts. The value of rho varies from 0 (complete equity among districts) to 1.00 (Compete inequity among districts).

To illustrate the meaning of rho consider the following example. Assuming a system allocates resources to schools equally or more or less equally such that when one calculates the average resource levels for districts, one finds that they are more or less the same – except for minor chance differences. In such a system the value of rho would be close to zero, because of small variations among the districts. In such a case most of the variation would be among schools within districts.

In a school system where there is large variation in resource allocation at district level due to administrative decisions, geographical differentiation, or other reasons, there would be large variations among districts. In this case the value of rho would approach unity. A large proportion of the variation would be due to variation among districts and there would be little variation among schools within districts.

As a further illustration consider a case where rho is 0.30. This would mean 30 percent of the variation could be attributed to differences among districts and 70 percent to differences among schools within districts.

(b) Variation among schools within districts

To quantify differences among schools within the districts the study will make a comparison of the differences among schools within districts with the variation among schools at national level. This simplified to the following formula:

$$\frac{\text{Standard deviation for schools in a district}}{\text{Standard deviation for schools in the nation}} \times 100$$

The standard deviation of an indicator for a particular district measures the amount of variation among schools within that district, whereas the standard deviation for the whole country measures the variation among schools for the nation. Thus the ratio of the standard deviation for schools in a district to the standard deviation for the nation expressed as a percentage provides a measure of the degree of equity within a district compared with the national picture.

To clarify the interpretation of the ratios it might be helpful to consider two hypothetical districts: Districts 1 and District 2. Assume that an indicator has a ratio of 80 percent for District A and 160 percent for District B. This would mean that the variation in resource levels among schools in district A would be 20 percent less than the variation in resource levels among schools in the whole nation. In contrast, the variation among schools in District B would be 60 percent higher than the nation. In other words, there is a more equitable allocation of resources among schools within District A.

General policy concern 17:
Have human resources been allocated in an equitable fashion among the districts and among schools within districts?

(a) Distribution of qualified and trained teachers and school head

Results for the assessment of equity in human resource allocation (a) among schools within the four districts, and (b) among districts are presented in Table 6.1. The final column contains values of rho (multiplied by 100), that is, the degree of variation among districts. For all resources except for pupil/teacher ratio, the value of rho was zero or close to zero.

The rho figure for the pupil/teacher ratio indicates that 13.5 percent of the variation among schools can be attributed to differences among districts. Although this figure is not very large, it does show there is some variation in pupil/teacher ratio among districts. Taken together, however, these values of rho indicate that the Ministry has achieved an equitable distribution of human resource inputs across the districts.

The first four columns in Table 6.1 present the standard deviations among schools within each district, expressed as a percentage of the standard deviation among schools at the national level. For example, the value of 112.2 percent for Manzini concerning “Reading teacher professional qualifications” indicates that the variation in this resource among schools within Manzini is 12.2 percent more than the variation among schools for the whole country. In contrast, for the same resource in Shiselweni the variation is 14 percent lower than for the national picture. This indicates that the allocation of reading teachers among schools is slightly more equitable within Shiselweni than it is within Manzini.

Table 6.1: Equity of human resource allocation as assessed by (a) variation among schools within districts, and (b) variation among districts

Human resources	Variation among schools within districts				Variation among districts (rho x 100)
	Hhohho	Lubombo	Manzini	Shiselweni	
Reading teacher professional qualifications	95.5	104.4	112.2	86.0	0.0
Reading teacher experience	86.7	119.7	89.6	102.6	0.2
Math teacher professional. qualification	89.5	107.4	99.6	106.1	0.0
Math teacher experience	100.1	106.8	107.4	86.1	0.0
School head professional. qualification.	110.0	99.4	97.4	91.7	0.0
School head experience	111.2	101.5	88.4	99.7	0.0
Pupil/teacher ratio	102.1	108.0	87.5	77.0	13.5

The Lubombo district shows that all but one of its figures is greater than 100 percent, whereas the Manzini and Shiselweni district figures are mostly below 100 percent. However, all the deviations are rather small -- less than 120 percent – which was the cut-off point used for interpreting the SACMEQ I study. In summary, the allocation of human resources among schools within districts is reasonably equitable.

General policy concern 18:
Have material resources been allocated in an equitable fashion among districts and schools within districts?

(a) Distribution of general school infrastructure

The study also looked at the distribution of material resources to among districts and among schools within districts. As in Table 6.1 the final column in Table 6.2 represents the values of rho (multiplied by 100). These figures give some measure of the variation among districts, which is actually very small, as indicated by rho values

that range from zero to 5.1. These figures show there is very little variation among the districts in terms of material resource provision.

Table 6.2: Equity of material resource allocation as assessed by (a) variation among schools within regions, and (b) variation among regions

Material resources	Variation among schools within regions				Variation among regions (rho x 100)
	Hhohho	Lubombo	Manzini	Shiselweni	
Classroom furniture index by reading teacher	115.2	94.7	90.4	98.0	0.0
Classroom furniture index by mathematics teacher	120.0	96.2	93.8	88.7	0.0
Toilets per pupil.	88.6	87.1	77.1	133.9	5.1
Classroom library by reading teacher	101.2	101.3	99.0	100.5	0.0
Classroom library by mathematics teacher	102.0	100.6	100.8	99.0	0.0
Classroom space per pupil	9.8	7.7	191.9	48.3	0.0
Reading teacher housing quality	98.9	97.2	100.9	95.5	4.6
Mathematics teacher housing quality	97.3	99.6	100.5	96.6	3.9
School resources index	107.3	110.9	94.9	76.6	3.7

The first four columns in Table 6.2 show the standard deviation among schools within each district expressed as a percentage of the standard deviation among schools at national level. The value of 133.9 percent for the Shiselweni district for toilets per pupil shows the opposite situation, with variation in this district being 33.9 percent higher within Shiselweni than for the whole country.

There is also a large amount of variation among schools in the Hhohho district with respect to the classroom furniture provided for mathematics lessons (120.0%). The variation in this district is also fairly large for classroom furniture provided for reading lessons (115.2%).

There is also great variation among schools in the Manzini district with respect to the amount of classroom space per pupil (191.9%). This variation is almost twice the variation for the nation overall.

Policy suggestion 6.1 The Research and Planning Unit should undertake a detailed survey in order to accurately assess inequities in (a) classroom furniture for the Hhohho district, (b) toilet provision in the Shiselweni district, and (c) classroom space in the Manzini district.

Conclusion.

This chapter has explored the allocation of resources (human and material) to primary schools in Swaziland. The general picture shows that the Ministry has achieved an equitable allocation of resources across districts in primary schools for both human and material resources. This achievement may be attributable to the centralised nature of the Swaziland planning system.

On the other hand, analyses within districts show that there are some large variations in both human and material resources inputs among the schools within certain districts. The Ministry should investigate the causes of this imbalance, which could eventually lead to some schools' becoming more "elite" than others and thus a failure to provide an "equal opportunity" education system. The study has revealed some emerging areas of inequality; but it is up to Ministry to explore the causes.

Chapter 7

Pupil and Teacher Competencies in Literacy and Numeracy

Introduction

In this chapter we present the research findings on reading and mathematics achievement levels for Grade 6 pupils and their teachers. The Grade 6 pupil tests were developed in consultation with curriculum experts in the respective countries. The teachers' tests were constructed in a similar fashion and included some items from the pupil tests. This made it possible to place pupils and teachers on the same underlying literacy and numeracy scales. All test items were piloted in all 14 countries and the best items were then selected to design the final tests. In Swaziland the tests were piloted in 20 primary schools - 5 in each district. A detailed description of the development and scaling of the pupil and teacher tests is presented in Chapter 2.

Three ways of reporting the tests scores

The performance results of Grade 6 pupils and their teachers are presented in three different ways.

(a) Means (traditional)

The first approach is the "traditional" method of reporting the mean scores of pupils and teachers across Swaziland overall and the four administrative districts. This approach provides an aggregated average measure of performance in the form of a number. While this approach follows a familiar pattern for the presentation of test scores, its disadvantage is that it does not clarify the "meaning" of a particular level of performance.

(b) Comparisons with expert judgements

The second approach to evaluating performance is to compare pupil and teacher test scores to agreed "standards" that have been defined by expert national committees (consisting of curriculum specialists, researchers, and experienced teachers) prior to the collection of data. These committees identified two reading and numeracy performances that they would expect from a student who (a) would barely survive during the next year of schooling (the "Minimum" level), and (b) was guaranteed to succeed during the next year of schooling (the "Desirable" level).

(c) Competence levels

The third approach is based upon a scaling technique known as the Rasch Model. This enables the ability levels of pupils and teachers to be aligned with the difficulty levels of test items according to a probabilistic linkage between person ability and item difficulty. This makes it possible to place the test items along a "difficulty" dimension and then group them into "clusters" that are linked to common groups of skills. The clusters of test items are then examined and described in terms of the specific skills required for pupils to provide correct responses. This enables the pupil and teacher performances to be aligned with one of eight levels of competence in reading and mathematics. The names and descriptions of these competence levels are presented in Chapter 2.

General policy concern 19:
What were the levels and variations in the achievement levels of Grade 6 pupils and their teachers?

(a) Reading and mathematics mean scores for grade 6 pupils

The average scores of Swaziland's Grade 6 pupils on reading and mathematics are presented in Table 7.1. The scores were scaled such that the average for Grade 6 pupils for all SACMEQ countries combined was 500 and the standard deviation was 100.

Table 7.1: Means and sampling errors for the reading and mathematics test scores of pupils with all items.

District	Pupil performance on all items			
	Reading		Mathematics	
	Mean	SE	Mean	SE
Hhohho	541.0	8.00	527.4	7.47
Lubombo	534.5	8.61	524.4	5.40
Manzini	525.0	6.18	509.0	4.56
Shiselweni	516.6	5.96	505.2	7.75
Swaziland	529.6	3.73	516.6	3.41

Grade 6 pupils in Swaziland scored an average of 529.6 on the reading test and 516.6 on the mathematics test. Both of these scores are above the SACMEQ reading and mathematics average of 500. Grade 6 pupils in Hhohho and Lubombo districts perform slightly better than pupils in Manzini and Shiselweni in both the reading and mathematics tests. What is surprising is the relatively low performance of the Manzini district. It was expected that pupils in this district would perform much better because many of the schools are located in urban areas. The study also reveals that Manzini district has the highest repetition rate at primary level. This might mean there is a problem with primary education in the district. Pupils in Hhohho have the highest average reading and mathematics scores of 541.0 and 527.4, respectively. This result was expected because most schools in this district have adequate material and human resources (teachers).

Policy Suggestion 7.1 The Research and Planning Unit should conduct further research in order to identify the causes of the relatively low performance by pupils in Manzini.

(b) Reading and mathematics mean scores of Grade 6 teachers

The application of the Rasch model in this study permits Grade 6 teachers to be scored on exactly the same scale as Grade 6 pupils. The technique used to undertake this scoring is described in Chapter 2. The mean scores for Grade 6 teachers are shown in Table 7.2.

At the national level the average reading score for Grade 6 teachers was 748.2, which was 248.2 points (or around two and half pupil standard deviation units) above the average reading score for Grade 6 pupils across the SACMEQ countries. The average mathematics score for Grade 6 teachers was 807.5, which was 307.5 points (or around three pupil standard deviation units) above the average mathematics score for Grade 6 pupils.

Table 7.2: Means and sampling errors for the reading and mathematics test scores of teachers.

District	Teacher performance on all items			
	Reading		Mathematics	
	Mean	SE	Mean	SE
Hhohho	746.9	9.27	809.8	16.12
Lubombo	754.5	10.56	795.3	10.26
Manzini	737.7	11.88	819.7	17.22
Shiselweni	757.2	11.07	800.7	15.65
Swaziland	748.2	5.47	807.5	7.79

The average reading and mathematics scores for teachers did not vary a great deal across districts. The higher and lower district average scores are well within boundaries of sampling error. One quite interesting result is that the average mathematics score for Swaziland Grade 6 teachers was over 50 points (or half a pupil standard deviation score) higher than the average reading score for Grade 6 teachers. This large difference indicates that Swaziland's teachers are (relatively) better prepared in mathematics than in reading.

The average teacher scores do not provide any specific guidance about particular difficulties experienced by the teachers. Further analyses of the data need to be undertaken to examine which test items are most difficult for the teachers. This information could then be used to target in-service training programmes.

Policy suggestion 7.2 The Research and Planning Unit and the staff of the In-service Unit should undertake a detailed analysis of teacher achievement on individual test items in order to identify specific areas where teachers could be given appropriately targeted in-service training.

Policy suggestion 7.3 The Chief Inspector Primary needs to investigate why Swaziland's Grade 6 teachers achieved at a relatively better level in mathematics than in reading.

(c) Minimum and desirable levels of pupil reading achievement

Before the data collection each of the SACMEQ Ministries of Education established expert national committees that included inspectors, teacher leaders, and teachers. The committees were asked to identify the reading performances that they would expect from a student who (a) would barely survive during the next year of schooling (the "Minimum" level), and (b) was guaranteed to succeed during the next year of schooling (the "Desirable" level). Note that the cut-off levels were established only for reading because this was the only subject matter tested in the SACMEQ I Project.

These cut off points were combined across the SACMEQ countries and then used to estimate the percentages of pupils that had reached the two-perfomance levels. The results are presented in Table 7.4 and 7.5 along with their standard errors.

Table 7.3: Percentages and sampling errors of pupils reaching minimum and desirable reading levels.

District	Pupils reaching minimum level		Pupils reaching desirable level	
	%	SE	%	SE
Hhohho	65.6	3.93	11.8	2.95
Lubombo	64.7	4.84	11.7	3.03
Manzini	58.2	3.74	8.3	2.14
Shiselweni	53.2	4.64	4.8	1.25
Swaziland	60.5	2.17	9.2	1.26

The figures presented in Table 7.4 indicate that only 60.5 percent of Grade 6 pupils have reached the "Minimum" level of reading, and a very small 9.2 percent have reached the "Desirable" level of reading. That is, less than two thirds of pupils are reading at the level required to "barely survive" during the next year of schooling, and less than one tenth of pupils are reading at a level that indicates they are"guaranteed to succeed" during the next year of schooling.

Policy suggestion 7.4 The Senior Language Inspectors should convene a conference of interested parties (from Fundza, the National Library, teacher unions, and the Reading Society) in order to review the poor reading performance of Swaziland pupils in comparison with "Minimal" and "Desirable" reading standards set down by SACMEQ's reading specialists.

(d) minimum and desirable levels of teacher achievement

The study also examines the reading achievement level of teachers against the same cut-off points that had been prepared to specify Minimal and Desirable levels for pupil reading achievement. The results , presented in Table 7.5, show that almost all of the teachers (100 percent for Minimal and 96.5 percent for Desirable) are above both pupil cut-off points.

There is one worrying aspect of these results. In Manzini 7.7 percent of the teachers did not reach the desirable level of pupil achievement. By comparing Table 7.4 and Table 7.5 we see that for Swaziland as a whole there are 9.2 percent of pupils who did reach the Desirable cut-off points, which means that the top 9.2 percent of Swaziland's pupils are at a reading level that is superior to the lowest 7.7 percent of teachers.

Table 7.4 Percentages and sampling errors of teachers reaching minimum and desirable reading levels

District	Teachers reaching minimum level		Teachers reaching desirable level	
	%	SE	%	SE
Hhohho	100.0	0.00	98.3	1.72
Lubombo	100.0	0.00	95.9	2.98
Manzini	100.0	0.00	92.3	5.40
Shiselweni	100.0	0.00	100.0	0.00
Swaziland	100.0	0.00	96.5	1.71

(e) Competence levels in reading for Grade 6 pupils and their teachers

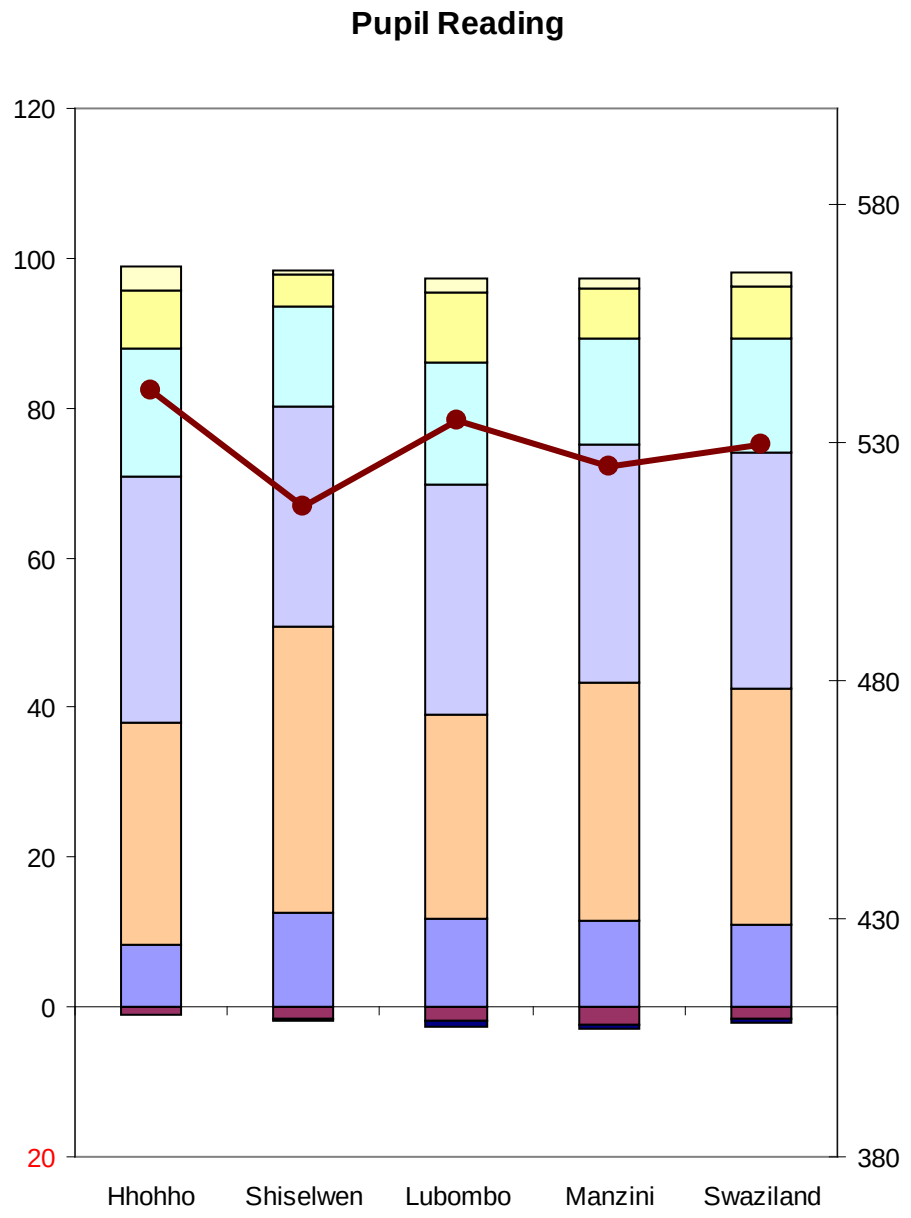
The Rasch technique was used to define a total of eight competence levels for reading and mathematics. These were described in Chapter 2. The shortened name of each level is presented in tables in the lower part of Figure 7.1 and Figure 7.2. The percentages of Grade 6 pupils and their teachers who reached the different levels of achievement are given in Tables 7.5 and 7.6, respectively. The pupils' competence levels are also presented in graphical form in Figures 7.1 and 7.2

Around two thirds of the Grade 6 pupils were located at Levels 4 and 5. There are only small differences across the districts in the performances of pupils at each of the 8 levels.

Table 7.5: Percentages and sampling errors for literacy levels of pupils.

District	Percentage of pupils reaching the reading competence level															
	1		2		3		4		5		6		7		8	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	0.0	0.00	0.9	0.43	8.4	1.31	29.5	2.71	32.9	3.05	17.2	1.96	7.7	1.35	3.4	2.03
Lubombo	0.6	0.50	2.0	1.47	11.8	2.99	27.2	2.37	30.7	3.33	16.3	2.15	9.4	2.51	2.0	1.01
Manzini	0.4	0.22	2.4	0.55	11.6	1.74	31.7	2.74	31.7	2.06	14.3	1.96	6.5	1.55	1.4	0.58
Shiselweni	0.1	0.14	1.7	0.72	12.5	1.55	38.2	4.22	29.6	2.64	13.3	2.65	4.3	1.14	0.4	0.22
Swaziland	0.3	0.12	1.7	0.38	10.9	0.93	31.7	1.61	31.4	1.39	15.3	1.10	6.9	0.82	1.8	0.65

The two lower levels of reading competence are concerned with "pre-reading" and "emergent reading". Pupils at these two levels should be able to undertake simple decoding tasks and match words to pictures and very simple phrases. However, neither of these levels requires pupils to read even simple sentences in order to extract meaning. Therefore, pupils at these lowest two levels could be categorised as "non-readers" in the sense that they cannot "interpret meaning in a short and simple text". It is satisfying to note that only 2 percent of Swaziland pupils are located at the "non-reading" level.



	Hhohho	Shiselwen	Lubombo	Manzini	Swaziland
1 Pre-reading	0	0	1	0	0
2 Emergent reading	1	2	2	2	2
3 Basic reading	8	13	12	12	11
4 Reading for meaning	29	38	27	32	32
5 Interpretive reading	33	30	31	32	31
6 Inferential reading	17	13	16	14	15
7 Analytical reading	8	4	9	6	7
8 Critical reading	3	0	2	1	2
500 Score	541	517	534	525	530

Figure 7.1 Reading levels and mean scores for Grade 6 pupils

The figures presented in Table 7.6 indicate that most teachers in Swaziland (96.5%) are performing at the top two reading competency levels (Level 7 and Level 8). There are some minor variations across the districts in the percentages of teachers at the higher level (Level 8) with the highest district being Lubombo (80.3%) and the lowest being Manzini (73.1%). These results are interesting becauseit was expected that that teachers from the more urbanised district of Manzini would perform better than elsewhere. More research discover why the results in Manzini were so poor.

Table 7.6: Percentages and sampling errors for teacher reading levels.

District	Percentage of teachers reaching the reading competence level															
	1		2		3		4		5		6		7		8	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	1.7	1.72	23.7	7.31	74.6	7.41
Lubombo	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	4.1	2.98	0.0	0.00	15.6	5.67	80.3	6.32
Manzini	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	7.7	5.40	19.3	5.94	73.1	7.31
Shiselweni	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	22.3	6.97	77.7	6.97
Swaziland	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.8	0.58	2.6	1.61	20.5	3.31	76.0	3.60

(f) Competency levels in mathematics for Grade 6 pupils and their teachers

The different levels of achievement for Grade 6 pupils and their teachers in mathematics are given in Tables 7.7 and 7.8 respectively. The pupil competence levels in mathematics also are described in Figure 7.2.

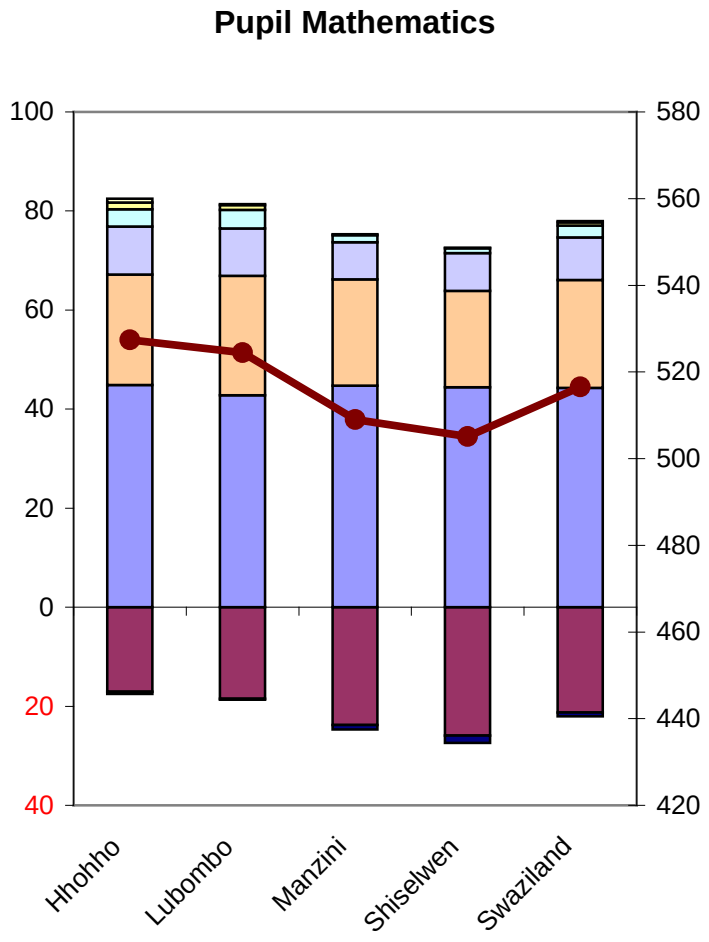
Table 7.7: Percentages and sampling errors for mathematics levels of pupils

District	Percentage of pupils reaching the mathematics competence level															
	1		2		3		4		5		6		7		8	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	0.5	0.24	17.1	2.11	44.9	2.35	22.3	2.04	9.7	1.33	3.4	0.88	1.4	0.78	0.7	0.75
Lubombo	0.1	0.14	18.5	1.92	42.8	1.86	24.2	2.31	9.6	1.82	3.8	1.06	0.9	0.62	0.1	0.09
Manzini	1.0	0.36	23.7	2.30	44.8	2.16	21.5	1.79	7.5	1.47	1.4	0.41	0.2	0.15	0.0	0.00
Shiselweni	1.5	1.33	25.9	2.85	44.4	2.17	19.5	2.94	7.6	1.78	1.0	0.47	0.1	0.09	0.0	0.00
Swaziland	0.8	0.33	21.3	1.22	44.3	1.10	21.8	1.13	8.6	0.79	2.4	0.38	0.7	0.26	0.2	0.22

The results for pupils at the lowest levels of numeracy competence ("pre- numeracy" and "emergent numeracy") are very disappointing. Pupils at these levels are only able to count, recognise shapes and numbers, carry out simple operations, and link simple verbal and graphic forms with simple arithmetic operations. Neither of these two levels requires pupils to work with three-dimensional shapes, use multi-step arithmetic operations, or undertake conversions using division. Therefore pupils at these lower two levels could be catergorised as "non-numerate" in the sense that they have not moved beyond the mechanical skills related to basic calculation and simple shape recognition. For Swaziland there was a total of 22.1 percent of pupils at this "non-numerate level. These results for mathematics were in complete contrast with the results for reading – where there were only a negligible percentage of pupils located at the lowest performance levels.

The figures in Table 7.8 show that most teachers in Swaziland (86.2%) are performing at the top two mathematics levels (Level 7 and Level 8).

There are some variations across the districts in the percentages of teachers at the highest level (Level 8) – with the highest district being Shiselweni (54.2%) and the lowest being Hhohho (40.6%)



	Hhohho	Lubombo	Manzini	Shiselwen	Swaziland
1 Pre-numeracy	0	0	1	1	1
2 Emergent numeracy	17	18	24	26	21
3 Basic numeracy	45	43	45	44	44
4 Beginning numeracy	22	24	21	19	22
5 Competent numeracy	10	10	8	8	9
6 Mathematically skilled	3	4	1	1	2
7 Problem solving	1	1	0	0	1
8 Abstract problem solving	1	0	0	0	0
500 Score	527	524	509	505	517

Figure 7.2 Numeracy levels and mean scores for Grade 6 pupils

Table 7.8: Percentages and sampling errors for teacher numeracy levels s

District	Percentage of teachers reaching the mathematics competence level															
	1		2		3		4		5		6		7		8	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Hhohho	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	13.4	5.22	46.0	8.60	40.6	8.33
Lubombo	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	10.9	4.86	46.3	9.51	42.8	9.55
Manzini	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	4.7	3.36	7.1	5.17	39.5	7.83	48.7	8.34
Shiselweni	0.0	0.00	0.0	0.00	2.0	2.04	0.0	0.00	1.8	1.78	14.9	6.05	27.1	7.90	54.2	9.90
Swaziland	0.0	0.00	0.0	0.00	0.5	0.48	0.0	0.00	1.7	1.01	11.6	2.66	39.7	4.28	46.5	4.49

General policy concern 20:

What were the reading and mathematics achievement levels of important sub-groups of Grade 6 pupils and their teachers?

(a) Differences in pupil achievement by gender, socio–economic background, and school location.

The study categorised Grade 6 pupils into Socio-economic status groups defined as having an above-average number of possessions (“high SES”) and below- average number of possessions (“low SES”). Pupils were also categorised according to their school location as specified by their school head. The intention was to explore whether these affected performance of pupils on either the reading or mathematics tests. The underlying concern here was that all Grade 6 pupils should receive the same quality of education irrespective of their gender, socio-economic status, or the location of their schools. In Table 7.9 the average reading and mathematics mean scores of Grade 6 pupils are shown for each of the groups.

Table 7.9: Means and sampling errors for the reading and mathematics test scores of pupils by sub-groups

Sub-groups	Pupil performance on all items			
	Reading		Mathematics	
	Mean	SE	Mean	SE
Gender				
Boys	525.0	4.15	519.0	3.30
Girls	533.9	3.79	514.3	3.96
Socio-economic level				
Low SES	519.1	2.75	511.4	3.02
High SES	541.0	5.77	522.2	5.15
School location				
Isolated/rural	517.8	3.26	511.0	3.43
Small town	552.1	11.00	528.3	6.77
Large city	562.1	13.13	531.1	13.27
Swaziland	529.6	3.73	516.6	3.41

The “gaps” in Grade 6 pupil reading and mathematics scores are quite small for gender, and much larger for both socio-economic status and school location. Girls perform an average of 9 score points better on reading, and boys perform an average of 5 score points better on mathematics. Both of these differences are small in comparison to the standard sampling errors. In comparison with low SES groups of Grade 6 pupils, the high SES groups of Grade 6 pupils are around 20 score points higher in reading, and around 10 score points higher in mathematics. The gaps between Grade 6 pupils in isolated/rural areas compared with large cities are even larger at around 45 points for reading and 20 points for mathematics. The average achievement levels in small towns fall between the extremes of isolated/rural and large cities. These results demonstrate that in Swaziland there are strong and consistent achievement differences between Grade 6 pupils from different socioeconomic backgrounds and different locations.

Policy suggestion 7.5 The Chief Primary Inspector needs to establish a task force to investigate the gaps in pupil achievement levels associated with socio-economic differences and school location differences.

Conclusion.

This study has revealed that Grade 6 pupils and their teachers perform rather well in reading. There are very few "non-readers" in Grade 6. Such results are very encouraging when one considers that many of the Grade 6 pupils had indicated that they came from homes where there were few reading materials. The worrying picture was in mathematics, as the study indicated that 22 percent of the Grade 6 pupils were performing at the bottom two "non-numerate" levels.

Another concern is that pupil achievement varies according to socio-economic level and school location. The study revealed that pupils from high socio-economic backgrounds and urban areas perform much better than those from low socio-economic backgrounds and from schools that are rural and isolated. Another worrying result is the low performance of pupils from the Manzini district. Pupils from this district perform poorly in both reading and mathematics. It is, however, encouraging to note that the study did not find any differences in performance by gender.

Chapter 8:
Agenda for Action

Introduction

This report has used research data to generate a range of policy suggestions aimed at helping Swaziland's educational planners make informed decisions about the quality of education. The policy suggestions describe the actions required to make Swaziland's primary education system more efficient and effective. In this chapter the major policy suggestions are reviewed and categorised into four main groups and then linked with time frames and costs.

Each suggestion also tries to identify the office within the Ministry that would be responsible for leading the discussion and taking action. The intention is to provoke discussion concerning the validity of the suggestion, modify the suggestion if necessary, and then integrate the revised suggestions into the Ministry's work plans. The policy suggestions have been made bearing in mind the social, economic and political systems realities in the country. Most suggestions are also intended for "national" implementation because Swaziland's system of planning, development, and engagement is mostly centralised at national level.

The classification of policy suggestions.

A total of 41 policy suggestions were made in Chapters 3 to 7. All of these suggestions were classified into the four main groups described below. The policy suggestions were then listed in Table 8.1.

(a) The four main groups

Group 1: Review of existing planning, operational, and policy procedures that are entirely within key portfolios in the Ministry of Education. Policy suggestions in this group might require a re-statement of policy, review of implementation strategies, or change of approach and focus. An example would be the equitable allocation of teachers across all districts. The study has indicated that most of the few graduate teachers are located in urban districts. The Teaching Service Commission in this case

would need to ensure that the two rural districts, Lubombo and Shiselweni, are also allocated some university-trained teachers. This requires no major funding, for it could be done with minimal costs and consultations, but would require a change in the approach to allocating teachers. .

Group 2: Consultation with staff, community, and national education stakeholders. The suggestions in this group tended to be low cost, and they could be implemented as part of the Ministry's normal operations. Some of these might involve a review of procedures, and a revitalization of certain key operations, but would not need major input from stakeholders outside the Ministry -- for example, an examination of the role of the Director of Library Services with respect to the resourcing of school libraries. Under present arrangements it is Fundza (a non governmental organization) that is mainly responsible for equipping school libraries with reading materials. In order to encourage schools to set up their own libraries, the Director of Library Services would need to engage Fundza to develop a national strategy.

Group 3: *Data collection, research, training, and consultations with stakeholders for major planning and policy suggestions*. Policy suggestions under this heading may require some funding outside "normal" budgetary allocations. In most cases these could include small data collection exercises, training or in-service and research activities designed to collect key planning information. For example, a district such as Manzini might be required to undertake an enquiry into the causes of grade repetition. This task would be performed in addition to normal operations and hence the Research and Planning Unit might need to request "additional" funding from the government for this purpose.

Group 4: Investment in infrastructure and major capacity building. These policy suggestions involve either major funding or extensive use of human resources -- for example an audit of the repair status of school buildings – which would involve cooperation among the Ministry of Public Works and Transport, the Ministry of Health and Social Welfare, and the Ministry of Education, in order to define the indicators and then undertake the study.

(b) The responsible authority

Although this report has assumed that the Ministry has the overall responsibility to address the policy suggestions, specific offices/sections within the Ministry that would be responsible for the coordination of the work involved have also been identified. The second column in Table 8.1 lists these offices and sections. The "listed authority" would also be expected to report implementation progress.

(c) Data and information sources

Some of the policy suggestions would require the Ministry of Education to interact with other stakeholders and the community. The third column attempts to identify the institution or individual that would be involved in providing information on the progress of implementation.

(d) Level

Swaziland's education system is very centralised and, therefore, most of the policy suggestions would be implemented at national level. However, some would fall under the control of units or individuals within the Ministry – and the levels at which these would operate has been listed in the fourth column.

(e) Costs and time

The main determining factors for the implementation of the policy suggestions (apart from their feasibility) would be the "costs" and "time" involved. These have been presented in the final column. The time estimates are based on these broad categories: short (within one financial year), medium (two to three years), and long term (included in the three-year rolling plan). The cost estimates are categorised according to low (within normal budgets), moderate (would require additional funds), or high (would require major inputs).

Table 8.1: Summary of policy suggestions in association with relevant department(s), and suggested level of engagement and cost/time involved.

Policy Suggestion	Coordinating office or institution	Data and information sources	Level	Costs/Time
Group 1: Review of existing planning, operational and policy procedures.				
Policy suggestion 3.5 The Research and Planning Unit in collaboration with the Principal Secretary should monitor and coordinate the opening of new schools in consultation with the District Education Offices and the National Regional Development Teams to ensure that the distances between schools and other social services are reasonable.	Principal Secretary	District Advisory Boards, Research and Planning Unit	District	Low/Short. New policy statement
Policysuggestion 3.8 The District Education Officers should inform school heads that all teachers should require pupils to have their homework signed each time it is given.	District Education Officers	School head, teachers and pupils	District	Low/Short. Policy statement
Policy suggestion 3.12 The Chief Inspector Primary and the Research and Planning Unit should review mechanisms by which the textbooks are distributed, and also develop some criteria for the allocation of books to those schools with the greatest needs.	Chief Inspector Primary and the Research and Planning Unit	School heads, Inspectors and District Education Officers	National	Low/Short. Review of guidelines and criteria
Policy suggestion 4.3 The Teaching Service Commission needs to review procedures used to allocate well-qualified teachers across the four districts in order to develop an approach that will promote a more equal allocation of teachers that have reached higher academic levels.	Executive Secretary. Teaching Service Commission	School heads, District Education Officers and the EMIS	National/District	Low/Short. Review of approach to appointment of teachers
Policy suggestion 5.1 The Research and Planning Unit should monitor the gender balance of the school heads across districts and provide this information to the Teaching Service Commission with the aim of appointing more female school heads - especially in the Manzini district.	Research and Planning Unit	Teaching Service Commission and EMIS	National/District	Low/Short. Policy direction.

Table 8.1: Summary of policy suggestions in association with relevant department(s), and suggested level of engagement and cost/time involved (cont'd).

Policy Suggestion	Coordinating Office or institution	Data and Information Sources	Level	Costs/Time
Policy suggestion 5.4 The Chief Inspector Primaryin consultation with the Guidance and Counselling unit should establish a national policy on the requirements of all schools to have well stocked first aid kits, and immediate steps should be taken to implement this policy.	Chief Inspector Primary and the Director of Career Guidance and Counselling	School heads and Regional Education Officers	National/District	Low/Short. Policy statement. Although costs might be incurred by schools
Group 2: Consultation with staff, community and national education stakeholders				
Policy suggestion 3.4 The Director of the National Library and Fundza should cooperate to ensure that there is equitable distribution of learning resource centres throughout the country, especially in rural primary schools.	Director of National Library Service	School heads, and Communities	National	Low/short
Policy suggestion 3.13 The Chief Inspector (Primary) in collaboration with the Head Teachers Association need to devise a strategy whereby pupils in schools with libraries are permitted to borrow books to read at home.	Chief Inspector Primary	Pupils, teachers and school heads.	National	Low/short
Policy suggestion 3.15 The Director of Education needs to establish measures in consultation with the Teachers' Union and other education stakeholders, to ensure that extra tuition does not become a problem that disadvantages those pupils who cannot afford it, and that tempts some teacher to give "preference" to paying pupils.	Director of Education	Pupils, teachers, parents and school heads	National	Low/short
Policy Suggestion 4.5 The Director of Education should establish a committee of inspectors to review the content and delivery of in-service training programmes and to bring forward suggestions for making them more effective.	Director of Education	Teachers and school heads	National	Low/short

Table 8.1: Summary of policy suggestions in association with relevant department(s), and suggested level of engagement and cost/time involved (contd.).

Policy suggestion	Coordinating office or institution	Data and iInformation sources	Level	Costs/Time
Policy Suggestion 4.14 The Director of Education and Fundza should devise mechanisms to increase the number of schools having school/classroom libraries and also ensure that there is a good storage facility in the schools for books.	Director of Education	School heads, Fundza and Inspectors	National	Low/short
Policy suggestion 4.15 The Research and Planning Unit and the Ministry should use the SACMEQ list of classroom resources as a starting point for building a more comprehensive checklist of "essential classroom resources" that can be used to study the allocation of resources among schools and districts.	Research and Planning Unit	School heads	National	Low/short
Policy suggestion 4.16 The Director of Education should clearly define the role of the Teacher Innovation and Development Centres and develop an organisational structure and provide resources for the centres to ensure that their work is clearly defined and coordinated, and that Teacher Leaders stationed in them have a clear role to play that will enable teachers to appreciate their usefulness.	Director of Education	Teachers and School heads	National	Low/short
Policy suggestion 4.17 The Coordinator of INSET should commission a study to find out why teachers seem not to be making full use of the centres, even when some of them are available and within travelling distance to schools.	Coordinator of INSET	Teachers and District Education Officers	National	Low/short
Policy suggestion 4.18 The Principal Secretary should establish an independent enquiry into the roles and performances of Inspectors and Teacher Leaders – with a view of bringing forward proposals aimed at developing good cooperation between the two groups and the teachers.	Principal Secretary and the Executive wing of MOE	Teachers, and District Education Officers	National	Low/short

Table 8.1: Summary of policy suggestions in association with relevant department(s), and suggested level of engagement and cost/time involved (contd.).

Policy Suggestion	Coordinating Office or institution	Data and Information Sources	Level	Costs/Time
Policy suggestion 5.7 The Permanent Secretary establish a working group with representation from the Ministry of Health and Social Welfare to define a national benchmark for the quantity and quality of toilet provision in primary schools and then communicate this information to school heads and communities.	Principal Secretary and the research and Planning Unit	School heads and Inspectors (Education and Health)	National	Low/short
Policy Suggestion 7.3 The Research and Planning Unit and the staff of the INSERVICE Unit should undertake a detailed analysis of teacher achievement on individual test items in order to identify specific areas where teachers could be given accurately targeted in-service training.	Coordinator of INSET	Teachers and school heads	National	Low/long
Group 3: Data collection, research, training and major consultations with stakeholders for major planning and policy suggestions				
Policy suggestion 3.2 The Research and Planning Unit should speak with school heads in the Hhohho district and also examine the school census information in order to explain why the participation of female pupils in this district was so low.	Research and Planning Unit	School heads and teachers	District	Moderate/long
Policy suggestion 3.6 The School Health Programme, in conjunction with the nurses (Ministry of Health and Social Welfare) attached to the Ministry of Education should strengthen the health monitoring aspects of their service – especially with respect to illnesses that could provide warning signs of the spread of the HIV/AIDS.	Director of Guidance and Counselling	School heads, teachers and pupils	National	Moderate/long
Policy suggestion 3.7 The Manzini District Education Office needs to set up a study to explore the causes of the high level of grade repetition in its primary schools.	District Education Officer	School heads, teachers and pupils	District	Medium/short

Table 8.1: Summary of policy suggestions in association with relevant department(s), and suggested level of engagement and cost/time involved (contd.).

Policy Suggestion	Coordinating Office or institution	Data and Information Sources	Level	Costs/Time
Policy suggestion 3.9 The Research and Planning Unit should design and conduct a research study in the homework practices in order to identify why any pupils are not receiving regular and frequent homework, and why a large percentage of pupils do not have their reading homework corrected.	Research and Planning Unit	School heads, teachers and pupils	National	Moderate/long
Policy Suggestion 4.7 The heads of the Reading and Mathematics Departments in Swaziland's teacher training colleges should share and discuss the results obtained on "the most important reading activities" with their staff as part of their own in-service training.	Chief Inspector Colleges	Lecturers from teacher training Institutions	National	Moderate/short
Policy suggestion 4.10 The Chief Primary Inspector should further clarify with teachers, curriculum developers, and inspectors the concept of "Continuous Assessment," and should ensure hat the recommended guidelines on the recommended frequency for using classroom tests are adhered to.	Chief Inspector Primary	School heads, teachers, Inspectors and pupils	National	Moderate/long
Policy suggestion 4.11 The Research and Planning Unit should undertake a research study on classroom assessment practices in order to gain more detailed information about this important area of teaching.	Research and Planning Unit	School teachers and pupils	National	Moderate/short
Policy suggestion 5.6 The Research and Planning Unit should expand the Annual School Census data collection to include the collection of information about the conditions of school building needs to undertake a comprehensive audit of all school buildings in the country with the aim of developing a programme of improving their conditions.	Research and Planning Unit	School heads and teachers	National	Moderate/long

Table 8.1: Summary of policy suggestions in association with relevant department(s), and suggested level of engagement and cost/time involved (contd.).

Policy Suggestion	Coordinating Office or institution	Data and Information Sources	Level	Costs/Time
Policy suggestion 5.9 The Director of Education should provide a forum for debate on the role of the primary school head in the new millennium and to consider the appropriate allocation of their time among the roles that they are required to take (accountants, managers, leaders, supervisors, inspectors, and teachers).	Director of Education	School heads and the head teachers association	National	Moderate/long
Policy suggestion 5.10 The Research and Planning Unit in consultation with other HIV/AIDS support groups needs to investigate the effects of HIV/AIDS and poverty in order to identify very needy pupils in the communities.	Research and Planning Unit	School committees and community development committees	National	Moderate/long
Policy Suggestion 6.1 The Research and Planning Unit should undertake a detailed survey in order to accurately assess the inequities in (a) classroom furniture for the Hhohho district, (b) toilet provision in the Shiselweni district, and (c) classroom space in the Manzini district.	Research and Planning Unit	School heads and teachers	District	Moderate/short
Policy suggestion 7.3 The Chief Inspector Primary needs to investigate why Swaziland's Grade 6 teachers seemed to be achieving at a relatively better level in mathematics than they are in reading.	Chief Inspector Primary	School heads	National	Moderate/short
Policy Suggestion 7.4 The Senior Language Inspectors should convene a conference of interested parties (from Fundza, the National Library, Teacher Unions, and Reading Society) in order to review the rather poor reading performance in Swaziland pupils in comparison with minimal and desirable reading standards set down by SACMEQ's Reading Specialists.	Senior Inspectors, English, Siswati and French	School heads, teachers and pupils	National	Moderate/short

Agenda for Action for the Ministry of Education.

This report was prepared during the time when the Ministry of Education was drafting the "Education for All Plan" for 2015. The study presented the Ministry with valuable information that could be used to identify areas of concern and bring forward suggestions for improving policy. In most cases, it identified which department of the Ministry of Education was the coordinating unit, in order to facilitate accountability and the reporting of progress. As mentioned earlier, Swaziland's system is centralised and therefore most policy suggestions need to be implemented at the national level.

Co-ordination of the Ministry's responses to the proposed agenda for action

The Ministry of Education's response to the Agenda for Action will require inputs from many different groups of people inside and outside the Ministry. This mobilization of efforts and resources will require close co-ordination to ensure that (a) decisions taken at the senior level of the Ministry concerning the policy suggestions are implemented, and (b) a mechanism is established to monitor and evaluate the progress and impact of these decisions.

The Research and Planning Unit should undertake this coordination. Arrangements will need to be made to ensure that the Research and Planning Unit staff involved in this work are given sufficient time, resources, and support to ensure that important decisions are followed up, and to guarantee that the Ministry's senior decision makers are given regular briefings on progress and achievements.

The future

This educational policy report grew out of series of cross-national research activities that were aimed at improving the capacity of educational planners to monitor the quality of education. The collaborative approach used to conduct this research represents a genuine breakthrough for the conduct of educational policy research in Southern and Eastern Africa. It is indeed rare, for a group of educational planners from many countries to join forces in this way to in order to produce research instruments, conduct surveys, and analyse and interpret the data.

The member countries of SACMEQ acknowledge the value of this co-operative approach towards capacity building, and they have all agreed to continue with their efforts to work together, to learn from each other, and to share their experience and expertise.