CHAPTER 4

RESEARCH METHODS APPLIED AND CONTENT VALIDATION OF THE QUESTIONNAIRES

4.1 Introduction

This chapter synthesises the literature dealt with in chapters one, two and three, and describes how the study was conducted. It provides a summary of the information and the data collected, and how they were gathered, both qualitatively and quantitatively. The chapter also provides details of specific objectives of the field research, the sources of data, the research questions, and the interview topics. The chapter ends with a summary and a discussion of the plan for analysing the data.

The ultimate goal of social science research is to produce an accumulating body of reliable knowledge. Such knowledge enables us to explain, predict, and understand empirical, logical and quantitative phenomena and data that interest us. This study therefore, approached theory by using research methods that are grounded empirically. Nachmias and Nachmias (1992:47) identified the following four steps to serve as guidelines in research projects:

- investigate a phenomena and delineate its attributes,

- measure the attributes in a variety of situations;

- analyse the resulting data to determine if there are systematic pictures of variation and;

- once the systematic patterns are discovered construct a theory.

On the basis of the general objectives set out for this study, and the findings from the review of literature, the collection of data combines four methods: the review of literature, structured interviews, questionnaire surveys and case study using semi-structured interviews (Cohen and Manion, 1994:123; Sharp and Howard, 1998:147). The collection of data was carried out in four stages. The first stage concentrated on a review of relevant literature. This was a key activity in the effective management of this research project as shown in chapter two and three. The second component of the study involved interviews with key individuals from the Ministry of Education and

the Kenya Institute of Education (Curriculum Centre). This was followed by an application of a questionnaire on the Principals of secondary schools and Heads of Department and lastly the conduction of semi-structured interview with computer teachers.

4.2 Planning for field research

Cohen et al. (2000:88-89) point out the importance of thorough planning for a field research project and suggest a four-point model as a guide:

- identify the purpose of the research;

- identify and give priority to the constraints under which

  the research will take place

- plan the possibilities for the research within these constraints;

- decide the research design.

This plan helped the researcher to consider the types of research instruments to be used to collect data at what stage and with different participants. The main issues involved in the planning for this field research included:

- identifying the objectives for the research, and giving priority to the constraints under which the research took place;

- Planning the possibilities for the research within these constraints and deciding on the research design;

- Discussing the objectives of the field research. This included time of the research, costs involved, physical facilities, materials, administrative expenses, participants, main focus of the research and ethics of the research;

- Considering specific objectives of the field research, research questions, focus of the research, validation, and kinds of data required;

- Deciding on the number of participants, and other sources of data, and how to verify the data and data analysis;

- Lastly, considering how to achieve coherence and practicability in the research design.

Cohen et al. (2000:88) and Sharp and Howard (1998:130) emphasise the usefulness of planning because it exposes key features of the research and enables the researcher to have a clear plan of action. Sharp and Howard (1998: 130) feel that whatever is involved in gathering the data, the process by which they are recorded often sets a definite limit on the rate at which they can be gathered, and the ease with which they can be covered. This obviously requires planning time and skills.

4.3 Specific objectives of the field research

This study comprised a series of embedded qualitative and quantitative studies involving the use of documentary analysis, interviews and questionnaires to collect data. The field research aimed to achieve the following objectives:

- The identification of the sources of data;

- The distribution of the questionnaires and arrangement for their collection in a reasonable time, and

- The collection of the required data from the participants using the instruments designed for this purpose.

4.4 Formulating the research questions

According to Grinnell (1993:27) the process of formulating research questions can be described in terms of the following four phases;

- gathering information;

- categorising ideas and questions;

- selecting research questions and ;

- constructing operational definitions of the concepts and variables represented in the questions.

The researcher was involved in an extensive study to identify and gather information on the specific aspects of the problem area proposed for this research. This included reading the literature and brainstorming to uncover ideas from previous survey reports

of earlier research. Such information helped the researcher to describe the research problem area, to construct specific research questions and record them. Table 4.1 summarises the main research questions and key issues the researcher investigated, and the type of date collected.

Table 4.1: The main research questions and sources of information

A Policy Factor	Data required	Sources of information
Is there a policy on the use of computers in schools in Kenya?	Documentary or anecdotal evidence of policies	Iuterview with officers from the Ministry of Education and KIE, documentary evidence and research publications (see Chapter 2)
Are schools implementing this policy?	Doeumentary reports or anecdotal evidence of implementation of computer policies	Interview with Senior education Officers (see Chapter 5), and response from Principals of schools, Heads of Department (see Chapter 6), and evidence from previous research (see Chapter 2).
How are the schools implementing this poliey?	Information on the use of computers in secondary schools	Response from Prineipals and HODs questionnaires (see Chapter 6) and previous research (see Chapter 2).
What are the eosts of supplying and maintaining computers and software packages in secondary schools?	Documentary evidence of Government financial involvement in the purchase of computers and evidence of expenditure by schools.	Interviews and diseussion with officers from the Ministry of Education (see Chapter 5) and documentary evidence from official reeords and previous research (see Chapter 2).
How are these costs financed?	Evidence of sources of finance for purchase of computers, software, textbooks, and other support materials.	Interviews with officials from the Ministry of Education (see Chapter 5), response from Principals (see Chapter 6) and previous research (see Chapter 2).
How do secondary schools use computers? How many of them	Documentary evidence on curriculum guidelines for the use of	Interview with Ministry of Education Officers and

us computers in teaching and learning?	computers in secondary schools. Evaluation report from schools with computers.	Curriculum specialists (see Chapter 5).
How many secondary schools have computers?	Information on the number of schools supplied with computers from the Ministry of Education and those purchased by the schools.	Interviews with the Ministry of Education Officers (see Chapter 5). Discussion with Principals (see Chapter 6).
B. School Factor	**Data required**	**Sources of information**
How do schools purchase computers and support materials?	School policy and practice on purchase of computer equipment.	Discussion with the Principals and responses from questionnaires (see Chapter 6).
Are computers and other resources available in schools	Information on the number of computers and related resource materials available in the schools to be investigated	Report from Principals and Heads of Departments questionnaire surveys (see Chapter 6).
Are teachers using computers for teaching and learning?	School policy regarding the use of computers in teaching and learning.	Response from the Principals and Heads of Department questionnaire survey (see Chapter 6).
What difficulties do they experience?	Nature of problems encountered by teachers with CIE in the classroom	Response from Principals and Heads of Department questionnaires (see Chapter 6).
C. Training Factor	**Data required**	**Sources of information**
Are teachers trained in the use of computers?	Evidence of training in computer education (Certificates and courses attended).	Interviews with Ministry of Education, and Officers from KIE (see Chapter 5), Response from Principals and HODs questionnaires (Chapter 6) and interviews with computer teachers (Chapter 7).
D. Departmental Factor	**Data required**	**Sources of information**
Do school Department have policies on the use of computers in teaching and learning?	Information on departmental commitment to computer education programme. Computer timetable and availability of resources.	Responses from Heads of Department questionnaire surveys
E. Classroom Factor	**Data required**	**Sources of information**

What type of software packages are used in secondary schools?	List of software available in secondary schools	Principals and Heads of Department questionnaire results (see Chapter 6), interview with computer teachers (see Chapter 7).
How are teachers using computers?	Availability of the syllabus and other resources.	Interviews with teachers who use computers in teaching and learning (see Chapter 7)
Are teachers integrating computers into teaching traditional subjects?	Subjects into which computers have been integrated.	Interviews with teachers who use computers in teaching and learning (see Chapter 7).
What are the variables influencing the use of computers?	List of variables encouraging and affecting the use of computers in schools.	Principals, HODs and teachers comments on problems and benefits of computers in teaching and learning (see Chapter 6 and 7).
What are the views and attitudes of teachers towards the use of computers in teaching and learning?	Evidence on opinions, attitudes and views concerning the computer as a tool for classroom instruction.	Response from Principals, HODs and teachers' opinions, views and attitudes reported in Chapter 6 and 7).

4.5. The content validation of the questionnaires

In addition to the field research questions, Cohen, Manion and Morrison (2000:105) report that before the research instrument is used in data collection, there is need to examine the validity of such instruments. According to Wallen and Fraenkel (2001:89) validity "refers to the degree to which the evidence supports any inferences a researcher makes on the basis of data collected with a particular instrument." But the "degree to which a research tool is valid depends on the amount and type of evidence available to support the interpretation that researcher wishes to make on the basis" of the data collected. Furthermore, Cohen et al. (2000) explain that a research instrument is said to be valid if it measures what it is supposed to measure. However, determining an instrument's validity is not an easy task because there are different kinds of validity and, again, validity is a matter of degree as well as kind.

Consequently, in this study the researcher considered the validity of the tools used in field research. The researcher was guided by addressing three questions: being a qualitative and quantitative study what kind of validity should this tool have? And to what extent must the instruments demonstrate this type of validity? Does the instrument provide useful information regarding the topic or variable as defined by the researcher? (Wallen and Fraenkel, 2001).

The validation of research instruments is an important requirement for both qualitative and quantitative study. Wallen and Fraenkel (2001) report that validation of a research tool refers to the process of collecting evidence to support inferences that will be made about the data gathered with the instrument. These inferences should be appropriate, meaningful and useful. Despite the general demand that validation must demonstrate that a particular research tool measures what it purports to measure, Cohen et al. (2000:105) report that in qualitative studies validity might be addressed through the honesty, depth, richness and scope of the data achieved. This also includes the participants approached, the extent of triangulation and the objectivity of the research. Moreover, Cohen at al. (2000:105) explains that in qualitative data the subjectivity of participants, their opinions, attitudes and perspectives all contributes to a degree of bias. Furthermore, Cohen et al. (2000:105) report that in qualitative data validity might be improved through careful sampling, appropriate instruments and appropriate statistical treatment of the data. However, Cohen et al. (2000), point out that qualitative research possesses a measure of standard error that is inbuilt and which has to be acknowledged. The content validity of the instruments used to collect data for this study were verified by my supervisors and the Department of Statistics of the University of Pretoria. The following sections describe the validation process.

Content validity refers to the extent to which the information incorporated in the research instruments are a representative sample of characteristics it is designed to measure. Content validation also includes the format, clarity of printing, size or type, adequate of space for writing (if needed) and appropriateness. In addition, Cohen et al. (2000): 109) and Wallen and Fraenkel (2001:91) state that the tools to be used to collect data must show that it fairly and comprehensively covers the domain or items that it purports to cover. They also point out that it might not be possible that each

issue could be addressed in its entirety due to time available or the participants' motivation to take part in the study or to complete the questionnaires if the researcher uses this tool. Therefore, the researcher had to ensure that the main issues covered in the study were both a fair representation of what is being investigated, and that the elements selected for the study sample are addressed in detail. This required a careful sampling of items to ensure their representation. Thus in the research instrument I have designed for the Ministry of Education Officials, Principals of secondary schools, and Heads of Department dealing with policy on computers in education, the information was relevant to studies reviewed in chapters one and two. This includes studies by Alkin (1992), Alverez (1995), Baron et al. (1999), Cornu (1996), Davis (1994), Mizukoshi et al. (2000), Pearson (2000), Rovisk and Kommune (1995), Sakamato and Miyashita (1996) and San Jose (1996) that indicated availability of government policy on the use of computers in teaching and learning. The importance of a clear policy on compute technology is a prerequisite for effective implementation of computer in education. There is a need for specific national policy on computer-integrated education that must be formulated in consultation with all the stakeholders, and should be guided by broader goals of education.

4.5.1 Questionnaires 1, 2, 3: background information of participants and school

All the research questions 1,2,3, in section A and B of the research instruments (see Appendices 3-5) were designed to collect biographical information about the participants and the case study institutions, and to provide quantitative data. These questions were designed by the researcher and were very useful since the study was to be carried out in mixed gender groups with different teachers of different ages drawn from urban, suburban and rural schools. In some cases, comparisons were made between the responses of these groups, or within the sample. For example comparing responses from newly trained teachers and the senior ones or teachers of different age groups. Coutts and Drinkwater (2001), Gobbo and Girardi (2001), Mccannon and Crews (2000), Myhre (1998) and Yee, (2000) all noted that teachers' use of computer technology often depends on their experience. Consequently, the questions in section A were developed from the ideas from the contribution of the above scholars.

4.5.2 Questionnaires 1, 2, 3, 4 on policies and the use of computers in schools

Some of the ideas for the design of the research questions on policies on the use of computers in schools were obtained from various sources. The first one was from the research by Baron, Hogarty, Kronrey, and Lenkway (1999:98), Christmann, Badgett and Lucking (1997:135-136) and Clark (2000) on the American policy on computers in schools. The second one was taken from the contribution of Mizukoshi, Kim and Lee (2000:101) about the government of Japan and Korean policy on Information technology in secondary education. The third one was obtained from the review of a study by Dawson (2000) concerning the British government policy on the use computers in schools, and lastly from Pearson (2001) about computer policy in Hong Kong. The questions contained in section C on the school policy about computer integrated education number 1 to 8 of the instrument designed for Principals of secondary schools were constructed from the research findings by Carol (1997:54-59), and Millar (1997:81) reviewed in Chapter 2. These questions were meant to generate information concerning school policy and practice on the implementation and use of computers. Sources of data came from interviews with the Principals and from documentary reports on policy and curriculum guidelines on the use of computers. The data obtained provided qualitative data on a wide range of evidence to show positive or negative commitment by Principals towards the use of computers in secondary schools. A study by Carol (1997:54-59) found that there was a whole school policy on the use of computers in British schools. A similar finding was also reported by Millar (1997:81). One of the objectives of this study will also be to determine whether there is such a policy in secondary schools in Nyanza province.

Questions 1 to 6 in section B and C on finance and resources were designed after the researcher reviewed literature by Sheffler and Logan (1998:306) indicating that the cost of technology extends well beyond the purchase and utilisation of hardware and software. A study by Barron et al. (1999:98-99) discussed in Chapter 2 indicated that the American government set aside 4.8 billion dollars during 1990s to purchase computers for secondary schools. Alkin (1992) and Mizukoshi, Kim and Lee (2000) reported similar financial arrangements for computer education in Japan, Korea and Russia. Thus the questions were constructed to investigate and provide evidence on school budget allocation for the purchase of computers and software. This included

sources of funds (donations from external sources, through fund raising, students' contribution that is Parent Teachers Association and Board of Governors decision, and contribution by politicians or individual personalities in the community). Data were obtained through questionnaires completed by the Principals.

Questions 1 to 7 contained in section D on the availability of computers in schools and related materials was designed after a review of literature from studies by Vannatta and Beyerbach (2000:150) and Peggy, Paul, Molly, Eva Ross and Denis (1999:66) reported in Chapter 3. These studies indicated that the lack of equipment was a barrier to the integration and use of computers in the classroom. The questions were designed to investigate and provide evidence of computers, software and other resources for use by teachers. The questions enabled the researcher to elicit qualitative and quantitative data.

Fifteen questions dealt with the use and integration of computers in teaching amd learning. These questions were contained in sections E, B, and F of instruments 1, 2, and 3 respectively. Most of the information contained in the questions is reflected in Chapter 2 of this report that discusses the roles and use of computers in teaching and learning computer literacy and traditional subjects. For example, a study by Azita (1999:33) recommended that greater attention be devoted to understanding why the potential of computers for teaching and learning remained unexplored. Consequently, Christman and Badgett (1997:136) suggested further studies to determine whether computers were effective in teaching difficult subjects. Pedretti (1999:33) suggested more qualitative studies that looked into the adoption and integration of computers by teachers. Therefore, questions 1-15 in section F-instrument 2, and B-instrument 3 were designed to provide qualitative data on the use of computers, its effects and the impact on students' learning.

Twelve questions addressed the issue of teacher training in the use of computers in teaching and learning. These questions were contained in sections F, G, and F of instrument 1, 2, and 3 respectively. Most of the information contained in the questions is reflected in Chapter 3 Section 3. 3. 1-2 of this report.. Adequate teacher training is an important factor in the effective integration and use of computers in teaching and learning. A study by Chiero (1997:135) found that lack of training was the highest obstacle to the use of computers by the teachers. Struddler et al. (1999:125-12)

suggested further studies to document specific current practices and level of teacher preparation, and to identify specific approaches that promote effective implementation of computers by beginning teachers. The questions in this section were designed to collect qualitative and quantitative data on this issue.

Questions 1 to 10 in section H on technical difficulties and physical problems also come from the review of literature in Chapter 3 Section 3.6. Andris (1996) and Chiero (1997) report that the problem of maintenance, repairs and technical support for teachers as a barrier to the use of computers in teaching and learning. For example, Veen (1996) noted that the support of the technical assistance was essential for teachers in the use of computers. The questions designed from these studies were meant to investigate and provide qualitative and quantitative data on the problems associated with the use of computers in the classroom.

Question 1 to 10 in section J on attitudes and views about the value of computers in teaching and learning were designed from research findings reviewed in Chapter 3. A study by Anandra (1998:284) noted that teachers' attitude towards technology was an important factor in the implementation and use of computers. Abbot and Faris (2000:159) suggested further research to increase the depth and breadth of information about participants' attitudes and beliefs associated with instructional technology and the integration of computers into teaching and learning. The questions designed from these studies provided qualitative data on the attitude of the Principals towards the use of computers in their schools.

The last question in all the three instruments was designed by the researcher to allow the participant to give any suggestions or recommendations for further improvement or development on the use of computers by the teachers.

4.5.3 Questionnaires 1 and 2

The information contained from the research findings of Millar (1997) and Carol (1997) reviewed in Chapter 3, was applied in the construction of eight questions (question1-8) related to policy issues and implementation of policies by teachers.

The information contained in questions 1 to 4 in section C for Heads of Department, and section D questions 1 to 6 for Principals on finance and resource allocation were

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drawn form the studies reviewed in Chapter 3 Section 3.9. The questionnaires sought information on financial involvement on the use of computers in schools. Some of the questions were relevant to research studies by Barron et al. (1999), Mellon, (1999), and Scheffler and Logan (1998) reviewed in Chapter 3. These studies indicated the need for funding to purchase and maintain computers and other related resources.

Effective us of computers in teaching and learning depend on the availability of sufficient equipment. Adequacy of computers, software and the support materials is an important factor in the implementation of technology. Chapter 3 section 3.4 indicated a lack of computers cited by several researchers including Becker and Ravitz (1999), and Vannata and Beyerbach (2000). The information in section D instrument 1 and 2 containing questions 1-6 also were relevant to the findings of these studies.

The information incorporated in questions 1 to 15 on the use of computers in section E of instrument 2 and 3 were also obtained from research findings reviewed in Chapter 1 and 2 on the role and function of computers in teaching and learning. The questions were designed to provide information on how schools use computers in teaching and learning. The questions are relevant to the research findings and studies reviewed in Chapters 1 and 2 (Heinich et al.1996: 232-245; Christmann and Badgett, 1999; Clark, 2000; Cornu, 1996; Mills and Ragan, 2000; Azita, 1999; Hargrave and Kenton, 2001; Karsten and Roth, 1998; Abas, 1996 and Zhang, 2000). The use of computers in teaching and learning should help students to learn and teachers to teach more effectively. To design such programs there is need for the designers to take into account the needs of students and teachers. Since they do not teach in schools and, therefore, cannot understand what teachers and students want because they are out of touch with them, the information needs to be revealed by research studies. The quality of computer programs is certainly an important factor in the successful use of educational technology in teaching and learning. Both the content and the style of presentation can highly influence the effectiveness of such programs. The questions in this section contained similar information aimed to reveal the role of computers in teaching/learning. Questions on the impact of computers on students learning were also relevant to Liu, Macmillan and Timmons, (1998:189-201) and Weller (1996: 461-485).

The questions dealing with effectiveness of computers in teaching and learning were relevant to Jones and Paolucci (1999:17) and, Higgins (1999:425) who stated that the effectiveness of any instructional program depends on how it is used, for what purpose it is used, and with whom it is used.

Questions 1 to 10 contained in instrument 2 for Heads of Department on the integration and use of computers and those in instrument 3 section B were based on the research findings reviewed in Chapter 1 and 2. The information was obtained from studies reported by Cornu (1996), Clark (2000), Dockstadder (1999), Heinich et al. (1996), Mills and Ragan (2000), and Woodrow (1998). The questionnaires designed by the researcher aimed to investigate if teachers in the study integrated computers in teaching traditional subjects.

Questions on teacher training in section F- (question 1) section G- (question 2) and section F- (question 3) were obtained from the review of literature in Chapter 1, 2 and 3. These questions sought information on pre-service and in-service teacher training. A study by Vannatta and Beyerbach (2000:132) reported that teachers were not adequately prepared to integrate and use computers in their classrooms. Shruddler et al. (1999) suggested further studies to document current practices and levels of teacher preparation and identified specific approaches that could promote effective implementation of computer education by beginning teachers. Teacher education programmes as a whole appeared to fall below expectation in their goal of providing pre-service teachers with appropriate skills or techniques due to insufficient exposure to teaching practices. Shrumm and Dehoney (1998) reported that computer programs should be incorporated into the teaching methods courses and teacher education preparation skills should be extended to classrooms. The information in the questions on teacher training was relevant to these studies.

Questions 1 to 9 on technical problems and physical facilities under section G of instrument 1 and 2 were also relevant and the information were obtained from studies by Andris (1996), Carol (1997), Chiero (1997) and Veen (1996) reviewed in Chapter 3 Section 3.6. The questionnaires were designed to provide data on the situation for comparison with other developed and developing countries.

A number of questions also dealt with the views and attitudes of teachers on the use of computers in teaching and learning. These questions were designed from the literature reviewed in Chapter 3 and were contained under section H of the first and second instrument and under section E of the third instrument. For example, the data from studies by Anandra (1999), Comber et al. (1998) and Young (2000). Some of the studies indicated favourable attitudes towards the use of computer programs. The questionnaires I designed sought information to determine the attitudes, opinion and views of teachers on the value of computers as a tool for classroom instruction.

The last question was designed by the researcher to elicit more information from the participants on future development and improvement of computer-integrated education in secondary schools in Kenya.

4.6 Collection of data

After designing the research questionnaires and considered where to draw the data, and what type of people could provide the information, I had to identify the participants. This was necessary because the location of data sometimes becomes very difficult and the researcher could be unsure of what the source will be (Sharp and Howard, 1998:130). Consequently, the first group of people to provide data consisted of policy makers and curriculum developers at national level. The others consisted of Principals, Heads of Department and computer teachers implementing the programs. Kane (1995:90) described an appropriate sample as one that " reflects with reasonable accuracy the opinions, attitudes or behaviour of the entire group." Four groups of interviewees were chosen to act as participants in this study. At the Ministry of Education, a Senior Education Officer and an Inspector of schools in charge of computer education in schools in Kenya were interviewed. Similarly at the Kenya Institute of Education the Director of KIE and the Curriculum specialists responsible for computer education for all schools in Kenya were also interviewed. The field investigation was conducted in schools with computers and Principals and HODs and computer teachers participated in the investigation. The case study schools represented rural, suburban and urban areas.

However, since gathering of data requires time, the criteria for the choice of secondary schools was based on:

- Accessibility

- Schools with computers

- Urban, suburban and rural areas; and

- Schools willing to take part in the study.

4.6.1 Choosing the sample

According to Wallen and Fraenkel (2001:128), a sample "refers to any group on which information is obtained." Often, it is selected from a larger group called a population. To select schools for the study, I obtained a list of 524 secondary schools in Nyanza Province from the Provincial Director of Education. Out of these schools, only 30 had computers. The researcher therefore decided to use the 30 schools as a sample but realized that the size of the sample would not meet the desired expectation of the researcher (see appendix 10). Nyanza Province is extremely diverse in terms of socio-economic development. Most of the schools in rural areas lack electricity and other physical facilities for the use of computers. Because the sample included all the schools with computers, it was representative. An attempt was made to ensure that each subject in the defined community was able to participate effectively by interviewing participants involved with the use of computers in schools to build a sample that was satisfactory for the purpose of the study.

In addition, this study was conducted in Nyanza Province because of the following reasons:

♦ Nyanza Province is the researchers' home province. The researcher knew the location of the schools so it was easy to access the schools that had computers;

♦ The students the researcher trains at Maseno University in Educational Technology practise teaching in some of the schools investigated. It was important to identify schools with computers so that the students could use computers during teaching practice;

♦ To serve as a role model for teachers and lecturers in the area and the students at Maseno to conduct future research in CIE in the province.

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Consequently, the original plan for collecting data was to interview 30 Principals, 150 Heads of Department and 30 computer teachers. The number from each group was chosen to be a fair representation of the targeted study. However this was not possible due to the following reasons. Firstly, only 25 Principals completed their questionnaires and returned to the researcher. Secondly, the researcher received 89 completed questionnaires from HODs. Thirdly, during my visits to schools to distribute questionnaires to the Principals and Heads of Department, the researcher identified only 20 teachers teaching computer education. So a sample of 20 computer teachers was used for the study. Fourthly, five schools did not have computer teachers and were not using computers for instruction. However, Bell (1993:83) noted that researchers are sometimes obliged to interview anyone from the total population who is available and willing at the time of the interview because unavoidable circumstances might force the researcher to modify the size of the population as well. Briefly the three groups of participants were as shown in table 4.2.

Table 4.2: Number of respondents representing the stndy schools

Participants	Rural	Urban	Suburban	Female	Male	Total
Principals	15	7	3	15	10	25
Heads of Departments	62	21	6	26	63	89
Computer Teachers	14	3	3	3	17	20
Total	91	31	12	39	95	134

As can be seen from Table 4.2, a total of 20 computer teachers from rural, urban and suburban took part in exercise, while 25 Principals instead of 30 completed and returned the questionnaires, and 89 Heads of Departments instead of 150 also completed and returned the questionnaires. The response rates of 83% from Principals and 59% from HODs were considered acceptable. The lower response rates from HODs may have been because many HODs who were not directly responsible for computer education did not consider the questionnaires relevant to them. Gender disparity was also noted. A total of 39 female respondents compared to 95 male participated in the study as displayed in table two above. At the same time there were

more Heads of Department from rural schools compared to those from urban and suburban schools. These factors were beyond the control of the researcher.

Therefore, the total number of the participants in the case study was determined by the situation in the field. Furthermore, with regards to the actual size of the sample, Cohen et al. (2000:93) and Wallen and Fraenkel (2001: 128) state that "there are no clear-cut rules for deciding on sample size." Consequently, the correct sample size depends on the purpose of the study and the nature of the population under scrutiny. Small samples are also more appropriate in an educational study that involves in-depth interviews. Sharp and Howard (1998) and Wallen and Fraenkel (2001:437) support the idea of a small sample. The small number in this case study can also be justified because a study that probes deeply into the characteristics of a small sample often provides more knowledge than a study that gathers less detailed data from a large number of participants (Borg and Gall 1994). The participants included both Senior Education Officers from the Ministry of Education as well as Curriculum Specialists from KIE, Principals, HODs and classroom teachers. Table 4.3 shows the total number of respondents who participated in the investigation.

Table 4. 3: Total number of respondents who participated in the investigation

Participants	Male	Female	Total
Ministry of Education/KIE	3	1	4
Principals	15	10	25
Heads of Department	63	26	89
Computer Teachers	17	3	20
Total	98	40	138

The data indicated in Table 4.3 were the only ones available at the time of this study and the researcher decided to settle at the figure representing schools that had computers after considering suggestions by Cohen and Manion (1994) and Wallen and Fraenkel (2001). Their suggestions that thirty participants is a reasonable number for a study encouraged the researcher to settle on the present sample for schools. The sample of participants from the schools represented rural, urban and suburban areas.

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4.7 Data collection procedures

When gathering both primary and secondary data it is necessary to be systematic. Sharp and Howard (1998:317) suggest that researchers should use the following check-list to ensure that data collected will be of an appropriate high standard so that:

- The data actually measures what they purport to measure;

- Proper attention is paid to measurement error and the reduction of its effects;

- A suitable sample is used, in particular that it provided a basis for generalisation; and is large enough for the effects of interests to be detected and;

- Data are properly recorded.

Considering the above points the researcher ensured that the conditions under which the data were gathered were properly identified and that suitable data recording methods were used and efforts made to detect errors and eliminate them during recording. As a result of this I adopted four strategies for collecting relevant field data. I chose the process of data collection that included consideration of: the research question, existing data, research assumptions, the resources and the participants as shown in Table 4.4.

Table 4.4: Methods of collecting data for the study

Method	Source of data	Purpose
Literature review	Primary and secondary literature	To get previous relevant information on the use of computers in schools
Structured interview	Ministry of Education and KIE	Policies and curriculum on the use of computers
Semi-structured interview	Teachers	Classroom practices
Questionnaires	Principals and HODs	General approach to computing in secondary schools

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The first phase of data collection consisted of a selective review of previous research literature on the use of computers in secondary schools. The second phase concentrated on interviews with key officers in the Ministry of Education and the Kenya Institute of Education. The third phase was concerned with a survey using questionnaires distributed to Principals and Heads of Department in secondary schools in Nyanza Province of Kenya. The last part involved visits to participating schools to carry out interviews using in-depth semi-structured interviews and tape recording with computer teachers. The field study was conducted between July and November 2001 in Nyanza Province of Kenya.

4.7.1 The consideration of the review of literature

The first phase of the data process concentrated on the objectives and purposes of using computers identified from various sources in secondary education. This was necessary in order to form key questions for the field research. In addition, a review of the literature was carried out to accomplish the following four purposes:

- To be come familiar with the background and history of the problem;

- To identify possible ways to study the problem;

- To assess the strengths and weakness of previous studies; and

- To develop a conceptual framework and rationale for the present study.

Therefore, a search of the relevant databases was carried out. The researcher conducted different types of literature searches. The first one was concerned with specific subjects closely related to the topic under investigation, and the second was based on methodology (Sharp and Howard, 1998). The literature search focused on four main areas:

- Policies on teaching and learning with computers in secondary schools;

- Integration and impact of computers on students' learning;

- The use of computers to improve the quality of teaching and learning, to motivate students, to widen access to education, and teaching and learning computer literacy skills;

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- Factors encouraging and affecting the use of computers and training of teachers in the use of computers.

The review of literature involved assessing methods and research findings relevant to my study, especially looking into the use of programs such as word processing, spreadsheets; databases and programming to allow for comparison where possible with my field work. The review also focused on the advantages and disadvantages of computer as a tool for instruction.

I used secondary and primary sources of information that included electronic media such as ERIC, INTERNET, and USENET to collect the data. All of these were in an attempt to identify and review the aims and objectives of employing computers in secondary education. Secondly, to examine the problems affecting the effective utilisation of computers, since the literature review is a key tool for providing information on what is new, important, reliable, and useful. The review of literature enabled the researcher to draw on the findings developed by others, and to assess the work already accomplished. The findings of the review of literature are reported in Chapters 2 and 3.

4.7.2 Use of structured interview method to collect data

As mentioned in chapter one, the first phase of field research to collect data involved visits to the Ministry of Education and Kenya Institute of Education. Data were collected using interviews to elicit qualitative and quantitative (materials) responses from key policy makers (Educational planners/administrators) and curriculum developers. The aim was to identify government policy for the use of computers in secondary schools. I used the interview method because it has some distinctive advantages. For example, it is possible to achieve a complete response with different interviewees directly and ensure the validity of the results, and to clarify the responses on the spot as the researcher interacts with them during face-to-face discussion. Interview method is also flexible. The researcher can use the responses of the interviewees to alter the interview situation. A researcher can probe for more specific answers and can repeat a question to the interviewees. This happens when the response indicates that the respondent did not understand the question (Bailey, 1994; Borg, Gall, Walter and Gall, 1996; Murioki, 1995; and Wallen and Fraenkel, 2001).

Moreover, the interviews involved the collection of data through direct verbal interaction between individuals. Face-to-face encounters enabled the researcher to evaluate the respondent and judge the truthfulness of their responses. It also gives a better response rate than mailed questionnaires.

I therefore developed a blue print to guide the qualitative study. This was a general interview guide outlining the issues and research topics that were to be covered and some general questions that were to be asked during the interview. Howard and Sharp (1998), Murioki (1995) and Mayan (1996) also report that an interview guide ensures that all relevant topics are covered, while enabling the researcher to build a conversation by adapting the interview to each situation and the participants. Mayan explains that having a guide keeps the interaction focused and makes the best use of the limited interview time available while permitting individual perspective and meaning to surface.

Two different interview guides were used in the investigation. The first was used to obtain information from the Ministry of Education, and the other for the curriculum developers at the Kenya Institute of Education. The interview schedules used for the field research are attached as appendices 8 and 9. The topics and questions differed at various levels. Although the two lists of questions differed in certain respects, they covered various issues so that direct links could be made. The topics for the interviews with the Ministry of Education were concerned with policy formulation and implementation and financing of computers studies in secondary schools. The topics for the interviews with the curriculum developers were concerned with curriculum guidelines for the use of computers in secondary schools. It also included aims of computer education in schools, guidelines for integrating computers into traditional subjects, support materials, evaluation reports, budget for computer workshops/seminars and problems encountered with computer education programmes. The interviewees were assured of confidentiality and anonymity.

4.7.3 The application of the questionnaires during the investigation

The second phase of the field research involved a questionnaire survey developed to collect information and to elicit quantitative and qualitative data on computer education in secondary schools. The questionnaires were hand delivered to the

participants and collected by the researcher. This was necessary so that the researcher could interact with the participants attend to any outstanding issues, and to cross check misinterpretation of the questionnaires. The researcher collected data from 25 Principals and from 89 Heads of Department. Due to circumstances beyond the control of the researcher, data from 5 Principals and 61 Heads of Department were not returned to the researcher as mentioned in section 4.6.1. This was because some Principals and Heads of Department were not available to hand in their questionnaires despite the researcher's visits to these institutions more than three times. At the same time, seven schools had no technical department (consist of subjects like Art and Design) and therefore no HODs to run such department. No questionnaires were therefore received from these schools.

There were two different sets of questionnaires. The first questionnaire was administered to Principals of secondary schools, and the second one was designed for Heads of Department (see section 4.5.3). Although the two questionnaires differed in certain respects, they contained many common topics to allow direct links and comparisons of responses. The questionnaires were piloted in four secondary schools and since there were no problems identified these questionnaires were included in the main data collection.

I used a questionnaire surveys because the method is generally accepted as useful in measuring participants' attitudes and opinions. The method is also useful in providing numerical data, and enables comparisons to be drawn across groups in a small sample (Cohen and Manion, 1994; Sharp and Howard, 1998). Moreover, Nachmias and Nachmias (1992) report that it is useful to administer questionnaires because it reduces biasing errors that might result from the personal characteristics of the interviewer and variability in their skills. The absence of an interviewer provides grater anonymity and it permits wider geographical contact at minimal cost. However, Wallen and Fraenkel (2001:434) point out that in qualitative study, it is possible to use questionnaires or tests but "any instrument used should be grounded in the data that is used, because they can help to further understanding of the life experiences of the participants."

Therefore, with these contributions from scholars the researcher designed the questionnaires containing similar themes for all the participants. Each Principal and

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Head of Department completed the relevant questionnaires containing a series of questions that could allow cross-references to be made with information obtained from the teachers of computer education. The researcher felt that a questionnaire of this type would be easy to administer and would reveal the most essential information required for this study. The items in the two different questionnaires were grouped into nine sections to correspond with the key issues that were to be investigated (see appendices 8 and 9 and section 4.5.3 in this chapter).

4.7.4 Use of semi-structured interviews to collect data

The last phase in data collection during the process of interviews were conducted in twenty public secondary schools where computers were used for teaching and learning. I decided to use this technique of gathering data because of its capability to generate insights to be investigated further. Bell (1993:8) argues that the semi-structured method is especially suitable when one aspect of a problem needs to be studied in some depth within a limited time-scale. Similar views are expressed by Borg and Gall (1994), Cohen and Manion (1994), Murioki (1995), Sharp and Howard (1998) and (Yin 1994). Furthermore, Cohen et al. (2000) report that the use of semi-structured interviews can help to establish cause and effect. While Wallen and Fraenkel (2001:437) state that sometimes much can be learned from studying just one individual, one classroom, one school or one school district. Therefore, the contributions of these scholars were taken into account by the current researcher. The field research was conducted in Nyanza Province of Kenya between the months of October and November 2001. The choice of techniques for collecting data was also influenced by the following factors:

- This was a suitable period of the school term as teachers were in session and had completed most of the course work so they were free to participate in the interviews and discussions without much pressure for classroom teaching.

- It was also easy to find the teachers and make arrangements with them to take part in the interview.

Techniques such as in depth interviews, long interviews, audio tape recording, participant observation and open ended-question are all very useful in collecting required information (Bell, 1993; Borg and Gall, 1994; and Cohen et al. 2000). I

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decided to employ semi-structured interviews after reviewing the contributions of Bell (1993); Sharp and Howard (1998); and Yin (1994). For this study, the semi-structured interview method was appropriate because it enabled the researcher to use a diverse range of techniques to collect the data and to analyse them both quantitatively qualitatively. Using the semi-structured method I employed tape recording of in-depth interviews and open-ended discussions to collect the data. Through careful motivation of the interviewees and maintaining a rapport with them, it was possible to collect the information within a short time. The use of semi-structured interviews, as indicated in Chapter 1, enabled me to employ a detailed topic guide and a number of predetermined questions on specific topics; while at the same time the participants are allowed to digress and the interviewer was able to employ unscheduled probes.

Moreover, the use of semi-structured interviews enabled me to include most of the supplementary sub-topics or items derived from my own experience with the use of technology. There were no questionnaires constructed before hand, but a list of topics was developed to act as a 'framework' for the interview (see appendix 12). This method allowed me to tackle each topic in a flexible manner and the interviewees were also free to elaborate on their responses and to give their views at their own pace. I also used careful 'probes' to encourage and motivate the interviewees to feel relaxed while trying to reduce bias (e.g. trying to avoid leading questions that might encourage interviewees to offer views acceptable to the interviewer).

I started by making an 'outline,' listing all of the main issues in the subjects being studied. This preliminary listing was classified to create seven separate topic areas for the interviewees that I used to develop the general format of the interview schedule. Next I created a list of headings for each category of information to be addressed in the interviews. Under each heading items, statements and phrases like "types of software used" or just a question on a specific topic were listed and arranged in a specific sequence. With the assistance from my supervisors, I checked on the wording, technical level of language, subject content and pattern of questioning. This was necessary because of the diversity of the participants and the interview environments. The interview questions and topics aimed to probe interviewees' experiences and present patterns of using computers in teaching and learning.

The interview topics and questions were those that I hoped and expected would enable all of the respondents to contribute freely and express their views and attitudes openly about how they use computers in teaching and learning in the classroom. It also sought to identify the needs of teachers and schools in order to use computer technology effectively.

4.8 Administration and application of the instruments

Once the field research instruments and topics were ready, arrangements were made with various groups of the participants before any investigation into the research problem was undertaken during the month of July and November 2001 (see Appendix 13 for tentative field research programme). The researcher made arrangements to visit the Ministry of Education, Kenya Institute of Education and secondary schools as explained in 4.8.1 to 4.8.3. This was important for four reasons. Firstly, the objective of the study had to be explained to the interviewees. Secondly, I had to seek permission to visit schools to distribute questionnaires and conduct interviews. Thirdly, I had to apply for access and for copies of relevant official publications or documents on computer education in secondary schools. Fourthly, I had to assure the interviewees of confidentiality and anonymity of their contributions.

4.8.1 Seeking permission to conduct interviews

Before any investigation into the research problem was undertaken, I had to obtain the consent and co-operation of the people selected to participate in the investigation. This was an important stage in the research project because of the type of data that were to be gathered. Permission to conduct the research was absolutely essential. Bell (1993:52) noted the importance of consent to conduct a study and states that "no researcher can demand access to an institution, and organization or to materials." It was also essential for me to give the people concerned a clear picture of what the research entailed, stating clearly:

- The purpose of the visit;

- The objective and nature of the study;

- Its practical application;

- The design, methods and procedures to be used;

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- The categories of participants who were to be interviewed and;

- The time for the interview and any other data to be collected (see Chapter 1 for details).

Three different letters were written and addressed to the interviewees (see Appendices G-J). One letter was addressed to the Principals of schools. It was an information letter concerning the intended visit and subsequent distribution of questionnaires and interviewing of teachers. The second letter sought permission from the Director of the Kenya Institute of Education to obtain data on curriculum regulations regarding the use of computers in schools. The third letter was addressed to the Permanent Secretary of the Ministry of Education. It sought information mainly on the Kenyan government policy on computer Education in secondary schools and requested that I meet with an appropriate Ministry Official.

Upon approval of the draft list of interview topics, by my supervisor, I drew up a tentative schedule for my fieldwork in Kenya.

4.8.2 Pre-interview arrangements

I started my fieldwork by visiting the Ministry of Education and Kenya Institute of Education to check if they had received my letter, to make an appointment for an interview and to collect an introductory letter to the Provincial Education Officer of Nyanza Province. Next I visited the Provincial Education Office to present the letter from the Ministry of Education and to collect another letter from them to visit the schools. Administration of the interview questionnaires was undertaken only after making appointments. Such briefing entailed obtaining permission from the school to conduct the interviews.

After receiving the letter from the Provincial Director of Education in Nyanza Province, I visited the schools to deliver the letters explaining the reasons behind the research project. This included distributing questionnaires to the Principals and Heads of Department, and making arrangements with the computer teachers for a suitable date for their interviews.

4.8.3 Interviews with Officials from the Ministry of Education, KIE and teachers

Before the interview, the interviewees were informed about the purposes and objectives of the study. I explained to the interviewees the importance of the study that was designed to examine firstly, the government policy and investment in computer education and secondly why computers are used in secondary schools, and thirdly to identify any problems they face with utilisation of the programmes.

The interviews were carried out in two phases during the month of August and November 2001. The first one involved senior officers from the Ministry of Education and Kenya Institute of Education. The second one concentrated on classroom teachers. In order to ensure maximum co-operation, the interviewees were assured of the confidentiality and anonymity of their contributions. I emphasised the need for accuracy and that they could modify their responses if necessary. I used note taking to record the data obtained from the Ministry of Education and Kenya Institute of Education. The responses from teachers were tape-recorded and some interviewees wrote their responses on note cards. The specific answers from the participants are presented in the analysis and discussion of the results in Chapter 5 and 7.

4.9 The general plan for data analysis

All of the information that I collected from the secondary and primary sources were subjected to analysis by either referring to the literature review chapters or to resources included elsewhere. However, with regard to the analysis of the data obtained from interviews using note taking and audio tape recordings, both basic descriptive statistics and qualitative techniques were used to demonstrate to the readers or users the different groups of data, their characteristics, range and averages. The data collected by questionnaires from Principals and Heads of Department was analysed by the Department of Statistics of the University of Pretoria using "Statistical Package: SAS Version 8."

I was obviously guided by the aims and objectives of the study in the analysis of the data. For the investigation institutions, and the participants (Principals, Heads of

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Department and computer teachers) this included the general background information of the schools and the participants. I was particularly concerned with the following issues (among others):

- The school policy and practice on the use of computers in teaching and learning;

- Availability of computer equipment and support materials in schools;

- Availability of software and the type used in the school;

- The actual use of technology and involvement of students in computer education;

- The perceived value, views, impact and problems of using technology in secondary education;

- The training of teachers in the use of computers and the financing of this training.

A similar plan was also arranged for the analysis of data from the Ministry of Education and the Kenya Institute of Education. It focused on government policies on computer education in secondary schools and the supply of computers, financial involvement, curriculum regulation relating to the use of computers in secondary schools, etc. The analysis of the data is presented in Chapters 5, 6 and 7.

4.10 Problems with data collection and field research experiences

The data were collected between the months of July and November 2001. An interview schedule for visits to each institution was developed. Unfortunately this could not be followed strictly due to some problems encountered such as lack of transport, and bad weather that rendered some roads impassable. However, there were few problems in the data collection exercise, since all schools were informed by telephone or in person well in advance and were very co-operative. There was only one or two instances where there was a communication break down between the researcher and the schools. The researcher had to make another appointment to meet the Principals and explain the purpose of the investigation. The other problem concerned the questionnaires that were not returned to the researcher.

The participants were assured that the findings would in no way be used for any other purpose apart from this research. Once the teachers were convinced on this point and the intentions of the study were clear, there was no difficulty in completing the questionnaires. All of the participants that co-operated were motivated and wanted more computer equipment and support materials.

4.11 Summary

This chapter has described the methods, techniques and procedures employed to collect data for this investigation. Information of how data were gathered at the various stages of the research has been presented. The specific objectives of the study, research questions and sources of evidence and assumptions about the use of computer programs have been identified and included. The choice of participants for the interviews, questionnaire surveys and interview topics have also been explained. Information was gathered through structured interviews using note taking and open ended discussion with Senior Education Officers from the Ministry of Education and KIE, questionnaires completed by Principals and heads of secondary schools, and through semi-structured interviews using audio tape recording with computer teachers. In addition, arrangements and general plans for data analysis for Chapter 5, 6 and 7 has been outlined. In the next chapter, I present the research findings from interviews with Officers from the Ministry of Education and Kenya Institute of Education on government policy regarding the use of computers in schools and curriculum materials available for the use of computers in teaching and learning.