SACMEQ Educational Policy Research Series

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

Seychelles
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

The Republic of Seychelles, a small island state located in the western Indian Ocean, is an archipelago consisting of 115 islands with a landmass of 445 square kilometres. Only four of the larger islands (Mahé, Praslin, La Digue and Silhouette) have a permanent sizeable population totalling up to 80,410 (Management and Information Systems Division, 1999). The population is concentrated on Mahé, the principal island, where the administrative centre of Seychelles has been established. Population growth is relatively low at less than 2 percent per year. Seychelles has developed a multiracial society with Christianity as the dominant religion and Creole as the mother tongue. English, French and Creole form the three national languages. Although there have been attempts at diversification, the Seychelles economy depends on tourism.

Since 1977, the year of independence, education in the Seychelles has been guided by the following policy concerns: education for all, education for life, and education for social and national development. The numerous reforms that followed independence were driven by the egalitarian principles of providing equal opportunities, the humanitarian principles of social justice and the educational principles of experiential learning. They were spearheaded by structural changes such as "zoning" where "all children had to go to school in their residing districts", by innovations in the secondary school, and the establishment of the polytechnic as the centre for further education. These reforms were consolidated by the amendment of the education act, expansion of the infrastructure to accommodate new schools, development of support services, and the continued renovation of teacher education.

The education system of Seychelles provides full access to ten years of general education, and in the year 1999 the net intake rate into primary schools was 100 percent. Dropout at primary level is not a problem although there are some instances of unexplained absences. In 2000, for example, 60 cases of truancy were being followed-up by the Student Welfare Unit at the Ministry of Education. However, dropouts in the last two years of secondary education were recorded as twenty-five percent in 2000. This may be a sign of deficiencies in pupils' learning that may need attention.

Curricular reform had been initiated in the primary and secondary school with the launching of the National Curriculum Framework and the Ministry has been concerned with implementing strategies to improve the quality of education. The School Improvement Programme (SIP), aimed at improving pupils' performance by introducing and implementing development planning in schools, has been functioning since 1995. The Quality Assurance Service set up in 1999 to support the internal evaluation of schools (which originated from SIP) and carry out external evaluation of schools is yet another indication of the Ministry's commitment to high standards and to increase the effectiveness of the education system.

The Ministry of Education has also been aware of international trends in the assessment of educational achievement. Both the Third International Mathematics and Science Study (TIMSS), carried out at the primary and secondary levels by the International Association for the Evaluation of Educational Achievement (IEA), and the Programme for International Student Assessment (PISA), developed by OECD (Organisation for Economic Co-operation and Development) member countries for all 15 year-olds, are examples of mechanisms set up to monitor educational quality in many countries. SACMEQ (Southern African Consortium for Monitoring Educational Quality) was a response by Ministers of Education in a group of developing countries in Southern and Eastern Africa to develop a multinational project for monitoring the quality of education. Seychelles had observer status during the first phase of SACMEQ (SACMEQ I) which was aimed at studying a range of educational inputs on the reading achievement of Grade 6 (P6) pupils.

On becoming a fully-fledged member of SACMEQ in 1999, the Ministry of Education participated in and supported the SACMEQ II project, which was an extension and refinement of SACMEQ I and included achievement in mathematics and reading comprehension at Grade 6 level. This provided a sound means of evaluating the quality of basic education.

The education system

Education in Seychelles is comprehensive, co-educational, and free of charge to all Seychellois children for a period of 13 years (from *Crèche* or pre-primary to secondary). In the year 2000, there were 3,065 children in preschool and over 10,000 pupils in primary schools, and nearly 8,000 students in secondary schools. At the same time, a flexible option system of post-secondary, further and continuing education has been evolving. This includes vocational training institutions under the auspices of other Ministries. Within the Ministry of

Education, there is an Industrial Training Centre, a college of further education (the Seychelles Polytechnic), a teacher training college (National Institute of Education), and an Adult Learning and Distance Education Centre. There is no university, and students follow graduate and other advanced courses abroad. However, collaboration and linkages with universities in other countries are being established.

The majority of the school population is concentrated on Mahé (88 percent) with 8 percent on Praslin and 4 percent on La Digue. Silhouette, on the other hand, has such a low school population that the primary school has a multi-grade system, and children have to live on Mahé to benefit from secondary education.

All children between the ages of 5 to 6 and 15 to 16 must attend school. The Education Act of 1983 made provision for nine years of compulsory schooling. This was extended to ten years in 1991. The Ministry of Education operates six years of primary (P1 to P6) and five years of secondary schooling (S1 to S5). The number enrolled in each group has remained fairly stable at around 1,600 pupils in each year of the primary/secondary cycle. This does not include the 7 percent who attend private primary or secondary schools.

(a) Pre-primary (*crèche*) education

Although crèche education is optional, over 99 percent of children aged between 4 and 6 attend crèches. These are mostly government kindergartens attached to primary schools. In addition, there are nursery schools – better known as day-care centres – which are privately owned. The possibility of lowering the age of entry in government crèches to 3½ years is being considered.

(b) Primary education

Of the 24 primary schools operated by the Ministry of Education, one is situated on La Digue, two on Praslin, and the rest on Mahé. These schools vary in size with only one class per year group in the smallest school and six in the largest school. However, the average school consists of about three classes per year group. Most of the teachers are trained to the local Diploma of Education level but 18 percent of teachers were still untrained in 2001 and part-time training courses for some of them were introduced in 2000.

The curriculum in the primary school focuses on communication skills, broad academic skills, and personal/social skills. Creole, (the mother tongue), English (the language of business and administration), and French (which historically remains very much part of the Seychellois culture) are the three languages taught. At the same time, a wide range of subjects - including mathematics and science, social science, some aspects of the arts, physical education and personal and social education - are also included. Whilst Creole is the medium of instruction in Crèche, P, and P2, English becomes the language of instruction throughout the school system from P3 onwards. Emphasis is placed on English as a key language in learning and teaching. The overriding objective of the Ministry of Education is to deliver a curriculum that will produce flexible, adaptable students, whose education is up to international standard as part of the human resource development strategies of a small state.

Progression through primary school is automatic with a national examination at the end of the 6 years of primary education. This examination is, in fact, a summative assessment in the following subjects: English, French, Creole, mathematics, science and social science. There has been some debate about the purpose and use of this examination (Leste, 1999). Some of these arguments have centred on "the lack of necessary information that would inform teaching and learning"; others have queried the use of the P6 tests as an "indication of the effectiveness of the curriculum."(Benstrong, 2000). The SACMEQ II Project offered a timely opportunity to test the basic skills in key subjects, namely English and mathematics. The SACMEQ II tests were developed and piloted internationally and it was therefore expected they would provide useful information on the strengths and weaknesses of pupil performance, and also generate information that could be used to set standards.

(c) Secondary Education

Secondary education is delivered in regional secondary schools. Instead of students remaining in the district where they attended primary schools, they are now being concentrated into fewer regional centres. The process of establishing ten regional secondary schools that was carried out during the 1990's is now essentially complete. All pupils from the primary schools enter the secondary school at S1. Students follow a core curriculum from S1 to S3, which is then followed by an option system in S4/S5 as students prepare for the National School Certificate and the Cambridge O-Level examination. In the year 2000, it was reported that around 70 percent of secondary school students proceeded to post-secondary institutions.

d) Administrative structure

Seychelles is characterised by a highly centralised education system with a common curriculum framework, common textbooks and learning teaching materials. The Ministry of Education manages the schools through individual head teachers; it controls facilities, resources, staffing, and budgetary allocation. One of the important objectives of the education system is to provide equal opportunities for all and to distribute resources equitably.

However, since the Quality Insurance Service has just been set up, and there has been no inspectorate system information about physical resources, the learning experiences of pupils, and the human resources available in schools has not yet been systematically collected. The SACMEQ II Project was expected to contribute to an assessment of educational provisions in primary schools and pupils' educational outcomes. .

Educational issues of the Ministry of Education and SACMEQ

Education is given high priority in Seychelles. Since 1990, the Ministry of Education has received between 13 to 17 percent of the total budget of the country. With such considerable investments, and in the wake of major reforms, particularly in secondary education, it has become extremely important for the Ministry of Education to set up monitoring mechanisms and to streamline its policies in relation to primary education.

The three main "operational objectives" of the Seychelles Education service in the revised policy statement (Ministry of Education, 1999) are:

- Equity not only in terms of access but especially in terms of conditions, inclusion and redressing gender imbalance in performance;
- Quality through quality assurance, institutional planning, and development; and
- Accountability by developing processes to evaluate outcomes, provide reliable information on learners' achievement and guide future planning.

To a great extent the main concerns of SACMEQ match those of the Ministry of Education:

- The Ministry of Education is concerned with monitoring achievement at key points in the system; SACMEQ's assessment of learning achievement at Grade 6 fixes a mid-

point target that will link backwards to early childhood and forward to secondary education.

- The Ministry of Education places great emphasis on planned change based on research; SACMEQ uses rigorous and extensive survey methods in its evaluation of educational provisions.

- The Ministry of Education is moving towards the implementation of educational strategies based on systematic investigation; SACMEQ is a leading organization in producing policy-orientated research.

Capacity building, which is one of SACMEQ's main objectives, allows the Ministry of Education to prepare a cadre of professional educators with research expertise, through the Co-ordinating Centre of SACMEQ

- The direction of SACMEQ is guided by the participating Ministries of Education, and as Seychelles was certified as a fully-fledged member, senior members of the Ministry of Education can have a significant input in the definition of policy issues and questions that are used to guide the SACMEQ research programme.

The SACMEQ II project was intended to address a number of broad policy issues. These are listed below as specific research questions about which the Ministry of Education is seeking answers:

1. What are the home backgrounds and characteristics of the pupils?
2. What are the characteristics of teachers and the conditions of teaching in the classroom?
3. What are the conditions of schooling in terms of textbooks and other supplies available to pupils, the adequacy of accommodation in the classrooms, the material and human resources in the schools?
4. To what extent are the physical resources equitably allocated to schools?
5. What is the level of achievement of P6 pupils in reading and mathematics?
6. How different is the level of pupils' achievement among schools, within schools, and between genders?

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.

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

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.

$$\boldsymbol{n^* = n_c / deff}$$

(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.

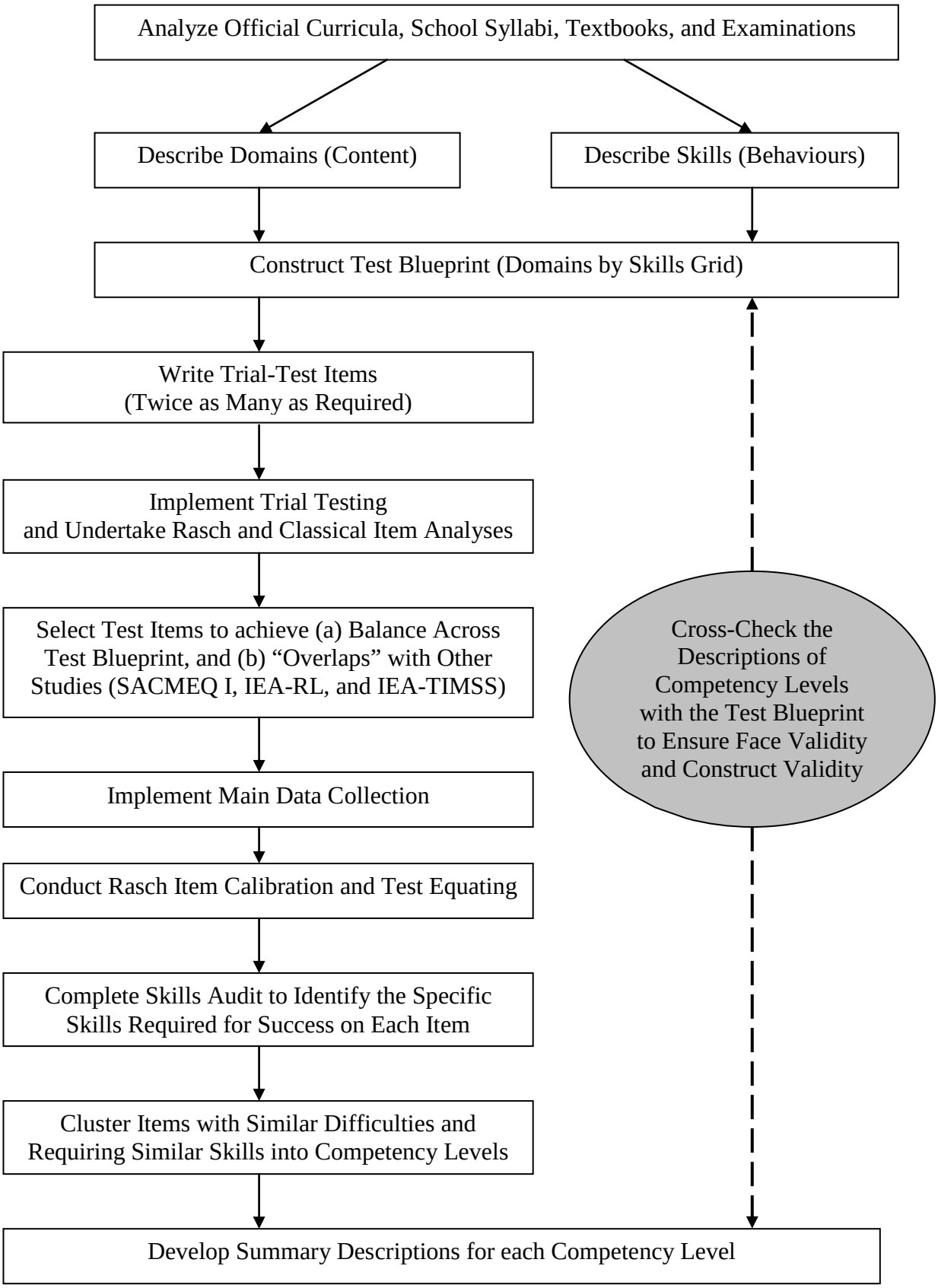

Figure 2.3: Main Steps Involved in Test Construction for the SACMEQ II Project

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).

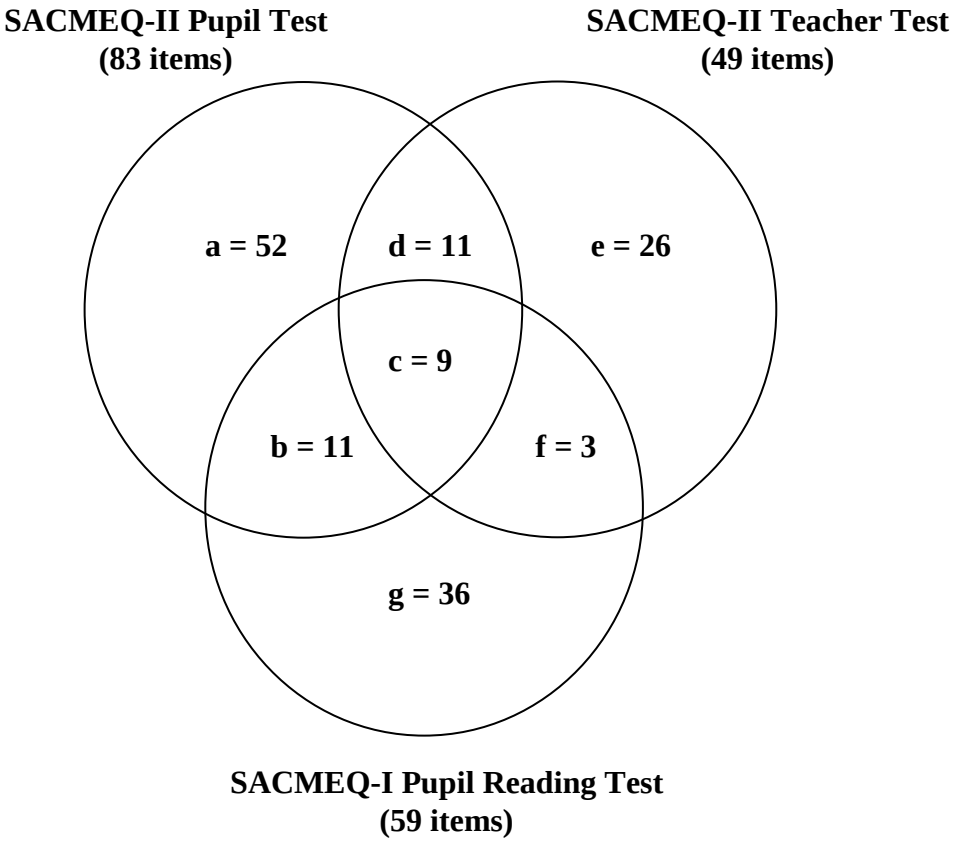

Figure 2.10: The 148 Reading Items for Three Groups of Respondents Taking "Different but Overlapped" SACMEQ Reading Tests

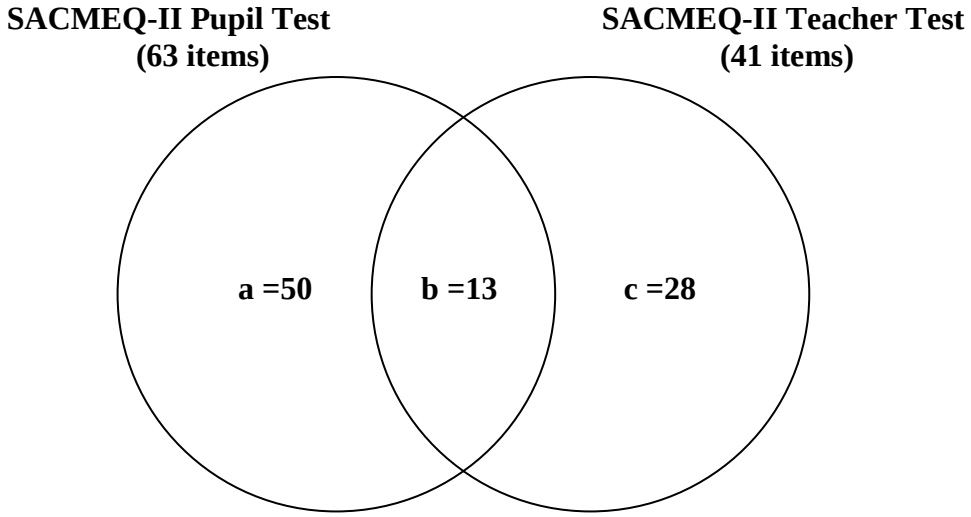

Figure 2.11: The 91 Mathematics Items for Two Groups of Respondents Taking "Different but Overlapped" SACMEQ Maths Tests

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.

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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

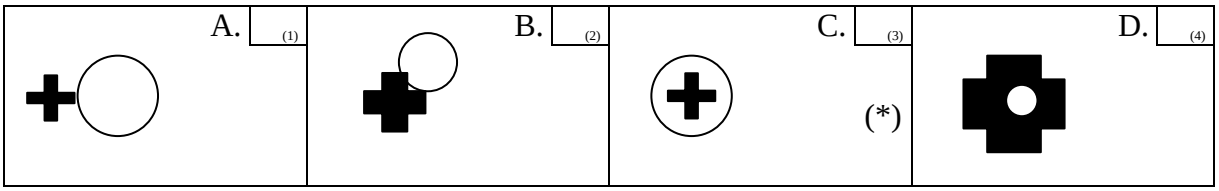
Example Test Items for Each Level of Competence in Reading

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 <u>main</u> 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.

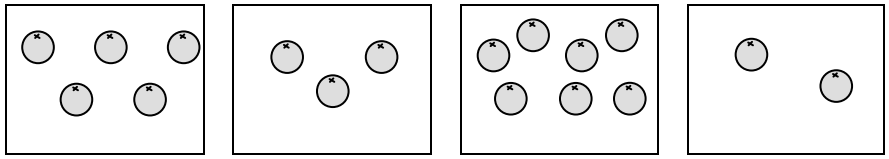
Appendix I

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

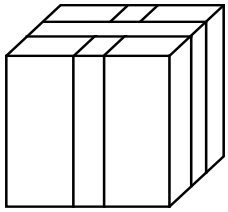
Comment: The pupil needs to perform the task of subtraction - with carrying.

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.)

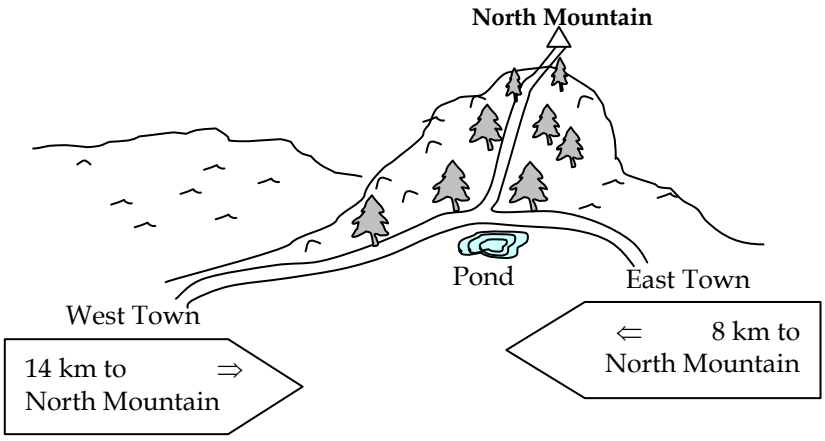
Level 8: Abstract Problem Solving (A New Level Generated from the Skills Audit)

(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

Introduction

In this chapter we discuss the characteristics of P6 pupils and their home environment. This will provide a context for analyses described later and set a baseline against which changes over time can be measured. More specifically, the differences in home background will be used to construct a socio-economic status scale, an important construct in educational research. It is by taking the socio-economic status of pupils' homes into account that certain problems within a school system can be clarified. Of particular interest for Seychelles is the practice of grouping pupils into ability streams within schools.

Regions used in this report

The results from the survey of 24 schools have been grouped by region. These groups were based on geographical clusters were established in the early 1980s for networking purposes by the School Division of the Ministry of Education. The resulting classification has been used by the School Improvement Programme to allocate teaching and learning support to schools and for organizing professional development activities. In this study one private school was included, whereas the school on Silhouette (because of its very small size) was excluded from the Islands region. The schools included in each region were:

Central	Bel Eau, Bel Eau Annexe, Independent, La Rosière, Mont Fleuri, Plaisance
East	Anse Aux Pins, Cascade, Pointe Larue
Islands	Baie Ste Anne, Grand Anse Praslin, La Digue
North	Anse Etoile, Beau Vallon, Bel Ombre, Glacis, La Retraite
South	Anse Royale, Baie Lazare, Takamaka
West	Anse Boileau, Grand Anse Mahé, La Misère, Port Glaud

A note on the interpretation of the data analyses

Before presenting the results, two points should be stressed. The first is that the variables presented in this chapter represent a small subset of the larger number of variables for which data were collected. The Ministry will make a separate publication containing descriptive statistics for all variables in the study available to interested readers.

In many reports of this kind, a sampling error is usually attached to each estimate presented. However, in Seychelles every pupil at P6 level was tested. No sampling was undertaken and therefore there was no standard error of sampling to be calculated. The values presented in the following tabulations represent the whole of the P6 level population.

The second point is that in interpreting the values in Table 3.1 and other tables throughout this report, it is important to remember that the percentages and means have been presented in terms of pupils. That is, pupils were the units of analysis - even though some variables referred to teachers or schools. Where a percentage for a variable that describes teachers has been 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 percentage of pupils were in schools with the particular characteristic.'

Specific policy questions related to educational inputs

As a starting point, the first broad educational policy issue identified at the end of Chapter 1 was transformed into a set of specific questions that would lead to structured responses. These questions were:

a) What was the distribution of boys and girls in P6 and how often were they absent from school?
b) What were the characteristics of the homes of P6 pupils?
c) What were the parent/pupil interactions about schoolwork in the home?
d) To what extent did pupils in P6 receive and do homework in the Seychelles?
e) To what extent did pupils in P6 have extra tuition in the Seychelles?

What was the distribution of boys and girls in P6 and how often were they absent from school?

In Table 3.1, the percentages of female pupils in school in each of the regions have been presented together with the number of days that both boys and girls were absent from school in the month prior to the data collection in July 2000.

Table 3.1: Percentages of female pupils in Primary 6 and the number of days absent

Region	Female pupils	Days absent Boys	Days absent Girls
	%	Mean	Mean
Central	52.3	1.02	1.12
East	47.6	0.51	0.28
Islands	43.9	1.27	0.84
North	50.0	0.66	0.84
South	50.0	0.93	0.64
West	44.7	0.90	0.70
Seychelles	49.2	0.90	0.83

(a) Gender Distribution

One of the prerequisites for gender equity in education is to ensure an even distribution of both sexes in the school system. In several studies (for example, Schleicher et al, 1995) it was found that not all countries had a balanced enrolment in primary school. The data presented in table 3.1 indicates that disparities in the enrolments of boys and girls in primary schools across regions were rather small. For the Seychelles overall, 49.2 percent of pupils in P6 were girls. However, two regions – West (44.7 percent) and Islands (43.4 percent) – showed variation from the national average that may need some explanation.

The highest percentage of girls was in the Central region (52.3 percent). This could be associated with two factors: employment and the zoning policy (which stipulates that pupils should be enrolled in schools within their own particular area or districts). When schools were examined individually, it was found that the Independent School had the highest percentage of girls (60.4 percent) of any school in the study, the Head Teacher explained, however, that the intake of boys and girls varied from year to year. The Independent School is a fee-paying school that enrols pupils from all regions of Mahé and so the zoning policy of government schools is not applicable.

For schools in the West region, the work commitment of parents in the capital may have had some influence on the gender distribution. Many parents seek special permission to enrol their children in a town school nearer to their place of work. It is more likely that these children are girls, whom the parents feel need more supervision than the boys.

A similar situation might explain the lower percentage of girls in the Islands region. People tend to migrate to the main island and particularly to the town area to seek work and it is likely that they would take their children with them, especially the girls.

These explanations are speculative. If the Ministry of Education wishes to maintain gender balance in its intake of boys and girls in schools, further investigation would be necessary.

Policy suggestion 3.1: The Ministry of Education should conduct a small investigation to discover where the girls who should have been in P6 in the Islands and the West regions have gone.

(b) Absenteeism in the previous month

The figures in Table 3.1 show that very few pupils were absent in the month of June 2000. The average for Seychelles was less than a day for both boys and girls. The pupils in the East region had the least absenteeism, but on the whole absenteeism does not appear to be a problem in Seychelles.

What were the home characteristics of P6 pupils?

The home background of pupils is made up of various components. One component concerns the parents' financial circumstances. Unfortunately, it is not possible to ask children what their parents earn. Thus some proxy, or indirect methods, of assessing the wealth of a home must be used. One possible proxy is the material wealth of the home (for example, home possessions). A second refers to health and nutrition (for example, whether regular meals are provided). A third is the intellectual milieu as characterised by the education of the parents and the reading material they have at home. The data on some of these selected aspects have been summarised in Table 3.2.

(a) Possessions in the home

The first set of data presented in Table 3.2 indicates the number of possessions in pupils' homes. A question on the pupil questionnaire asked about material possessions and amenities. These were: daily newspaper, weekly or monthly magazine, radio, TV set, video cassette recorder (VCR), cassette player, telephone, refrigerator/freezer, 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 14.

The average number of possessions for Seychelles was 10.8 out of 14. The items on the list relevant for reading that were missing most frequently were daily newspaper (43 percent of pupils stated that there was no daily newspaper in the home) and a weekly or monthly

magazine (51 percent did not have one). The pupils in P6 on the Islands were the poorest with a mean of 9.8 possessions, and those in the South were the wealthiest with a mean of 11.3 possessions. However, in general, there was not much difference among the regions.

Access to reading material has been considered as an important contribution to the reading level of pupils. Access to newspapers and magazines provides pupils with greater exposure to reading material, and this in turn, leads to better reading comprehension. Limited availability of these items has led to an impoverished learning environment in Seychelles. This point will be explored later in this chapter.

(b) Index of regular meals

The second column of figures in Table 3.2 concerns pupil nutrition and whether they are having three meals a day, but not taking into account the nutritional value of each meal. The question asked about a morning meal, a midday meal, an evening meal, and how many times a week they were eaten. 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. Out of a maximum score of 12, Seychelles registered a mean score of 10.2. Although this would indicate that the majority of P6 pupils were having three meals per day, there was a group of pupils who were not eating regularly. When the frequency distribution of the meals index was examined it was found there were 164 pupils with a score of less than 8. This would indicate that they had less than two meals per day every day of the week, a finding that requires further investigation. Pollit (1990) has pointed out that poor nutrition may affect concentration and learning in school. Therefore, it will be important to discover if a particular type of pupil is being affected.

(c) Books in the home

The third set of data presents the number of books in the home. International surveys (Elley, 1992, for example) have demonstrated that availability of books in the home influences school achievement in reading. In the questionnaire, pupils were asked to chose a range from the following categories, which would give an indication of the number of books in their homes:

1= no books in the home

2 = 1-10 books in the home

3 = 11-50 books in the home
4 = 51-100 books in the home
5 = 101-200 books in the home

6 = 201 or more books in the home

The mid-point of each value range was used to give an approximate number of books in the home. For example, the value 0 was recorded as zero books, the value 5 was recorded for the second category, the value 30 was recorded for the third category, and so on. For the last category a value of 250 was used

The third column of figures in Table 3.2 indicated that the average number of books in the homes of the pupils in the different regions was not high. The average of 26.0 books for the Islands was the lowest value for a region and was below the national mean of 44.4 books. The general pattern of figures suggests that in Seychelles there is a lack of a reading culture. This conclusion can be substantiated by the fact that only about 50 percent of the families of P6 pupils took a newspaper or magazine. This phenomenon should be examined and library provisions re-assessed in the light of these findings.

Policy suggestion 3.2: The Ministry of Education should develop contact with the National Library to discuss its role in providing reading material for children and to examine the possibility of increasing its mobile library service. The Ministry of Education could also pay for each school to receive several newspapers and magazines.

(d) Parents' education

The final information presented in Table 3.2 relates to the parental education of the Primary 6 pupils. Parental education has been identified as a key component of the socio-economic status of pupils (Kulpoo, 1998). It is an important factor in the achievement level of children since it is assumed that parents with a high level of education will tend to create more conducive learning environments in the home. Separate questions were asked about the mother and father's levels of education. The responses were coded as follows:

Did not go to school = 1
Completed some primary education = 2
Completed all of primary education = 3
Completed some secondary education = 4
Completed all secondary education = 5
Completed some education/ training after secondary school = 6

Many pupils reported that they did not know the educational level of their parents, which created a problem for interpreting the data. It was decided to find a way of approximating some of the missing data. This was done by assigning the mode values for either the mother or the father to the learners who reported that they did not know the level of education of one of their parents. For those who did not know the level of education of either parent's mode

values based on a hierarchical grouping of criteria, possessions, the class, the school was calculated. The values for each child's mother and father were then summed to provide an 'Index of parental education'. A score of '1' indicates that neither parent had received any formal education and a score of 12 indicates that both parents had received some post-secondary education.

Variations in the average level of parental education among the regions were minimal. The Central region recorded the highest index (8.9). This would seem to suggest that most learners have parents who have both completed all of primary and all of some secondary education. These findings reflect the general educational trend in the country.

Table 3.2: Mean values of the selected variables for the quality of the home

Region	Possessions in the home	Meals	Books in home	Parental education
	Mean	Mean	Mean	Mean
Central	10.8	10.3	50.9	8.9
East	10.5	10.3	35.4	8.7
Islands	9.8	10.4	26.0	8.4
North	10.9	10.1	54.6	8.7
South	11.3	9.9	41.4	8.6
West	10.6	10.5	40.8	8.8
Seychelles	10.8	10.2	44.4	8.7

What were the parent/pupil interactions about schoolwork in the home?

Parental encouragement has been linked to higher learning performance in school. Douglas (1967) in his study of the home and the school concluded that there was a positive relationship between parental interest and the child's achievement. Recently, Education Authorities in many countries have emphasised the need for parents to become actively involved in the education of their children. To glean some information about a parent's or other significant adult's participation in the education of children, it was decided to examine the level of parental support given to children with homework in general, and in English and mathematics, in particular. In addition, attendance at "extra tuition" classes has been included as another index of parental interest since it is usually the parents who make the decision and the necessary arrangements.

(a) Assistance with homework

Pupils were asked how often a person other then their teacher made sure that they had done their homework and how often they received help from someone other than the teacher.

Similar questions were asked specifically about reading and mathematics. The response categories were "never" (which was combined with "I do not get any homework"), "sometimes" and "most of the time".

The responses of pupils answering "most of the time" have been tabulated in Table 3.3. It can therefore be assumed that the difference between the percentage given and 100 percent are those who either never received homework or answered "never" or "sometimes" to the question.

Table 3.3: Percentages of pupils responding 'most of the time' to questions about homework and how often someone had

Region	Ensured homework done	Helped with homework	Looked at work completed at school	Asked you to read to them	Asked you questions about reading	Asked you to calculate	Asked questions about your math
	%	%	%	%	%	%	%
Central	63.1	30.4	42.0	21.8	23.6	30.5	26.0
East	61.6	39.8	40.4	21.8	17.7	22.1	22.2
Islands	48.1	28.8	40.4	25.5	19.0	26.9	20.5
North	67.1	44.5	33.9	29.0	23.6	30.4	22.7
South	51.9	22.4	34.4	21.9	23.1	25.7	23.5
West	52.1	29.2	31.2	15.2	13.9	19.7	17.4
Seychelles	59.3	32.7	38.1	22.7	21.1	27.1	23.0

An inspection of Table 3.3 revealed that pupils received minimal outside help in their learning. Whereas 60 percent of pupils had parents who ensured that the homework was done, only about a fifth to a third of pupils had parents or others who helped them with their homework, looked at what they had done, read to them, asked them questions about what they had read, asked them to do calculations or asked them what they had been doing in mathematics.

Some schools have been aware of the need to motivate parents to play a more active role in the education of their children. In 2000, the case study of a school in Seychelles was presented at the Pan-Commonwealth Conference on School Improvement. It demonstrated how parents participated in the teaching of reading to their children and how this resulted in more parents visiting the school and keeping abreast of their children's progress.

Four schools in Seychelles have included in their development plans the goal of building partnership between the parents and the school; the aim is to encourage parents to take part in the education of their children. However, these are recent initiatives that need to be extended and monitored at a later stage. Research on these schools seemed to suggest that parents

could do more to help their children learn and to support the school in its work. It may well be the case that parents are not aware that small actions such as asking their children what they have been doing in reading or in mathematics can affect how their children learn. The school should give parents helpful tips of how to improve home learning support.

Policy suggestion 3.3: The Ministry of Education should include "home support and parental involvement in education" in the management courses for head teachers and in-service courses for teachers.

To what extent do Seychellois P6 pupils receive and do homework?

It is in connection with the above description of parental involvement in the education of their children that the question of homework arises. Recent research has begun to associate homework with achievement. Doyle and Barber (1990) stated that homework is a positive learning experience for pupils and gives parents insight into the school curriculum. Walberg (1994) has shown that pupils who receive homework achieve at a higher level than those who do not receive homework. Furthermore, those who receive homework and also have it corrected by the teachers achieve at an even higher level. The data about homework are presented in Table 3.4.

Table 3.4: Percentages of pupils receiving and doing reading and mathematics homework

Region	Receive reading homework (1-2 times per week)	Teacher always corrects reading homework	Receive math homework (1-2 times per week)	Teacher always corrects math homework
	%	%	%	%
Central	44.3	45.6	46.1	68.1
East	46.3	68.9	35.3	77.7
Islands	58.8	64.6	64.4	80.1
North	37.6	38.8	41.4	77.6
South	42.8	48.1	24.7	63.0
West	36.5	46.5	57.3	61.0
Seychelles	43.9	50.0	44.6	70.8

(a) Homework given

In Seychelles there were 43.9 percent of P6 pupils receiving reading homework at least once or twice per week. Some variation was evident among regions and it should be noted that the P6 teachers in the West and North regions were, at least according to their pupils, not giving reading homework as often as the national figure. A more detailed analysis of pupils' responses showed that 13.9 percent of the pupils indicated that they do not receive any reading homework, and 18.6 percent said that they received reading homework only once or twice per month.

The percentage of pupils receiving mathematics homework is slightly higher (44.6 percent) than for reading. Again, there was considerable variation among the different regions. However, the percentage of pupils reporting that they were given homework in mathematics on most days of the week was as high as 50 percent. The percentage of learners in the South region reporting they were given homework in mathematics 1-2 times per week was very low (24.7 percent).

In order to interpret these results the position of the Ministry of Education needs to be considered. Three circulars issued by the Ministry of Education in 1981, 1982 and 1988 emphasised the value of homework in the "wider context of learning in schools". These gave instructions about the duration, regularity, and control of homework throughout the primary school cycle. At the P6 level, the Ministry of Education recommends assigning homework of 60 minutes, five times a week, in two subjects per evening. Taking into account the small percentage of pupils who said that they did not receive any homework, it can be assumed that most schools are adhering to the injunctions of the Ministry and that most primary pupils are receiving homework regularly. However, given the importance of key subjects such as English and mathematics, and the large amount of curriculum time assigned to them, it can be argued that those two subjects were not adequately represented in the assignment of homework to pupils

Policy Suggestion 3.4: The Ministry of Education should review its position on homework with a view to establishing a national policy on homework - especially with respect to the two key subjects.

(b) Homework corrected

Half of the P6 pupils reported that their teachers always corrected their reading homework but this value was quite low for the North region (38.8 percent). Some argue that if a teacher gives homework then he or she should always correct it. Others argue that for some type of homework it is sufficient just to give it. A fairly high percentage of pupils (70.8 percent) reported that their teachers always corrected their mathematics homework. The West and South regions had somewhat lower values compared to those of Seychelles as a whole. A lot may depend on what the pupils perceive as homework being corrected and this should be investigated.

Policy suggestion 3.5: The Ministry of Education should examine why there is such a large difference in the percentage of reading and mathematics homework that is being corrected and determine whether or not the Ministry should take action to ameliorate the situation**.**

To what extent do P6 pupils in Seychelles have extra tuition?

In SACMEQ I it was found that much higher percentages of Grade 6 pupils had extra tuition classes than had been expected. In general, 40 percent of pupils had extra tuition, and in Mauritius it was even as high as 70 percent. It was therefore decided to ask the questions again in the SACMEQ II Project. The results have been recorded in Table 3.5. The first piece of information concerned the percentage of P6 pupils who said that they had extra tuition classes in English, mathematics and other subjects; the second concerned payment.

It can be noted that nearly half of the P6 pupils did not take any extra tuition. However, about a fifth had extra tuition in English and in mathematics. Those in the South had more extra tuition in English and those in Central had slightly more in mathematics. About a third took extra tuition in "other subjects" with those pupils in Central taking more than those in other regions. In all, 13 percent of pupils said that the lessons were paid for, 23 percent said that they were not paid for, and 16 percent did not know.

At first glance these results may seem alarming, but they need to be interpreted with care. When pupils were asked about extra tuition it was assumed that they would report on private lessons that were given by qualified teachers and paid for by the parents. But, in fact, extra tuition for the children included a number of teaching and learning activities outside of the normal timetable. Three categories of extra tuition have been identified.

Table 3.5: Percentages of pupils taking extra tuition and payment for it

Region	Don't take %	In English %	In mathematics %	In other subjects %	Payment made %
Central	41.1	24.6	26.1	38.5	16.5
East	49.4	12.6	22.1	22.2	10.4
Islands	58.0	23.3	17.6	25.8	14.0
North	54.5	15.5	14.7	31.4	8.3
South	34.4	32.2	22.0	32.4	16.3
West	62.3	16.4	21.1	17.0	9.6
Seychelles	48.2	21.3	21.6	30.5	13.2

In the first category, the pupils could be referring to extra classes that are provided at school. It is a common practice in some schools to operate extra classes for P6 pupils especially, as a preparation for the P6 national examination. The classes are organized by teachers in the school on a voluntary basis. Although attendance is optional, many pupils take advantage of these classes. It would appear that these after-school classes could have increased the percentage of pupils reporting they have extra tuition. This interpretation is further supported by the responses of pupils reporting that there was no payment.

The second category of extra classes could refer to those classes offered to schoolchildren by organizations such as the *Alliance Française*. As a way of promoting the French language, classes are organized after school at the Alliance Française Centre. Pupils have to enrol and there is a fee. Apparently the classes are very popular since there is a long waiting list, and they are attended mostly by pupils in the Central region because of the location of the centre. This may account for some of the extra tuition in "other subjects" in the Central region.

The third category of extra tuition refers to private lessons. These may take a variety of forms. They can be operated for individuals or groups of pupils. The groups are taught by teachers - although it is not usually the day-to-day teacher, but rather another teacher who has been identified by parents. Individual tuition is usually provided by a person identified by the parents; it could be a relative, a friend, a teacher or another person known to the parent. In some cases there would be payment and in other cases the extra tuition would be rewarded in kind.

Although previous information on extra tuition is not available for the country, from observation and discussion with parents it would appear that the number of pupils having extra tuition has risen. As parents feel that both school and society are becoming more competitive, and as their socio-economic conditions increase, the popularity of extra tuition has risen. Parents usually seek extra tuition when their children are not performing well, but

the quality of this tuition varies widely. From the data gathered so far, extra tuition does not appear to be a major problem in Seychelles.

If a system of education is working well there should be very little need for extra tuition. As the Mauritian example illustrates, he practice of extra tuition has become a lucrative, large-scale business for the teachers, but a socially divisive practice for the pupils. Care must be exercised to ensure that the amount of extra tuition and the way in which it is conducted does not follow that of Mauritius.

Policy suggestion 3.6: A special study of extra tuition should be undertaken to identify the nature and extent of this practice, and to explore strategies for ensuring that it does not become a major problem as it has in Mauritius.

Conclusion

One of the interesting findings in this chapter concerns the home circumstances of P6 pupils in Seychelles. The homes of pupils participating in the study tended to be quite wealthy in terms of material possessions but rather poor as a learning environment. Although the homes of pupils contained most, if not all, of the basic possessions and facilities, reading materials were scarce. A large percentage of parents were educated at least up to secondary education, but they were providing a low level of support for homework. It is clear that Seychellois parents need to be sensitised about the importance of being actively involved in the school life of their children. Parental involvement will be commented on at various points in this report as a salient element in pupils' learning.

Other aspects highlighted in this chapter were gender, absenteeism, homework assignment, and extra tuition. Problems associated with these were not serious but still merit on-going attention and monitoring by the Ministry of Education.

There was a reasonable gender balance at P6 level in all regions except Islands; and therefore it may be useful to find out more about the situation in that region. On the whole, pupils were rarely absent from school. However, it will be necessary to include further information on absenteeism as part of behavioural problems in schools; and this will be examined in Chapter 5. Homework received by pupils was well within the guidelines set by the Ministry of Education. Nevertheless, justification for placing more emphasis on English and mathematics was presented. Finally, although extra tuition is not a major concern in Seychelles at this time, there may be a need for further investigation.

Chapter 4

The Teachers

Introduction

This chapter examines selected background characteristics of P6 reading and mathematics teachers and the basic teaching-learning conditions in their classrooms. The data on teachers have been presented not only to prepare the interpretation of the achievement data later on but also, as mentioned in the previous chapter, to set a baseline against which to measure changes in the future.

The following major questions were posed:

1) *What were the characteristics of P6 reading and mathematics teachers?*
2) *What were the reading and mathematics teachers' perceptions of the roles of inspectors and advisors?*
3) *What were the major sources of satisfaction for the reading and mathematics teacher?*
4) *What were the reading and mathematics teaching conditions in the classrooms?*
5) *What were some of the selected aspects of teaching English and teaching Mathematics?*
6) *What was the situation about textbooks in P6 classes?*

In reporting the data results on teachers, it should be emphasised that only 50 English and 48 mathematics teachers were tested. Therefore, although some comparisons have been made among regions, these results must be interpreted with caution because they are based on a small number of teachers.

What were the characteristics of teachers of P6 pupils?

Several important characteristics were measured. These concerned the age, sex, socio-economic status, academic qualifications, professional qualifications, years of teaching experience, and the number of in-service courses attended. A sub-sample of P6 teachers consisting of all those teaching English and mathematics was used.

The data on teachers have been weighted by the number of pupils in P6. As an example, in Table 4.1 in the bottom row, the figures 38.5 for age and 99 percent for female are given. The value of 38.5 for age means that the average P6 pupil in Seychelles had a teacher who was

38.5 years old whilst the second value of 99 means that 99 percent of P6 pupils had teachers who were female.

(a) Age, gender, and socio-economic status of teachers

As can be seen from Table 4.1, the average P6 pupil had an English teacher who was 38.5 years old and a mathematics teacher who was 32 years old. The range of mathematics teachers' ages was greater than for English teachers. It went from 44 years old in the East region to 30 in Islands for the English teachers, and 27.5 in the South region to 41.8 in the East for the mathematics teachers.

Table 4.1 Age, gender and socio-economic status of English and Mathematics teachers

Region	Age (years)		Gender (Female)		Socio-economic status	
	English	Mathematics	English	Mathematics	English	Mathematics
	Mean	Mean	%	%	Mean	Mean
Central	40.5	30.8	100	77.8	10.8	10.9
East	44.4	41.8	100	100	10.5	10.0
Islands	30.4	33.2	100	100	9.8	9.6
North	34.2	30.5	92.8	72	10.9	10.2
South	41.2	27.5	100	80.4	11.4	9.6
West	36.4	29.4	100	60.9	10.6	10.1
Seychelles	38.5	31.9	98.8	80.5	10.7	10.3

There was also a marked difference between the proportion of females and males teaching English and mathematics. Ninety-nine percent of pupils had English teachers who were female, and in all regions the teachers were female except for the North. Only 81 percent of pupils had mathematics teachers who were female and in the West only 61 percent of pupils had female mathematics teachers.

Teachers were asked a few questions about the possessions they had in their homes (the same questions as described for pupils in Chapter 3). An identical "Possessions Index" was calculated. The results are presented in the last two columns of Table 4.1.

There was reasonable agreement between the English and mathematics teachers on their possessions, a proxy measure for wealth. The exception was in the South, where the English teachers seemed to be better off than their mathematics counterparts.

The teacher characteristics presented so far suggest a slightly unequal representation of age and considerable gender imbalance across English and mathematics teachers. These results are perhaps linked to recruiting patterns. For example, the younger age of mathematics

teachers may be a sign indicating that more young mathematics teachers have been recruited and that this needs to continue. However, it has been difficult for the Ministry to attract male students to train as primary teachers so it has not been possible to offset the trend whereby 86 percent of primary school teachers were female (Education Statistics, 2000).

(b) Education, training and experience

Other features of teacher background were also examined. These were education, training, and teaching experience. The results are presented in Table 4.2.

Years of academic education

In the questionnaire teachers were asked about the highest level of academic education they had attained. The options given were:

- Primary education or equivalent;
- Junior secondary education or equivalent;
- Senior secondary education or equivalent;
- 'A-level' or some further study but not a first degree;
- Tertiary education (at least a first degree).

Primary education was coded as 6 years, junior secondary as 9 years, senior secondary as 11 years, A-levels as 13 years and tertiary as 15 years. These values were used to calculate the mean number of years of academic education.

From Table 4.2, it can be seen that the average P6 pupil had an English teacher who had just over 12 years of education and there was very little variation among the regions. The mathematics teacher, on the other hand, had slightly more academic education, but again there were no large differences among the regions.

These results indicate that graduate teachers did not form part of the main teaching force in primary schools. There were very few pupils benefiting from an English or a mathematics teacher having an academic education at or above tertiary. When the percentages of pupils who had teachers with qualification above tertiary level were calculated, it was found that only 6.3 percent of pupils were taught by degree-holding English teachers, and 3.4 percent by degree-holding mathematics teachers. Islands, South, and West were the most disadvantaged with no graduate teachers for either English or mathematics. The Ministry of Education has been aware of the lack of well-qualified teachers in the primary school, and the recent teacher

training programme, which links the National Institute of Education with International Universities, has been created to address this problem.

Years of teacher training

In Seychelles, teacher training has changed over the years from a two-year to a three-year course after which teachers return for a further year of in-service training. With the opening of the National Institute of Education in 1998, a four-year pre-service course for primary school teachers was established. The variation in the mean number of years of teacher training has some relationship to the changing programme.

Table 4.2 Means for selected teacher background characteristics

Region	Academic education (Years)		Teacher training (Years)		Teacher experience (Years)		In-service (Number)	
	English	Math	English	Math	English	Math	English	Math
Central	12.0	12.9	3.0	3.4	23.3	10.7	5.3	2.1
East	12.0	12.1	2.9	3.0	26.4	22.9	3.4	3.5
Islands	12.3	12.0	3.0	2.7	10.0	14.0	6.8	4.3
North	12.3	12.4	2.2	3.0	14.7	10.3	27.1	6.1
South	12.6	13.0	3.1	3.7	21.8	6.8	9.7	5.2
West	11.9	13.0	3.1	3.7	17.4	9.4	1.8	10.4
Seychelles	12.1	12.6	2.9	3.3	19.8	12.0	9.3	4.3

There were some differences in the length of training between the English and Mathematics teachers that are worth noting. The average pupil had an English teacher with just under three years and a mathematics teacher with just over three years of teacher training. This difference may be because the mathematics teachers tended to be younger and had therefore benefited from the longer, more recent teacher training programme. What is more striking, however, is the situation in the North region where pupils had English teachers with just over two years of teacher training, a difference of nearly a year from the country as a whole. It would seem that teacher allocation patterns need to be examined by those concerned with staffing in the School Division.

Years of teaching experience

The mean number of years of teaching experience presented in Table 4.2 indicates that the average pupil had an English teacher with 19.8 years of teaching experience but a mathematics teacher with only 12 years of experience. There were large regional differences for both types of teachers. For English the range was from 10 years in the Islands to 26 years in the East region. For Mathematics the range was from 7 years in the South region to 23

years in the East. As mentioned above, these large discrepancies among regions point to the need to review existing teacher allocation procedures.

Staffing also needs careful consideration by the Ministry of Education. The difficulty in staffing stems from two main issues: teacher supply and teacher training. There are a few untrained teachers in the system. These tend to be more in vocational subjects, although as the data have indicated there are also some teaching English and mathematics. Further analysis has confirmed that 3.4 percent of English teachers and 1 percent of mathematics teachers were either untrained or had received training for less than one year.

Corrective action to provide courses for untrained teachers began in 2001. But the issue of teacher allocation has not yet been dealt with. Because of teacher shortages, the distribution of teachers has not been addressed, and therefore teachers have simply been allocated to schools where there were vacancies. Leste (1998) in an analysis of the professional development of newly-qualified teachers argues for a more integrated model of teacher deployment and professional development. Transparent procedures for placement and transfer of teachers should be established, and the training of primary school teachers to degree level should also be encouraged.

Policy suggestion 4.1: The Ministry of Education should develop a school staffing policy that will take into consideration qualifications, training, age, and gender (where possible) to ensure an equitable distribution of teachers in school.

(c) Number of days of in-service courses attended

The teachers were also asked about their participation in in-service courses during the past three years. The figures presented in the first two columns of Table 4.2 show that the average P6 pupil had an English teacher with 9.3 days and a mathematics teacher with 4.3 days of in-service training. The number of days varied among regions with certain anomalies in the North region for English and the West region for mathematics teachers.

When teachers who attended in-service courses were asked about the effectiveness of this training, it was also found that about half of the pupils had teachers who had not attended any in-service training course in the last three years (54.6 percent and 46.3 percent of mathematics and English teachers, respectively). The mathematics teachers were more impressed with their training than the English teachers, and believed that the courses would help them to

improve their teaching. Around 40 percent of pupils had a mathematics teacher who rated the course as effective against 12.4 percent of pupils' English teachers.

In-service courses for teachers in Seychelles take various forms. Sometimes there are courses held during the school holidays in specific subjects. The provision of this training depends on identified problem areas and the need to familiarise teachers with new approaches to teaching certain aspects of a particular subject. Furthermore, at different stages in the school year, head teachers or senior members of staff in the school may request workshops on a variety of topics. In addition, as part of the School Improvement Programme, professional development sessions are organized to provide in-service opportunities for teachers.

When teachers were responding to questions about in-service training in this study, they encountered some problems in taking into account the diverse nature of in-service courses. This was obvious in the North region, for example, where two English teachers in one school recorded 6-month and 9-monthcourses and in the West region where the mathematics teachers had been involved in a special project. The greatest concern for the Ministry of Education is the large number of teachers who claimed that they had not attended any in-service courses for the last three years, and this finding will have to be clarified. Since there has been a general concern about the teaching and learning of mathematics, interest has been generated through in-service courses for mathematics teachers, which may account for their more positive opinions. What is needed is a centrally co-ordinated programme of in-service courses for teachers.

Policy suggestion 4.2: In consultation with the relevant sections, the National Institute of Education should co-ordinate all forms of in-service training for teachers in order to ensure regular and integrated programmes, and to achieve a more balanced coverage of in-service training opportunities across regions and subject areas.

What were the teachers' perceptions of the roles of inspectors and advisors?

Inspectors and advisers are prominent figures in the education system of Southern African countries. In Seychelles, the practice of inspecting schools is being re-introduced and the role of advisers re-defined.

As mentioned in Chapter 1, an inspectorate system ceased to exist in 1978 because the government had planned to replace it with an external audit of schools. It was only in 1999 that a Quality Assurance Section was created within the Ministry and, with the consultation of

specialists from Scotland, inspections in schools began on a pilot basis in the year 2000. Therefore, in this study no data could be collected on inspectors.

The matter is more complicated concerning advisors because after the closure of the Curriculum Development Section in 1999, advisory visits were limited to those conducted on an *ad hoc* basis by one or two senior officers from the re-structured Schools Division. However, through the School Development Programme, School Improvement Co-ordinators were appointed in the different regions to support and promote the professional development of teachers. It was only in the year 2000 that these posts were formalised, even though these teachers had been providing advice and support for some time. It is clear why there would have been a great deal of confusion in teachers' minds when they tried to answer questions on advisors. Therefore data on advisors have not been included in this study

However, one of the major tasks of head teachers is to advise teachers on their teaching. The frequency with which the English and mathematics teachers reported being advised by the Head Teacher has been recorded in Table 4.4.

Table 4.4: Frequency of advice on teaching received from head teacher

Frequency	Reading teachers	Mathematics teachers
	%	%
Never	10.4	9.4
Once a year	20.0	27.1
Once a term	44.7	35.1
Once or more per month	24.9	28.3

There was reasonable consistency between the reading and mathematics teachers. It is presumed that the cases where the Head Teacher never gave any advice is where the teachers were very good and really didn't need any advice from the Heads. The other figures reported were encouraging. The frequency was as expected in a good and vibrant school system. What is not known, of course, is the quality of the advice offered.

Policy suggestion 4.3: The supervisory and advisory role of the head teachers should be included in the management training of head teachers.

What were the major sources of teacher satisfaction?

The Ministry of Education needs to sustain the training of primary teachers at degree level. However, one of the problems of having highly qualified teachers in a small system such as Seychelles is the retention of those teachers. The Ministry of Education is constantly

competing with other organizations for qualified personnel, and therefore it must be concerned with the conditions that contribute to teacher satisfaction.

The revision of the Teacher Scheme of Service in 1999 has shown the commitment of the Ministry to motivate teachers. In other SACMEQ countries there has also been considerable interest in those factors that contribute most to job satisfaction. It is widely believed that satisfied teachers will tend to work harder for the benefit of the pupils and will be less likely to leave the teaching profession.

Teachers in this study were asked to respond to 16 possible reasons for satisfaction with their jobs. These reasons have been grouped under five headings in Table 4.5: living conditions, school facilities/equipment, relationships with others, career advancement, and the educational outcomes of pupils. Where all pupils had teachers rating the source of satisfaction as 'very important', these regions have been listed using C for Central, E for East, I for Islands, N for North, S for South, and W for West.

Table 4.5: Percentages of pupils with teachers rating sources of teacher satisfaction as very important

Source	English teachers	Regions	Mathematics teachers	Regions
Living conditions				
Travel distance to school	62	S	55	
Availability of teacher housing	49		51	W
Quality of teacher housing	83	E, I	80	E, I
School facilities and equipment				
Location of school	68	S	77	W
Quality of school buildings	83	E, I	80	E, I
Availability of classroom furniture	91	C, I	88	I, W
Quality of classroom furniture	89	C, I, W	93	E, I, S, W
Availability of classroom supplies	95	C, I, S, W	96	Nearly all
Relationships with others				
Quality of school management and administration	92	C, S, W	98	All
Amicable working relations with other staff members	92	C, S, W	90	E, I, S, W
Good relations with local community	83	C,W	80	S,W
Career advancement				
Expanded opportunities for promotion	79		70	
Opportunities for professional development	84	I, W	92	I, N ,S
Level of teacher salary	86	S	92	E, I, S, W
Timely payment of salaries	76		82	E, I
Educational outcomes of pupils				
Seeing pupils learn	95	nearly all	100	All

The overall pattern of responses shows agreement between the responses of the English and mathematics teachers. Several results in Table 4.5 deserve comment. First, the ratings of 90 percent or more for "quality of school management" and "amicable relationship with other staff" suggest that the Ministry needs to monitor and foster good relationship within schools. The attention of head teachers should be directed towards this result and, perhaps in-service training for head teachers would provide training in this area. Second, very high rating of close to 90 percent or higher were given to three factors that focus on working conditions within classrooms: availability and quality of school furniture, and the availability of classroom supplies. It is clear that teachers' satisfaction will be lowered if they do not have access to the basic equipment and supplies that are required for effective teaching. It was very pleasing to see the extremely high rating given to "seeing pupils learn". Most teachers in the world gain professional pride and great motivation when their students succeed.

Teachers were also asked to select the three most important reasons for job satisfaction from among the 16 items. The English teachers selected 'seeing my pupils learn', followed by 'level of salary' and then 'opportunities for further study', whereas the mathematics teachers selected 'seeing my pupils learn', 'quality of school management' and 'salary'. Both groups of teachers rated the 'educational outcome of pupils' as being the source of greatest satisfaction and for both of them 'level of salary' featured among the three reasons. However, the English teachers were also concerned with their 'professional development through further study' whilst the mathematics teachers also expressed their feelings of satisfaction through the 'quality of leadership'. As has been noted previously, the mathematics teachers tended to be younger and it can be assumed that as young aspiring professionals trying to establish themselves, they had to negotiate this role with the school managementl - hence their interest in the style of management. On the other hand, the more mature English teachers were more concerned with their career advancement and they might have felt that not enough opportunities were available for their own professional development. They were therefore concerned with opportunities for further study. The importance accorded to salary by both English and mathematics teachers points to another area of concern. The salary advancement of primary teachers, in particular, is less attractive than that of other professionals. These issues need to be considered by the Ministry of Education in order to create favourable conditions for teachers.

Policy suggestion 4.4: The Ministry of Education should carry out an investigation of teacher motivation and use some of these findings to study the responses of teachers concerning job satisfaction in order to identify strategies to address some of the national- and regional-level concerns.

What were the classroom teaching conditions?

In order to assess the teaching conditions in the classroom, a checklist of basic material and learning resources (previously agreed by SACMEQ National Co-ordinators) was completed by the teachers. In addition an examination of the teaching load and available time for preparation and marking was undertaken. It was also necessary to quantify teachers' contact with parents as this extends the link between home and school and constitutes an important teacher activity to facilitate pupils' learning.

(a) Teaching materials and classroom furniture

The results in Table 4.6 suggest that most classrooms had adequate teaching materials and classroom furniture. Most classrooms had a usable blackboard and chalk, a wall chart, and a teacher table and chair. Most also had cupboards, lockers and shelves. Surprisingly, there were many classrooms without a book corner. The answers to this question tally well with the answer to another question about the number of books in the classroom library. The responses to the first question showed that over 20 percent of pupils studied in classrooms without a book corner. However, the answers to the other question indicated that although nearly 80 percent of pupils were in classrooms with a book corner, the average number of books was below 100. Given the importance of having books for pupils to read at school and to take home and read, every effort should be made to identify the classrooms without a book corner and ensure that one is provided.

Policy Suggestion 4.5: The Ministry of Education through the Documentation Centre should devise strategies to improve access to reading materials through the provisions of books to school and classroom libraries.

The availability of a number of other classroom items needs to be examined. The geometrical instruments referred to in the table include such things as a compass and a protractor to be used by teachers when drawing on the board. It was interesting that the English and mathematics teachers had different perceptions of what existed in the classrooms, a perception that may change according to who is the class teacher. Just the same, a check should be made in order to find out which mathematics teachers or which classrooms were lacking geometrical instruments, and an effort made to acquire them. Subject-based teacher guides are another basic tool for teachers. It would appear from the results that most teachers were aware of what was available for their specific subjects, with the English teachers well equipped, and some of the mathematics teachers less so. This finding suggests another matter for further enquiry.

Table 4.6: Percentage of P6 pupils in classrooms and schools with selected teaching materials and classroom furniture

	Percentage with Item	
	Reading	Mathematics
In classroom		
A usable writing board (F)	95.7	100.0
Chalk (or other markers) (F)	98.0	98.3
A wall chart of any kind (M)	98.0	98.3
A cupboard or locker (F)	92.6	92.4
One or more bookshelves (F)	95.6	100.0
A classroom library, book corner or book box (M)	78.6	76.7
A teacher table (F)	98.0	100.0
A teacher chair (F)	98.0	100.0
Available in school		
A map (M)	97.6	88.0
An English dictionary (M)	100.0	100.0
Geometrical instruments (M)	72.9	87.0
Teacher's guide (English) (M)	97.0	57.8
Teacher's guide (mathematics) (M)	54.3	88.0

F = Furniture; M = Materials.

It was possible to examine the differences among regions on two scales: a 'Teaching materials index' (the sum of the seven items designated as 'M' in the table above), and a 'Classroom furniture index' (the sum of the six items designated as 'F' in the table above). The regional differences on these two indices are presented in Table 4.7.

On the whole teachers thought their classrooms were relatively well equipped. Central was worse off for furniture. Although the furniture and material indices were at a reasonable level, it is obvious that deficiencies need to be rectified. It is suggested that the Ministry should conduct an audit of all schools not only for these items but also for others that the Ministry considers as important. On the basis of these findings contingency plans for equipping the schools should be developed. This is necessary because, as noted previously in this chapter, well-equipped schools are an important factor in satisfying teachers in their profession.

Table 4.7: Means for the Indexes of teaching materials and classroom furniture

REGION	Teaching materials index (Max. 6)		Classroom furniture index (Max. 7)	
	English	Mathematics	English	Mathematics
Central	6.6	6.6	5.7	5.9
East	6.5	6.1	6.0	6.0
Island	5.9	6.0	6.0	6.0
North	6.3	6.0	5.9	6.0
South	6.4	6.4	6.0	6.0
West	6.1	6.5	5.9	5.9
Seychelles	6.3	6.4	5.9	5.9

(b) **Sitting and writing places and materials used by pupils**

The condition of desks for sitting and writing was checked. All were found to be satisfactory. A similar check was made on the number of exercise books, notebooks, pencils, pencil sharpeners, erasers, rulers, pens, and files or folders that pupils possessed for their work in the classroom. All pupils in all regions had the required materials.

Policy suggestion 4.6: It is suggested that the Ministry should conduct an audit of schools with respect to all teaching materials and classroom furniture that the Ministry considers as important, and then begin to rectify any shortfalls.

Table 4.8: Time spent by English teachers teaching, preparing lessons, and marking homework

Region	Periods per week	Hours teaching per week	Hours preparing and marking	Total time per week
	Mean	Mean	Mean	Mean
Central	26.6	17.8	9.8	28.3
East	29.4	19.6	16.2	35.8
Islands	24.7	16.5	9.5	26.0
North	24.7	16.5	12.0	28.5
South	28.6	18.2	9.2	27.4
West	26.7	17.8	9.9	27.7
Seychelles	26.7	17.7	11.0	29.0

(c) The teachers' teaching time

In Seychelles, primary school teachers are expected to teach 20 hours per week. The teachers were asked how many periods/lessons a week they taught and the average length of each period. Then they were asked how many hours on average they spent each week working on lesson preparation and marking homework or class work. The information is presented in Tables 4.8 and 4.9 for English and mathematics teachers respectively.

From Table 4.8, it can be seen that the number of periods spent teaching corresponded with what was expected in Seychelles for the two kinds of teachers. The mathematics teachers reported teaching about two hours more a week, on average, than English teachers. It is worth noting that teachers spend at least an additional quarter of their teaching preparing lessons although the figure from the East and Islands seemed somewhat exaggerated as it is well above the mean for the country. However, preparation and marking time needs to be taken into consideration when preparing timetables for teachers.

Table 4.9: Time spent by mathematics teachers teaching, preparing lessons and marking homework

Region	Periods per week	Hours teaching per week	Hours preparing and marking	Total time per week
	Mean	Mean	Mean	Mean
Central	29.0	20.1	10.1	30.2
East	30.2	20.1	10.2	30.3
Islands	29.3	19.5	18.1	37.6
North	26.0	17.4	10.3	27.7
South	31.0	20.7	7.4	28.1
West	26.7	18.7	10.5	29.2
Seychelles	28.6	19.4	10.9	30.5

(d) Meeting parents

Postlethwaite & Ross (1992) have shown that in many countries, the more the head teachers and teachers have contact with parents, the more effective the school was in promoting the reading achievement of pupils. The importance of parental involvement in the educational process of their children has already been highlighted in Chapter 3. Here, a question was asked about the frequency of teachers meeting parents and a further question on the perceived percentage of pupils whose parents or guardians met with the teacher in a year.

Table 4.10 (a): Frequency of teacher meetings with parents/guardians

Region	Never		Once per term		More than once per term	
	Reading	Maths	Reading	Maths	Reading	Maths
Central	4.3	0.0	89.7	95.1	7.0	4.9
East	0.0	0.0	100.0	100.0	0.0	0.0
Islands	28.7	0.0	71.3	100.0	0.0	0.0
North	0.0	6.1	95.1	93.9	4.9	0.0
South	0.0	27.7	88.6	72.3	11.4	0.0
West	0.0	20.1	100.0	60.9	0.0	19.0
Seychelles	4.6	6.8	90.8	89.3	4.6	3.9

Table 4.10 (b): Proportion of pupils with parents/guardians meeting with teacher

	Proportion of pupils with parents/guardians meeting with teacher	
Region	Reading	Maths
Central	64.0	73.4
East	78.1	76.5
Islands	53.1	71.1
North	64.8	68.0
South	67.4	71.8
West	60.3	55.4
Seychelles	64.8	70.2

From table 4.10 (a) it is evident that most teachers met with parents once a term. This would usually be associated with open days when parents have the opportunity to discuss the end of term report with teachers. Only four percent of teachers met with parents more frequently, and five percent of teachers never met with any parent. The problem of never meeting with

parents was evident in the Islands region for reading, and South and West regions for mathematics.

This result was very disappointing. The information presented in table 10 (b) indicates that around one third of the pupils had teachers who *never* met with their parents. The result for Islands was particularly low for reading. It is very difficult for schools to deliver good education if the parents feel themselves to be uninvolved. Through in-service and initial teacher training the importance of meeting with parents should be stressed and a check-up made in about two to three years' time to see if the percentage of pupils whose parents meet with teachers has been raised to at least 95 percent.

Policy suggestion 4.7: The Ministry of Education should use forums such as the Parent Teacher Association and Parents Educators Council to sensitise parents to the desirability of meeting teachers. Information and training to interact and communicate with parents should also be provided both through pre-service and in-service courses of teachers. A check-up should be conducted in two to three years' time to ensure that teachers are meeting with the parents of at least 95 percent of pupils.

What were some of the selected aspects of teaching English?

Teachers were asked to provide information on whether they gave special comments on English in the school reports. They were also asked whether parents had to sign that pupils had completed their reading assignments as homework, and on the frequency with which they asigned written tests in reading comprehension. The teachers were also asked about the importance of certain pupil activities in the teaching of reading, the goals for reading and the use of certain approaches in the teaching of reading.

(a) Parental involvement

It is standard practice to have a section in the school report for each pupil to show his or her performance in English. Parents need to be fully informed about their child's progress and in this way they become involved in the education of their children. The percentages of pupils in schools where this practice existed are presented in Table 4.11. Other information on parental involvement is presented in the table showing percentages of pupils whose parents were asked to sign that their children had completed their reading assignments.

Table 4.11: Parental involvement

Region	Section on English in the school re report	Parents sign
	%	%
Central	100	71
East	77	88
Islands	100	85
North	100	88
South	100	10
West	100	85
Seychelles	96.8	68

The information in Table 4.11 shows that all school reports have a separate section on English with the exception of some schools in the East region. This finding for East region needs to be further investigated.

Around two thirds of pupils were in schools where the parents had to sign that their children had completed their home reading assignments. The odd region here was South region, where only 10 percent of pupils had parents who were asked by the teacher to sign. It would appear that there was no general policy regarding this practice, and two teachers in the South region indicated that there was no policy on this in their schools. As the question related particularly to reading rather than English in general, there may have been some uncertainty when teachers responded. However, parental involvement in the school should be discussed and encouraged.

Policy suggestion 4.8: The School Division should check up on policy and practices related to parents checking homework and what is happening in the South region. This should be accompanied by a meeting of all head teachers to decide on clear policies concerning involvement of parents in their children's education.

(b) Frequency of testing

In Table 4.12 the percentages of pupils who were given written tests are presented as a means of gauging the regularity with which teachers attempted to receive feedback on how their pupils were performing. Around 82 percent of pupils had teachers who gave them tests at least twice a month. However, there were notable variations in frequency of testing across regions. Therefore, some guidelines should be provided to teachers about the frequency of testing. This topic will be taken up later in the chapter.

Table 4.12: Frequency of tests

	2-3 per term	2-3 per month	1+ per week
Region	%	%	%
Central	9.3	3.1	57.6
East	0.0	45.8	54.2
Islands	34.8	21.1	44.1
North	25.1	47.0	27.9
South	50.8	27.9	21.3
West	0.0	13.8	86.2
Seychelles	17.5	33.0	49.6.1

(c) **Teaching strategies for reading**

Teachers responded to several statements intended to assess their views about pupil activities for the teaching of reading. They were asked to rate each of the statements on a three-point scale from "low importance" to "high importance". In Tables 4.13 to 4.15 the percentages of pupils having teachers who gave the highest rating have been recorded.

Table 4.13: Pupil activities for reading

Activity	Activity rated as 'very important'
	%
Reading for comprehension	100
Taking books home to read	98
Learning new vocabulary from a text	94
Pronouncing or sounding words	94
Reading materials in the home	93
Silent reading	75
Listening to someone reading aloud	72
Reading aloud in class	64

It can be seen that 100 percent of pupils had teachers who endorsed the statement 'reading for comprehension' as very important compared to a much lower percentage for "reading aloud", 'listening to someone reading aloud' and 'silent reading.' Although all the ratings tended to be rather high, the last three activities can be differentiated from the others as being of lesser importance to the teachers. However, they form an integral part of learning to read and instructional practices in the classroom should be observed to determine if there are discrepancies between what the teachers think is important and what the teachers actually do.

The next set of ratings concerns the goals of reading that teachers think are important for their pupils. There were seven statements listed in Table 4.14. It is clear that all English teachers endorsed the goals of 'extending pupils' vocabulary' and 'developing a lasting interest in reading'. There was only a slightly lower percentage endorsing 'opening up career

opportunities' and 'development of life skills'. Again, although the ratings were very high, f the last two might indicate a neglected area relating to the goals of reading.

Table 4.14: Teaching goals for reading

Goal	Goals rated as 'very important' %
Extending pupils' vocabulary	100
Developing a lasting interest in reading	100
Improving pupils' reading comprehension	98
Improving word attack skills	97
Making reading enjoyable	96
Development of life skills	86
Opening up career opportunities	81

English teachers were also asked about their teaching approaches for reading. In Table 4.15 it can be seen that only two approaches 'asking questions to assess text comprehension' and 'asking questions to deepen understanding' were endorsed by nearly all teachers. Eighty-one percent of pupils had teachers who endorsed 'giving positive feedback' as practiced 'very often'. 'Reading aloud to the class' and 'introducing the background of a passage' did not receive much endorsement. Then, surprisingly, 'using materials you have created yourself' did not receive much endorsement at all. There is one school of thought that suggests that teachers who create a lot of their own materials are those who are 'go-ahead', have many ideas, and are better teachers. It is an approach that has been encouraged in many countries. It does demand, however, that the teachers be trained to create their own materials, and that the necessary resources are readily available in each school.

Table 4.15: Teaching approaches for reading

Approach	Percentage endorsing 'often' %
Asking questions to assess text comprehension	98
Asking questions to deepen understanding	98
Giving positive feedback	81
Introducing the background of a passage before reading it	50
Reading aloud to the class	46
Using materials you have created yourself	23

The findings relating to pupil activities, goals, and teaching approaches need to be interpreted with care. Even so, these results provide a general indication of the type of English classroom in the primary schools in Seychelles and the attitudes of teachers concerning the teaching of reading. When the results of pupil activities are placed against those for teaching approaches, it becomes apparent that teachers concentrated on reading exercises that involved

comprehension and question and answer techniques. Obviously, there is nothing wrong with that, but when it is emphasised so much to the detriment of 'softer' methods which will promote the enjoyment of reading for its own sake, the impression remains that something is lacking in the quality of teaching. Unfortunately, these results were somehow contradictory to those of the goals where interest and enjoyment were highly endorsed. It would appear that there is some discrepancy between what the teachers believe and what is practised in the classroom. However, there is a tendency for teachers to view reading in its immediate practical context but not as a more general skill which helps pupils to make sense of the world around them and which contributes to other areas of learning such as life skills. Perhaps this can be associated with the teachers' restrained use of their own material. There again, they may be constrained by the lack of facilities and resources in the classroom and the school. There is a need to investigate further what is happening in the classroom with respect to pupil activities and teaching approaches.

Policy suggestion 4.9: The Ministry of Education should commission an observational study of teaching approaches and pupil activities in the English classroom.

What were some of the selected aspects of teaching mathematics?

The information collected about the teaching of mathematics was similar to that about the teaching of English. The results of the analyses are presented in Tables 4.17 to 4.19.

(a) Parental involvement

Table 4.17 is best interpreted alongside Table 4.11 for the English teachers. These tables show the percentage of teachers who knew there was a section in the school report reserved for mathematics was relatively lower than in the other regions. This is similar to the responses of the English teachers in the East region. The overall percentage for parents being asked to sign that homework assignments had been completed was somewhat higher for mathematics than for English, although in both cases the percentages for the South region were very low. As mentioned earlier, term reports are compiled for every pupil for all taught subjects including mathematics, and therefore it will be necessary to find out why some teachers in the regions identified said that there was no section for Mathematics in the school report. With regard to parents' signing, this should be taken up at schools level in the region concerned.

Table 4.17: Parental involvement

Region	Section on maths in the school re report	Parents sign
	%	%
Central	100	91
East	72	100
Islands	100	66
North	100	87
South	100	12
West	81	66
Seychelles	94	77

(b) Frequency of testing

The frequency of testing by mathematics teachers is reported in Table 4.18. Mathematics teachers tested less frequently than reading teachers (see Table 4.12). This finding needs to be placed in the context of standard practice in schools. Term examinations are institutionalised features of the school assessment system. However, testing at classroom level is left to the individual teachers. Although there has been more emphasis on continuous assessment as part of teaching strategies since 1999, no definite guidelines have been provided about the frequency of testing. Perhaps the Ministry should incorporate this matter in the national review of assessment procedures that it plans to implement in the near future.

Table 4.18: Frequency of tests

	2-3 per term	2-3 per month	1+ per week
Region	%	%	%
Central	48.1	39.3	12.6
East	64.5	0.0	35.5
Islands	34.8	65.2	0.0
North	54.3	45.7	0.0
South	38.8	39.3	21.9
West	54.0	46.0	0.0
Seychelles	49.5	38.6	11.9

(c) Teaching strategies for mathematics

Table 4.18: Pupil activities for mathematics

Activity	Activity rated as 'very important'
	%
Using practical equipment	96
Homework assignments	87
Quizzes, tests, examinations,	82
Working in pairs to solve math problems	76
Working alone on problems	72
Reciting tables, formulae	55
Preparing projects or posters to be shown to the class	55
Studying and interpreting graphs from magazines newspapers,	53

The activities selected to identify typical practices of teaching mathematics in schools as listed in Table 4.18 provide some contradictory results. It was assumed that when teachers endorsed these activities as very important this would reflect what the teachers were actually doing and that they had adopted these particular methods because they believed in their effectiveness. However, it would appear from the results that the teachers' responses were influenced by what would be desirable, not actual practise.

The responses to the first three activities need to be interpreted with that in mind. The high rating for the importance of practical equipment would seem to indicate the wish of the teachers to have the opportunity to use practical equipment since, from observation, teachers rarely use any mathematical equipment and pupils rarely have a mathematical set to use in the mathematics lesson. The report of the Mathematics Curriculum Steering Committee claimed that teachers were not using a variety of materials and equipment in the mathematics classroom and that schools should make these available to teachers and pupils. So, it would appear that teachers were responding to what they thought the pupils should do. On the other hand, with the emphasis placed on homework and examinations in the school, it is understandable that the teachers would endorse these activities as very important.

Taking into consideration the "desirability effect", one would have expected a much higher rating for problem solving activities and project work. This was not the case: the percentage of pupils whose teachers reported they thought such classroom activities were important was comparatively lower when compared to examinations and homework. This may be pointing to a problem area but, again, the differences are not pronounced enough to make any firm statement. However, the teachers' views on the potential for wider applications and the enjoyment of mathematics as being of lesser importance, as extrapolated from the last two items, should be a cause for concern.

In addition to pupils' activities, various goals for mathematics education were listed and teachers were asked to rate their importance. The results have been recorded in Table 4.19.

Table 4.19: Teaching strategies for mathematics

	Goals rated as very important
Goal	%
Confidence in solving math problems	100
Basic numeracy skills	99
Problem solving (transfer of skills to everyday life and applying knowledge)	97
Satisfaction from doing mathematics	95
Thinking skills including different ways of thinking and solving math problems	92
Development of life skills	89
Opening up career opportunities	74

A high concordance was again evident in the results. In fact, the responses to the pupils' activities and those concerning goals are rather contradictory. With the goals, most teachers rated problem solving as very important - but this was not in keeping with the importance relating to pupil activities (Table 4.18). However, the lack of variance in the response pattern may be an indication of full agreement by all teachers as to the importance of these goals except, perhaps, the last one. But it may also mirror a weakness in the way the questions were asked. In either case, interpretation of the data on the goals of teaching mathematics is limited.

Whereas the questions on goals were meant to bring out the teachers' beliefs in relation to the teaching of mathematics, those on approaches were meant to gauge the instructional orientation of teachers. In this case, it is the percentage of pupils whose teachers responded 'often' when asked how frequently they used each of the approaches that is recorded in table 4.20.

It can be seen that no one approach was used exclusively. Indeed, this would make sense because pupils differ and teachers often use different approaches because of the different kinds of children in the class. However, even though there was a clearer pattern in the type of practices that teachers claimed they use very often, one still senses that teachers were responding both to what was desirable and to what they actually did. It is evident from the data that the first five approaches relate more or less to general practices and the last four to more progressive methods. Just the same, the high rating of "relating to everyday life situations" is not consistent with "using everyday problem…."

The lack of emphasis on problem-solving as a classroom

Table 4.20: Teaching strategies for mathematics: frequency of usage for certain approaches

Approach	Percentage endorsing 'often' %
Relating to everyday life situations as much as possible	80
Giving positive feedback	76
Explaining mathematical processes	76
Basic skills training	74
Teaching the whole class as a group	72
Using available local materials	54
Using everyday problems (verbally, written or worksheets)	52
Teaching individually	49
Teaching through question and answer techniques	49
Teaching in a small group	19

activity has already been commented on. Perhaps this find is just an extension of that situation. It is evident that teachers tended not to use 'teaching in a small group' very often. One tentative conclusion is that the more challenging methods, those involving individualised and group teaching, were the least used.

On the whole only guarded comments can be made from the pupils activities in the mathematics classroom and the goals and approaches of teaching mathematics. The desirability effect and questionnaire bias has reduced the possibility of drawing firm conclusion. Further observational research would be needed to focus exclusively on instructional practices.

Policy suggestion 4.10: The Ministry of Education should carry out an observational study on the methods of teaching mathematics in the primary classroom.

What was the textbook situation in English and mathematics classes?

The distribution of textbooks is a complicated issue in schools. Although the acquisition of textbooks is processed centrally by the Ministry of Education, difficulties have arisen not only in the provision of appropriate textbooks but also in their replacement, distribution, and in keeping effective records. Although the intention is to have one textbook per child in school, it sometimes occurs that pupils have to share textbooks and in some dire cases pupils do not have any textbook. Information on the provision of textbooks is provided in Table 4.21a for reading and Table 4.21b for mathematics.

Table 4.21a: Pupils have reading textbook

Region	No textbooks	Only teacher has book	Share with two or more	Share with one other	Have own textbook
	%	%	%	%	%
Central	5	5	16	27	46
East	2	5	19	29	44
Islands	3	2	9	24	63
North	3	4	19	37	38
South	4	3	18	30	45
West	2	6	24	24	45
Seychelles	3.6	4.4	17.1	28.7	46.2

Table 4.21b: Pupils have mathematics textbooks

Region	No textbooks	Only teacher has book	Share with two or more	Share with one other	Have own textbook
	%	%	%	%	%
Central	3	3	10	11	73
East	0	5	14	7	75
Islands	0	1	3	5	91
North	2	2	5	18	74
South	1	2	7	22	69
West	1	5	8	9	78
Seychelles	1.6	2.7	8.4	12.2	75.2

From Tables 4.21a and 4.2b it can be seen that the state of textbook provision in the last class of primary schools in Seychelles was far from perfect. A small percentage of pupils did not have textbooks at all in English and mathematics. Only 46 percent had their own textbooks in English and only 75 percent in mathematics while 29 percent were sharing their English textbook. It really is important that all children have their own textbooks to be able to refer to them when they wish.

These figures confirmed the concern of the Ministry of Education with respect to the provision of textbooks. The audit conducted in secondary schools should now be extended to primary schools. Since most of the textbooks used in primary schools are locally produced, the Ministry of Education should devise a system of reproducing and replacing textbooks for the primary school children. The textbook policy of one textbook for each child for each subject should also apply to primary schools.

Policy suggestion 4.11: The Ministry of Education should carry out an audit of textbook provision in the primary schools and take the necessary action to ensure that all pupils have their own personal copy.

Conclusion

The presentation and discussion of data in this chapter have focussed on the basic conditions in classrooms and have also explored aspects of the teaching and learning environment. From the results it is quite clear that although some of the basic facilities are in place in the classroom, the provision of certain important human and material resources needs attention. However, as the analysis has shown, there are certain aspects related to teaching approaches and pupil activities in the classroom that are quite complex and therefore several of the policy suggestions have advocated further investigation.

The analysis of teacher characteristics leads to a critique of staff allocation and deployment. The supply, training, and recruitment of teachers have all received continuous attention by the Ministry of Education. However, an adequate supply of qualified teachers in primary schools has *not* been achieved. In addition, within the constraints of teacher availability, the Ministry also needs to ensure an equitable distribution of teachers in schools.

Two main issues emerge from the information on teaching conditions. The first, which is striking, is that schools were well equipped: most classrooms had the basic teaching facilities and adequate classroom furniture. The second, which is broader, refers to facilitating conditions that support and motivate teachers. For example, some consideration needs to be given to preparation time for teachers, more sustained efforts need to be made to get teachers to meet parents, and also teachers need opportunities for professional development. A policy suggestion has been made to address the major problem of inadequate textbook provision.

The study has tried to explore teaching strategies by learning more about the teacher's goals and approaches, and pupil activities. The results seem to show that teachers were rather more concerned with the functional approach to reading than they were with more expressive and enjoyable aspects of teaching and learning. Perhaps this outcome is linked partly to complacency of teachers and partly to a lack of resources. It is suggested that adequate facilities and resources should be made available to motivate teachers to be more creative in their teaching. The data on problem solving has provided contradictory results. Probably the used of a questionnaire to study teaching practices is not the best method. It is proposed that better understanding of instructional methods in the classroom might be gained by using direct observation.

The data presented and analysed in this chapter provide a baseline that can serve as a reference t for further study. It also sets the scene for the next chapter, which considers the wider aspects of educational process within the school and the leadership role of the Head Teacher.

Chapter 5

The Head Teacher and the School

Introduction

This chapter presents data describing the head teachers and the schools in which the P6 pupils found themselves. It provides a context for interpreting the achievement data to be presented later in the report, and it also establishes a baseline for planners to monitor changes in the conditions of schooling over time.

The major questions answered in this chapter are:

1. What were the characteristics and experience of the head teachers?
2. What was the staffing situation in the schools?
3. What was the school enrollment and how did schools operate?
4. What were the major activities and problems in the schools?
6. What conditions were the school buildings in?
7. What resources did the schools have?
8. What were the school-parent relationships?

What were the characteristics and experience of the head teachers?

The Head Teacher is often said to be the driving force of a school. Studies link the effectiveness of schools (see Southworth, 1995, for example) to the leadership skills of the Head Teacher, and more recently, the OFSTED (Office of Standards of Education) reports of schools in the UK have associated the leadership of the head teacher with quality learning and teaching. It has often been stated that if a good Head took over a school, he or she would attract good staff and within four years the school would be better than it was before. Conversely, if a poor Head were appointed, the academic and social life of the school would deteriorate. In Seychelles, the criteria for the selection of head teachers have never been formalised, but they include teaching experience and teaching qualifications. Moreover, those teachers who have shown commitment to education and who have made contributions to public life will have a greater chance of being promoted to the position of Head Teacher. It is important to gain some appreciation of the characteristics of primary head teachers in order to understand how schools operate.

This chapter is based on information furnished in 2000 by all but one of the head teachers in Seychelles, who was posted at the school on one of the outlying islands with only six pupils in P6 that was omitted from the data collection. To calculate average values for each region (representing between 3 to 6 head teachers) could lead to misleading inferences. Therefore values have been calculated for the 24 schools, and differences between regions have only been mentioned when they were dramatic.

(a) Characteristics of head teachers

In Table 5.1, there is information on the age, academic qualification and professional training of the head teachers.

Table 5.1: head teachers characteristics

	Age in (years)	'A' level	First degree or HND	Teacher training (years)
	Mean	%	%	Mean
Seychelles	45.4	52.1	9.7	3.0

The statistics in the tables are reported in terms of the pupils. Thus, the average pupil in P6 had a Head Teacher who was 45.4 years old with three years of teacher training. Just over half of the P6 pupils had head teachers who had obtained at least an A-level qualification. According to the revised Teacher Scheme of Service in the year 2000, the pre-requisite qualification for head teachers was stipulated as a first Degree or Higher National Diploma (HND). In this study, only 9.7 percent of pupils were in schools with head teachers who had completed a course of study at tertiary level. Therefore, the qualification levels of head teachers were below the standard set by the Ministry of Education, and this must addressed.

Policy suggestion 5.1: The Ministry of Education needs to identify appropriate courses to up-grade the academic education of primary head teachers.

(b) Experience and teaching load of head teachers

It can be argued that head teachers with more experience as Heads and also with more experience as teachers should be more effective in managing and providing leadership to the whole of the school community than the less experienced ones. It can further be argued that head teachers who actually teach in their schools as part of their regular duties will stay more abreast of the teaching and learning activities in their schools than those who do not. In Table 5.2, information is given on the number of years that head teachers in the year 2000 had been in their current position, had been a Head Teacher, had been teachers, and the number of hours they spent teaching in their current school each week.

Table 5.2: Experience of head teachers

	School Head of the school (years)	Experience as School Head (years)	Teaching experience (years)	Teaching hours per week
	Mean	Mean	Mean	Mean
Seychelles	4.9	8.7	28.2	2.2

The average P6 pupil had a Head Teacher who had been in his or her current school for about 5 years with altogether 8.7 years experience as Head, and who had been teaching for around 28 years. This latter figure was quite high and it reflected the criteria used to select primary head teachers. What seemed surprising was the teaching time of the Head Teacher. Nearly 65 percent of pupils had head teachers who did not teach at all. This accounts for the very low average of 2.2 hours for the country. The East and South recorded values of nearly six hours per week of teaching, whereas head teachers in the Central and West regions reported that they only taught for an average of ten minutes per week.

The teaching time of head teachers has been on the Ministry's agenda for several years. In a review of the Head Teacher's job description, at the beginning of the year 2000, it was stipulated that Heads should teach a minimum of 5 periods a week (4 hours per week). From the data, it is clear that many head teachers are opting not to teach. Head Teachers feel that administrative and disciplinary activities limit the time they have available for teaching. However, it remains important to re-consider the teaching commitment of head teachers.

Policy suggestion 5.2: The Ministry of Education should review the job description of head teachers and reinforce the minimum teaching time.

What was the general staffing situation in the schools?

In order to gain an overall view it is first necessary to find out about the teaching capacity of the school and the quality of the teachers. Information regarding teacher employment, gender of teachers and teacher education was gathered for all teachers in the primary schools. The pupil-teacher ratio was also computed from information on total number of pupils and the total number of teachers in the school. The results are presented in Table 5.3.

Table 5.3 Staffing conditions and teacher education in schools

	Permanent teachers	Temporary teachers	Female teachers	Pupil-teacher ratio	Tertiary education	Teacher training 3 years at least
	%	%	%	Mean	%	%
Seychelles	84.7	15.3	90.4	16.6	61.8	52.1

As in other small countries, human resource needs must be carefully monitored, and teacher supply remains a challenging pre-occupation for the Ministry of Education. The figures in Table 5.3, show that over 80 percent of pupils were in schools staffed by permanent teachers, and that the average child was in a school with a pupil-teacher ratio of 16.6. This ratio compared very favourably with international standards, and there was very little difference amongst regions. Nevertheless, the situation of employing "temporary teachers" who are, in fact, more like permanent supply teachers is a cause for concern since most of them are not qualified.

Further comments on the qualifications of teachers can be made from Table 5.3. Sixty-one percent of pupils were in schools where teachers had at least some higher education and 52 percent also had at least three years of teacher training. At the same time, there was some variation with the variable 'at least tertiary education' where the Centre region had 53 percent and the North 82 percent. Two points can be made. Firstly, it can be argued that although the overall number of teachers might seem adequate, the qualifications of teachers must be addressed. Secondly, the distribution of qualified teachers should be taken into consideration when placing teachers in schools (see policy suggestion 4.1).

What was the school enrolment and how did schools operate?

(a) School and primary 6 enrolment

The data on school and P6 pupil enrolment have been presented in Table 5.4. The average school enrolment was 691 with an equal number of boys and girls; the Central region had larger enrolment (927). The P6 enrolment was 84 with more or less equal numbers of boys and girls. It was noted earlier in this report that there were fewer girls than boys in the East and Islands regions but there were more girls in Central. At this stage, it is not possible to explain this. But the demographic trend seems to indicate that girls may be moving from these two regions to Central because of job and housing opportunities for the parents, especially the mothers.

Table 5.4: School and Grade 6 enrolments

Boys	Girls	Total	P6 boys	P6 girls	Total
Mean	Mean	Mean	Mean	Mean	Mean
346	345	691	41	43	84

(b) Head teacher's activities

Information has already been furnished about the head teachers' teaching experience and the number of years' experience as a Head. In this section, several activities in which Heads were involved are considered. Head Teachers were asked to rate the importance of the following activities: 'Contacts with local community', 'Monitoring pupils' progress', 'Administrative tasks concerning functioning of school', 'Discussing educational objectives with teaching staff', 'Professional development of teachers' and 'Professional development of school heads'.

The percentage of pupils with head teachers who considered all of these activities as 'Very important' was 95 percent. These responses would indicate that there is a compliance problem and, therefore, further interpretation of this data could be misleading.

What were the major activities and problems in the schools?

(a) School activities

Apart from day-to-day learning and teaching activities, there is in each school a range of events and activities that are meant to extend pupils' learning, generate pupils' enthusiasm, and create the ethos of the school. In reading, for example, there are selected activities that are known to develop children's interest in reading and deepen their understanding of what they read. In a study by Elley (1992) it was found that in schools where the pupils produced a

school magazine or journal or had a debating society that, other things being equal, pupils had a higher reading performance than in schools without such activities. Pupil performance was also enhanced wherever there were frequent meetings between parents and teachers. . The SACMEQ National Research Co-coordinators decided on a list of activities that were important in reading. The percentages of pupils in schools where these various activities occurred have been recorded in Table 5.5.

Table 5.5: Percentages of pupils in schools with selected activities

Activity	Percentage of pupils
	%
Production of a school magazine as booklet or sheets posted on wall	51
Public speaking day when pupils read own writing to parents	8
'Open door policy' for parents to visit school head or teachers at any time	100
'Open day policy' where 'special day' allocated for parents to visit head and teachers	100
Formal debates or debating contests	3

It was clear from the figures in Table 5.5 that some of the Ministry's initiatives to involve parents in the school and to ensure that parents have easy access to head teachers were having very positive results. However, the production of magazines, the holding of debates and public speaking performances do not seem to form a significant part of school activities. It is true that the Ministry of Education organizes a national public speaking day on a yearly basis for schools, but this does not preclude such activities within schools. These results suggest that, in most schools, reading and writing were seen as just part of the formal curriculum and not as an enriching experience that should be shared with others and, in particular, parents. This suggests that schools need to create an environment that is much more vibrant and forward-looking. Another kind of thinking among teachers and in the Ministry could lead to more school activities that encourage learning and promote community spirit.

Policy suggestion 5.5: The Ministry of Education should review its policy about general school activities that should be encouraged.

(b) Behaviour problems with pupils and teachers

Teacher behaviour

The work of head teachers goes far beyond the usual tasks of pedagogical and administrative leadership – and involves substantial effort related to staff management. Such work requires advanced inter-personal skills and in some cases may even require supportive interventions by more senior members of the Ministry.

In this study, the head teachers were asked to provide some broad information concerning ten aspects of the general behaviour of teachers in their schools. The behaviours were selected because each of them represented a "serious problem" if they were prevalent in schools. In other words, they were selected because of (a) their potential to impact upon the smooth functioning of schools, and (b) their capacity to involve the Head Teacher in time-consuming staff management tasks.

The head teachers were invited to rate the behaviours according to whether they "never", "sometimes", or "often" occurred in their own schools. It must be conceded here that this broad rating system was not a precise measure of the incidence rate. However, when these data were aggregated to regional and national levels it was expected that they would provide some general trends that could be analysed in more detail at a later stage.

The ten behaviours have been listed in Table 5.6 along with the percentages of pupils whose head teachers rated the problem as occurring sometimes in their schools. In the exceptional case of "teacher health problems", the figure in the table actually represents a composite of 82.5 percent that rated it as "sometimes" a problem and 17.5 percent that rated it as "often" a problem.

Table 5.6: Teacher behavioural problems

Frequency of teacher behavioural problem	Indicating " sometimes" or "often"
	%
Teacher health problems (*)	100.0
Teachers arrive late	96.9
Teacher absenteeism	69.6
Teachers bully pupils	59.9
Teachers abuse alcohol	27.8
Teachers use abusive language	23.6
Teachers skip class	20.3
Teachers harass teachers	00.0
Pupils harass teachers	00.0
Teachers use drugs	00.0

The final three entries in Table 5.6 indicate that there were no problems in Seychelles primary schools concerning the serious matters of sexual harassment and drugs. However, it would appear there is some concern among head teachers about teacher health problems (100 percent), teachers arriving late at school (96.9 percent), and teacher absenteeism (69.6 percent). These three areas have a direct impact on the smooth functioning of schools and would appear to warrant further exploration with head teachers. For example, if teachers are

late or absent then this disrupts classes and tends to provide an unacceptable example to pupils. In addition, if teacher health problems are prevalent then this can cause major problems in the daily school routine because in Seychelles there is no "supply teacher" system to provide replacements for teachers who are absent due to illness.

Policy Suggestion 5.6: The problems of teachers arriving late, being absent, and not being covered when absent due to illness should be included on the agenda for discussion at one of the head teachers' occasional meetings.

The responses to each question related to teacher behaviour were combined to form a scale that reflected the total number of teacher behaviour problems in each school. This was achieved by (a) assigning a school a score of "0" if the Head Teacher indicated that a particular behaviour was "never" a problem and "1" if the particular behaviour was "sometimes" or "often" a problem, and (b) summing these to give each school a score on a 10-point scale. The mean score for schools in each region and for Seychelles overall have been presented in Table 5.7.

The results showed that the incidence of teacher behaviour problems was fairly low at the national level – with a mean of 4.0 on the 10-point scale. Similar values of 3.5 to 3.9 were registered for all regions except for East region where a somewhat higher mean value of 5.3 was noted. This value is sufficiently different from the other regions to suggest that further exploration is needed. The East region is in a densely populated area of Seychelles with problematic housing conditions and it is possible that tensions within the community may have overflowed into the school environment, thereby resulting in difficulties and extra stress for teachers.

Table 5.7: Number of teacher behaviour problems

Region	Teacher Behaviour Problems
	Mean
Central	3.9
East	5.3
Islands	3.9
North	3.7
South	3.5
West	3.5
Seychelles	4.0

Pupil behaviour

The head teachers were also asked to describe behavioural problems among pupils by indicating from a list of 18 pupil behaviours whether each behaviour occurred according to

the following frequencies: “never”, “sometimes”, or “often”. The responses were re-coded following the scheme used for teacher behaviour information. That is, where head teachers indicated the behaviour was a problem “sometimes” or “often” they were given a score of “1”, and where they indicated “never” a score of “0” was assigned.

As for the teacher behaviour data, the above values were averaged to form proportions and then transformed into percentages. In addition, a total pupil behaviour score was formed by adding these individual behaviour scores together to obtain a score for each school with a possible range of 1 to 18.

In Table 5.8 the percentages are given for each pupil behaviour and in Table 5.9 the mean of the total pupil behaviour score tallied for regions and Seychelles overall.

The results in Table 5.8 show that there appear to be very few behaviour problems related to pupils’ dropping out, injuring staff, harassing teachers, or abusing alcohol. In contrast, there are other problems that do have major impact upon (a) individual pupil educational performance (absenteeism, health problems, and lateness for schools), and (b) the smooth functioning of the school (classroom disturbance, abusive language, bullying, fighting, and theft).

The behaviours listed with an asterisk in Table 5.8 are those where 20 percent or more of pupils had head teachers who said that the problem occurred “often”. Of particular note are the following behaviour problems involving 30 percent or more of the pupils: classroom disturbance, abusive language, bullying, and pupil health problems.

5.8: Pupil behavioural problems

Frequency of pupil behavioural problems	Indicating "sometimes " or "often"
	%
Absenteeism (*)	100.0
Health problems (*)	100.0
Classroom disturbance (*)	96.9
Abusive language to pupils (*)	96.9
Bullying (*)	96.9
Fighting (*)	96.9
Lateness for school (*)	93.6
Cheating (*)	88.9
Theft	87.1
Vandalism	79.5
Abusive language to staff	56.1
Sexual harassment of pupils	48.8
Skipping classes	41.7
Dropping out	17.3
Injuring staff	10.1
Sexual harassment of teachers	5.0
Alcohol abuse	3.8
Drug abuse	2.2

The results presented in Table 5.9 show that the incidence of pupil behaviour problems was fairly high at the national level – with a mean of 11.2 being registered on the 18-point scale. Five of the regions had similar average scores ranging from 10.2 to 11.4. The exception, as fit also was for teacher behaviour, was East region. In this region the average was higher, with a value of 13.7. The two higher values for both teacher and pupil behaviour problems in East region suggest that further investigation of these data is warranted.

Table 5.9: Number of Pupil behaviour problems

Region	Pupil behaviour problems
	Mean
Central	11.6
East	13.7
Islands	11.4
North	10.6
South	10.5
West	10.2
Seychelles	11.2

Policy suggestion 5.7: The Schools Division should arrange a confidential meeting with head teachers in the East region to discuss the finding that suggests an elevated level of behavioural problems among teachers and pupils. This meeting should be asked to bring forward more detailed information and to prepare a plan of action for the future.

What condition were the school buildings in?

The assessment school building size and state of repair was conducted by asking the head teachers to report on the number of permanent classrooms and other teaching spaces and to indicate their size in square meters. The results have been presented in Table 5.10.

Table 5.10: Number and size of general classroom facilities and condition of school buildings

Classroom numbers	Classroom size	Classroom Sq. meters per pupil	Repair status of buildings			
			Major repairs	Some major or all minor	Minor only	Good condition
Mean	Mean	Mean	%	%	%	%
28.2	1115	1.9	23.1	20.3	13.6	43.0

The average P6 pupil was in a school with 28.2 classrooms and a combined surface area of 1,115 square meters. The average space per pupil was 1.9 square meters. Many countries have 1.5 square meters per pupil as a norm so that 1.9 square meters per pupil for Seychelles compares favourably. However, there were some schools in the Central region that were below the norm of 1.5 square meters and it would appear that some further building will be required. In fact, recent plans at the Ministry of Education include the reconstruction of two schools in that region.

The head teachers were also asked about the condition of their school building using a five-point scale with the following values: 5 = in good condition; 4 = some classrooms need minor repairs; 3 = most or all classrooms need minor repair; 2 = some classrooms need major repairs; and, 5 = the school needs a complete rebuilding. For reporting purposes, the categories of 'major repairs' or 'complete re-building' were collapsed.

The percentage of pupils in schools needing either *complete rebuilding or major repairs* was 23. There was variation among the regions: in the East it was 72 percent (note again environmental difficulties in that region) and in Islands it was 45 percent. Twenty-three percent of pupils were in schools where the head teachers said that *some major repairs or many minor repairs* were needed. These were all in the Central (see above) and South regions (future plans for the complete renovation of one school in the South has been anticipated by the Ministry of Education). High percentages of pupils were in schools in the Islands and West regions where the Heads stated that some minor repairs were required. In Seychelles as a whole some 43 percent of pupils were in schools where the Heads perceived

them to be in a good condition. It is worth noting that no Heads in the Islands and West regions thought that their schools were in good condition.

The results seem to indicate that the maintenance needs of schools vary throughout the country. However, with almost one-quarter of the P6 pupil population in schools needing complete rebuilding, the Ministry of Education needs to take action. Although the Ministry of Education has on-going plans for the rebuilding of schools, their implementation may be more effective if carried out on a regional basis.

Policy suggestion 5.8: The Ministry of Education should ask the Project Implementation Section to visit all schools and prepare a report indicating the shortfall from the Ministry's norms in each school in the regions and offer suggestions for school building improvement.

What resources did the schools have?

In SACMEQ I it was found that school resources varied greatly from country to country in the various countries. Furthermore, availability of resources was highly related to performance in reading. Information has been displayed in Table 5.11 for four categories of general school facilities: school buildings, school grounds, general services, and equipment.

Table 5.11: Percentages for schools with general facilities

Facility	Percent with facility %
Buildings	
School library	100.0
School or community hall	15.8
Teacher/staff room	100.0
Separate office for school head	97.9
Storeroom (separate from Head's office)	91.9
Cafeteria	70.4
School grounds	
Sports area/playground	95.7
School garden	63.5
Fence or hedge around school borders	73.4
General Services	
Piped water	100.0
Electricity	100.0
Telephone	100.0
Equipment	
First aid kit	75.9
Radio	100.0
Tape recorder	100.0
TV set	100.0
Video cassette recorder	90.2
Photocopier	96.4
Computer	97.8

The data presented in Table 5.11 create a favourable picture of the availability of general facilities and equipment in schools. All schools had libraries and staff rooms. As expected, they were serviced by electric, water, and telephone. The use of technological equipment was quite advanced since one hundred percent of pupils were in schools with radios, tape recorders, television, and 98 percent of them were in schools equipped with one or two computers.

However, the regional data indicate that some deficiencies existed. There was a lack of school halls in the East and Islands regions. It is clear that in the building of schools this had not been a priority – the North and South regions had schools where less than 50 percent of the pupils were benefiting from the use of a school hall whereas in the central region 94 percent of pupils were in schools with a school hall. Around 50 percent of pupils were in schools without cafeterias

in the North and the Islands regions.

The data for school grounds seems to show that some embellishment of the school grounds would be necessary for some schools. The need was particularly acute in the East, where 100 percent of pupils were in schools without a garden and 72 percent of pupils were in schools without fencing.

Several new primary schools were built in the 1990s and there are plans to re-build others and to even build an additional primary school. It is not surprising that Tables 5.11 and 5.10 reinforce the general view that school building has been an important consideration at the Ministry of Education and that the physical resources in primary schools in Seychelles are only in a fair state. However, in order to continue the improvement of school facilities, the Ministry of Education should continue to review its resource allocation to schools as well as the development of school buildings and school grounds.

Policy Suggestions 5.9: The Ministry of Education should ask the Project Implementation Section to consult with head teachers and prepare a priority list concerning further improvement of school facilities.

What were the school-parent relationships?

The final section in this chapter considers school-parent relationships. From other research (cf. Postlethwaite and Ross, 1992) it has become evident that community co-operation with the school is very important not only in the life of the community in general but also for the pupils' learning in the school. Coleman (1994) in his work on 'social capital' has indicated that where there are strong links between the church or mosque or temple and the school and the parents, then the pupils learn more and there is less crime in the community. For this study, the head teachers were asked to indicate the extent to which lack of co-operation from the community was a problem. The results are displayed in Table 5.12.

Table 5.12: Lack of community co-operation perceived as a problem

Region	Not a problem	Minor problem	Major problem
	%	%	%
Central	8.8	57.2	33.9
East	49.0	28.1	22.9
Islands	0.0	100.0	0.0
North	26.9	61.0	12.1
South	27.7	72.3	0.0
West	55.3	44.7	0.0
Seychelles	24.1	58.8	17.1

The Ministry of Education has made deliberate efforts especially through the Parent-Teacher Association to encourage parents in the community to become more involved in the school. It was expected that by the time the data were collected some of the effects of this effort would have been felt. Therefore, there was strong feeling by head teachers that, on the whole, although they might have been encountering some problems, most of the problems were minor. Thus, 82 percent of pupils were in schools where "no problems" or only "minor problems" were recorded.

Also, specific projects have been initiated at the individual school level, to encourage parents to take an active role in pupil learning, especially in English language. In effect, these projects have been active in the Central region where there appeared to be more problems with community co-operation as shown in table 5.12. But they were initiated before the data were collected, and it would be useful to monitor the situation at a later stage.

The ways in which parents in the community help the school are presented in Table 5.13. The percentages of pupils in schools with different forms of parental co-operation are given for Seychelles as a whole.

Table 5.13: Parent/community contributions to the school.

Item	Percent contributing
	%
Maintenance of school facilities	7.8
Construction or maintenance and repair of furniture, equipment etc.	6.4
The purchase of textbooks	28.3
The purchase of stationery	79.2
Payment of amount on top of teacher salary	17.6
Extra-curricular activities including school trips	70.8
Provision of school meals	51.5

It can be seen that parental co-operation with schools acts mainly to provide stationery for the pupils and to fund extra-curricular activities. These are the areas where parents have direct input. In the case of stationery, parents ensure that their children have the necessary exercise books, pens and other equipment for class. As for extracurricular activities, parents raise funds for the school or contribute money to support these activities.

Table 5.13 concerning meals is more difficult to interpret. The situation in Seychelles is not clear except to say that half of the total population are not provided with lunch by their parents. Although a school meal service is operational, it has not been very popular,

especially among older children. Many children receive money from their parents or guardian to buy lunch, or in some cases lunch boxes are provided. It would be useful to find out to what extent the other half of the P6 population are availing themselves of the school meal service and what other arrangements are made for lunch.

With regard to book purchases, only 28 percent of pupils were in schools where their parents bought textbooks for them. This figure is very low. The Ministry of Education did provide textbooks for most pupils although data in chapter four indicates that a substantial number of pupils did not have their own copies of mathematics or English textbooks, and this is cause for concern.

From the last two tables it can be observed that, in general, parents were helpful to schools. Parents were willing to help with the payment of extracurricular activities and the purchase of stationery. On the other hand, h some 17 percent of pupils were in schools where there was poor co-operation between parents and schools. The low incidence of parental contribution to the purchase of textbooks needs further investigation (see policy suggestion 4.11).

Policy suggestion 5.10: The recently launched Parents Educators Council that brings together the chairperson of the Parent Teacher Association should explore strategies to strengthen and extend the co-operation between school and the community and the Ministry of Education. The School Improvement Programme should sustain its programme to bring the parents into the school.

Conclusion

This chapter has outlined the main features of schools in Seychelles as drawn from information supplied by head teachers. Indicators such as the characteristics of head teachers, the school environment in terms of staffing, organization, and school-parent relationships were examined to provide a backdrop for later analyses, to establish a base line for future monitoring, and to guide policy proposals.

The results do not point to any gross deficiencies in school conditions. The physical facilities appeared to conform to international standard, and Seychelles seemed to have reached a high level of technological resources. With regard to staffing, however, some comments have been made concerning the low academic qualifications of head teachers, the lack of qualifications of the temporary teachers, and the substantial number of teachers who were not adequately

qualified. There were also deficiencies in extracurricular school activities, although data were collected only for English. Whereas the researchers had assumed there would be many extra activities in all subject areas to make life more interesting for the pupils and also motivate and help them to learn, this did not seem to be the case. Generalizing from the data on school activities directly related to language development — such as debates, production of school magazines, and public speaking –such activities were clearly lacking in the primary schools in Seychelles. The head teachers should try to create a livelier atmosphere with a range of extracurricular activities linked to learning. Moreover, there were some behavioural problems, which can affect the learning environment. Although major anti-social behaviours were not prominent in the school, disciplinary problems such as classroom disturbances, use of abusive language, bullying, fighting, lateness and cheating were found to be high with pupils; health problems, lateness and absenteeism were prevalent among teachers. With the Head Teacher constrained by administrative duties and disciplinary problems, the educational environment of the school could suffer. Schools seemed to lack the quality of a vibrant and dynamic learning community where the enjoyment of teaching and learning goes beyond the classroom and enthuses both the school and the community.

Chapter 6

Achievement of P6 Pupils and their Teachers in Reading and Mathematics

Introduction

In Chapters 3, 4, and 5 we examined the home background of pupils, their classrooms, their teachers, and the condition of their schools. But in the end, the most important consideration is the learning experience of the pupils themselves. In this chapter, a proxy measure for learning is examined. It is the pupil's achievement level as measured towards the end of the pupils' time in P6. Also included in this chapter are the teachers' achievement results with special regard to reading and mathematics

The pupils and teachers were administered tests in reading and mathematics. How these tests were constructed has been described in Chapter 2. The tests were standardised to a mean of 500 and a standard deviation of 100. The data were also analysed to produce a scale from which different levels of achievement could be identified so that the percentages of pupils and teachers reaching these levels could be calculated.

Analysis of overall achievement

a) **Achievement in reading for pupils and teachers**

The overall scores for reading and mathematics for both pupils and teachers are presented in Table 6.1. They show that pupils' scores were above the means for reading with an overall score of 581.9 while teachers' scores were well above the mean with an overall score of 872. The teachers scored over 200 points higher in reading and over 300 points higher in mathematics than their pupils. One other point to note is that the pupils' mean scores for mathematics were lower than their mean scores for reading - a difference of around 27 score points. On the other hand, the mathematics teachers were performing much higher than the reading teachers. This may be due to the fact that mathematics in P6 is taught by specialist teachers whose knowledge of mathematics is expected to be quite advanced.

Table 6.1: The reading and mathematics test scores of pupils and teachers

Region	Reading		Mathematics	
	Pupil	Teacher	Pupil	Teacher
	Mean	Mean	Mean	Mean
Central	596.7	795.2	567.0	880.5
East	560.3	800.0	551.5	839.5
Islands	576.6	788.8	552.4	900.8
North	567.4	801.9	534.6	847.6
South	585.2	836.4	554.1	909.0
West	584.9	841.9	550.0	856.6
Seychelles	581.9	806.8	554.3	872.0

There were some regional variations in scores. Pupils in the central region had the highest scores for both reading and mathematics. This was not the case for the teachers, whose scores were highest in the West for reading and the South for mathematics. It is also apparent that pupils' scores in the East were well below the national average for reading and somewhat below the national average for mathematics. Some of the earlier findings (see chapter 5) about the elevated level of behavioural difficulties in East region schools could help explain these learning results. However, the range of teachers' and pupils' mean score for reading was rather small across regions, around 36 score points for pupils and 46 score points for the teachers. The range for mathematics was also small for pupils (around 17 points) but somewhat larger for the teachers (around 70 points).

b) Analysis of pupil achievement levels in reading

The percentages of pupils reaching the eight different levels of reading have been presented in Table 6.1. These achievement levels can also be regarded as instructional levels. For instance, those pupils who are functioning at Level 3 but not at Level 4 are in a position to begin to learn the knowledge and skills embodied in Level 4 and to consolidate the work represented by the skills listed in Level 3. At the national level, this type of feedback can be used to guide curriculum planners.

If Level 4 is taken as the point where children can 'read for meaning', then 19.2 percent of pupils had not mastered that level. The lowest percentage of pupils who were not operating at Level 4 was in Islands and conversely, the highest percentage of pupils who had mastered Level 4 and beyond was also in Islands. At the same time, the highest level of literacy, where pupils were functioning as "critical" readers, was identified in the Central region.

Table 6.1: Percentages of pupils reaching the various levels of achievement in reading

Region	Levels							
	1	2	3	4	5	6	7	8
	%	%	%	%	%	%	%	%
Central	2.9	7.9	6.4	11.7	13.8	13.0	20.6	23.6
East	3.9	7.4	9.9	15.8	16.2	14.8	21.7	10.3
Islands	1.8	5.5	8.6	14.4	17.5	19.9	22.3	9.9
North	2.4	8.5	12.4	15.4	13.4	13.4	19.5	15.0
South	3.9	6.0	11.5	9.9	16.4	13.1	21.8	17.4
West	2.9	6.8	6.9	10.3	12.7	21.3	28.2	10.9
Seychelles	3.0	7.4	8.8	12.8	14.6	15.0	21.8	16.7

Although the results indicate that the large majority of pupils have reached the level where they can "read for meaning" and those just below 40 percent have become "critical and analytical" readers, there is still cause for concern; a group of pupils have managed to reach P6 without moving beyond levels 1, 2 and 3 in their reading skills. If the percentages of pupils at levels 1, 2 and 3 are converted into figures, the number of pupils at those levels equals 296 and the extent of the problem in a small school system becomes more apparent.

Some tentative explanations could be attempted at this stage. These pupils were concentrated in the lower educational streams. Whatever the remedial action was, it had not been effective since, through automatic promotion, they were able to enter P6 without having reached a level of reading where they could extract meaning from texts and documents and interpret information. Due to lack of diagnostic facilities and underdeveloped remedial services in the school, it seems likely that these pupils have been allowed to move through the primary school system without the necessary care and attention being given to their learning experience, since operating at that low level of literacy would make learning t a rather painful and de-motivating experience. It will be possible later in this report to link **these results** more specifically with certain aspects of the school structure.

Policy suggestion 6.1: The Ministry of Education, through the Early Childhood and Primary Education Committee, should investigate the reason why there is a group of children who are so poor in reading.

c) Analysis of reading levels for sub-groups

The reading data was analysed further by classifying pupils into three sub-groups (Table 6.2). The first sub-groups examined were boys and girls. The second set of sub-groups consisted of two socio-economic levels – high and low – based on pupil total possessions as a proxy

measure for the wealth of the home (see chapter 3). The third sub-group consisted of pupils in schools in different locations: rural, small town, main town.

Table 6.2: Percentage of pupils reaching the reading competence level

Sub Groups	Levels							
	1	2	3	4	5	6	7	8
	%	%	%	%	%	%	%	%
Gender								
Boys	2.9	25.3	27.9	18.4	10.6	9.9	3.7	1.4
Girls	2.2	14.7	20.5	21.0	17.0	16.8	6.3	1.6
Socio-economic level								
Low SES	3.7	23.5	25.9	22.7	11.5	9.4	2.6	0.7
High SES	1.8	17.8	23.1	17.8	15.2	15.8	6.5	2.0
School location								
Isolated/rural	2.5	20.1	26.6	23.9	9.4	11.0	4.1	2.4
Small town	3.3	22.5	24.9	17.5	13.0	12.4	5.4	1.1
Main town	1.7	16.5	22.2	20.7	16.8	15.6	5.1	1.5
Seychelles	2.6	20.0	24.2	19.7	13.8	13.3	5.0	1.5

An inspection of Table 6.2 reveals certain trends worthy of note. As far as the location is concerned, the pattern fits the general one for Seychelles in the previous table. Pupils in the 'main town' did tend to reach the highest level of literacy followed by pupils in the 'small town' and rural or isolated areas. However, the differences at the lower end of the literacy levels were not so consistent. This is understandable since the sharp demarcation between rural areas, towns and cities that feature in many other SACMEQ countries does not exist in Seychelles due to its size. It has been shown in other SACMEQ countries that pupils in or near the main cities perform better because of better facilities and the fact that the better teachers tend to stay near the big cities as do the wealthier pupils. For Seychelles, this effect seems to be fairly small in terms of reading competence. However, in relation to gender and socio-economic status of pupils, certain prominent features were apparent.

There were only 16.9 percent of girls who were at Levels 1 and 2, whereas there were just over 28 percent of boys in that category. Out of every eight pupils reaching the highest literacy levels (levels 6, 7 and 8) five were girls. Thus the gender imbalance in reading is quite evident. It reflects the different performances of boys and girls and the fact that there are more boys than girls in the lower streams. This financing will be dealt in the next chapter. For now it is clear that that the problem needs attention.

The relationship between reading and socio-economic-status followed the expected pattern. More pupils from high socio-economic situations reached higher levels of literacy, while those showing lower levels of literacy tended to be pupils of low socio-economic status. Nevertheless, it is interesting to note that a small portion (around 12 %) of low socio-economic status pupils (around 178 pupils) did reach the higher literacy levels (6, 7 and 8). At the same time, there were 17.8 percent of pupils (i.e. 264 pupils) from very high-class socio-economic background at level 2 and 23.1 percent (i.e. 341 pupils) at level 3. It is obvious that those pupils were underachieving. The two groups of pupils need to be studied further to gain an understanding of what other contextual variables may be influencing the reading outcomes.

Policy Suggestions 6.2: The Ministry of Education should use the SACMEQ data to investigate the personal and school characteristics associated with those pupils in the lower socio-economic group who managed high scores in reading and those in the higher socio-economic group who performing poorly in reading.

d) Analysis of pupil achievement levels in mathematics

The percentage of pupils reaching the eight levels presented in Table 6.4 showed that the mathematics score for pupils in Seychelles were more or less evenly distributed through all the levels where 'basic numeracy' was the model level with 38 percent of pupils. There is some disagreement as to just exactly what constitutes numeracy when these levels are considered. It could be argued that a pupil at level 3 is just about to become numerate. Hence the pupils at Levels 1, 2 and 3 could be classified as innumerate. But, some may consider only Levels 1 and 2 pre-numerate. Either way, caution needs to be exercised when attaching labels to these descriptive levels. Whichever selected, the result is ominous for Seychelles.

Table 6.4: Percentages of pupils reaching the various levels of numeracy

Region	Levels							
	1	2	3	4	5	6	7	8
	%	%	%	%	%	%	%	%
Central	1.7	16.2	22.3	20.3	17.1	15.6	5.3	1.6
East	2.9	24.7	19.7	20.6	11.9	9.9	8.9	1.5
Islands	2.5	23.8	23.7	14.9	13.0	17.3	3.7	1.2
North	4.4	22.0	28.3	17.7	14.6	9.3	2.8	0.8
South	3.9	17.5	27.3	17.6	12.0	14.7	5.4	1.6
West	0.6	21.8	26.4	26.0	7.5	11.5	4.0	2.3
Seychelles	2.6	20.0	24.2	19.7	13.8	13.3	5.0	1.5

Over 46 percent of the total population of P6 pupils were at Levels 1, 2 and 3. It is difficult to understand how these pupils managed to reach P6 without having at least mastered the skills

at level 4. If one includes the raw figures of 694 pupils out of 1484, the results unveil some disturbing problems with the teaching and learning of mathematics in Seychelles. Some concern has been expressed before about the poor performance of pupils in the P6 mathematics examination, but without follow-up. The Chief Examiner, for example, has consistently commented on the poor performance of pupils in mathematics.

Unfortunately, the P6 examination which, so far, is the only occasion when performance in mathematics is monitored at national level, has been criticised for providing just a single grade that does not help to identify weaknesses or to analyse difficulties. It is evident that this problem has existed for some time without appropriate strategies being developed to rectify it. When numeracy is examined through these derived levels, it is disturbing to note at what a low level pupils seem to have "got stuck". Attempts to revise aspects of the mathematics curriculum have been undertaken by isolated individuals without the necessary resources and support for implementation. Just the same, the problem may be related more to the teaching-learning environment and this should be studied in conjunction with a thorough examination of the curriculum not only for P6 but also for the preceding grades.

Policy suggestion 6.3: The National Curriculum Committee should set up a task force to examine the primary mathematics curriculum in order to establish the cause of the poor performance.

e) Numeracy levels by sub-groups

The percentages of pupils in different sub-groups and the different levels of numeracy they reach are given in Table 6.5.

Table 6.5: Percentages of sub-groups of pupils reaching different levels of numeracy

Sub-group	Levels							
	%	%	%	%	%	%	%	%
	1	2	3	4	5	6	7	8
Gender								
Boy	2.9	25.3	27.9	18.4	10.6	9.9	3.7	1.4
Girl	2.2	14.7	20.5	21.0	17.0	16.8	6.3	1.6
Socio-economic level								
Low	3.7	23.5	25.9	22.7	11.5	9.4	2.6	0.7
High	1.8	17.8	23.1	17.8	15.2	15.8	6.5	2.0
Location								
Rural	3.3	22.5	24.9	17.5	13.0	12.4	5.4	1.1
Small town	1.7	16.5	22.2	20.7	16.8	15.6	5.1	1.5
Main town	2.6	20.0	24.2	19.7	13.8	13.3	5.0	1.5
Seychelles	2.5	20.1	26.6	23.9	9.4	11.0	4.1	2.4

The pattern in mathematics is fairly similar to that in reading. More girls than boys reached higher levels of numeracy. Pupils in town areas had a slight advantage over those elsewhere. Pupils in the higher socio-economic group tended to reach higher levels of numeracy when compared with pupils in the lower socio-economic group. However, there were unacceptably high percentages of pupils at the higher socio-economic level who reached only Level 2 numeracy.

Given that the test was based on the collective curriculum of the SACMEQ countries it is clear that Seychelles is not performing as well in mathematics as in reading. What could be going wrong? This is not a new question for the Ministry of Education but considering some of the difficulties which have beset the Curriculum Development Section (defunct since 1999), the difficulties in staffing the Mathematics Unit of that section and the difficulties in supporting and monitoring the learning of mathematics in school, the answer to this question must be explored by considering three main aspects of the system: the curriculum, the teaching-learning situation and school structure.

As far as curriculum is concerned, a new curriculum prepared previously by the Curriculum Development Section is now operational in schools. A National Curriculum Committee has been set up and a Curriculum Co-ordinator located at the National Institute of Education has recently been appointed. Therefore, in the light of this study, the curriculum needs to be examined in the context of some of the achievement results. What is more important is that teacher training, the monitoring of teachers, the development of appropriate resources for teachers and the provisions of learning material for pupils need attention. It is clear that so far, P6 pupils are not motivated to learn mathematics and they are not being challenged to do so. As with the reading results, the next chapter will explore certain structural problems that may have aggravated this situation.

Policy suggestion 6.4: The National Curriculum Committee should use the numeracy levels in the SACMEQ project to investigate the poor performance of P4 pupils onward in mathematics.

Conclusion

In this chapter the achievement of pupils and teachers in reading and mathematics has been examined. The findings show t there was a much greater spread of pupils cross the numeracy levels established by SACMEQ than for literacy. There was a disproportionately large percentage of pupils at levels 1, 2 and 3 and this points to some urgent need to improve the quality of teaching and learning of mathematics in Seychelles.

On the other hand, the performance of teachers in those two subject areas was very good. When the levels of teachers were examined it was found that only 5.8 percent of teachers were at Level 7 and the rest were at Level 8 in reading. Similarly, the majority of mathematics teachers (75.9 %) were performing at Level 8 and the others at Level 7. The practice of having specialist teachers in the primary school could be one of the reasons for these results. One can conclude that teacher knowledge and competence in reading and mathematics is not a problem in Seychelles.

However, a few policy suggestions have been attempted with respect to pupils' performance. Examining the curriculum, investigating further the cause of the poor performance in mathematics and the effectiveness of the remedial system for reading have been suggested. Nevertheless, exploring further some of the factors associated with achievement will provide valuable information for more specific policy consideration.

Chapter 7

Equity

Introduction

The policy statement of the Ministry of Education in Seychelles defines equity as a multidimensional concept in which access is only one element. Equity also involves the "sharing of resources", the creation of "conditions for optimum achievement by every group" and providing "equal opportunities … of success to both genders". In this chapter, the issue of equity is discussed by locating the differences in resource inputs to schools, by studying the pattern of achievement of boys and girls, and by considering the variations in learning outcomes among schools and among classes within schools. This is followed by an appraisal of organizational structures such as streaming, which is prevalent in primary schools in Seychelles. Exploring these areas of equity will enable policy-makers to know which resources are evenly or unevenly distributed, to pay attention to how pupils are grouped or allocated to classes, and to become aware of gender imbalances.

Equity in the distribution of physical resources

(a) Variations in the allocation of physical resources

The mean values of physical resource indices for schools in each region, for the region as a whole, and for Seychelles overall are displayed in table 7.1.

For the 'Classroom resources index' most of the variations were among schools within regions. However, the means for Central and South regions were well below the overall mean. Two schools were particularly affected. School R in the South had a mean of 5.8, whilst School B in Central had a mean of 4.0 - a difference of 1.5 and 2.3 points, respectively, below the mean for Seychelles as a whole. This would suggest that special attention should be given to those two schools when considering the distribution of resources to classrooms.

It can be seen from the 'School resources index' that all the regions but one (the East) had mean values above the national average. In the East region all schools registered values below the national average and it can be assumed that the two schools with low mean values of 15 were poorly resourced. Further inspection of the means for individual schools within regions showed that School B in Central and School P in the North also had very low mean values for that particular input. Although, generally, there has been an attempt by the

Ministry of Education to distribute resources equitably to schools, certain schools have been neglected, and this needs to be addressed.

The variable in the third column of the table refers to the number of pupils per toilet. There were certain variations among regions, with three of the five regions registering values above the national average. Furthermore, there was considerable variation between schools in most regions. For example, in the Central region the 'School toilet ratio' ranged from a low of 11.1 pupils per toilet in School C to a high of 39.6 pupils per toilet in school F, and in the Islands region one of the three schools registered a high mean of 39.1 pupils per toilet. This is quite serious and action is needed.

Table 7.1: Variations in material resources

Region	School	Classroom resources index	School resources index	School toilet ratio	Classroom space per pupil
		Mean	Mean	Mean	Mean
Central	A	7.8	19.0	26.1	1.7
	B	4.0	14.0	14.6	1.3
	C	8.0	20.0	11.1	3.1
	D	6.2	18.0	24.8	1.1
	E	7.7	17.0	38.1	1.4
	F	6.9	17.0	39.6	1.1
	Sub Total	**6.9**	**17.7**	**29.1**	**1.4**
East	G	7.7	15.0	28.0	1.8
	H	8.0	17.0	13.7	3.6
	I	8.0	15.0	20.3	2.0
	Sub Total	**7.8**	**15.4**	**22.6**	**2.3**
Island	J	7.1	17.0	39.1	2.0
	K	8.0	18.0	19.6	1.2
	L	8.0	19.0	16.9	1.3
	Sub Total	**7.6**	**17.7**	**27.6**	**1.5**
North	M	7.0	20.0	16.1	2.0
	N	7.2	17.0	23.1	2.3
	O	8.0	18.0	13.0	4.9
	P	8.0	14.0	15.4	3.3
	Q	7.5	18.0	9.7	3.9
	Sub Total	**7.4**	**17.9**	**16.6**	**2.9**
South	R	5.8	18.0	22.3	1.4
	S	7.5	16.0	14.9	2.0
	T	8.0	19.0	11.5	1.3
	Sub Total	**6.7**	**17.7**	**17.9**	**1.5**
West	U	7.4	19.0	21.1	1.6
	V	6.0	17.0	14.5	2.1
	W	8.0	16.0	5.7	2.5
	X	8.0	17.0	24.8	1.6
	Sub Total	**7.4**	**18.0**	**19.1**	**1.8**
Seychelles		7.3	17.4	23.4	1.9

Although the national average for the 'Classroom space per pupils' index was reasonable by international standards, there were some variations among regions and considerable variations between schools within regions. Three regions – Central, Island, and South – had mean values below the national average of 1.9 square metres per pupil. Also, especially in Central region, some of the schools had values well below the national mean. This would suggest there was sufficient lack of equity between schools among regions that the issue should be dealt with at a national level.

These results suggest that the Ministry of Education has been partially successful in providing an adequate level of material resources to schools. However, attention needs to be focussed on those regions where the distribution of specific resources has been uneven. The situation concerning classroom resources and toilets is quite serious and action should be taken. As noted in Chapter 5, the Ministry is developing plans to improve facilities and resources, and it would be advantageous if the results of this study could contribute to the process.

Policy Suggestions 7.1: The Resource Planning and Project Development Section should investigate the situation of unequal allocation of physical resource inputs a) among regions and b) among schools within regions – especially in the Central and Islands regions.

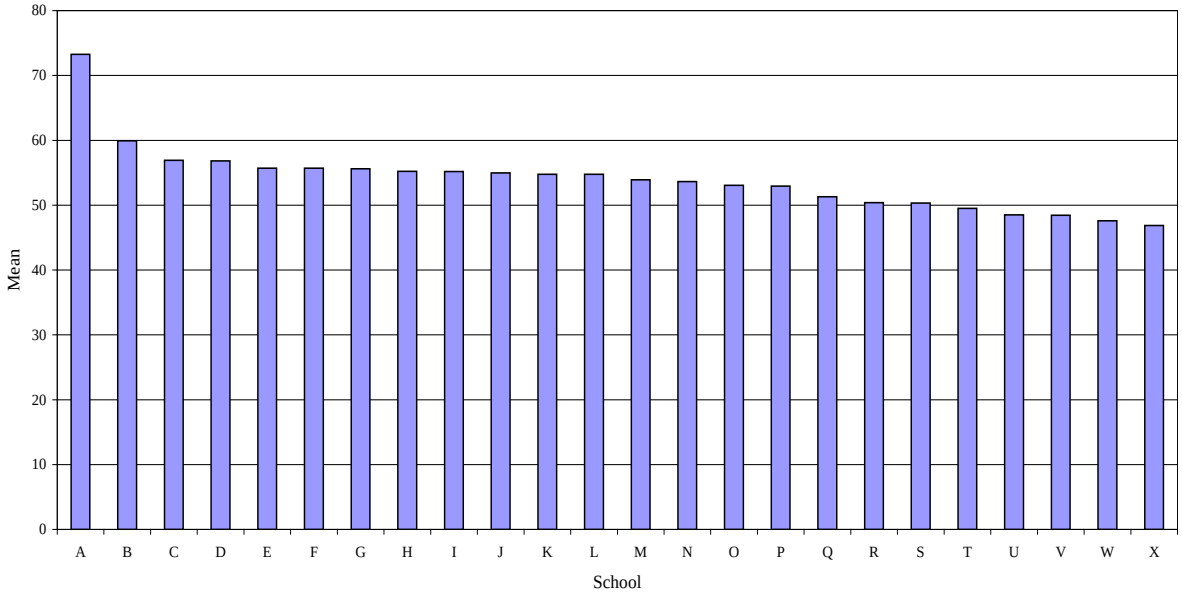
(b) Variations in the distribution of human resources

Information concerning human resources for schools in each region, in the region as a whole, and for Seychelles overall are presented in Table 7.2.

Table 7.2: Variations in human resources

Region	School	Teacher academic qualification	Teacher professional qualification	Teacher experience	Teacher pupil ratio	Permanent teachers
		Mean	Mean	Mean	Mean	%
Central	A	20.3	7.0	10.7	15.7	100.0
	B	21.0	6.0	16.5	13.1	84.2
	C	25.0	8.0	23.0	15.3	100.0
	D	17.3	6.3	16.4	18.8	77.6
	E	19.3	6.5	33.0	16.5	73.9
	F	18.9	6.5	16.6	18.3	100.0
	Sub Total	19.4	6.6	17.2	17.2	89.1
East	G	17.4	5.9	25.3	19.1	100.0
	H	17.1	7.2	9.0	15.2	74.1
	I	18.0	5.0	36.2	14.8	67.2
	Sub Total	17.5	6.0	24.7	17.0	84.9
Island	J	20.0	6.4	7.4	17.4	75.0
	K	18.0	4.0	19.0	17.1	100.0
	L	19.5	7.0	10.3	13.5	84.0
	Sub Total	19.2	5.7	12.0	16.5	85.4
North	M	18.5	5.2	21.7	16.6	100.0
	N	17.7	4.7	10.9	17.0	60.5
	O	22.8	5.1	5.4	10.0	61.5
	P	21.0	6.4	5.7	14.8	100.0
	Q	19.8	7.0	6.1	11.4	72.7
	Sub Total	19.5	5.3	12.5	14.8	80.1
South	R	21.0	6.6	13.7	27.7	100.0
	S	21.0	7.2	13.7	11.9	74.3
	T	18.0	6.6	16.4	14.8	68.0
	Sub Total	20.3	6.8	14.3	20.5	85.9
West	U	19.2	6.3	16.7	15.3	78.2
	V	18.0	7.0	16.0	10.1	73.9
	W	21.0	8.0	4.5	9.0	100.0
	X	21.0	7.0	7.5	9.6	58.1
	Sub Total	19.6	6.7	13.4	12.7	76.3
	Seychelles	19.3	6.2	16.0	16.6	84.7

Table 7.2 shows the rather low level of variation among regions for teacher professional qualifications, academic qualifications, and the percentage of permanent teachers. However, some of the variations within regions are worth noting. In the East region two of the three schools had values well below the national average for 'Teacher academic qualification'. Similarly, for 'Teacher professional qualification', there were two schools, School K in the Islands and School N in the North region, where the low mean values might signal a need for action. In addition, the values for 'Permanent teachers' indicates there were substantial variations within all regions. In some schools all the teaching staff were permanent, but in many others the percentage of permanent staff ranged from 60 to 85 percent. School X in the West region registered the lowest mean of 58.1 percent.



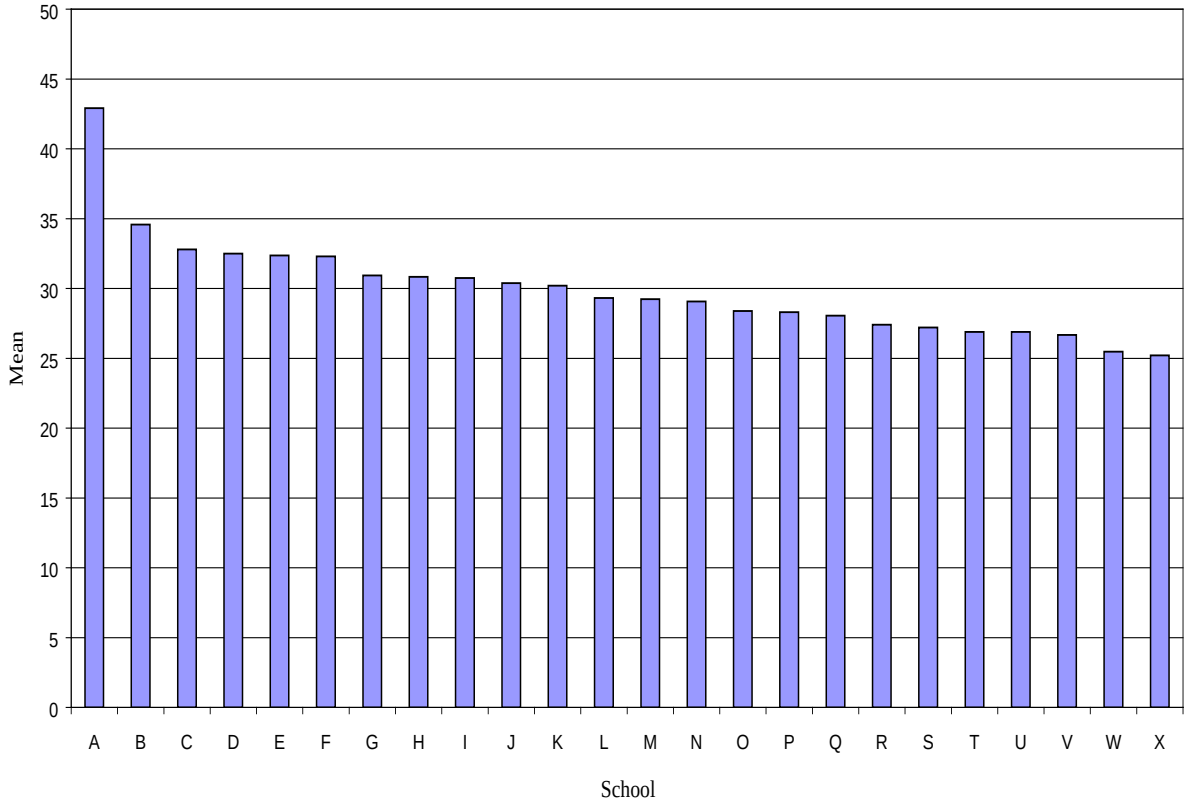
There were more variations for the human resource inputs associated with 'Teacher pupil ratio' and 'Teacher experience'. School R in the South region seemed to be worse off for 'Teacher pupil ratio' whilst there were pronounced variations within all the regions for 'Teaching experience'. These results suggest that the staffing situation with respect to the allocation of experienced teachers and numbers of teachers deserves attention. As mentioned previously, the human resource issue is receiving close attention from the Ministry of Education and these results have targeted specific areas where the Ministry needs to take action.

Policy Suggestions 7.2: The Ministry of Education should undertake an investigation of the specific instances of unequal distribution of human resources (a) among regions, and (b) among schools within regions in the East and South regions.

Variations in learning outcomes

The principle of equity in educational inputs does not solely imply that pupils receive comparable education, which then results in comparable outcomes. Attention also needs to be given to the fair organization and just treatment of different groups of pupils within schools. In Seychelles, it is important to explore the variation in learning outcome among schools and also within schools whilst taking into consideration the streaming structure of the primary school system. Therefore, variation in learning achievement in reading and mathematics may be related to the class grouping and gender differentiation.

Achievement results for reading are ranked by school in Figure 7.1 and for mathematics in Figure 7.2. The reading test had 83 items and the mathematics 61 items. The mean scores in reading and mathematics for all pupils were 54.2 and 30, respectively. It was clear that, except for school A, there was not a great deal of variation among schools in achievement. Those for reading ranged between 60 and 48 and those for mathematics from 34 to 25 in all



the other schools. There is still is one standard deviation difference and this difference will need to be addressed.

The intraclass correlation (rho) may be calculated to quantify the variations among schools. It can be used to partition the total variation in the reading and mathematics scores into the component due to variation among schools and the component due to within-school variations. The values of rho were very small for both reading (6.2) and maths (8.5). This indicated that for reading, 93.8 percent of the total variation, and for mathematics 91.5 percent

of the total variation among pupils, was associated with variation among pupils within schools.

In Figures 7.1 and 7.2, School A stands out. This is the only private school in Seychelles and it serves a privileged community. There is something to be learned from the way pupils in that school reached such a high level of achievement. However, as far as government schools were concerned, the results did not show that pupils were at a disadvantage if they happened to be in a particular school. This would suggest that for Seychelles overall there was equity among schools in the level of achievement.

(a) Variations in learning outcome among classes within schools

It has been a traditional practice in the Seychelles education system to assign primary school children to different classes within a school on the basis of general ability. Thus most of the primary schools have streamed classes. The number of streams depends on the size of the school. Of the 24 schools tested, four had one class only, ten had two classes, seven had three classes, one had four classes, one had five classes and one had six classes. The mean score in reading and mathematics for the different classes (streams) have been presented in Table 7.3.

The data show that the pupils' achievement levels in reading and mathematics is a consequence of their learning in a particular class within a school. Class 1 is the top stream, Class 2 the second stream and so on. Pupils in the top stream achieved well and performance declined progressively as pupils found themselves in the lower streams. The standard deviation on the test was 16 for reading and 10 for mathematics. There was a difference of more than 5 standard deviations between scores in the top streams and those in the bottom streams. In surveys of this kind it is often the case that one standard deviation in test scores is the equivalent of a year's schooling Therefore, the large variation in learner achievement among streams is alarming. The value of rho was .72 for reading and .92 for mathematics, which indicated that 72 percent of the variation among pupils' reading scores and 92 percent of the variation among pupils' mathematics score were associated with variations among classes. Thus the difference between streams is massive, and this points to serious inequity among classes in the learning outcome of pupils.

Table: 7.3: Variation in the mean score in reading and mathematics

Stream	Reading	SD	N	Maths	SD	N
1	63.15	11.32	655	36.28	9.22	655
2	47.83	14.66	491	26.54	8.05	489
3	39.54	11.11	221	21.59	5.80	221
4	34.76	8.94	66	20.34	4.60	66
5	27.31	6.75	38	17.00	5.09	38
6	24.54	3.43	13	16.77	3.29	13
Total	52.04	16.43	1484	29.50	10.36	1482

(b) Variations in achievement between boys and girls

Achieving gender equity in education is one of the concerns of the Ministry of Education. Results of the P6 national examination show a consistent pattern of boys under performing in most subjects. It is also evident in the primary schools that boys outnumber the girls in the lower streams. These two aspects of gender inequity are examined by comparing the scores for girls and boys in reading and mathematics and by recording the percentage of boys and girls in the various streams.

Table 7.4 Mean scores of boys and girls in reading and mathematics

Sex	Reading	SD	N	Maths	SD	N
Boy	44.55	15.72	742	27.60	10.06	741
Girl	52.84	14.85	742	31.45	10.33	741
Total	48.70	15.36	14840	29.53	10.37	1482

The mean score for reading and mathematics are presented in Table 7.4. They show that girls scored better than boys in both subject matters. These differences were large - over one standard deviation for reading and nearly half a standard deviation for mathematics. Why is there this inequity between the scores of boys and girls? A further insight into this situation is obtained by comparing the number of boys and girls in each stream in Figure 7.3.

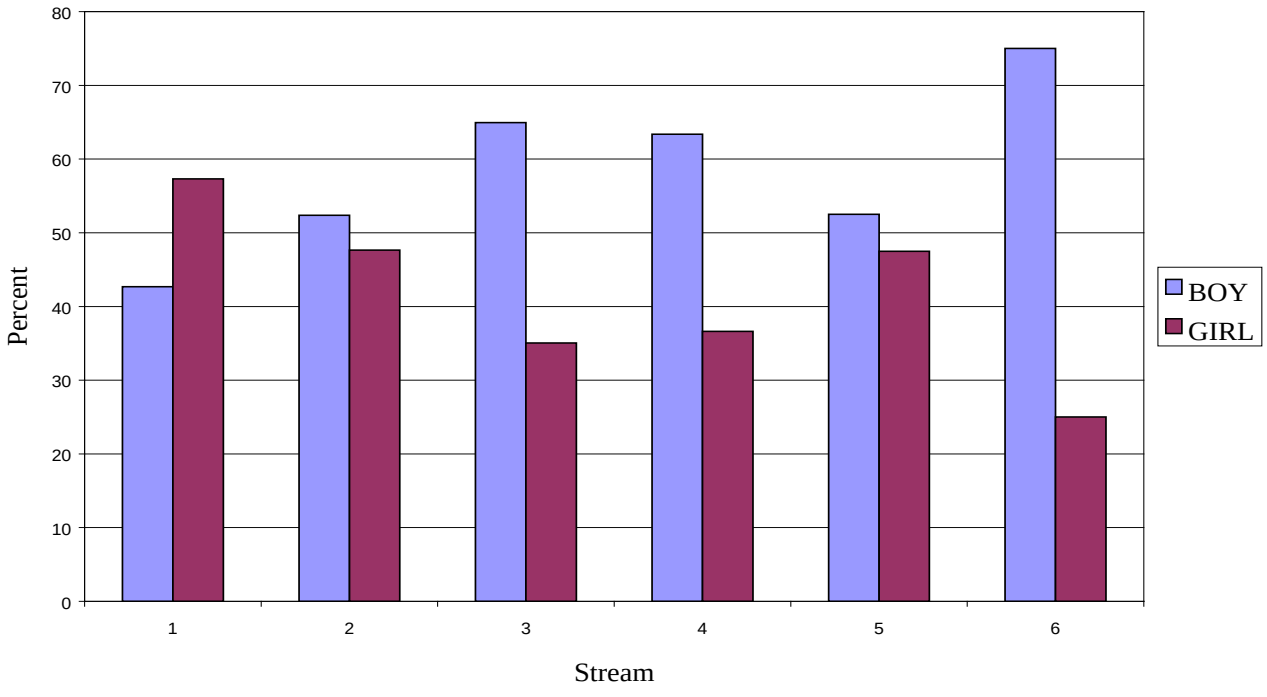
Figure 7.3: Boys and girls by stream

Although there were 785 boys and 761 girls in P6, the girls outnumbered the boys in the top stream, where 58 percent of all pupils were girls. But, thereafter, the boys outnumbered the girls and in the sixth stream (which was in one school) 75 percent of pupils were boys. This indicates that the practice of streaming favoured girls getting into the top stream and produced a selection bias that contributed to the large gender differences in achievement between boys and girls.

Streaming

Streaming was inherited early mission primary schools where some children were deemed to be "good at school" and were placed into a different group from the others. Streaming by ability, largely based on school assessment and teachers' judgement, continued until the educational reform of 1978. This reform was meant to replace the selective system with a more egalitarian one, and, in that context, streaming was discouraged. However, the practice of streaming carried on covertly. It became so pervasive in the culture of schools that a policy stating that schools should not stream children before the end of P4 was introduced in 1988 to reduce the tendency for schools to stream children as soon as they entered P1 (if not before). Unfortunately, the implementation of this policy was not closely monitored.

Teachers like to organize their instruction around homogenous groups of pupils. Streaming has become accepted by the Seychellois society as a way of identifying the bright children. Head teachers feel pressurised to group children by ability. Although the Ministry of Education has expressed concern about children who were underachieving, streaming has continued as an accepted practice, and schools in Seychelles undertake streaming by placing children into so-called ability groups. The research findings described above show the wide gap between pupils in the top stream and those in the bottom stream. This necessarily leads to unequal chances of scholastic success.



Although one or two head teachers are regrouping pupils to do away with streaming, all schools with more than one P6 class (except the private school) use streaming as a method of placing pupils in different level classes within the same year. In countries such as the United Kingdom (Barker-Lunn, 1970, for example) and the United States (where it is known as tracking, see Slavin 1989, 1990, for example), where large-scale studies have been done on achievement in streamed and non-streamed schools, the general conclusion has been that ability streaming does not enhance achievement. Unfortunately, others studies that attempted to show the effects of streaming on 'low' and 'high' achievers, or to study the benefits of other forms of groupings (reviewed in Harlen and Malcolm, 1997; Sukhandan and Lee, 1998), have produced inconsistent results.

Nevertheless, it is evident from this study that streaming is a major source of inequity in the education system of Seychelles. It has a negative impact on pupils' achievement in the lower streams in both mathematics and reading comprehension in English and there are large variations between the top streams and the lower streams. Furthermore, the streaming issue has become entangled with the gender issue. It becomes apparent that streaming is not just by ability but that teachers use other criteria as well to stream children.

It is most unlikely that girls are intrinsically better learners than boys are. It is more likely that streaming takes place very early in childhood education and is influenced more by subjective and social criteria rather than ability. From some head teachers' views it is apparent that these judgements are related to pupils' behaviour, to influences of parents, to how young children adapt initially to the environment of the school, and to teachers' perceptions of them. These biased judgements tend to favour the girls, who are looked upon as being more passive and less disruptive than the boys. By the time the pupils are assessed to be assigned to different classes, the polarising and differentiating effects of streaming has already taken place (Lacey, 1970) and the gap in achievement between groups of pupils had been created.

It is known from other research (see Oakes et. al., 1992) that streaming 'causes' wide gaps in achievement between children and that over time this gap increases. The achievement gap is apparent in Seychelles at the secondary level, where over 60 percent of student are said to be "underachieving". The Ministry of Education faces a dilemma. Seychelles requires leaders of world quality but it does not want a discriminatory system of education that will lead to a

divided society. Besides, as a small society, Seychelles needs to use as much of its human resources as possible. At the same time, ability grouping has become very much part of the organization of the primary school system. Dealing with the situation will require system-level action relating to the selection practices of schools and policies of allocating children to classes within schools.

Policy Suggestion 7.3: The Ministry of Education should enlist the help of the head teachers and teachers to implement a policy against streaming and to develop strategies to promote mixed-ability teaching in the primary school.

Conclusion

In this chapter issues relating to equity in physical and human resources and equity in educational outcome have been discussed.

It was found that the Ministry of Education has had some success in its efforts to achieve equity in the distribution of material resources to primary schools, both in schools and in the classrooms. However, it was pointed there were some variations among regions that need attending to. Also, a small minority of schools seemed to have been overlooked. More pronounced variations were identified in relation to 'school toilet ratio'. These deficiencies would need to be rectified.

Also, it was found that although teachers where equitably distributed among regions in terms of qualifications, there were one or two schools within regions that did not have their fair share of qualified teachers. On the other hand the percentage of teachers who were on the permanent staff varied considerably within region, and the same was true for the number of experienced teachers. This would suggest that there were certain problems with the allocation of staff to schools.

One of the dominant findings relates to learning outcome. It has emerged that pupils' achievement was less a consequence of their learning experiences in a particular school than a result of being assignment to a particular stream within a school. This was also linked with gender differences in achievement. The discussion calls on decision-makers to focus on the streaming problem to find ways of reducing inequity in pupils' achievement.

Chapter 8

Policy Suggestions and Agenda for Action

Introduction

This report is the first study of primary education in Seychelles. It comes at a propitious moment when, following the Education for All movement, many countries have become concerned with the quality of their basic education systems. In Seychelles, the decision to evaluate the primary school system coincided with the recent policy statement of the Ministry of Education that placed strong emphasis on quality, with a commitment to "adopt a planned approach to education development based on systematic investigation and research".

The analyses in the preceding chapters have been based on data emanating from a national survey of primary schools in Seychelles. They yielded detailed information on the conditions and the functioning of primary schools. By relating the results to the local context, it has been possible to highlight the successes of the system and also to identify areas needing improvement. The research findings have demonstrated the importance of many Ministry initiatives, such as developing structures to link the school with the home, revising the teachers' service scheme, and continuing to up-grade school buildings. The Ministry has achieved a good level of literacy and an equitable distribution of physical resources in primary schools. The results of this study also confirm some of the concerns of the Ministry, such as textbook provision, improvement of the learning environment in the classroom, and improving the level of mathematics achievement in general. In addition some of the weaknesses of the system in terms of teacher motivation, school organization, and school climate are highlighted. This approach to research provides a good example of the way in which educational data can inform policy and how research findings can be made readily accessible to policy-makers for future actions.

The overall picture of primary schools depicted by the results is quite encouraging. Although primary schools in Seychelles were generally quite effective, there were still some critical issues such as streaming and equity that clearly needed attention. These issues must be addressed if the quality of primary education in Seychelles is to improve further. In Chapters 3 to 7 a range of policy suggestions were made in order to generate discussion and stimulate action.

Classification of policy suggestions

A total of 30 policy suggestions emerged from the analyses. In order to facilitate discussion concerning these suggestions, and to assist decision-makers in devising a plan of action that can result in coherent strategies from the various divisions, sections and units of the Ministry of Education, the policy suggestions were grouped under five main categories. These were: the establishment of consultative arrangements with staff, community members and experts; reviews of existing planning and policy procedures; further small-scale data collections for planning purposes; the initiation of large-scale educational research studies; and, investment in infrastructure and resources. This classification was based on the operational implications that these suggestions have for the Ministry of Education.

1. Consultation with staff, community and experts: This group contains six suggestions (*3.2,* 4.7*, 4.8, 5.6, 5.7, 5.10)* about various consultative arrangements that the Ministry of Education will need to make with different stakeholders in education. They involve meetings and discussions that would promote an open and on-going dialogue aimed at generating strategies for productive action. This could be achieved by arranging initial meetings, forming special discussion groups, or using existing forums.

2. Reviews of existing planning and policy procedures: Six **policy** suggestions (3.4, 4.1, 4.3, 5.2, 5.5, 7.3**)** are grouped together under this heading. They concern both specific policy reviews and general policy development. The policy concerns that are related to homework, the role of head teachers and school activities could be dealt with at system level, whereas concerns about staffing policy and streaming policy require both a system-level and a national-level approach.

3. Data collection for planning purposes: A total of six suggestions (3.1, 3.5, 3.6, 4.11, 6.1, 6.2,) appear within this group. They are intended to point out those gaps in the system where more specific information is needed. They involve fairly small-scale investigations that would extend the knowledge of the Ministry of Education on issues such as homework, the provision of extra tuition, and the characteristics of certain groups of learners.

4. Educational research: Five major investigations were suggested (4.4 4.9, 4.10 6.3, 6.4) in this group. Projects relating to evaluation studies, curriculum research, observation studies and monitoring reviews could be set up and implemented by the Ministry of Education.

These large-scale research projects would assess the effectiveness of various aspects of the system and provide decision-makers with substantial information on its functioning.

5. Investment in infrastructures and resources: In this group seven policy suggestions (4.2, 4.6, 5.1, 5.8, 5.9, 7.1, 7.2**)** were collected that require the Ministry to provide funds for training, development of facilities, and procurement of resources. Although in-service courses may not require a big investment, courses for head teachers that take place overseas probably would. In some cases there may be a need to re-allocate resources, but in other situations a major programme to repair buildings and provide facilities will need to be established.

Table 8.1: Summary of policy suggestions

Policy suggestions	Relevant departments	Time	Cost
Group 1: Consultation with staff, community and experts			
Policy suggestion 3.2 The Ministry of Education should develop contact with the National Library to discuss its role in providing reading material for children and to examine the possibility of increasing its mobile library service. The Ministry of Education could also pay for several newspapers and magazines for each school.	Documentation Centre	Short	Low
Policy suggestion 4.7 The Ministry of Education should use forums such as the Parent Teacher Association (PTA) and Parents Educators Council (PEC) to sensitise parents to the desirability of meeting teachers. Information and training to interact and communicate with parents should also be provided both through pre-service and in-service courses for teachers. A check-up should be conducted in two or three years' time to ensure that teachers are meeting with the parents of at least 95 percent of pupils	Schools Division	Long	Medium
Policy suggestion 4.8 The Schools Division should check up on policy and practises related to parents checking homework and what is happening in the South region. This should be accompanied by a meeting with all head teachers to decide on clear policies concerning the involvement of parents in their children's education.	Schools Division	Short	Low

Policy suggestions	Relevant departments	Time	Cost
Policy suggestion 5.6 The problems of teachers arriving late, being absent, and not being covered when absent due to illness should be included on the agenda for discussion at one of the head teachers' occasional meetings.	Schools Division	Short	Low
Policy suggestion 5.7 The Schools Division should arrange a confidential meeting with head teachers in the East region to discuss the finding that suggests there is an elevated level of behavioural problems among teachers and pupils. This meeting should be asked to bring forward more detailed information and to prepare a plan of action for the future.	Schools Division	Short	Low
Policy suggestion 5.10 The recently launched Parents Educators Council that brings together the chairperson of the Parent Teacher Association should explore strategies to strengthen and extend co-operation between school and community and the Ministry of Education. The School Improvement Programme should sustain its programme to bring the parents into the school.	Schools Division and School Improvement Programme	Long	Low
Group 2: Reviews of existing planning and policy procedures			
Policy Suggestion 3.4 The Ministry of Education should review its position on homework with a view to establishing a national policy on homework – especially with respect to the two key subjects.	Schools Division	Short	Low

Policy Suggestions	Relevant Departments	Time	Cost
Policy suggestion 4.1 The Ministry of Education should develop a school staffing policy that will take into consideration qualifications, training, age and gender (where possible) of teachers to ensure an equitable distribution of teachers in schools.	Schools Division and Personnel Section	Short	Low
Policy suggestion 4.3 The supervisory and advisory role of the head teachers should be included in the management training of head teachers.	Schools Division and National Institute of Education	Medium	Low
Policy suggestion 5.2 The Ministry of Education should review the job description of head teachers and reinforce the minimum teaching time.	Schools Division	Short	Low
Policy suggestion 5.5 The Ministry of Education should review its policy about what general school activities should be encouraged in the school.	Schools Division	Short	Low
Policy Suggestion 7.3 The Ministry of Education should enlist the help of the head teachers and teachers to implement a policy against streaming and to develop strategies to promote mixed-ability learning in the primary school.	Schools Division and Educational Planning Division	Long	Medium
Group 3: Data collection for planning purposes			
Policy suggestion 3.1 The Ministry of Education should conduct a small investigation to discover where the girls who should have been in P6 in the Islands and West regions have gone.	Education Planning Division	Short	Low

Policy Suggestions	Relevant Departments	Time	Cost
Policy suggestion 3.5 The Ministry of Education should examine why there is such a large difference in the percentage of reading and mathematics homework that is being corrected, and determine whether or not the Ministry should take action to redress the situation**.**	Schools Division	Short	Low
Policy suggestion 3.6 A special study of extra tuition should be undertaken to identify the nature and extent of this practice, and to explore strategies for ensuring that it does not become a major problem as it has in Mauritius.	Research Evaluation Section	Medium	Low
Policy suggestion 4.11 The Ministry of Education should carry out an audit of textbook provision in the primary schools and take the necessary action to ensure that all pupils have their own textbooks.	Resource Planning and Project Development Section	Medium	Medium
Policy suggestion 6.1 The Ministry of Education, through the Early Childhood and Primary Education Committee, should investigate the reason why there is a group of children who are so poor in reading.	Schools Division and Research Evaluation Section	Short	Low
Policy Suggestions 6.2 The Ministry of Education should use the SACMEQ data to investigate the personal and school characteristics associated with those pupils in the lower socio-economic group scoring high in reading while those in the higher socio-economic group are not performing so well.	Research Evaluation Section	Medium	Low

Policy suggestions	Relevant departments	Time	Cost
Group 4: Educational research			
Policy suggestion 4.4 The Ministry of Education should carry out an investigation of teacher motivation and use some of these findings to study the responses of teachers concerning job satisfaction in order to identify strategies to address some of the national- and regional-level concerns.	Research Evaluation Section	Long	Medium
Policy suggestion 4.9 The Ministry of Education should commission an observational study of teaching approaches and pupil activities in the English classroom.	Research Evaluation Section	Medium	Medium
Policy suggestion 4.10 The Ministry of Education should carry out an observational study on the methods of teaching mathematics being used in the primary classroom.	Research Evaluation Section	Medium	Medium
Policy suggestion 6.3 The National Curriculum Committee should set up a task force to examine the primary mathematics curriculum to establish the cause of the poor performance in mathematics.	National Curriculum Committee	Long	Medium
Policy suggestion 6.4 The National Curriculum Committee should use the numeracy levels in the SACMEQ Project to investigate the poor performance of pupils in mathematics from P4 onwards.	National Curriculum Committee and Research Evaluation Section	Medium	Low

Policy suggestions	Relevant departments	Time	Cost
Group 5: Investment in infrastructures and resources			
Policy suggestion 4.2 In consultation with the relevant sections, the National Institute of Education should co-ordinate all forms of in-service training for teachers in order to ensure regular and integrated programmes, and to achieve a more balanced coverage of in-service training opportunities across regions and subject areas.	National Institute of Education	Short	Medium
Policy suggestion 4.6 It is suggested that the Ministry should conduct an audit of schools with respect to all teaching materials and classroom furniture that the Ministry considers as important, and then begin to rectify any shortfalls.	Resource Planning and Project Development Section	Medium	High
Policy suggestion 5.1 The Ministry of Education needs to identify appropriate courses to upgrade the academic education of primary head teachers.	Principal Secretary and Training Section	Medium	High
Policy suggestion 5.8 The Ministry of Education should ask the Project Implementation Section to visit all schools and prepare a report indicating any shortfall from the Ministry's norms in each school in the regions, and offer suggestions for improving school buildings.	Project Implementation Section	Medium	High

Policy suggestions	Relevant departments	Time	Cost
Policy suggestions 5.9 The Ministry of Education should ask the Project Implementation Section to consult with head teachers and prepare a priority list concerning further improvement of school facilities.	Project Implementation Section	Medium	High
Policy suggestions 7.1 The Resource Planning and Project Development Section should investigate the situation of unequal allocation of material resource inputs a) among regions and b) among schools in Central and Islands regions.	Resource Planning and Project Development Section	Medium	High
Policy suggestions 7.2 The Ministry of Education should undertake an investigation of the specific instances of unequal distribution of human resources (a) among regions, and (b) among schools within regions in the East and South regions.	Schools Division	Medium	High

Agenda for action

The economic conditions of Seychelles and the constraints of a small island state in terms of human and material resources make it unrealistic for the Ministry of Education to address all of the above policy issues at one time. It would not be possible for the Government of Seychelles to fund all of these projects or to have the human resource capacity to manage them all.

It must be evident from the research findings that Seychelles has established a functional primary education system and that many of the suggested projects are intended to fine-tune the system with perhaps one or two areas that would need more radical change. Therefore, the presentation of an agenda for action takes into consideration time and cost, as indicated in the third and fourth columns of Table 8.1. It must be remembered that these are rough estimates and that both educators and decision-makers need to participate in discussing and reviewing the plan.

The time estimates were designated as “short”, “medium” and “long”, whereas the cost estimates were designated as “high”, “medium” and “low. The short timeframe was estimated as being around three to nine months, medium as being from one to two years, and long as being around three to five years. In a similar way, low cost was estimated for initiatives that could be accommodated within the recurrent budget, medium for those initiatives that could build on existing budgets in association with additional funds, and high cost for major projects that could be planned as capital projects by the Ministry of Education, and would probably need to be budgeted with some external assistance.

Taking the cost factor into consideration, the Ministry of Education could adopt a four-stage approach as an agenda for action. In the first stage the Ministry could activate proposals that do not need extra funding. These could be started immediately. Once action in this stage is well under way, the second stage could commence. The third stage would require the gathering of substantial information to plan for further action. The final stage would require long-term planning and major capital investment and negotiation with funding agencies.

Stage 1: The timeframe and cost patterns discussed above show that the Ministry’s first actions in response to the list of suggestions given in Table 8.1 should be concentrated on those that were listed under Group 1. All of these suggestions require setting up consultative

structures that would allow dialogue and negotiations. Except for policy suggestion 4.7, all the others do not require extra funding. For this suggestion, the Ministry could make a start through existing structures, namely, the Parents Educators Council and the School Improvement Programme.

Stage 2: The suggestions in Group 2 should be the main focus of the Ministry of Education action. These involve reviews and developing policies and procedures that would follow-on fairly consistently from the first stage. However, suggestion 7.3, which is probably one of the most important proposals concerning the improvement of the learning environment and the quality of primary education, may need some extra funding for the training and monitoring of teachers.

Stage 3: At this stage it is recommended that the Ministry of Education consider planning for the research projects identified in Group 4. All of those projects (except one) have medium to high costs. It may be possible to begin by implementing suggestion 6.4, whose costs are low. The other four policy suggestions would need to be phased in and prioritised; some preliminary planning should be carried out so that they can be written-up as project proposals and advice and resource inputs from outside agencies sought.

Stage 4: .The Ministry of Education should bring these suggestions in line with its long-term strategic plan. However, it should already be possible to begin to plan for suggestions 4.2 and 4.9. Nevertheless, it is proposed that the Ministry prioritise three of the other suggestions and prepare project proposals to discuss with outside agencies for appropriate funding.

Concluding remarks

This report was prepared as the Seychelles' component of the second cross-national educational policy research project undertaken by the 15 Ministries of Education that form the Southern African Consortium for Monitoring Educational Quality (SACMEQ). This project, known as the SACMEQ II Project, was designed and implemented as a collaborative venture undertaken by national teams of educators and researchers, and with the technical support of staff from the International Institute for Educational Planning (IIEP).

The production of the report evolved through a series of capacity-building training activities that included intense training workshops conducted by the IIEP in Paris (2000), Seychelles

(2001), and Mauritius (2002). The outstanding success of SACMEQ II illustrates the effectiveness of SACMEQ's unique co-operative "working style" whereby expertise and knowledge are exchanged, and concerns and experiences are shared at an international level. The authors of this report hope that the report will provide the impetus for Seychelles to undertake a national debate concerning the issues that were raised as "Agenda for action" in the final chapter of this report.

The data archive prepared as part of the SACMEQ II project was??? expected to be released in late 2003, and at that time it will be possible to undertake a variety of cross-national comparisons of the quality of education in the SACMEQ countries. Also, additional analyses and supplementary research reports have been planned for individual countries in order to broaden understanding of primary education systems, and to enhance the quality of decision-making and developmental planning in the Ministries of Education.

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