CHAPTER 4

RESEARCH DESIGN AND METHODS

This chapter presents philosophical assumptions, research design, general procedures followed in the strategy of inquiry, and detailed procedures of data collection and analysis. The chapter is divided into four main sections: Section 4.1 which gives an overview of the chapter followed by the research paradigm in Section 4.2. An overview of the research design is presented in Section 4.3. A detailed research design of the baseline survey, the case studies and the legitimation of the findings which forms the three identified phases of the research design of each research question are spelt out in Section 4.4. The issues of validity and reliability are presented in Section 4.5, and ethical issues and conclusion of the chapter in Sections 4.6 and 4.7 respectively.

4.1 Introduction

This chapter focuses on the research designs and methods employed in this study. The research paradigm is discussed to indicate the theoretical assumptions underpinning the operations of this study. The research design employs a mixed method approach, comprising the baseline survey, the case studies (interview and classroom observation schedules) and the ICT use conference. In an attempt to obtain valid and reliable responses, the research designs further discussed population and sample, instrument development, data processing and analysis, and research procedures.

4.2 Research paradigm

This section presents the theoretical assumptions underpinning this research. A pragmatic approach has been adopted as a framework guiding the general philosophical ideas of the researcher. The research question influenced the research design. Generally, knowledge paradigm claims arise from actions, situations and consequences. The actions involve the identification of the problem, and then develop strategies and approaches to understand and address it. In this study a pluralistic approach was used to generate knowledge about the 'what' and 'how' (Creswell, 2003) of the identified problem, and according to Creswell (2003, 2009) pragmatism is not committed to one specific method to address the problem. This notion was further supported by Johnson and Onwuegbuzie (2004:15), who suggest that 'taking a non-puristic or compatiblistic approach allows a researcher to mix and match the research design components offering the best chance to answer their research questions'. In this same vain, Teddlie and Tashakorrie (2003:27) offer two decision rules to combine the two methods as follows: a) deciding on the priority of either the quantitative or qualitative methods depending on the weight, and b) deciding on the sequence of two by identifying the order of conducting the complementary methods, which is either a preliminary or a follow up phase sequence in which the two methods have to follow each other sequentially. A sequential mixed method approach is one in which the researcher seeks to elaborate on or expand the findings of one method with another method.

This study decided to choose the "Mixed Methods" due to the following reasons:

1. It ensures balancing of biases that may arise from using a single research method. Information obtained using a single method is triangulated and leads to convergence between quantitative and qualitative methods.
2. It allows for simultaneous exploratory explanatory and confirmatory questions in the same study.
3. The adoption of the sequential mixed method approach allows for movement from description of the context to an in-depth understanding of

cases studied. Thus, results from the quantitative method were used to select cases for the qualitative component to explore whether the factors that influenced ICT implementation could be confirmed.

4. Deliberation in curriculum conference is *praxeological,* i.e. an open system that allows new research results and rational argumentations that are for and against proposals are integrated to resolve a practical problem (Mulder, 1994).

5. The mix methods allow for flexibility of *integrating fi*ndings from both the quantitative and qualitative methods to seek convergence of the results (Creswell, 2003; 2009).

In summary, this study adopted a pragmatic research approach to guide the research design and the selection of the research methods used to collect and analyse the data obtained. A sequential mixed method approach was used to collect data for this study using the following: conducting a baseline survey through the development and administration of questionnaires, compile and analyse results using appropriate statistical tools, and through the use of modern ICT techniques, a conference of invited guests was organized within the case study area, i.e. rural situation for the purpose of openness, certification of data, and to seek for further comments on key issues of the research. The research design is elaborated in the next section.

4.3 Research design

It is generally believed in Namibia and other parts of the world that rural teachers receive inadequate support to implement ICT at classroom level, hence making it difficult for learners to meet to modern academic challenges. This forms the basis of this research, with the aim of evaluating the ICT Policy implementation in Namibian rural junior secondary schools and formulating strategies on how the implementation process can be improved.

This section presents an overview of the research design in Section 4.3.1. The survey method used is presented in Section 4.3.2. The case studies methods are

presented in Section 4.3.3 and the ICT use conference method is presented in Section 4.3.4.

4.3.1 Overview of research design

This section presents the research methods used in this study: the survey, the case studies and the legitimation of the findings. The research design for each phase is presented accordingly. The population and samples of the survey, case studies as well as for the ICT use conference are described, followed by data collection strategy and the description of the instruments for each phase.

Based on problems highlighted in Chapter two, three out of four rural based educational regions were selected to obtain rich descriptive information necessary to answer this main research question:

"*How and to what extent is the intended ICT Policy implemented in the rural junior secondary schools in Namibia"*

As stated in Chapter one, the main research question can be further divided into the following sub-questions:

1. *What is the national context with regard to implementation of the ICT Policy for Education in rural junior secondary schools?*
2. *How has the national ICT policy been implemented in science classrooms?*
3. *What factors influence the ICT Policy implementation in rural schools?*

In answering research question one, this study followed two approaches: 1. a document analysis and 2. an interview with the National ICT Policy Coordinator in Namibia. The findings of these two approaches are presented in chapter two.

On research question two, the approach of conducting a baseline survey, the development and administration of questionnaires was followed. As explained in Chapter two, several existing national documents give inconsistent and conflicting information on the real situation in such schools at different times. With the approach taken by the research, accurate and reliable results and information about the availability of ICT can be obtained and appropriate advice and implementation strategies can be formulated to ensure effective and sustainable use of ICT in schools in both rural and urban areas.

As a means of addressing research question three and to identify factors that affect ICT implementation, two research approaches were employed, viz a survey and a case study approach. Some answers to questions raised in the questionnaires of the baseline survey sought to answer the research question, especially identifying factors that influence ICT Policy implementation. Part of the data for research question three was obtained through case studies. The case study methodology includes classroom observations, interviews and filling in structured questionnaires by a heterogeneous group of science teachers, principals, ICT technicians and a National ICT Coordinator.

To legitimise the findings of research questions two and three, the approach of organizing an 'ICT use conference' was taken. This approach was adopted from the 'curriculum conference' method as presented by Mulder, 1994), (see also Brinkerhoff, 1983). The ICT use conference is an approach for deliberations about ICT use that will generate recommendations about ICT use and its implementation. A number of stakeholders, different from the case study participants were brought together as a consultation group to discuss pertinent issues in the ICT use domain (Mulder, 1994:157). Because of its obvious advantages, this method has been adapted for 'ICT use' in this study. The findings developed after the conference are a true reflection of situations in the study area, and any results and conclusions that will emanate from such a study will be used as template or guide on how ICT can be improved in these regions and the country at large.

In terms of research design, both quantitative and qualitative methods were used and therefore the study applied sequential mixed methods. This is diagrammatically presented below:

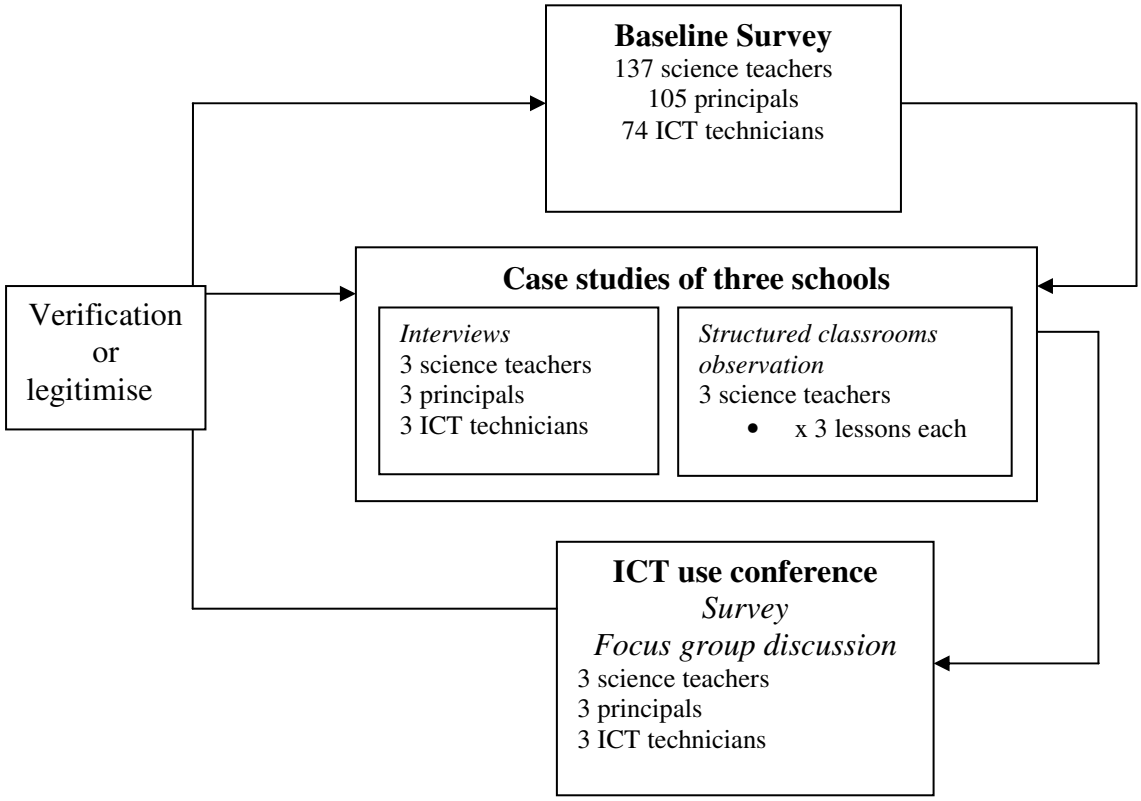

Figure 4. 1: Research design

Figure 4.1 (above) refers to the research methods employed in this study. According to the figure, the methods start with the survey, followed by case studies that used two methods: interviews and structured classroom observations. Data from both the survey and the case studies was analysed so as to give to the participants accurate results and information during the ICT conference, for possible comments and pave the way for improvement in their existing strategies.

Data sources for this study were identified for quantitative as well as qualitative methods. Data sources were identified for various constructs proposed in the conceptual framework of Chapter three of this study. For better understanding, various concepts necessary for addressing the research questions are defined

and plotted in the Table 4.1 (below) with an indication of the data sources for particular pieces of information.

Table 4.1: Data collection matrix

		Data sources									
		Survey (Questionnaires)			Case studies						
					Obser-vation	Interviews			ICT use Conference		
Constructs	**Construct description**	**P**	**T**	**ST**	**ST**	**P**	**ST**	**T**	**P**	**ST**	**T**
Background information	Characteristics of the respondents				✓	✓	✓	✓	✓	✓	✓
Leadership	Developing an overall view of how to use ICT, channelling school development and inspiring goals.	✓		✓		✓	✓	✓	✓	✓	✓
Vision	Overall school's view of ICT programme	✓		✓		✓	✓	✓	✓	✓	✓
Expertise	Knowledge and skills regarding ICT application,	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Professional development	Acquisition of knowledge and skills on the use of ICT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Constructs	Construct description	P	T	ST	ST	P	ST	T	P	ST	T
Collaboration	Collaboration between teachers in the same school sharing knowledge in a team	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pedagogical support	Support given to teachers regarding curriculum related challenges – see comments on 'curriculum' made in interview schedule			✓	✓	✓	✓		✓	✓	
Technical support	Support given to teachers regarding trouble shooting related problems	✓	✓			✓	✓	✓	✓	✓	✓
Digital Learning Materials	E-content supplied to or available in schools		✓	✓	✓	✓	✓	✓	✓	✓	✓
ICT infrastructure	Availability of ICT at the schools	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Use of ICT	The types and frequency of ICT use	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Appropriateness of ICT		✓	✓	✓	✓	✓	✓	✓	✓	✓

P=Principal, T=ICT technician, ST=Science teacher

The constructs used in Table 4.1 (above) are taken from the literature reviewed in detail in Chapter three, and described as follows:

Demographics: biographical information about the respondent and the school.

Leadership: Developing an overall view of how to use ICT, channelling school development and inspiring goals.

Vision: the school's view of good teaching and the way to achieve it.

Expertise: knowledge about ICT, skills to use ICT and attitude that motivates teachers and the school management to do their work efficiently.

Professional development: Acquisition of knowledge and skills on the use of ICT.

Collaboration: Collaboration between teachers in the same school sharing knowledge in a team. Given the rural situation, collaboration is an important factor between the school and the community within which the school is located.

Pedagogical use of ICT: Use of ICT for purposes of teaching science.

Technical support: Support given to teachers regarding trouble shooting related problems.

Digital learning materials: computer programmes that the school uses, as well as formal and informal digital education content (Kennisnet, 2008:18).

ICT infrastructure: ICT is any electronic device used in teaching. It ranges from computers, printers, cell phones, PDAs etc.

ICT use: the types of ICT and frequency of use. Also, the appropriateness of ICT to be used is very important.

As stated above, many of the constructs used in the matrix above are taken from the literature. These also appeared in the SITES2006 questionnaires for principals, science teachers, and technicians adopted for use in this study. The SITES2006 questionnaires addressed similar concepts to this study by seeking information on how teachers organized their teaching and learning, the ICT available at school, how they use ICT for teaching and learning, and the obstacles

or difficulties they experience in relation to ICT. The researcher believes that information sought with these questionnaires will dig deep into the current state of pedagogical approaches and on how technologies support them. The ultimate aim of the survey is to allow educational practitioners and policymakers to gain a better understanding of areas in the implementation of ICT in education in rural areas that need interventions and additional support.

A major difference in contents of the SITES2006 and this study lies in the context of the study. On that basis, the SITES2006 questionnaires were adapted to suit the Namibian conditions, and especially the rural situation. Some aspects of the questionnaire considered highly technical to a developing nation were taken out. The language used in the SITES2006 questionnaires was also adapted to contain familiar words used in the Namibian context. The case study utilised classroom observations and interview methods. The principle of triangulation was applied to verify the information gathered through the two methods. The case study approach would also help in filling the gap of missing information from the survey. In addition to quality issues of this study, the ICT use conference design is adopted to allow stakeholders to bring forth the argumentations for a better perceived educational philosophy, goals, values and standards before conclusions are drawn and suggestion are made for consideration in the science classrooms.

To summarise, the study adopted a mixed method approach to tackle the research questions 2 and 3. Constructs crucial to these research questions are explained for better understanding of the context. For the survey part of the study, the SITES2006 questionnaires were adopted and adapted for use in the Namibian context. The case studies as well as the curriculum conference designs are explained to complement the results from the quantitative methods. The methods adopted in this study are further elaborated on in the next Section 4.3.

4.3.2 Survey

This subsection presents the research design used in the survey. After a summary of the purpose of the survey, the research design is outlined according to the components population and sampling, instrument development and pilot study, data collection, data analyses, and research procedures.

The aim of the survey is expressed in two operational research questions (viz 2 and 3), formulated in line with the objective of this study. It is imperative to obtain a good understanding of the use of ICT in schools and particularly by science teachers in terms of pedagogical practices, support provided to science teachers (see Chapter one) and availability of appropriate infrastructure. These three elements constitute the perspectives from which the characteristics of the teachers' use of ICT are viewed during the survey. The characteristics identified for teachers' use of ICT was informed by literature and later by the pilot of the data collection instruments. In order to determine the quality of the questionnaires, the validity and reliability of the adapted SITES2006 questionnaire was checked.

Population and sampling

The population of this study comprises rural schools. This study has identified three categories of respondents: principals, science teachers and ICT technicians in order to provide school level data. They also provide data about their specific contexts as principal or science teacher or ICT technician. The study has therefore three sub-populations with their responsibilities described below:

School principals - have the responsibility of implementing the government policies on education, including the national ICT policy for education. They are also responsible for creating a conducive environment for the implementation of ICT.

Science teachers - are active subjects to be studied in terms of whether they implement the ICT policy at classroom level.

The ICT technicians - are active subjects who are either appointed formally or informally in the position of an ICT technician. Formal appointment of a technician refers to a person who is occupying a designated position of a technician at the school. Informal appointment of a technician refers to a teacher who acts in this position voluntarily by virtue of his or her knowledge of ICT.

The survey draws participants from the three educational regions: Ohangwena, Oshana and Oshikoto, to represent the rural context. As referred to in Chapter 2, the country is divided into thirteen regions clustered into north, west, south and east. The three educational regions of interest are located in the far north of the country and are known as the North Central Regions (NCR). The three educational regions shared the same history of education before the Namibian independence in 1990 and beyond. The two regions, Ohangwena and Oshana were heavily militarized by the South African army during the liberation struggle. The Oshikoto region was partly militarized but the region was extended to include the nearest town Tsumeb after 1999. The schools in the Tsumeb area were excluded from the sample for this reason.

There is no difference between the three regions in terms of socio-economic development, language, and budgetary allocations by the Revenue Office, Ministry of Finance. People in these regions speak the same language of Oshiwambo, although in at least eight different dialects. The difference between the regions lies in the remoteness of the areas and the infrastructure to access the schools. The Ohangwena region has far more schools than the other two regions and is highly populated if far more remote and isolated than the other two regions. Most of the circuit offices and schools were only accessible using a 4X4 vehicle.

The population of the survey comprises 247 schools, which include combined schools (CS), Junior Secondary School (JSS) and Senior Secondary Schools (SSS), befitting the description of schools with secondary grades. The decision to include all schools with secondary grades in the population was made after reviewing several government reports.

The samples of schools per region were purposely selected to include those with electricity and functioning ICT. A total of 163 schools befitting the criteria of electricity and functioning ICT were identified from the EMIS database (MoE, 2010). In search of answers to research question 2 and part of research question 3 of this study, the questionnaires were sent to the identified schools with electricity and functioning ICT (n=163). Thus, three questionnaires were sent to each school (for the principal, the science teacher and the ICT technician).

Table 4. 2: Population and samples of schools per educational region

Region	Population	Planned sample	Achieved sample	% Achieved
Ohangwena	116	63	43	68
Oshana	67	62	62	100
Oshikoto	64	38	32	84
Total	247	163	137	84

The table above shows that 84% of the planned sample was achieved. This figure is good enough to make general statements about rural schools in northern Namibia.

Instruments development for surveys

The study used three questionnaires adapted from the SITES 2006 study. The SITES instruments have proven to be valid and reliable in the SITES study, and address topics and issues also relevant for this study. These questionnaires have been developed to address how ICT is being implemented in schools and the fact that the questionnaires have been used in a number of countries makes them very reliable. The questionnaires were adaptable for changes to suit the Namibian situation. The development process of the questionnaires was informed by the literature review on what and how ICT is influencing policy or vice versa and how it is being used in classrooms. A number of authors refer to factors influencing ICT

use and have identified constructs (Howie, 2009; Kennisnet, 2009; ten Brummelhuis, 1995; Anderson & Plomp, 2009).

In this study, many constructs were identified and were found to be well operationalised in the SITES2006 questionnaires for principals, science teachers and the ICT technicians. The depth of coverage was considered adequate at national as well as at school level, where it was also important to categorise the identified factors and how they possibly related to each other. Questions were clustered according to variables they addressed and in line with the aims and objectives described in Chapter 1. Several drafts of the adapted questionnaires were produced and reviewed by experts for purposes of content validity (Cohen, Manion & Morrison, 2000; 2007), to ensure that the questionnaires targeted the intended respondents and that the results would obtain face validity by testing whether the questionnaires actually tested what they were designed for (Cohen, et al., 2000; 2007).

The questionnaire for School principals

The SITES2006 questionnaire for school principals *(Appendix E)* has been modified to suit the Namibian context. The components on history of innovation and educational systems structure and responsibility have been deleted as it is assumed to have high level content about which rural teachers may not have knowledge. Also, the component on budgetary issues has been deleted because Namibian schools are fully funded by the government and do very little to raises funds to purchase their own equipment. The adopted questionnaire consisted of 10 main sections that also appear in the conceptual framework (Section 3. 7), as follows:

Table 4. 3: Contents of the principals' questionnaire

Part	Construct	Information being sought
A	Demographics	Information about the school and personal information
B	Vision of your school	Principal's vision
C	Leadership and ICT	The leadership style used at a school to encourage ICT use
D	Cooperation	Type of cooperation from either outside or within the school and support given to teachers
E	Support	Pedagogical support and technical support
F	ICT infrastructure	The type of ICT available at schools
G	Use of ICT	The types of ICT use at the school
H	Expertise	Principal's knowledge about ICT versus teacher's attitude and skills
I	Pedagogical support for teachers	The pedagogical uses of ICT
J	Obstacles	Obstacles experienced by the principals

It was noted that some questions refer to the entire school, while others refer to Grades 8 to 10 only. Also, some questions ask for educational policies and activities in general in the school, while other questions explicitly focus on the use of ICT. The questions contained multiple choice items with Likert scale or nominal scale and open-ended questions. Although the majority of the questions were closed, they provided the principals with the opportunity to express their views and opinions by exploring the 'other specify___' type of items. Also, the principals were asked to comment on any other issues that were not addressed in the questionnaire.

The questionnaire for science teachers

The questionnaire *(see Appendix F)* contents are listed in Table 4.4 (below). Particularly, this questionnaire asks for information from teachers about science education and policy matters in the school related to pedagogical practices and ICT. When a question is about ICT and/or ICT use, this was explicitly stated. Most questions were answered by marking the most appropriate answer. A few questions (16, 17 and 18) required responses to (a): whether certain activities were taking place without ICT and (b): whether the same activities as in (a) were taking place using ICT. Teachers were asked to mark one most appropriate answer for each of the two parts in each row. Also, guidelines to identifying the "target class" were provided *(Appendix F)*. Teachers were also provided with the opportunity to express their views and opinions by exploring the 'other specify___' type of items, and also to comment on any other issues that were not addressed in the questionnaire. Some of the items on 'Impact of ICT Use' have been deleted from the original questionnaire as they do not apply to the Namibian situation in which ICT was recently introduced to schools and so would not yet warrant an impact study.

Specifically, the questionnaire was composed of the following parts:

Table 4. 4: Contents of the science teachers' questionnaire

Part	Construct	Information being sought
A	Demographics	Biographical information about the school and the teacher
B	Curriculum Goals	The importance to achieve educational goals
C	Leadership and vision	The extent to which leadership goals are applied in decision making and teacher collaboration and support
D	Digital Learning Material	The different methods of ICT use
E	Expertise	The frequency of ICT use for different purposes
F	ICT infrastructure	ICT infrastructure availability and accessibility at and after school
G	Use of ICT	The confidence teachers have in using ICT
H	Specific Pedagogical Practice that Uses ICT	The times allocated to ICT use and the different types of use

The questionnaire for ICT technicians

The components of questionnaire for technicians *(Appendix G)* are shown in Table 4.5 (below). Most of the questionnaire comprised a number of closed questions related to the parts listed. For the part that asked for infrastructure, the type of information needed was nominal, providing space for writing the exact numbers of the available infrastructure. Specifically, this questionnaire asked about the current state of pedagogical approaches and the technological support provided to teachers and principals.

Table 4. 5: Content of the ICT technicians; questionnaire

Part	Construct	Information being sought
A	ICT in your school	Biographical information and the general use of ICT
B	Digital Learning Material	The availability of ICT and need for ICT
C	ICT infrastructure	availability and accessibility of ICT
D	Professional Development	Ways to acquire skills on ICT
E	Support facilities for ICT	Responsibilities of a technician
F	Obstacles to realize pedagogical goals	Reasons for not using ICT

All three questionnaires described above were designed to collect information about vision and leadership, ICT provision, teacher professional development and e-content development in a rural school. The information gathered through the survey is triangulated using case studies and data collection strategies.

For purposes of validity and reliability the three questionnaires (principal, science teacher and ICT technician) were sent for piloting to 20 schools, randomly selected within a short distance from the researcher's duty station, Oshakati. Fifteen out of 20 schools returned the questionnaires. The pilot was conducted towards the end of the year when all schools were busy with examinations and had little time for other activities. Given that situation, the number of returned questionnaire seemed sufficient. However, three more schools made efforts to return the questionnaires, resulting in a total of 18 questionnaires returned. These were later administered in the main data collection of this study.

The main objective of the pilot was to increase validity of the instrument to be used for the main study. Also, the pilot was used to ensure that the respondents would understand the questions being asked in the same manner. In ten cases the

researcher had meetings with schools principals, science teachers and ICT technicians to explain the purpose of the survey and also observed them as they completed the questionnaire to ensure content and construct validity. It is important that the respondents understand the way the questionnaire is constructed, especially the response categories. The participants were given a chance to raise queries on the questionnaire in writing, or by expressing them during the interview with the researcher. Also, the time it took them to complete the questionnaire was timed in order to check whether the respondents answered the questionnaires within the given time. The reliability of the instruments was checked to see if the respondents answered in a similar kind of way, and also for pattern identification in the responses. During the piloting, no major problems were detected with any of the questionnaires. However, the principals raised concerns about the length of the questionnaire, although they managed to complete it within the given time (30 minutes). It was observed that most schools did not have an ICT technician, however it was explained to the school that whoever was responsible for ICT was considered to be the ICT technician in this study, and therefore qualified to fill in the questionnaire for technicians. Some schools relied on the service by *SchoolNet* technicians, but since its funding was exhausted this service had been terminated. The instruments were finalised and sent to Ohangwena first, then to Oshana and Oshikoto educational regions. Ohangwena has the highest number of schools and most remote of the three regions.

Data collection

The researcher attended an informal meeting with school inspectors through the Ministry of Education, where she had a short briefing meeting with individual inspectors to explain the purpose of the survey and distributed the questionnaires per circuit. She also asked the inspectors to collect the questionnaires from schools through their respective offices. This was done to establish a good relationship with the participants with an aim to get them to participate and minimise rejection.

The vastness of the country was considered and school inspector's offices or circuit offices were used as distribution points for questionnaires. It is a practice that school principals visit the circuit office on average twice a week. The principals collected envelops within which three questionnaires (one for the Principal, one for the Science teacher and one for the ICT technician) were enclosed. The respondents were given one month to respond to the questionnaire, after which they were expected to return to the principal's office for return to the circuit office. After a month of non-response, follow-ups were done through telephone calls and by sending short text messages with a cell phone to the school inspectors, reminding them of the due date.

Three methods were used to collect the questionnaires from the circuit office: 1) the circuit office was advised telephonically to send the questionnaires to the Ohangwena Examination Officer, who was personally known to the researcher and would send them to the researcher; 2) the researcher collected the questionnaires herself from the circuit office; and 3) the researcher collected the questionnaire from non-responding schools as a last resort to get a response.

Data was entered in the SPSS statistical package (version 17.0). It was also audited and verified before analysis. A database to record the returned questionnaire was developed to ensure proper data storage. Returned questionnaires were checked for completeness before data was entered into the statistical package. This data was analysed to give descriptive and inferential statistical information, after which it was interpreted (Fink, 1995) in order to determine the actual situation.

Data analyses

Data was captured and analyzed using the Statistical Package for the Social Science (SPSS – version 17.0). The analysis of the data is descriptive and frequency counts standard errors as well as maximum and minimum values were calculated, to measure the extent to which ICT is being implemented. Further, the outcome resulted in explanatory analysis of constructs, aimed at identifying the different factors that affect ICT implementation and how these factors correlate with each other.

The exploratory factor analysis was used to reduce the data set from a group of interrelated variables into a smaller set of uncorrelated factors and achieve parsimony by explaining the maximum amount of common variance in a correlation matrix using the smallest number of explanatory concepts (Field, 2000). The amount of common variance was calculated by estimating the communality values for each variable by extracting the underlying factors. The communality is a measure of the proportion of variance explained by the extracted factor. The correlation matrix was computed to determine the variates. The number of variates calculated will always equal the number of variates measured (*p*). The variates are described by the eigen vectors which are the weights of each variable. The eigen vectors are associated with the correlation matrix. These values are the factor loadings. Factors with relatively large values are retained. Further, Field (2000) recommended $r > 0.7$ as the cut-off point, and only when the determinant was less than 0.001. The correlation matrix aimed to eliminate one or more variables that correlated highly (Field, 2000).

In addition, the Kaiser-Meyer-Olkin (KMO) method was used to determine whether the correlations for the data were adequate for factor analysis. According to Hutchinson and Sofroniou (1999, in Field, 2000), values below 0.5 are poor, values above 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb. Thus the reliability of the constructs was developed (see Appendix, O). Similarly, Bartlett's test of Spherecity was applied to tests whether the off-diagonal components were

not zero. The Bartlett's test of Spherecity value should be always significant ($p<.05$) for sufficient correlation between the variables, so as to proceed with the analysis (Field, 2000).

The minimum criterion for the Cronbach's alpha of the scale was determined to be 0.70 (Pearson, 2010), for the items to be combined into a single scale. Brigss and Cheek (1986) in Pearson (2010) suggest that the average inter-item correlations of 0.2 to 0.4 justifies the combination of items into a scale of fewer than 10 items. For this study, correlations of 0.70 were considered as adequate to continue with the development of the factors.

This study met the above conditions and the constructs were extracted using the Kaiser-Guttman retention criterion of eigen values greater than 1.0. A scree plot was generated to provide a visual presentation of the best solution of the data. Cattell in Field (2000) argues that the cut-off point should be at the point of inflexion of the curve. The 0.40 cut-off point was used in this study for factor loadings, which represent substantive values (Field, 2000). This value has been used frequently by factor analysts as a means of making preliminary examination of the factor matrix. Factors that weighed more than 0.50 were identified and named to suit the items underlying the set of items on a scale.

In order to determine the level of ICT implementation in rural schools, the responses were converted in indices to develop levels of implementation. The descriptive analysis used measures of central tendency (percentages) and variation (standard error) to describe the biographical information. The scores from the questionnaires were converted into indices in order to calculate the maximum and minimum value of ICT Policy Implementation. The development of indices in this study borrows from the concept of Gender Status Indices (GSI) (2004). The GSI focuses on the quantitative aspects of gender relations. In this study, the GSI model is adapted to create levels of pedagogical use of ICT. An index was compiled and comprised three levels: low, medium and high levels of pedagogical use of ICT. This index is used by governments to evaluate good practices in

neighbouring countries and learn from them. In this study, the indices were used to determine the level of ICT use in rural schools.

Calculating the indices entailed providing the indicators the same weight in each scale. Thus, each construct has the same weight in each scale and each scale has the same weight of indices. The weight of a constituting item depends on the number of items in a constituting scale (Economic Commission for Africa, 2004). In order to determine the validity of the constructs used in the conceptual framework of this study, a regression analysis was employed. The constructs were considered in the regression analysis used to predict the value of one variable on the basis of other variables. The technique involves a mathematical equation that describes the relationship between the variable to be forecast, called the 'dependent variable', and the variables that the statistics practitioner believes are related to the dependent variables, called the 'independent variables'.

In order to analyse data for research question 2, relating to how ICT is being implemented, sub-total scores were calculated for each item per construct. The subtotals were converted to percentages to indicate the level of ICT implementation per individual. The percentage was divided by three to determine the range that represented each level: low (0, 33.3%), medium (33.3, 66.6%) and high (66.6, 100 %). The response rate for individual items was noted for all the constructs (see Appendix O). In line with Table 4.2 (above) the response rate for the questionnaires was 83%, but the response rate for individual items may vary.

In order to analyse survey data generated for research question 3, frequencies were calculated and analysed per construct. The same method used to analyse research question two was adopted. Thus, the exploratory factor analysis, the indices and the regression analyses were applied to determine the factors that affect ICT policy implementation in rural areas. The responses from the principals and the science teachers were combined to form one data set, representing the school level. The responses from the principals were matched to those of the science teachers and a reduction in data should be noted. Data from ICT

technicians was left out as it did not cover all the constructs noted in the conceptual framework of this study (see Chapter 3). Data from principals and science teachers was considered sufficient to represent their respective schools. Responses from schools that had two science teachers were averaged to indicate a response at school level. A Pearson's correlation was run to determine the strength of the relationship between the respective construct. In addition, linear regression analyses were also run to strengthen and direct relationships between variables and to be able to assess the "statistical significance" of the estimated relationships, namely, the degree of confidence that the true relationship was close to the estimated relationship (Zikmund & Babin, 2007; Aaker, Kumar & Day, 2004). The quantitative findings were discussed in relation to the case studies findings to find one common finding per construct.

4.3.3 Case studies

This subsection presents the purpose for the case study design, strategy for data collection and structure. The population and sample size and methods are also presented, followed by the instrument development and data processing and analysis. Finally, the research procedures are presented.

The case studies method of this study was inspired by the Success Case Method (SCM) (Brinkerhoff, 2005). According to Brinkerhoff (2005), the SCM is simple and can be implemented in a short timeframe. In general, SCM is aimed at producing concrete evidence of the effect of – in Brinkerhoff's case - training (or the lack of it), in ways that educational stakeholders find highly believable and compelling, relating verifiable incidents which can be convincingly shown to lead to worthwhile results. SCM is used in this study to get better understanding of what is going on in the science classroom in terms of ICT use and pedagogical use of ICT.

Population and sampling

The population for case study comprises a total of all schools (N=137) captured in the survey. Through the survey, extrapolating results were obtained to get an estimate of quantitative estimates of the proportion of teachers who have used ICT, and particularly how they have used it. Table 4.6 (below) shows the population considered for the case studies selection, as well as that three success cases have been selected per educational region.

Table 4. 6: Population and samples for case studies per educational region

Region	Schools (N)	No of success case studies
Ohangwena	43	3
Oshana	62	3
Oshikoto	32	3
Total	**137**	**9**

To select the 'success cases', this study adopted the *expert judges* purposive sampling method, which sampled respondents with high scores in the survey. The schools considered for sampling were those that had ICT and use it more than others. Based on the survey data, per region three success cases were selected, from which one per region was selected for the case study based on the recommendation of principals. A jury of five principals was identified, based on the information from the survey, to recommend at least one or more schools in their regions that they knew were practicing ICT. The decision to ask for recommendation from at least five principals was based on the fact that schools are divided into circuits and principals know which schools use ICT most of the time. In addition, the issue of accessibility to schools was also considered due to a flood that occurred in the regions during the time of data collection. The sample for the case study comprised one school per region, and from each school the principal, one science teacher, and the ICT technician.

Instruments development and piloting

The instruments used in the case studies were interview schedules and classroom structured observational schedule. The development processes are explained below.

Interviews schedules

The interview guides were developed in light of filling the gaps that were detected in the survey. The interview questions were structured and aimed to seek the best practices or recent advances (Brinkerhoff et al., 1983). The interview guide has been developed such that it followed a pattern of categories similar to that of the science teacher questionnaire (Section 4.4.1).

Interview guide development

The interview guides were developed to elicit the best possible understanding of ICT and the use thereof. Questions for principals (*Appendix H*) focused more on the vision, leadership of the school, and collaboration and support from the school leadership to the science teachers. Questions for the science teachers (*Appendix I*) focused on ICT infrastructure, expertise, vision and digital learning materials. Questions for the ICT technicians (*Appendix J*) were the same as those of the science teachers. The pilot study of the interviews was conducted with one science teacher who taught at a local secondary school in Windhoek prior to entering the field. The teacher was practicing and sometimes acted as a principal in the absence of the principal of her school. In addition, she was computer-literate. The purpose of the pilot was to determine the suitability of the research questions and clarify interview questions.

Classroom structured observational schedule

The classroom observation schedule was adapted from the Model of patterns of innovative uses developed by Kozma and McGhee (2003; 2006) (see Chapter 3, Table 3.1). The observation schedule is structured and focused on seeking

evidence for various ways of ICT use, such as tool use, information management, teacher collaboration, production creation and tutorial projects were closely monitored for noting in the observational schedule (Cohen, Manion & Morrison, 2000) *(Appendix K).*

Classroom structured observational schedule development

The observation schedule was developed based on the constructs that appear in the science teachers' questionnaires. Each construct had a number of variables that the researcher would look for during the observation. The researcher ticked off these events off as they happened and wrote notes in a separate column. Upon arrival at one of the selected schools, the observation schedule was piloted. The events the researcher planned were listed on the observation schedule. In addition, the researcher took notes. No changes were made on the observation schedule.

Data collection procedures

In this study however, the concept of Success Case Method (SCM) of Brinkerhoff (2005) was adapted to identify the success stories amongst rural schools with regard to ICT implementation. Firstly, the researcher identified the potential and likely success stories (Brinkerhoff, 2005) based on the survey results. Success stories are stories of teachers who have been successful in using ICT in their science classroom. These individual teachers have been identified through the survey and also by asking their principals. Secondly, interviews and observation methods were used to codify success stories and documented.

Before any data is collected, the researcher explained to the participant that his/her participation in the research is voluntary and he/she could withdraw anytime of the research process when not feeling comfortable. Confidentiality was also assured.

Upon the consent of the participant, interviews were conducted and recorded using the MP3 device. The interviewee was questioned in order to probe the answers and also to repeatedly check the reliability of the answers and also verify the interviewee's interpretations (Kvale & Brinkmann, 2009).

During the interview process, the screening of the candidate was done in order to determine whether the person being interviewed can be considered a representative of a true and verifiable success story. Upon meeting the earlier requirements, the candidate was probed during the interview, and the success story was documented. The interview outputs were stories of ICT use and the findings supported by evidence that would "stand up in court" (Brinkerhoff, 2005: 91).

The interview took approximately 45 minutes for the science teachers and 30 minutes for each of the principals and technicians. The interview was recorded using an MP3, a modern recording device, and notes were also taken during the interview as a method of contingency. The recorded conversation was transcribed, distinguishing clearly the interviewer from the interviewee through the transcription process. Transcriber reliability is noted by replaying the inaudible section of the recording over a number of times before transcribing. The verbatim descriptions such as pauses, repetition, and tone of voice were also noted for purposes of validity. Text data were produced.

In addition, a structured observation schedule was conducted. The focus of the observation was the teacher to events. The length of the observations was three lessons at the frequency of 45 minutes per selected schools. Notes were also taken as part of the text data.

Data analysis

Data collected through the interviews with the principals, science teachers and the technicians was analysed manually. The text data were analyzed using a coding schemes system which categorized it into constructs to allow for simple statistical

analysis (Nachmias & Frankfort-Nachmias, 1996). A computer programme, *MSWord* was used to categorize and group the data into constructs. In this study, an inductive coding scheme was used for data analysis. In this scheme, data was transcribed from the recorded tables used to record participants' responses. This raw data from the transcripts, including the response from each of the interviews, was then organized into constructs. These were then grouped together in order of the responses by schools to determine the finding for each construct. Data from the questionnaire and observation worksheets was analyzed using basic descriptive statistics. In order to summarise the findings, the cases were cross-analysed per construct and by position of the respondents at school level. The meaning was condensed and categorized for interpretation of meaning (Kvale & Brinkmann, 2009).

4.3.4 The ICT use conference

This subsection presents the research design of the ICT use conference, based on the curriculum conference approach of Mulder (1991, 1994). The purpose for this approach, the curriculum conference method, the conceptual framework for analysing curriculum deliberation and the use thereof in this study are presented. In addition, the population and sample, the instrument development, the data collection procedures and the analysis are presented.

The phase of the study was inspired by Mulder (1991, 1994), who describes the curriculum conference as the process aimed at addressing questions of quality of curriculum deliberation involving broader communities. Mulder used the curriculum conference approach in a number of curriculum development projects to deliberate, validate, and legitimise findings of a those projects. The curriculum conference method has to be adapted to specific application situations and could be used to determine the consequences of new technologies for programmes, to validate these consequences and to justify curriculum content for the curriculum in the respective domains, and to make decisions about investing on a large scale in certain expensive equipment.

This approach has been adapted in this study to verify and legitimize preliminary findings of the research with a heterogeneous group of stakeholders who have an interest in the implementation of ICT in rural schools in Namibia. The approach is to make an inventory of the differences and agreements in opinions between ICT Project Manager, and representatives of the school principals, the technicians and the science teachers about the findings on ICT implementation in rural schools and to explore the nature of these differences and agreements. Also, this approach is useful for exploring the existence of a typology of decision-making profiles in ICT deliberations and the retention of the emerging convergence (Mulder & Thijsen, 1990). The thrust of this exercise is to verify and legitimise the description of the constructs and the factors that may possibly have an effect on ICT policy implementation in Namibian rural schools. In the following sections, the population and sampling, instrument development, data collection procedures and analysis are described.

Population and sampling

This phase of the study adopts the *key informants* purposive sampling method (Brinkerhoff, Brethower, Hluchy & Nowakowski, 1983). This method used purposive sampling criteria and sampled respondents who have participated in the baseline survey of this study, but not in the case studies. In addition, the respondents have an interest, knowledge, and experience in the general use of ICT. Some respondents have particular experience in ICT use in the science classrooms. These participants have not acted in the interest of their own schools but in the interest of all rural schools. In addition, these participants were willing to participate in the ICT use conference. It was believed that by purposively sampling respondents from three schools, which are different from the schools that participated in the case study, in the three educational regions of interest, plus the National ICT Project Coordinator, a good verification and legitimation of the findings could be obtained. The composition of the conference included: one ICT Project Coordinator, three principals (one per school), three science teacher (one per school), and three technician (one per school).

Table 4. 7: Population and samples for ICT use conference per educational region

Region	Schools (N)	No of participants (1 school per region)
Ohangwena	42	3
Oshana	62	3
Oshikoto	32	3
Sub total	**136**	**9**
National ICT Coordinator	**-**	1
Total respondents		**10**

Table 4.7 (above) shows a heterogeneous group of respondents selected from schools in the three educational regions plus the National ICT Project Coordinator. As described above, these participants possess the characteristics that enable them to represent rural schools. Thus, whatever arguments and opinions expressed by them in the ICT use conference, these represented the schools. However, these participants have equally scored high in the baseline survey and on that basis they qualified to part take in the ICT use conference.

Instrument development and piloting

Mulder (1991, 1994) warns that the basis of the curriculum conference is the necessity to share information. This information can be provided by the conference organizers in a form of a document that is forwarded to participants four weeks before the conference takes place. The document can contain various types of information, to be gathered using different strategies and different modes of inquiry. The document prepared for the ICT use conference, comprised a *PowerPoint* presentation (*Appendix M*) which contained information about the introduction to the study, aims, the research questions, research design and the preliminary findings of this study.

The materials for ICT use conference composed of a questionnaire and a *PowerPoint* presentation. The multi-perspectival preliminary studies (survey and case studies) were combined, commonalities and discrepancies were described. Tentative conclusions were formulated about the outcomes of the study and presented on *PowerPoint*. The instruments for the conference were designed based on the outcomes of the survey and case studies.

The questionnaire had two exercises (*Appendix N*). A set of instructions to fill in the questionnaire was provided in order for the participants to understand what was required of them. Exercise 1 was aimed at verifying and legitimising findings for research question 2 of this study. Exercise 1 consisted of a set of statements derived from the findings of the baseline survey. A set of statements were composed per construct in order to allow for verification of findings from the baseline survey. The statements had a four point scale response, ranging from 'strongly disagree' to 'strongly agree' and 'very sufficient' to 'not sufficient at all', for some of the constructs. Each construct had its own scale, befitting the statements.

Exercise 2 was aimed at verifying and legitimising findings for research question 3 of this study. Exercise 2 comprised a matrix of constructs and a response scale of four points, ranging from 'very important' to 'not important at all' to allow for variance in the response. Also, instructions on how to complete this exercise were provided. Additional space was provided in case the respondents had comments to make about the ICT use conference.

In order to test for validity and reliability, several drafts of the conference instrument were developed. The drafts were presented to an expert for review in terms of content and structure. In addition, the instrument was piloted with three schools in the three educational regions of interest to test if the participants could understand the sequence of event and structure of the questionnaire, and also to test if the participants would understand the contents as intended.

The participants of the pilot study did suggest some changes to the instrument but rather emphasised that the researcher needed to develop the programme to be followed during the ICT use conference so that the activities are easy to follow. Also, the expert suggested that the instrument should include clear instructions for undertaking the activities. The programme for the conference (*Appendix L*) was designed based on suggestions from Mulder &Thijsen (1990). The *PowerPoint* presentation was sent to the participants a week before the conference for perusal and also for the participants to familiarize themselves with the content before the ICT use conference. The programme for the conference was also attached.

Data collection procedures and analysis

As described earlier, Mulder (1991, 1994) suggests adaptation of the method which uses a deliberation approach to collect data from the participants. This is useful for establishing agreement on practical curriculum matters. Mulder (1994) argues that the usefulness of deliberation is that the curriculum work is interwoven with the constellation of its context, and that the processes are predominantly situation specific, as context tend to vary significantly on certain variables. Decisions may also be influenced by intuition and praxis. In order to establish an agreement on the desired curriculum, deliberative decision making combines 'epic' description of and issues in the field, on the one hand, and 'emic' perceptions and preferences of the decision makers on the other hand (Mulder, 1994:172).

Further, Mulder describes four possibilities of curriculum deliberation. These are possibilities that could happen during the curriculum conference:

1. If the preferences are homogenous, the group of decision makers probably does not need much deliberation, as there exists perfect preconcensus. Conclusions can easily be drawn. If the preferences are heterogenous, several things can happen.
2. The participants can jump to conclusions and take decisions without further discussion of differences of opinion. This approach is called *quasi deliberation*.

3. Participants may go a step further in analyzing the heterogenous preferences, and discuss the issues of the problem. Proposals may be formulated, conclusions drawn, and decisions taken. This approach is called *restricted deliberation*.
4. Ideally, from a deliberation point of view, participants with different preferences specify the issues within the problem, exchange their opinions, and base these on arguments; these arguments are weighed and conclusions are drawn, and decisions taken. This approach is called *full deliberation*, or simply *curriculum deliberation*.

In line with what Mulder (1994) prescribes, this research opted for a full deliberation approach so that the point of view of the ICT use conference are exchanged, bases for these arguments are presented and that the arguments are weighed before the conclusions are drawn. This approach was applied in this study as follows:

In order to validate and legitimise the findings for research question 2, the National ICT Coordinator collected the data through questionnaire on preliminary findings asking the participants to tick the most appropriate answer first, individually and then collectively discuss their scores in groups of three (3) as per the rank they occupy at their schools. The participants also expressed their opinion in terms of issues they had problems with. The conversations were recorded throughout the conference.

In order to validate and legitimise the findings for research question 3, the National ICT Coordinator collected the questionnaires, added the scores of each construct and determined the highest score. The participants decided to group themselves in two groups A and B. Each group drew one picture (see Chapter 8). The participants deliberated on the relationships that exist between the factors. These findings on the relationships between the factors were presented by one of the group members to the rest of the audience and other members could interrupt or add onto the presentation for purposes of clarification.

Data analysis

Data analysis used simple statistics such as frequency counts. Data was analysed using frequency count per construct. The scores were presented immediately to probe further deliberation and test the stance of the participants. Further, the results were negotiated before conclusions were drawn. Particularly for Exercise 2, the pictures were collected as evidence of what the participants presented as influence on factors that affect ICT implementation in rural schools. These pictures are analysed in comparison with the correlation analysis presented in Chapter 6 (see Chapter 8).

4.4 Methodological norms

This section presents issues of validity and reliability that were considered in the development of the instruments. It is highly unlikely that research would be done without possible threats that would interfere with the interpretation of the results, if not controlled throughout the research process. The following validity variables were considered for quantitative data as well as for qualitative data:

The issues of quantitative data considered important are the content validity reliability of the questionnaires and the transferability as discussed below:

Content validity - The researcher ensured content validity in both the survey and case studies by ensuring that the instruments (questionnaire, interview schedule, classroom observation and conference material) tested what they were supposed to test. This has been done by reviewing the content of the questionnaires and piloting them. The content of the instruments for both the survey and case studies was presented to a number of experts in the field for their comments. The comments were included in the questionnaires before they were piloted with principals, science teachers and technicians through the pilot study.

Reliability of the data

The reliability of the data was assessed through Cronbach's alpha analyses, which showed that the instruments and the scales have internal consistency and reliability. Cronbach's alpha reliability coefficient normally ranges between 0 and 1 with no lower limit to the coefficient. The more the Cronbach's alpha coefficient is close to 1.0, the greater the internal consistency of the items in the scale. Based upon the formula = rk / [1 + (k -1) r] where k is the number of items considered and r is the mean of the inter-item correlations. The size of alpha is determined by both the number of items in the scale and the mean inter-item correlations (Zikmund & Babin, 2007). The results of the reliability analysis are depicted below in Table 4.8. One may conclude that the reliability of all instruments is sufficient till good (Cohen, 1969)

Table 4. 8: Reliability analysis of questionnaire data per instrument

Reliability Statistics	**Cronbach's Alpha (+)**
Technician questionnaire	0.754
Principals' questionnaire	0.943
Science teachers' questionnaire	0.890

Transferability- various data collection instruments were used to enable judgment to be made about the transferability of this research findings to another setting of similar nature. Thus, the methodological procedures may be generalized to the broader theory of evaluation studies. The findings of this study may be applied in at least all rural junior secondary schools since they share the same characteristics.

This study discusses issues of qualitative data such as credibility and trustworthiness as it pertain to this study:

Credibility : refers to the truthfulness of the data. Credibility is enhanced when strategies are put in place to check on the inequity process of data and to allow for direct testing of findings and interpretations by the human sources from which they have come (Lincoln and Guba 1985). In addition, credibility was enhanced by using various methods such as survey, case studies, ICT use conference, thereby triangulating the research methods suggested by Cohen et al. (2007).

Trustworthiness: refers to the trustworthiness of the interview instruments. There are many criteria to insure the trust (Denzin & Lincoln, 2003). These criteria are concerned with determining the criteria to judge confidence in the outcome of the study and the extent to believe what the researcher has reported (Maykut & Morehouse, 1994). In this study, in order to know that the data of the interview is trustworthy, the researcher considered the credibility and transferability of the instrument.

Triangulation: refers to the use of multiple sources of data and using it to build a coherent justification for variables (Creswell, 2009). the study used results from survey to inform the case studies. The results from both methods were compared, combined and verified and legitimised in the ICT use conference.

4.5 Ethical issues

This section presents the ethical issues that the researcher was confronted with in the research process of this study. It is important to note that the requirement for conducting research at the University of Pretoria was met. Permission to conduct research was sought from the Faculty of Education after which it was granted by the University of Pretoria ethical clearance committee. The committee approved the procedures suggested for consideration during the research process.

Debriefing and the right to non-participation: Prior to undertaking any research activities, all participants were informed about the nature of the research, its

objectives and that their participation is voluntary. Also, it was explicitly stated to the participants that they could withdraw at any time of the research if they felt uncomfortable (Denzin & Lincoln, 2003).

Confidentiality and privacy - The researcher knows who has provided the information or is able to identify participants from the information given, the participants identity remains un-announced to the public. Therefore it was explicitly stated at the beginning of the questionnaire that the information provided by them would remain confidential and should they be required to part take in the recorded interviews and classroom observations, their permission would be sought. The researcher also guaranteed privacy whereby the participants have the right not to take part in the research, not to answer questions, not to be interviewed and or to be observed (Cohen et al. 2007).

Equality - All participants for the curriculum conference were treated equal without intimidation by the supervisors.

Respect and autonomy - Arguments and deliberations from all participants were treated with autonomy at each typology (Cohen, et. al., 2007). All participants were entitled to reasonable opinions and suggestions for improvement.

Public perspicuity -This study considered openness to the public (Cohen et al., 2007). Any member of the public can question the evaluative procedures, their intentions and their results.

4.6 Conclusion

This chapter presented the research design of this study, which consists of three parts: the survey, case studies and the ICT use conference. The survey aimed at describing ICT infrastructure, expertise, cooperation and support, leadership, digital learning materials, and vision of ICT as implemented. In addition, the case

studies approach adopted for this study was also presented. The case studies aimed to explore ICT use events and understand how ICT is being implemented in rural schools. The case studies entail interviews with principals, science teachers and ICT technicians. The classroom observation is conducted with a few selected science teachers. The findings obtained through these methods were summarised and presented at the ICT use conference where the participants were expected to verify and legitimised them. The involvement of experts in the field has added value to the development of the instruments and also the research design of the study. These efforts have laid the foundation for Chapters 5 in which the survey results are presented as well as for case studies results presented in Chapter 6.