DESIGNING AND MAKING A DIFFERENCE: AN EXPLORATION OF TECHNOLOGY EDUCATION FOR RURAL SCHOOL TEACHERS

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Marc Schäfer

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ABSTRACT

This qualitative study focused on a Technology Education programme for farm school teachers in the Eastern Cape province of South Africa. These teachers were faced with the challenge of incorporating Technology Education into their curriculum. The study was conducted within the context of an investigation into the conceptual nature of technology and an exploration of the theoretical underpinnings of Technology Education within both the international and South African context.

Technology Education is being introduced into the South African curriculum against a background of educational transformation and the building of capacity to solve real life problems. This calls for a curriculum that will empower learners to be innovative, creative and skilled problem solvers.

The introduction and incorporation of Technology Education into the school curriculum poses a formidable challenge to farm schools in particular. Their unique history of neglect and legacy of underqualified teachers has made the introduction of any curriculum innovation process very difficult and challenging.

This study analyses how an introductory Technology Education programme for farm school teachers in the Winterberg area of the Eastern Cape impacted on the teachers' professional and personal lives. It shows the importance of developing technological skills in conjunction with life skills in contributing to the empowerment, both in the work place and in the wider context, of rural school teachers. It highlights the need for supportive in-service education programmes and strengthens the argument for an integrative and mulitidisciplinary approach to the introduction of Technology Education in farm schools. Data was collected by means of questionnaires, interviews and photographs.

PREFACE

The fundamental premise upon which this research project is based is consistent with Merriam's (1998:6) key philosophical assumption that qualitative research embraces the view that "reality is constructed by individuals interacting with their social worlds". Throughout, this thesis is concerned with how people experience their world and how people interact in this world. The research facilitated my interaction with the world and it challenged me also to critically analyse my own assumptions, worldviews and perceptions. It inspired a review of my *Lebensraum* and offered me a wonderful opportunity to learn from and interact with others. These interactions form the backbone of this thesis and I am indebted to the following for their generosity in giving their time, sharing their expertise, opinions and perceptions and taking an interest in my work:

- my two supervisors and friends, Prof. Pat Irwin and Dr. Jaap Kuiper, not only for their invaluable advice and help, but also for challenging and inspiring me to grapple with fundamental assumptions and issues I had taken for granted;
- all the teachers of the Winterberg Schools Trust who gave so generously of their own time and who were so willing to share their perceptions and experiences with me;
- my family, who gave consistent support and showed understanding for my numerous trips to the Winterberg;
- all my colleagues in the Education Department who so willingly created space for my research pursuits;
- Jean, my wife, for her artistic expertise;
- Rhodes University, for the financial support.

To keep a consistent personal sense in the narrative, this thesis was written in the first person.

To all those who teach in the rural areas of South Africa, often under trying conditions, in neglected and inadequate facilities and with minimal resources. You have been a source of inspiration to me and your dedication and commitment to good education leaves much hope for this land.

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ABBREVIATIONS

CENCE	Centre For Continuing Education
DATA	Design And Technology Association
FDE	Further Diploma in Education
HDE	Higher Diploma in Education
HEDCOM	Heads of Education Committee
ICASE	Internation Council of Associations of Science Education
INSET	In-Service Education and Training
IRTEP	Introductory Rural Technology Education Programme
NQF	National Qualifications Framework
OBE	Outcome-Based Education
ORT-STEP	Organisation for Educational Resources and Technological Training - Science and Technology Education Project
PSP	Primary Science Project
RUMEP	Rhodes University Mathematics Education Project
SASA	South African Schools Act
SCANS	The Secretary's Commission on Achieving Necessary Skills
TIMSS	Third International Mathematics and Science Survey
WST	Winterberg Schools Trust
QCA	Qualifications and Curriculum Authority
UNESCO	United Nations Educational, Scientific and Cultural Organisation

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The intended introduction of Technology Education into the school curriculum in South Africa (RSA, 1996a) has raised a number of interesting issues not least of which is a conceptual understanding of 'Technology' itself. The spectrum of technological consciousness spans a wide continuum of perceptions and understanding. It ranges from what Ernest (1991) refers to as the technological pragmatist representing the interests of industry and commerce, which emphasizes the utilitarian aspects of technology, to the more liberal and progressive proponent who sees technology within a context of social and environmental interaction (Volmink, 1998). Numerous educational initiatives across the globe, placing themselves in various positions on this continuum, have conceived of different models of Technology Education to suit their needs and their curriculum.

The introduction of Technology Education into the South African curriculum is in its embryonic stage and numerous organizations, researchers, academics and initiatives have contributed towards conceiving a local model that will facilitate a national implementation strategy. I was involved with the ORT-STEP Institute, which in collaboration with the Education Department of Rhodes University researched and developed teacher education programmes in Technology Education. This partnership culminated in a host of projects including a development initiative with the Winterberg Schools Trust (WST) in the rural area of the Winterberg mountains.

The challenge of the official drive to make Technology Education "...part of every boy, girl, teacher and adult learner by the year 2005..." (RSA, 1996a) was taken up by us with the implementation of the Introductory Rural Technology Education Programme (IRTEP) which sought to:

- facilitate professional growth for farm school teachers in terms of developing technological and life skills
- contribute to the personal development of farm school teachers
- contribute towards teacher development in the context of Technology Education in South Africa.

Not only was I instrumental in the design of IRTEP, but I also implemented the programme.

As a mathematics educator I had always searched for opportunities to contextualize mathematics in the real world. My understanding of and interest in technology in general facilitated this contextualization. Through my experience in integrating technology and mathematics I became involved in Technology Education in particular. Initially, my involvement was restricted to secondary school level but as my career progressed into the tertiary sector I became more involved in teacher development and teacher education. This inevitably led to my involvement in In-Service Education and Training (INSET) programmes. My particular interest in rural teacher development stems firstly from my own experience as a novice teacher in a multigrade school in rural Switzerland and secondly from my personal passion for the rural lifestyle.

Against that background, this study represents a journey with many exploratory deviations in an attempt to gain a rich experience in coming to grips with a theoretical framework for Technology Education in general, and gaining insight into the implications this has for introducing Technology Education into farm schools in particular.

1.2 THE GOAL OF THE RESEARCH

The overall goal of this research project was to explore the concepts that underpin Technology Education within an innovative programme in a rural environment. A subsidiary goal was to contribute towards the discourse on the broader educational transformation process in South Africa.

To achieve the overall goal of the study the following objectives were articulated:

1. To engage with the international literature in an attempt to formalize an understanding of the fundamental concepts of technology which would ultimately inform a theoretical framework for Technology Education and contribute towards the development of a workable model for Technology Education in South Africa.

2. To analyse the South African context by looking at its past legacy in terms of technical education and the associated ideologies that underpinned it. This also involved an examination of rural education in general and of farm schools in particular.

3. To explore and elaborate on my theoretical worldview of education and cognition, through clarifying and analysing a conceptual understanding of INSET.

4. Through qualitative empirical research to establish whether, and to what extent, IRTEP facilitated change in the professional and personal life of a community of farm school teachers.

In the context of Technology Education in a rural environment, this study is, to my knowledge, the first of its kind in South Africa and hence very little support was derived

from local experience. It does not claim to tell a definitive story, but it hopes to contribute to a better understanding for those wishing to travel a similar path.

1.3 FRAMEWORK OF THE THESIS

Chapter two outlines the research methodology employed. It brings to attention the difficulties in pigeonholing a qualitative research process and engages in the dilemmas and tensions that the research generated.

Chapter three explores the concept of technology by reflecting on the traditional and stereotypical notions of technology, particularly in relation to science.

Chapter four focuses on Technology Education and analyses different approaches and understandings that underpin two particular models.

Chapter five provides a global overview of Technology Education preceded by a discussion on differentiating between Technical Education and Technology Education.

Chapter six deals with Technology Education in the South African situation by briefly looking at past perspectives on Technical Education and by contextualizing it within the current educational transformation process.

Chapter seven discusses the nature of rural education with specific reference to farm schools in an attempt to contextualize IRTEP and the research site.

Chapter eight deals with INSET and some of the theoretical issues associated with it. It looks at the process of cognition with special reference to constructivism.

Chapter nine describes the Winterberg Schools Trust, its location, its activities and the people involved.

Chapter ten presents an outline of the aims, contents and framework of IRTEP.

Chapter eleven focuses on the development of themes that developed in the interview process. It also provides personal profiles of the interview participants.

Chapter twelve is dedicated specifically to the transcript analyses of the interviews and questionnaires. In an attempt to make sense of the conversations, the analysis is grouped around four themes (perceptions of IRTEP, impact of IRTEP on teaching, impact of IRTEP on personal lives, and problems encountered). Photographs are used to illustrate some of the issues and points raised by the participants.

Chapter thirteen provides a short synopsis of the study and in conclusion suggests a working model for Technology Education that takes into consideration aspects of this research project. It further reflects on some of the limitations and opportunities of the study and provides some recommendations and suggestions for further research.

CHAPTER TWO

PROCESS OF RESEARCH

2.1 INTRODUCTION

The study developed in two phases. The first phase constituted an exploration and analysis of various conceptual understandings of technology documented in the literature. This was done in an attempt at establishing a theoretical frame of reference for the development of Technology Education in the South African context in general, and in a rural environment in particular. The second phase of the study involved an empirical research process, which focused on IRTEP (details in chapter 10). The aim was to investigate and seek understanding how far IRTEP facilitated change in the professional and personal life of the teachers in the Winterberg.

This chapter explores and describes the paradigms and methodologies that underpin the study and aims to highlight the tensions and problems associated with trying to 'pigeonhole' research within a particular approach. In its deliberations and analyses of issues, this chapter is slanted towards the empirical phase of the study. This chapter also deals with the research techniques and procedures employed.

2.2 RESEARCH METHODOLOGY, APPROACHES AND PARADIGMS

Exploring the historical and methodological dimensions of educational research revealed that a qualitative approach to investigating the extent of IRTEP's contribution in facilitating change in the professional life of teachers participating in this project would be the most appropriate strategy. Researching and understanding a dynamic social phenomenon like the Winterberg situation requires tools and techniques which not only facilitate the understanding of that social phenomenon, but also contribute towards the

unravelling of the social processes involved in the make-up of the phenomenon. The IRTEP programme revolved around a group of people interacting with each other in constructing meaning to make sense of their world. Merriam (1998) recommends that a **qualitative research** approach facilitates this understanding. Quoting Sherman and Webb, Merriam (1998:6) suggests that qualitative research "implies a direct concern with experience as it is lived, felt or undergone". Furthermore, the emphasis of a qualitative approach is on process and as Burgess and Bryman (1994:2) suggest, such research cannot be "reduced to particular techniques nor to set stages". Qualitative research attempts to integrate and link together problems, theory and methods. One of the implications of this approach is that the research methodology is of an 'emerging' type, where the phenomenon under scrutiny and the social dynamics of the situation determine the process of research. The research process in this study evolved and gained shape as the project (IRTEP) and the research engagement unfolded over time.

In qualitative research, the role of the researcher is critical because the integrative and holistic nature of the research implies an intimate relationship between the researcher and the situation under scrutiny. Many researchers refer to this relationship as **'participatory'** in the sense that participants in the research project, in this case the teachers themselves, take part directly or indirectly in implementing the research (Cohen and Manion, 1994). Because qualitative research strives to "understand situations in their uniqueness as part of a particular context" (Merriam, 1998:6) this participation of the teacher and the researcher forms the core of this study. Kassam (1980) identified participative research as a three-pronged process involving: social investigation with the full participation of the community in the entire process; an educational process towards mobilization for development; and a means of taking action for development. As Van Vlaenderen and Gilbert (1992) have noted, it includes aspects of research, education and action. In attempting to establish how IRTEP has facilitated change in the Winterberg region I was not only interested in the perceptions, feelings, understanding and opinions of the participating teachers as data for my analysis, but also concerned that in the spirit of participatory research, the participating teachers were engaged in a process of human

and organizational capacity building and development. So when we explored the issue of skills development, for example, (refer to sections 12.1, 12.2, 12.3), the context within which this took place was very important. I was interested in establishing a picture of **how** these skills were being used and in what way these skills impacted on their professional and personal lives.

The techniques (the details of which will be articulated later in the chapter) that were employed in gathering data were all based on regular and intensive participation by the teachers. Researchers like Cohen and Manion (1994) would classify this research as having elements of **'action research'**. Apart from insisting on a participatory approach in their definition, they suggest that action research is "small scale intervention in the functioning of the real world and a close examination of the effects of such intervention" (Cohen and Manion, 1994:217). On this level the IRTEP research fits the criterion very conveniently, but on closer examination of other writers (Denzin and Lincoln, 1994) action research often emphasizes the diagnostic and therapeutic elements. IRTEP does not have an explicit agenda to direct change as a result of a diagnostic process. IRTEP and the research is essentially concerned with teacher development and growth, and not teacher therapy. 'Therapy', in my opinion, assumes a pathological condition which needs to be rectified. From its conception IRTEP assumed a non-judgmental stance to development and positioned itself in the arena of developmental and growth INSET as opposed to a defect approach which assumes a situation in need of being set straight (see chapter 8).

As can be expected, the close connections between the project (IRTEP) and the research (establishing the extent to which IRTEP facilitates change) has influenced the methodology and the assumptions of the research significantly. The close participation of the researcher, the implementer and the participators point towards an action research methodology. Defining exact boundaries between different research practices and methodologies is, however, in my opinion, impossible and not very helpful. Kemmis (1988) for example, emphasizes the self-reflective enquiry undertaken by the participants

in his characterization of action research. Kemmis (1988:42) suggests that a self-reflective spiral of planning, acting, observing, and reflecting is central to the action research approach. In terms of this study, in its methods and techniques, there is some evidence of this process. In early writing on action research, Stenhouse (1976) stresses that action research should contribute to both the practice and the theoretical understanding of education of the participating teachers. From the outset, IRTEP and this research project has articulated the importance of a desired contribution to the praxis of the Winterberg teachers. The interviews explicitly explore how IRTEP has affected the teachers' classroom practice and in turn reflect on how this has impacted on their perception of education and professionalism (refer to chapter 12).

Many researchers will place elements of this research within an **ethnographic** context as the study revolves around a well defined community of people (teachers of the Winterberg district). LeCompte and Preissle (1993:1) refer to ethnography as the "writing about people" with the "basic goal of creating a vivid reconstruction of the culture studied" (LeCompte and Preissle, 1993:235). The concept of culture has a wide array of definitions and understanding. It is not the purpose of this study to unpack the concept at great length or deal with its complexities, yet some understanding is important as it will assist in positioning this work in terms of its assumptions. Linton (1945) in LeCompte and Preissle (1993) adopts a very broad view and suggests that culture is the way of life of a people. Cross and Mkwanazi-Twala (1998) assert that culture is dynamic and "dialectic" in that it incorporates new forms and meanings as it develops. The definition such as that of the 19th century anthropologist Tylor, who suggests that "... culture or civilisation is the complex whole ... acquired by man as a member of society" (in Thornton, 1988:22) is more narrow, however, in that it confines culture to a collection of 'acquisitions' such as knowledge, belief, custom, morals, values, and art. Further, the definition implies a value system or lifestyle which remains unaltered and static.

In terms of the above standpoints any study which concerns a group of people can be classified as ethnographic. Although ethnographic research consists essentially of a description of events and processes that occur within a group of people (Taft, 1988), the distinguishing feature of a 'classic' ethnographic study, in my understanding, is the requirement that the researcher participates and immerses him/herself in some part of the 'normal' life of the group and uses this experience as part of the data. This study is ethnographic in the sense that it revolves around a group of people - a community - and focuses on aspects of their lives which are part of their culture, their 'way of life'. It is not ethnographic, however, in terms of the researcher's lack of intimate involvement in the lives of the participants. Although a significant aspect of the research involved the personal lives of the teachers, I did not spend substantial time within the community. For the type of information and data I was seeking, I felt that it was not necessary to immerse myself in the everyday lives of the participants. Ethnographic tools and techniques, such as interviews, were used to gather the data. Although this does not necessarily produce an ethnography (Merriam, 1998), the analysis component of the research consisted of socio-cultural elements.

The study of a group of people or a community can rarely move away from analysing their experiences and interpretations. These experiences often stand alone and need to be taken at face value. This research takes into account such experiences and reactions to a particular phenomenon (in this case IRTEP), in its endeavour to make sense of people's perceptions. This **phenomenological approach** focuses on the "essence or structure of an experience" (Merriam, 1998:15) which in this project revolves around a Technology Education programme and its impact on a group of rural teachers. Phenomenology, according to Cohen and Manion (1994), has the distinguishing feature of the philosophical belief in the importance of subjective consciousness. The subjective nature of this study therefore places it in a phenomenological context and reinforces Merriam's (1998) assertion that phenomenology underpins all qualitative research.

Some researchers will be inclined to classify aspects of this research as a **case study**. Definitions of 'case study' vary from researcher to researcher. Yin (1994:13) for example defines a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context...." Merriam (1998) suggests that this definition emphasizes the research process whereas Stake's (1995) understanding focuses on the 'uniqueness' of the case. Stake (1995:2) says that a case "... is one among other. In any given study we will concentrate on the one.... The case is a specific, complex, functioning thing". Stake (1995) stresses the tangibility of the phenomenon. He suggests that an innovative programme may be a case, a teacher may be a case, but a relationship among teachers or the reasons for innovative teaching are not considered a case. The boundaries between the 'tangibility' of a case are naturally very diffuse and Merriam (1998:27) advises that a case should be a "bounded system". This concept was borrowed from an early ethnographer, Louis Smith, who, according to Stake (1995), suggested that a case is an object rather than a process. The concept of 'boundedness' is useful, in my opinion, as it suggests that the data is 'situation- or phenomenon-specific' and that the case is, as Merriam (1998) articulates, an instance of some concern. The common feature in the case study debate is its descriptive, particularistic and heuristic nature. In coming to terms with what constitutes a 'case study' Stenhouse (1988) classified case studies into four useful categories. Firstly, the *Ethnographic Case Study* studies a single case in depth by participant observation supported by interviews. It concentrates on the understanding of human societies and cultures. Secondly, the *Evaluative Case Study* is an in-depth study of a situation in order to provide educational role-players and decision makers with information that will assist them in formulating policy. Thirdly, the *Educational Case Study* concerns itself with the understanding of educational action to enrich thinking and discourse of educators in their endeavours to unravel educational theory. Fourthly, the *Case Study in Action Research* is concerned with providing and developing feedback for the purpose of revision and refinement of the particular case. Stenhouse (1988:49) asserts further that it is the data collecting and recording techniques which characterizes a case study. He regards the following techniques as generally characteristic:

a) participant or non-participant observation and interviewing;
b) descriptive statistics and questionnaires;
c) use of photography, video recording or motion pictures.

Stenhouse's position is very useful in placing this work. This research project consists of ethnographic case study elements in terms of its concern with a particular group of people; it is evaluative in the sense that it hopes to provide useful data and interpretations for the wider educational community in general, and for the technology education and INSET sector in particular. The educational nature of this study speaks for itself, and the action research case study component will provide valuable information for the reflexive process of the Winterberg Schools Trust.

The difficulty in pigeon-holing this work within one methodological category due to its 'multi-disciplinary' nature and approach is consistent with the qualitative nature of research and re-inforces Denzin and Lincoln's (1994) position that qualitative researchers deploy a wide range of interconnected methods. This study may best be described as one which uses a host of methods and techniques consistent with a **qualitative approach** falling within the **interpretivist-naturalistic paradigm.** (Schwandt 1994, Lincoln and Guba 1985, Denzin and Lincoln 1994, Cohen and Manion 1994). Key features within the interpretivist paradigm that characterise this study can be listed as follows:

- Interpretation is key to understanding any situation.
- Understanding a situation is based on the perceptions and points of view of those who live in it.
- This research thus starts with individuals and seeks to understand their interpretation of their world.
- Both the researcher and the participants are involved with and participate in the research.
- The research is seen as a process which emerges and grows, and is reflexive in nature.

- The methodology of the research is multi-dimensional.
- The data may be gathered using methods of interviews, questionnaires and observation.

In summary, this study is a case study, with ethnographic and phenomenological elements, based on a group of 22 rural school teachers in the Winterberg Area of the Eastern Cape who are taking part in a professional development and enrichment programme run by the Winterberg Schools Trust. It focuses particularly on the Technology Education (IRTEP) component of the broader INSET programme of the Winterberg Schools Trust and one of its goals is to establish whether, and evaluate to what extent, the IRTEP has facilitated change in the professional and personal life of the teachers. In the terminology of Hitchcock and Hughes (1995:319), the teachers formed the "key players" of the case study; IRTEP, in the context of the Winterberg area, formed the "key situation" and "critical incident" of the study. These also constituted the 'boundaries' of the "bounded system" that Merriam (1998) - referred to above - alluded to.

In order to facilitate and accommodate an emergent model of research and data collecting, the research design did not consist of a rigorously predetermined structure. This meant that data collection and data analysis were often a simultaneous activity. This enabled important and, in my opinion, essential understanding of current issues and perceptions, before moving on to a subsequent phase of data collecting.

2.3 INTERVIEWS AND QUESTIONNAIRES

The techniques used to obtain the necessary qualitative and interpretative data in this study were **interviews** and **questionnaires.** Further, **photographs** were used to keep continuous record of the IRTEP process and also to illustrate and emphasize certain issues (see chapter 12).

Cohen and Manion (1994:308) define the **research interview** as "a two-person conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information, and focused by him [her] on content specified by research objectives of systematic description, prediction, or explanation." It centres on people's stories - the verbal articulation of experiences, perceptions and feelings. The Vygotskyan school of thought would view stories as a microcosm of people's consciousness (Vygotsky,1987). This consciousness within the context of IRTEP, was central to this research, and the interview was used firstly to elicit explicit verbal articulation of perceptions, and secondly to probe in-depth understanding of the situation under investigation. Consistent with Seidman's (1991) view, the purpose of in-depth interviewing in this study was not to get answers to questions, nor to test hypotheses, but to make sense of people's understanding of a situation (IRTEP in this case); and to make meaning of those experiences. Interviewing usually forms an important part of qualitative research and is necessary particularly when perceptions, feelings and interpretations cannot be observed (Merriam, 1998). In my view, it is an indispensable tool when attempting to probe 'what is going on in someone's mind'. Weiss (1994) suggests that interviewing gives the researcher:

- access to the observations of others,
- access to people's interior experiences,
- a window on the past.

Many researchers such as Fontana and Frey (1994) identify a wide range of forms and uses of interviews. They range from formal and structured interviewing through to informal and unstructured interviewing. It is useful to briefly analyse the spectrum in more detail as this study employs the entire range of interviewing.

The structured interview is one in which the questions, content and procedures have been predetermined. This usually means that a schedule, sometimes in the form of a

questionnaire, has been prepared in advance. Cohen and Manion (1994) refer to this as a closed situation with little freedom for the interviewer - and, in my opinion, the interviewee. The interviewer has no flexibility to adapt his/her questions to the responses of the interviewee or to change the direction of the interview. The structured interview calls for the interviewer to play a neutral role and, according to Fontana and Frey (1994), never interject his or her opinion. This type of interview is particularly appropriate for survey- and intercept-type situations where the standardization of questions and responses permits comparisons among subgroups and allows for a quantitative analysis approach.

The unstructured interview, on the other hand, is a more open situation that allows greater flexibility and freedom. It provides for greater depth and allows for a more qualitative approach to understanding the situation. Weiss (1994:3), who refers to this type as qualitative interviews, asserts that this kind of interview sacrifices the uniformity of questioning (as in structured interviews) to "achieve fuller development of information."

The unstructured interview usually relies on a much smaller sample than the structured sort. Analysis of the unstructured interview will rely less on quantitative strategies such as counting and correlating, and more on interpretation, summary and integration. The findings will, according to Weiss (1994), therefore be supported more by quotations and descriptions than by tables and statistical measures. Some researchers, particularly ethnographers, refer to this interviewing as 'in-depth', characterized by open-ended questions and leaning towards a conversational approach which allows for interaction between researcher and participant. Seidman (1991:16) advocates that in in-depth interviewing "we recognise and affirm the role of the instrument, the human interviewer". Although the core of this research was based on interaction and participation, the interviews had structure to them in the sense of exploring certain themes (see chapter 11). It was therefore appropriate to use the "loosely-structured interview" (Griffin, 1985: 100) to gather the bulk of the data. Pseudonyms were used for the participating teachers to ensure anonymity.

Questionnaires were also employed to gather information of a more descriptive nature. I used questionnaires in the earlier phases of the empirical research to establish personal profiles concerning, for example, historical details of the participants, and to get an initial albeit superficial sense of their perceptions and opinions. Questionnaires, according to Scott (1996:61), "allow the respondent to set the agendas and are primarily about the perspectives and views of social actors." It is an instrument which usually takes the form of a written document on which respondents reply and which can be used in a number of ways, from "the collection of factual data to the itemising of opinions and views of respondents" (Scott, 1996:61). The questions can be structured or unstructured and the replies can form, as was the case in this study, very useful pointers for the preparation of interviews. A questionnaire was also used as part of the summative evaluation process of Phase I of IRTEP. Much of the information generated by the latter questionnaires was used in conjunction with the interviews and served as a valuable tool to compare and substantiate statements made in the interviews and so validate the process and establish reliability and legitimacy of the data. Some researchers such as Fontana and Frey (1994:373) refer to the use of a multimethod approach to ensure more reliability and better results as "triangulation" . In analysing the interviews and the questionnaires (refer to chapter 12) a variety of fonts were used to distinguish what the teachers said during the interviews and what they articulated on paper. See appendix 1 for detailed referencing.

2.4 SELECTING THE PARTICIPANTS

Due to the time-consuming nature of qualitative research and the potentially voluminous nature of the data generated by this type of research it was decided to limit the number of participating teachers in the interviewing process to four, representing the pre-primary, junior primary, senior primary and junior secondary divisions. The selection process of teachers taking part in the interviews was, however, participative in the sense that I did not want to exclude any teacher who really wanted to take part in this research project.

Voluntary participation was hence emphasized. Further, it was important that the following criteria were met:

1. The participants needed to be able to interact and communicate in English as I am not a competent Xhosa speaker;
2. The participants needed to represent the spectrum of the Winterberg teachers in terms of age, qualifications, grades and types of schools;
3. The participants needed to show an interest in the research.

During one of the IRTEP sessions the entire process of the research and the goals of the research was articulated to the 22 Winterberg teachers. It was explained that the interviewing process was an element of the investigation and that other forms of exploring, like questionnaires where everybody would take part, would also be included. In order to ascertain their preferences and willingness to take part in the interviewing process a simple ticking questionnaire, as shown in figure 2.1, was handed out.

NAME.....

		Please tick
1.	I do not want to be interviewed	.....
2.	I don't mind being interviewed	.....
3.	I don't mind not being interviewed	.....
4.	I would like to be interviewed	.....

Figure 2.1 Questionnaire to ascertain the teachers' willingness to participate in the interviewing process

As English was the second language of all the Winterberg teachers, the above questionnaire was workshopped together in order to ensure clarity and avoid potential misunderstanding such as the double negative in point 3. The majority of the teachers **did not mind** being interviewed whereas 5 teachers explicitly **did not want** to be interviewed and 3 teachers **wanted** to take part in the interviews. On the basis of this information, the criteria set, and direct consultation with the management of the Winterberg Schools Trust, four teachers were selected. Their profiles with specific details follow in 11.3.

2.5 THE EMPIRICAL RESEARCH PROCEDURE

In order to establish a personal profile and facilitate a familiarization process, an initial questionnaire was handed to the four selected teachers (see appendix 2). On the basis of that questionnaire I was able to research early perceptions and acquire knowledge about their personal history, education and home background. I found this a very valuable exercise and, although I did not want to devise a structured interview schedule, it enabled me to prepare an appropriate and personalized interview plan and overview for each participant. Seidman (1991:10) strongly recommends in his "three-interview series" model that the first interview should focus on the participant's "experience in context" and should consist of asking the participant about his or her life in light of the topic under consideration. The reason for a written form of questionnaire was to slowly familiarize the teachers with the reflexive process of personal evaluation and personal reflection which was core to the later interviews. I felt that proceeding straight into an interview situation would be too intimidating and alienating. The questionnaire technique enabled them to think about themselves in their own space and their own time. The later interviews would provide ample opportunity for them to respond more spontaneously in the company of a relatively unfamiliar researcher. This initial phase of familiarizing the participants with a research process was fundamental in creating an atmosphere of mutual

trust and warmth which, in my opinion, is fundamental to qualitative and naturalistic research.

The interview phase developed into a two-stage process:

Stage 1

The first stage of interviews proved to be more problematic than expected. The transcripts showed that the interaction was not very spontaneous and that the conversation was not as fluid as I had hoped. This often resulted in contrived and shallow answers from the respondents on the one hand, and leading questions from me on the other. I found it difficult to use their responses as cues for the next questions and hence the interviews tended to lose their thread and theme. The reasons for the problems were many:

1. Although the teachers taught in English (their second language) and all expressed their confidence in participating in that language, they found it difficult to articulate feelings and perceptions in English.

2. As a novice interviewer I tended to 'support' them too much and put words in their mouths. In having to repeat and rephrase questions and pointers I tended to use too many leading questions.

Example: In trying to establish whether the intended skills of the Technology Programme were appropriate or useful I asked:

Why do you think it is important that one knows about this Technology?
Zoleka answers:
...[Silence] ... eh ... I can say ... it is important because you do in your own time what you want to do ... anything you can, so from what we have learnt there ... technology ... more especially yesterday's work. ... ... I mean ... [Silence]
I then suggest ...

So you can use the skills that you have learnt there?
Zoleka then replies:
YES...even if we are not using them at school. ... but in our own time ....

It was quite clear that Zoleka struggled to express herself. There was a lot of hesitation and silence. In trying to help her, my suggestion actually distracted her from what she was trying to explain and 'assisted' her in answering the questions the way I desired. She may well have thought that the skills learnt in the Technology Course were useful, but what she was trying to explain was the notion that they helped her **outside** the school environment. In this context it is significant to note that when she 'agreed' with my leading question she quickly added her initial intention.

3. I was not very successful in following up cues from the respondents. If I had reacted to those cues they would have offered ideal opportunities for rich and personal reflection. Although the interview was unstructured, I was too closely focused on obtaining answers explicitly relevant to 'my' model, hence the cues often went unnoticed.

Example: In trying to establish how the skills that were developed at IRTEP were being used I asked:

In what other way have these skills helped you? Are there any other ways that you have used these skills?
Noluthando answers:
[Silence]....to teach other people and children ....
OK ... you have given me lots of examples ... is there anything that is missing in the Technology Education programme?

Noluthando provided an ideal opportunity to explore how she used the technology skills "to teach other people and children", but I did not make use of this cue and went on instead, exploring the issue of how the participating teachers would change the IRTEP programme, which was the next item on my interview agenda!

4. As a whole, the interview situation was a foreign and intimidating experience for the teachers. The teachers were self-conscious on numerous levels:
   a) They were very aware of the tape-recorder.
   b) They were not accustomed to being critical and reflexive.
   c) They were concerned about giving the 'wrong' answer.
   This would often result in a lack of spontaneity and forthrightness on their part.

Stage 2

Despite the difficulties experienced during the first stage of interviews, a measure of rich and valuable information and data was generated. The second stage of interviews developed as a result of lessons learnt during the first stage and it enabled me to revisit and explore deeper issues raised during those initial conversations. The development of the second round also entailed involving a fifth teacher in the interviewing process. During the course of IRTEP, Nondusimo emerged as a highly motivated, articulate and insightful professional. Further, in the course of IRTEP, she enrolled in an FDE (Further Diploma in Education) course at a university which led to a significant level of awareness and interest in educational issues. She became very outspoken on educational matters and made interesting contributions to the IRTEP sessions, particularly during the evaluation periods, at the end of each IRTEP session. I felt she would add an interesting dimension to the original group of interviewees and after consulting with her I invited her to the process, and she agreed to take part.

> *I think Marc, I'm at an advantage because of the FDE that I'm doing, because now we are doing curriculum ... so I can combine my understanding* [of IRTEP] *with my training with the FDE stuff ...* (Nondumiso).

In addition to Nondumiso, two staff members of the Winterberg Schools Trust were also interviewed. They were Barbara, the executive director of Trust, and Jo, the co-ordinator for teacher development in the pre-primary and junior primary level. They were seen as 'outsiders', in the sense that they did not actively take part in IRTEP, but observed with

much interest. Their insights and perceptions provided an added beneficial dimension to the interviews. In terms of IRTEP, the two staff had an interesting relationship with the programme: firstly, they facilitated the programmes infrastructure and management; secondly, they raised the funding for the programme; thirdly, they based their follow-up sessions and support programme on the IRTEP sessions; and fourthly, they were directly accountable to the Winterberg Schools Trust Council and the community for the success or failure of IRTEP. Their 'involvement' in IRTEP therefore had many agendas and there was a lot at stake for them. They were interviewed together, and once again the interview was of the conversational type. In the analysis of these interviews and the development of the narrative of the themes, their responses were integrated with those of the teachers.

I set about the second stage with much more care for letting the interview develop and unfold itself. This meant having to remain silent more often and refraining from 'encouraging' the respondents during moments of hesitation and silence. It also implied that I listened more carefully to pick up cues that were perhaps less obvious. During the second round of interviews the atmosphere was more relaxed and hence more conducive to in-depth conversation and interaction. The respondents were more forthcoming and the general quality of the interview improved significantly. I was satisfied that enough space was created to facilitate a reflective process and that the teachers were engaged in more spontaneous and meaningful discourse.

The above interview process strengthens the notion that a pre-interview session or a pilot-interview stage can prove to be a useful component when using this technique, particularly in a novice-research situation. Although the initial questionnaire was intended to set the scene, in retrospect it did not prepare the respondents and the interviewer adequately for the interview experience. On the other hand, the emerging nature of the interviews facilitated a truly qualitative scenario and helped to create a research situation which was emergent and interpretivist (naturalistic).

A summative evaluation questionnaire was used at the end of IRTEP to establish a more global sense of what IRTEP meant to the teachers. This questionnaire was filled in by all the Winterberg teachers and incidentally gave interesting insight into how the responses of the five interviewees related to the rest of the group. Further it enabled me to 'triangulate' the responses, as mentioned above.

Other data which was gathered continuously over the entire process consisted of, firstly, **photographs** (see chapter 12 for examples). They served two purposes:

a) To keep a visual record of the skills development of IRTEP. Most of the artifacts that the teachers made were photographed after each session. The portfolio thus produced enabled the teachers to reflect in more concrete terms and it also enabled the programme organizers to plan more effectively for subsequent sessions.

b) To reinforce and substantiate statements that the interviewees made during the interviews.

Secondly, a simple **evaluation sheet** which consisted of a one-page questionnaire/survey type document was filled in by every teacher after each session (see appendix 3). It not only provided me with insight and data, it was also consistent with the Winterberg School Trust's evaluation policy.

Thirdly, **samples** of the teachers' work was kept throughout the course (see chapter 12 for examples). This served to illustrate the progress and the growth that did (or did not) take place. Samples of their drawing skills depict this growth particularly well.

2.6 PROBLEMS AND TENSIONS

Although this research was committed to a qualitative framework and encompassed the methodologies and techniques within this framework, numerous tensions were encountered. These tensions possibly arose out of my personal socio-historical background which was essentially based on an empiricist, scientific and positivistic education. Although it is not my intention to justify qualitative research in the face of such stereotyped objections as, not being: scientific, objective, trustworthy, formalised, quantitative, generalizable and valid (Kvale, 1994), it is useful to highlight some specific instances which generated tension within my research.

2.6.1 The role of the implementer and the researcher

The distinction between IRTEP - the programme, and the research on IRTEP, was often a schizophrenic one, and at times I found it difficult to distinguish between the two. Initially I perceived this tension as problematic, as I wanted to differentiate the role of implementer from the role of researcher. As the programme and the research project progressed and unfolded I found the relationship between the two roles less and less problematic and realized that their roles were not mutually exclusive. This inter-relationship is consistent with participatory research. When gathering data, in the interviews, however, I was constantly reminded how easy it is to fall into the trap of posing leading questions that will result in self-fulfilling prophecies. The problems regarding leading questions was illustrated above and is an issue that faces every qualitative researcher using this technique. This apparent problem is perceived by critics as a significant weakness of qualitative research. In my view, however, this 'weakness' can also be its strength. Although leading question can lead to distortions of reality it can produce more reliable results. Kvale (1994), for example, suggests that leading questions are very useful and particularly well suited for checking the reliability's of the interviewee's answers.

By virtue of being so closely attached to the programme it was tempting to steer the interview into a bias that would show up a falsely 'favoured' picture of IRTEP. By the same token it was easy to avoid problematic issues that occurred during IRTEP in order not to paint a 'tarnished' picture. This apparent limitation of being so closely linked to both processes (the programme and the research) can, however, also be perceived as the strength of this work. The research fed in constantly to the programme, and vice versa the programme fed in directly to the research - the one informed the other. The evaluation sheets that the teachers filled in at the end of each session, for example, provided me with data for my research and were a source of valuable feedback for planning purposes for future sessions. The same applied with the interviews, although they only commenced well into the IRTEP programme.

2.6.2 Subjectivity

The researcher being the implementer of the programme under investigation warrants a close and critical look on the score of subjectivity. From a quantitative and positivistic standpoint it can be argued that the inextricable linkage, referred to above, can give rise to excessive subjectivity and hence endanger the reliability of the study. Subjectivity is the capacity to consider one's own relationship to whatever is researched. This is in contrast to objectivity, "which is based on the imposition of rules of behaviour and thought, and the making of a person into an observer set on discovering general laws governing human behaviour" (Cohen and Manion, 1994:24). Objectivity is central to positivism which, according to Cohen and Manion (1994), fails to take into account the unique human ability and capacity to interpret his/her experiences and represent them to him/herself. Holbrook (1977) criticizes research and findings of positivistic and objective social science as often being banal and trivial because of the restricted environment that the researcher finds himself in (-by creating restricting and controlling variables that lead to a synthetic picture of the truth-) and present a misleading picture of people (Cohen and Manion, 1994). Good research, in my view, therefore has to incorporate the values,

beliefs and perspectives of the researcher. This, according to Anderson (1994:11) does not necessary imply that the research is subjective. He maintains that research needs to be valid in the sense that "similar approaches should lead to similar conclusions". Guba and Lincoln (1989:112), in making a strong case for qualitative research, argue that "we have become too pre-occupied with objectivity" and have overlooked the close relationship and interactions between the researcher and the researched. Subjectivity is an intricate aspect of qualitative research, and Guba and Lincoln (1989) advise that researchers needs to be more up front about this. Instead of agonizing over the extent of subjectivity in this study, I will rely on a critical discourse and ensure that in the research process I remain an "accountable partner" (Guba and Lincoln, 1989).

2.6.3 Validity

Along with the initial concern about subjectivity, I wrestled with the concept of validity which from a positivistic position is associated with an empirical criterion-based concurrent and predictive understanding. Guba and Lincoln (1989:60), who refer to research within a positivistic paradigm as adopting "conventional methodology", suggest that the traditional "confounding" of variables, which supposedly leads to unquestionable validity, "effectively strips away the context". Qualitative research by its very nature relies on a process of contextualization and is context-specific. Kvale (1994) therefore argues for a broader concept of validity and suggests that validity should be contextualized within an open process. He proposes that "to validate is to investigate". My assertion supports the view that validation is more than correlations, corroboration and concurrence. It is, as Kvale (1994) says, "a process for developing sounder interpretations of observations". Validity, in this research, is not seen as part of a final product control process or verification, but rather a continuous process of credibility, growth and understanding.

2.7 CONCLUSION

This chapter has described and justified the paradigm, the methodology and the techniques that inform this study. Specifically it was argued that this research:

- is qualitative within the interpretive paradigm;
- is an investigation which uses elements of a case study, in an ethnographic, evaluative and phenomenological research method;
- uses data collecting techniques such as interviews and questionnaires.

CHAPTER THREE

WHAT IS TECHNOLOGY?

3.1 INTRODUCTION

This chapter offers a conceptual exploration of the concept technology. Technology as a problematic and complex issue is fundamental to any discussion about Technology Education. The concept will be explored by first reflecting on the traditional and stereotypical mechanistic notions of technology. The focus will then shift to the more complex and subtle issues that underpin a holistic understanding of technology *vis-à-vis* its interaction and relationship with the physical and social environment. This will incorporate a critical analysis of the relationship between science and technology.

3.2 A CONCEPTUAL EXPLORATION

At the outset of this thesis it is worthwhile to unpack the notion of 'technology' and elaborate on different understandings of a concept which evokes as much controversy in the natural and technological sciences as in the social sciences.

At the beginning of each Technology Education module that I present to HDE (Higher Diploma in Education) students at my university, I conduct an informal survey which simply asks the students to articulate their perceptions and understandings to the question:

What do you understand by the term Technology?

Inevitably, the majority of the responses revolve around a very stereotypical 'technicist' perception:

- *...the way you can use tools*
- *...practical work*
- *...where you create something*
- *...it is to do with inventing*
- *...the way things fit/go together to make something work/function*
- *...what is behind mechanical devices*
- *...construction*
- *...making various mechanisms*
- *...a maths oriented subject*
- *...the usage of advanced equipment such as computers*
- *...electronics*
- *...linked to science and means something technical*
- *...mechanics and efficiency*
- *...computers and devices*

This is not surprising as the popular understanding, in my opinion, is generally restricted to a very narrow perception of technology, only to be reinforced by advertising media which promulgate a 'zero-defect' mechanistic culture driven by consumerism, profiteering and market positioning. Naughton (1994:7) accepts this attitude only in the sense that it represents common usage. It has severe limitations because it ignores and misrepresents all the other dimensions inherent in a concept which is complex and in many respects abstract. Postman (1993:5) warns against "zealots" and "one-eyed prophets" (he calls them Technophiles) who cannot see beyond the utilitarian aspects of technology, focus only on what new technologies "can do", and ignore what they "undo". He advocates a more critical attitude towards technology because, he says, once a technology is admitted, "it plays out its hand; it does what it is designed to do" (Postman, 1993:7). This in my view is too general and cynical a statement which views all "admitted" technologies as 'monsters' which need to be tamed lest we go under with

them. He redeems his absolutist view by suggesting that when we admit a new technology into a culture, "we must do so with our eyes wide open", implying that we need to understand the technology in its:

- intention (design),
- implementation (product) and
- attainment (consequences).

Naughton (1994:7) suggests four important ingredients which need to be considered in order to conceptualize a more appropriate understanding of technology. They are: *goals, people, knowledge* and *social organization.* This, in my view, is consistent with shifting from an industrial, product-orientated paradigm (aptly illustrated by the students' responses which rely heavily on end-product results) to one which incorporates and considers social processes, organizations and interactions. In coming to grips with the concept of technology and integrating this with my research, I will adopt a holistic attitude to the concept by viewing the close interaction between goals, people, environment and knowledge as fundamental to the understanding of technology.

In an attempt to synthesize the four ingredients mentioned above into an all-encompassing definition, Naughton (1994:12) views technology as "...the application of scientific and other knowledge to practical tasks by organisations that involve people and machines". Although this definition appears to be a departure from a modernistic frame of reference which assumes 'scientific' sanctity and views "scientific knowledge as the vehicle to deliver humanity from oppression to freedom" (Seidman, 1998:1), it nevertheless explicitly includes the notion of scientific knowledge, reinforcing the traditional view that technology without the application of scientific knowledge is a myth. Naughton does soften his stance a little by including a notion of 'other' knowledge. In the light of a post-modern and more open approach to knowledge, which according to Seidman (1998:227) seees knowledge as "deliberately antisystematic and irreverent towards conceptual authority", Naughton's definition, in my view, would have more

credibility if it simply read: 'Technology is the application of **all** knowledge to practical tasks by organizations that involve people and machines.' This definition however remains problematic in its assumption that technology only relates to 'practical' tasks. What Naughton means by practical is uncertain, but it implies that some tasks are unpractical and by inference are therefore not technological. The notion of practical, however, carries baggage of utilitarianism, applicability and usefulness with it. This once again places technology in the context of the technical and alienates it from the exoteric.

The above argument is reinforced by Black and Harrison (1994:14) who suggest that there has been an over-emphasis on the practical 'capability' of technology which has merely reinforced the stereotypical attitude of viewing technology as a mechanistic activity. The key element in the understanding of technology, in their view, is the interaction between "the processes of innovative activity and the resources being called upon... it is a continuous engagement and negotiation between ideas and facts, guesswork and logic, judgments and concepts, determination and skill" (Black and Harrison (1994:16). They draw the analogy that setting lyrics to music, for example, also calls for "imagination and intuitive flair" (Black and Harrison 1994:15). Postman (1993), when analysing the impact of computer technology on American education, provocatively suggests that instead of focusing on the efficiency and the capacity of the computer as a teaching tool, consideration should rather be levied at how it has altered the conception of learning and 'undermined' the old idea of school, suggesting that there is more to technology than the mere mechanical product.

Eggleston (1996) concurs with Black and Harrison (1994) and is also of the opinion that the 'technicist' approach to technology should be transformed into a broader socially interactive concept. He warns, however, of the danger of turning technology into a subject where "realisation is only the making of drawings and models" (Eggleston, 1996:27). He postulates that if taught properly, Technology Education will succeed in breaking down the social barriers between those who *do* technology and those who *use*

technology. A further divisive cause of unequal social structure is an oft-perceived incompatible agenda between those whose role is largely 'cerebral' (the professional technologist) and those whose role is largely 'manual' (the technician). The shift to social considerations is significant, and in my view will ultimately affect the way that technology is understood and handled at school. The essentially political and neo-marxist consideration of bringing together the professional technologist and the technician and the synthesizing of those who do technology and those who use technology is underpinned by the notion that technologies need to be considered within a social and environmental context. Eggleston (1996) therefore argues that there needs to be a very close relationship between 'design' and 'technology'. He views the 'design' process, with its detailed preliminary identification and understanding of a problem and the conceiving of various solutions, to include social considerations such as the appropriate diagnosis of needs and potential impact. It is interesting to note here that the subject Technology Education is referred to as *Design and Technology* in Great Britain, presumably to reinforce the notion that design and technology are inseparably linked.

The users or consumers of technology form the core subject of Postman's (1993) work which warns against the tyranny of machines. He suggests that society has been transformed from one which **uses** technology (a tool-using culture) to one which is **shaped** by it (a technocracy). With his often popularistic tendencies he unfortunately over-generalizes these concepts by further suggesting that another term for tool-using culture is "third-world country". One can only assume that Postman has fallen prey to the stereotypical notion that "third-world" countries consist only of tool users and do not contribute to the 'tool-making' market of the world economy. Toffler (1970:25) who also warns against a technocratic society points to technology as being one of the most powerful "engines of change". This change which is accelerating at an alarming rate, he suggests, is constantly fuelled by new knowledge and innovation and is threatening the very existence of human kind. The great paradox and contradiction which faces society is that technology makes more technology possible and, to avert what Toffler calls

"future shock", the maintenance of this reinforcing cycle is precisely the challenge that faces all humankind.

To illustrate the exponential growth rate of this change, Toffler (1970:15) divides the past 50 000 years of human existence into 800 lifetimes (each about 62 years old). Of these 800, "fully 650 were spent in caves" . One of the technological benchmarks and milestones in history is the development of the printing press which transformed an essentially oral culture into a literal culture. And this transformation only occurred within the last 6 lifetimes! Toffler (1970) makes the observation that only in this lifetime (the 800th) did the majority of all material goods which we use in daily life develop. It is this lifetime which Postman (1993) marks as the "technocratic" era - the one where [hu]man's relationship to resources has "reversed itself" (Toffler, 1970).

Kimbell *et al.* (1996) present an interpretation of technology based on an outlook concerned with human rather than technical/mechanistic matters. Technology, they suggest, is "essentially about satisfying human desires" (p19). The development and growth of civilizations and communities are based on how effectively these communities are able to modify the environment to suit their needs and desires. Technology provides the means and the tools to facilitate this development, often to the detriment of the environment and the community. Kimbell *et al.* make the interesting observation that technology is based upon "dissatisfaction"; humans are constantly driven to seek to "improve their lot" (p18). This constant striving to improve and develop can be interpreted in many ways. On one hand there is the desire based on 'genuine' needs such as the need to upgrade housing facilities in squatter areas, and on the other hand the desire based on less tangible needs such as the exploration of Mars. Both enterprises, the upgrading of squatter camps and the Mars space programme, rely extensively on technology, yet the outcomes to satisfy these needs are clearly different. Although extreme in nature, they are not mutually exclusive as both needs result from human desires. Postman (1993:71), however, would see the latter example as a manifestation of what he terms a "technopoly" - a self-justifying, self-perpetuating system where

technology is uncritically granted sovereignty over social institutions. A characteristic of a technopoly is the conviction that technical progress is humanity's supreme achievement.

Kimbell *et al.* (1996:18) maintain that the overarching reason for technology is to "create purposeful change ... something did not exist before, but now - as a result of human design and development - it does exist". The key concept here is "purposeful change". To what extent is the exploration of Mars more purposeful than upgrading housing facilities in a squatter camp, and vice versa? Short of over-simplifying the dilemma there is no clear answer to this question. Purposeful change must be seen within the context of the situation. If the agenda points towards a 'technopological' situation then clearly the extent of the technological change is questionable.

3.3 TECHNOLOGY AND SCIENCE

No discussion which unpacks the complex issues surrounding an understanding of technology is complete without reference to science. The relationship between science and technology is fundamental to the philosophical understanding of Technology Education and it "fundamentally affects the ways we choose to teach the subject in the classroom" (Davies, 1997:101).

For many people science and technology are indistinguishable and indeed "scientific and Technology classroom activities may be difficult to distinguish" (West, 1991:56). Yet, for others, science and technology need to be differentiated.

De Vries (1996) notes that, in his opinion, the 'technology as applied science' paradigm currently informs much of the global education policies. The notion that technology is applied Science is very popular and widespread and is found time and again in literature. Connected with this theme. De Vries (1996) notes that there is a general assumption

which asserts a more or less straightforward path **from** scientific knowledge **to** the technological product. This is challenged more and more, with researchers and practitioners citing various examples that illustrate quite the opposite. De Vries (1996) refers to the classic example of the steam engine which was developed well before conclusive scientific understanding of the underlying physical concepts was established. Heptinstall (1998:4) cites the example of Stephenson's rocket which 'rocketed' before any substantial understanding of thermodynamics and pressure. He further cites the work of Waks (1995) to suggets a compartmentalization of science and technology:

SCIENCE	TECHNOLOGY
Aims at exploring natural phenomena and to reach an ever-increasing understanding of such phenomena.	Aims at designing and developing new products which help to solve new or existing problems.
Is curiosity driven.	Is needs and wants driven.
The internal criteria are probabilistic truth, accuracy and the ideal.	The criteria are solutions which are effective, efficient and within acceptable tolerances and standards.
Looks for universal knowledge.	Looks for optimal solutions for specific situations.
Works with idealized, simplified pictures of the world.	Works in the real, complex, human world.

Source: Waks, 1995

The above comparison, in my view, is highly simplistic and offers very little insight into how technology and science are related. It relies too heavily on generalizations which are not necessarily true. To maintain that science is curiosity driven as opposed to needs driven, for example, suggests that all scientific innovation and progress merely serves society's ego and curiosity as opposed to its needs. Many scientists would contest this notion vigorously and in his response to Heptinstall's paper on *People's Perception of Technology*, Linder (1998) indeed suggests that categorizing technology and science as independent compartments is an oversimplification of the situation. He quotes the example of a research programme at his university which attempts to develop more efficient and cost effective solar cells. Heptinstall would lead us to believe that this is

technology, yet the researchers involved, according to Linder (1998), think that they are involved in scientific research!

In my view it is the interconnective, intertwining and reflexive nature of science and technology which needs to be stressed and not the demarcation of where science and technology begin or end. Linder (1998) further notes that Heptinstall's delineation, which suggests that only technology operates within a social context and that science is asocial and neutral, is an illusion which only reinforces the stereotypical notion that science is a value-free and objective activity.

West (1991) also suggests that it is wise to differentiate science and technology as these differences, in his opinion, are significant for the establishment of a curriculum. He conjectures that "*Science* is enquiry-led and concerned with the pursuit of better investigative strategies, more reliable knowledge about the physical and biological world", whereas "Technology is led by the desire to meet human needs and opportunities" (West, 1991:56).

The **'demarcationist perspective'** is analysed extensively by Davies (1997) and he cites the arguments of Wolpert (1992) who argues that "science is to produce *tested knowledge,* whereas technology results in the production of *usable objects.*" Implicit in Wolpert's (1992) argument once again is the notion that science is an objective, value-neutral activity which, according to Davies (1997), describes external reality within an independent and sterile framework. Herschbach (1995) also advocates a demarcated approach by distinguishing between science and technology primarily in its *purpose* and *intent.* The purpose of science, in his opinion, is to understand phenomena, whereas the purpose of technology is "praxiological" (Herschbach, 1995:34). This means that technology is utilitarian in the sense that it is concerned with efficient control/manipulation of the physical world. The above notion, I believe, needs to be questioned, however, as scientific knowledge is becoming less certain and more contested (Davies, 1997).

In this debate, the cultural and social contexts are becoming more and more significant and the position of science *vis-à-vis* the society is increasingly affecting modern 'scientific' endeavours. This implies some connection between scientific knowledge and technological implications and suggests a perception that technology is **'applied science'** (Davies, 1997). This view is supported by the plethora of 'inventions' and developments of artifacts which have emerged as a result of 'scientific' discoveries and research. Davies (1997) quotes the popular example of the development of nuclear power as a result of Einstein's work on nuclear fission. Within this view there is an implied hierarchy, with science taking precedence over technology. This can lead to the commonly held view in educational debate, of teaching the scientific concepts *first* and then applying them in a technological context. Davies (1997) notes that because science has a longer history and is widely regarded as more academic and intellectual than technology, this state of affairs has been allowed to persist and indeed has guided policy decisions regarding the oft-perceived undervalued place of Technology Education. Feiblman cited in Herschbach (1995) reinforces the applied science dogma by strongly suggesting that a continuum exists in which he distinguishes between pure science which uses experimental methods in order to formulate theoretical constructs, applied science, which focuses on applications of purposeful activity, and technology which puts applied scientific knowledge to work. This 'simplistic' view does not match with reality, however, as history is "littered with technological advances which took little or no account of science" (Davies, 1997:101).

Further, Davies (1997) suggests that cognitively, learners tend to transfer concepts from the practical to the theoretical rather than the reverse as implied by the applied-science model. The resultant **'materialist view'** which asserts that experience with tools, materials and instruments is necessary for conceptual development, led to the view that historically and ontologically technology precedes science. Citing Wolpert's (1992) argument, Davies (1997:107), indicates that although technology did not need science for most of its history, "science by contrast has always been heavily dependent on the

available technology, both for ideas and apparatus". An example cited is the use of the telescope by Galileo to develop a model of the universe. This view ignores the fact that much of contemporary technological innovation is highly scientific in nature.

Arguments for a clean, well defined division between technology and science are clearly not very helpful. A separatist attitude can easily lead to an oversimplification of the debate and contribute minimally to the understanding of the role played by science and technology in the development of a Technology Education model. By contrast, an '**interactionist perspective**' will strengthen the position that science and technology are intertwined, argues Davies (1997). This view is reinforced by the observation that the roles of professionals in both fields are often intertwined. An interactionist perspective can underpin an interdisciplinary approach to Technology Education and ensure a healthy interaction between the two. One of the criticisms of an interactionist view is that it may 'soften' and compromise too much the credibility of the 'scientific' world on the one hand and the pragmatic field of engineering on the other. An interactionist view may well be construed as a 'fence-sitting' option.

This thesis views the close interaction between goals, people, environment and knowledge as fundamental to the understanding of technology. It is positioned within the interactionist perspective of science and technology and concurs with the suggestion that there is more to technology than the mere mechanical product.

Although the fundamental principles of Technology Education will be analysed in the next chapter, it is useful at this point to consider the position of Technology Education in the technology-science debate. Figure 3.1 illustrates Davies' (1997) understanding of Technology Education within this debate. The model suggests that individual perceptions of Technology Education will be determined by one's position and view in relation to the technology-science continuum.

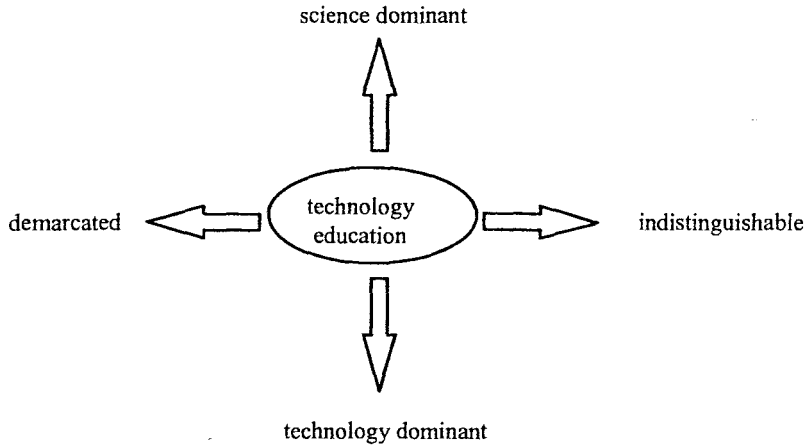

Figure 3.1 An interactionist framework

In his argument against an interactionist approach, however, Harrison (1994) warns of the incongruencies between reality and idealistic intellectualization. Despite the guidance provided by the national curriculum in Britain which points out that science and technology are intimately linked and that their teaching needs to be properly coordinated, Harrison (1994:242) suggests that this is impractical as "Science and Technology Education were separately defined". Schools as a rule do not offer an integrated programme and there is often "reluctance to...cross-department moves" (Harrison 1994: 242). The 'traditional' school system is still one of disjointed modules that socializes students into compartmentalized subjects, and until more integration of learning areas occurs, Technology Education will be in danger of merely occupying a another, discrete pigeonhole.

Kuiper (1998), quite rightly in my view, warns against the simplified view that technology - and Technology Education - is merely about identifying problems and then looking for optimal solutions, albeit within a social context. It is a complex concept which cannot stand on its own due to the sophisticated linkages with other enterprises, disciplines and activities. It appears to me that the issue of demarcating and isolating technology and Technology Education as an enterprise on its own, is merely a strategic attempt by some educationists to justify its inclusion in the curriculum. In my opinion

this is unnecessary as technology can be viewed as much an art as a science and it is the extent to which they inform each other which should form the basis of any conceptualization of a definition.

As opposed to some of the polarized perspectives mentioned above, Davies (1997) suggests that the synonymous interpretation of science and technology has lead to a rationale for education which has a strong 'industrial and vocational' flavour. He postulates that this outcome is a result of the media using the term 'science and technology' interchangeably and many politicians interpreting the engine for economic growth to be driven by 'science and technology'. The 'relegation' of technology-related subjects like woodwork, metalwork and needlework to the ranks of vocational and 'practical' subjects is all too familiar in the South African context, where these activities have also been seen as escape routes for the 'academic less able students'.

3.4 CONCLUSION

Many writers warn against a naive approach to technology, alluded to earlier in this chapter, and authors such as Postman (1996) and Toffler (1970) have eloquently articulated the dangers of being seduced by the obvious advantages of technology. Eggleston (1993) warns against a too 'positivistic' attitude towards technology, in the sense of uncritically and naively ignoring the problematics associated with it.

The rationale upon which Technology Education is based in South Africa rests on the definition which says that "technology is the use of knowledge, skills and resources to meet human needs and wants, recognise and solve problems by investigating, designing, developing and evaluating products, processes and systems" (RSA, 1997b:83). This interpretation concurs with Kimbell *et al.*(1996) in terms of its emphasis on the human factor. It implies that technology is a human activity concerned with the manipulation

and reshaping of resources in order to satisfy a predetermined idea or vision that will have an impact on our lives.

CHAPTER FOUR

TECHNOLOGY EDUCATION

4.1 INTRODUCTION

This chapter will offer an analysis of Technology Education, including the broad interactionist understanding of technology developed in chapter 3. In an attempt to reinforce and emphasize the interactionist perspective, I will focus on two models of Technology Education, one developed in Britain and another in South Africa. Further, the analyses of these models will inform the development of an alternative interactionist model (see chapter 13) which attempts to incorporate the central themes of Technology Education with issues concerning the implementation of Technology Education in a rural environment.

4.2 TOWARDS AN INTERACTIONIST UNDERSTANDING

4.2.1 Technology Education as a response to market forces

There are many common identifiable trends in the world of Technology Education, yet there are also many diversities. In the western world much of the present trends in the development of Technology Education emerged as a result of strong calls from the industrial sector for an education that is more accessible and more in touch with the demands of the world of work. This is not a novel concept, as throughout history, education has often been perceived as a respondent to market forces, and as a terrain for feeding 'educated' and productive individuals into the market place. The United States' Secretary of Labour, for example, initiated the Secretary's Commission on Achieving Necessary Skills (SCANS) to investigate the core and essential "competencies" that are

required of people who are about to enter the work place (Fitzgerald, 1993). The SCANS report identified the following criteria:

1. A solid foundation in:
   a) the basic literacy and computational skills;
   b) the thinking skills necessary to put knowledge to work, and in the personal qualities that make workers dedicated and trustworthy.

2. The ability to:
   a) manage resources;
   b) work amicably and productively with others;
   c) master complex systems;
   d) work with a variety of technologies.

(Fitzgerald, 1993)

Woodburn (1994) pointed out that the SCANS criteria were not comprehensive enough and suggested that the following critical skills needed to be added:

1. Communication skills
2. Analytical skills
3. Production skills
4. Teamwork skills
5. Time management skills

The above competencies, in my view, are seen primarily through the lenses of the work place and focus predominantly on success, production, profit and achievement in the market place. A curriculum for Technology Education based solely on the above criteria can result in a very narrow approach which ignores crucial issues such as environmental factors and socio-cultural dimensions. The explicit exclusion of any environmental

considerations in the SCANS criteria suggests a very narrow understanding of education as a whole and of Technology Education in particular. Although the demands and the requirements of the work place need to be considered in the conceptualization of any curriculum, the needs of the society for which the curriculum is intended must be reflected. This, in my view, applies particularly to a rural community whose needs centre more around self-sufficiency and poverty than production and profit. It is therefore important to recognize a diversity of needs when considering a framework for Technology Education. Williams' (1996) implied stance against a general or global premise to Technology Education suggests that each country (community) will (should) identify different and unique needs. The type of Technology Education, therefore, needs to appropriately reflect the needs and desires of that country (community) and must build upon the unique history of technical (and general) education, resulting in a unique Technology Education programme (Williams, 1996). Many countries, for example, will have unique experiences in inherent 'indigenous' cultures of technology development, and usage of technologies, to draw from. This needs to be an integral factor in the conceptualization of an appropriate Technology Education model, particularly when considering rural schools which have a unique set of problems and factors to consider.

4.2.2 Ranges of Technology Education

To envisage a model of Technology Education, it is useful to consider different approaches to Technology Education presently used in various parts of the world. Banks (1996) cites De Vries of the Eindhoven University of Technology who succinctly articulated them as follows:

(The countries that dominate a specific approach are given in brackets)

- A *craft-oriented approach.* An approach which is dominated by teaching the handling of tools and materials by making predesigned pieces of work. (Western Europe).

- A *production-oriented approach.* Here the emphasis is on skills for modern mass production, control and organization. (Eastern Europe).

- A *'high- tech' approach.* This approach emphasizes Information Technology and looks ahead into the future. (France, Germany, USA).

- An *applied-science approach.* The context of science learning dominates this approach. (Denmark, Switzerland).

- A *technological-concepts approach.* This approach is characterized by a strong theoretical underpinning of technological concepts. (Australia).

- A *design approach.* Here the designing process is the core element. (England, Wales).

- A *problem-solving approach.* This approach concentrates on addressing the social needs and takes a cross-disciplinary line. (Scotland, USA).

- A *key competence approach.* Competencies such as cooperation, communication, innovation and creativity are the central tendencies in this approach. (England, Wales, USA).

A s*cience, technology and society approach.* This approach concentrates on the relationships between science, technology and the society. (England).

In chapter 5 a more detailed global analysis will be presented by focusing on individual perspectives of specific countries, namely North America, Britain, Australia, East Asia, Nigeria, Malawi, Cameroon, Botswana and Lesotho, and although some links will be made to the classification above, it is important that the framework above be read in conjunction with chapter Four. Reference to the South African situation will be made in chapter Five.

The questions that arise out of De Vries' list quoted in Banks (1996) are:

> *Does a specific approach determine a particular Technology Education model, or vice versa does a particular Technology Education model determine a specific approach?*

In order to explore possible answers to these questions I will consider two models of Technology Education:

a) The Eisenberg model developed by Eisenberg of the ORT-STEP Institute, and
b) The DATA model for Design and Technology developed by the Design and Technology Association in Britain.

The reason for choosing these two models are:

- Eisenberg's model has a South African context.
- The DATA model is non-South African and is based on many years of Technology Education experience.
- They both point towards an interactionist's perspective.

4.2.3 Eisenberg's model

Eisenberg's (1996) premise is that an effective Technology Education programme should be based on a balanced foundation in terms of *content, methodology* and *context.* (Figure 4.1 refers.)

The content

This integrates the knowledge, skills and attitudes that underpin a Technology Education syllabus. The knowledge and skills components relate to the fundamental concepts, principles, systems, controls, structures, mechanisms, hand skills and tool skills required to function within a technological framework. Other less explicit skills which include competencies in problem-solving, decision-making, communication, creative and innovative thinking and management also form an integral part of the content aspect of a Technology Education model. Further, Eisenberg (1996) argues strongly for a model which recognizes that Technology Education is seen as a 'social practice'. This requires a strong emphasis on attitudes and values and an understanding of social constructivism which will be examined in chapter 8. Eisenberg (1996:37) is of the opinion that Technology Education "comprises the thought processes of the brain, use of the hands for making and includes the attitudes and values of the heart".

The methodology

Here the focus is on process as opposed to product. The technological process is based on the popular, often cliched, concept of *design, make* and *evaluate.* Design incorporates aspects of need identification, articulation of the brief and understanding, investigation, research, developing and generating possible ideas and solutions, and the selection of the optimal solution. Making refers to the realization stage of the process and incorporates such aspects as planning, use of materials and tools, manufacture and finishing.

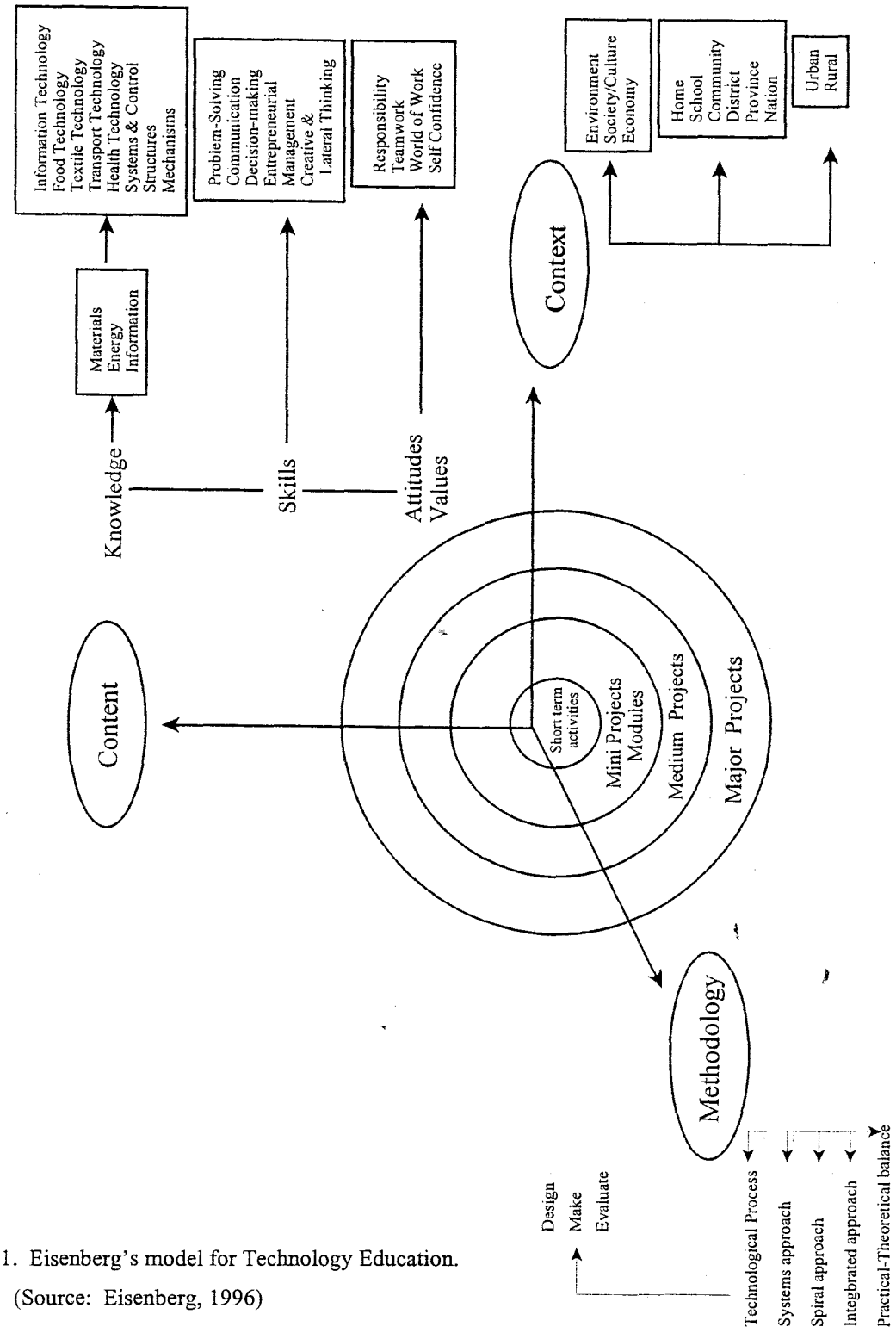

Figure 4.1. Eisenberg's model for Technology Education.

(Source: Eisenberg, 1996)

Evaluating is an ongoing process which includes assessment of product, testing of product, marketing of product, improvement of product, and reflection of process.

The context

The model sees it as critical that Technology Education is contextualized appropriately by placing all activities in an accessible and meaningful context. Eisenberg (1996) maintains that in all technology projects, for example, implications in terms of environmental, social, political and economic issues are considered. The context may be 'technology itself', in which case aspects of design and realization become the appropriate context.

The three components - content, methodology and context - are best facilitated through tasks, activities and projects, according to Eisenberg's model. This reinforces the idea that one of the essentials of Technology Education is application and realisation. The juxtaposition of content, context and methodology with practical application (see figure 4.1) is central to Eisenberg's model. Eisenberg (1996) identifies a hierarchy of tasks which he simply refers to as short term activities, mini projects, medium projects and major projects. These are represented as ever increasing concentric circles in figure 4.1. This order of tasks has become very popular and is consistent with the British influence which refers to the short tasks (the short term activities) as *Case study tasks.* They are short tasks which aim to link the learner with a particular technological experience. The mini and medium Projects, referred to as *Resource tasks,* are focused activities which will reinforce a concept, strategy or methodology; and the *Capability tasks* correspond with Eisenberg's 'major project' and consist of a more open-ended activity that will usually include all the elements of the technological process referred to previously (Ter-Morshuizen *et al.* 1997). A Capability task will normally culminate in a product accompanied by a comprehensive portfolio and/or 'evidence trail' which articulates, through various mediums, the technological process. The portfolio will typically include

such aspects as the entire design process from the preliminary brainstorming to the final and detailed diagrammatic stage. It will include appropriate aspects of the research done and a detailed narrative of the making and evaluating process. It will also include a reflexive and critical account of the entire process.

4.2.4 The DATA model

As a result of a recent review of the National Curriculum in Britain by the Qualifications and Curriculum Authority (QCA) together with the Design and Technology Association (DATA), which included wide range consultations with the major stakeholders such as professional institutions, school, teachers, lecturers and trainee teachers (Breckon, 1998:102), a "coherent" model for Design and Technology was developed. This model is represented in figure 4.2.

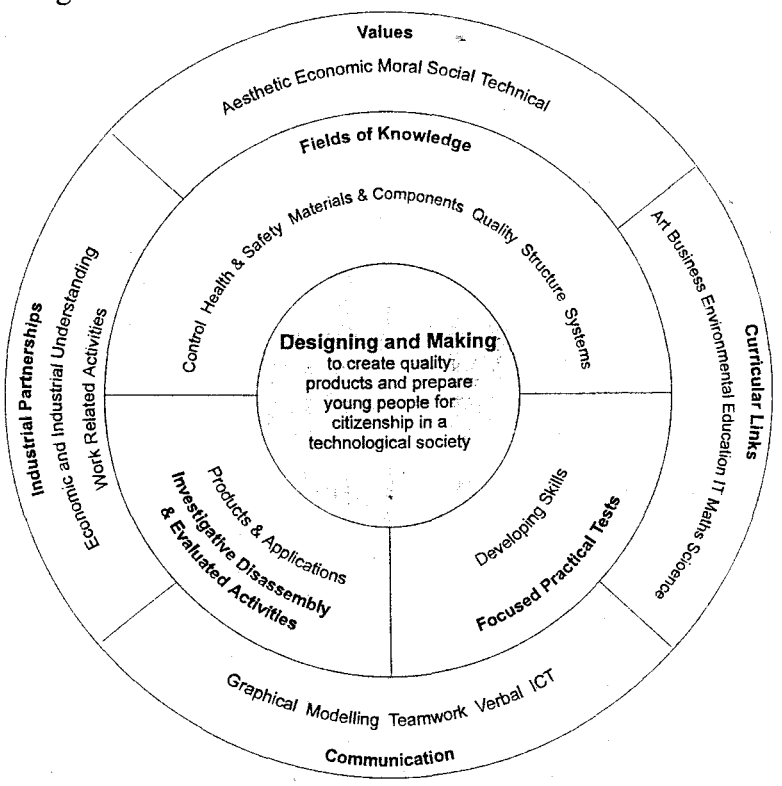

Figure 4.2 DATA's model for Design and Technology
(Source: Breckon, 1998:101)

The heart of the model lies in the 'design and making' of quality products which prepares learners for "citizenship in a technological society" (Breckon, 1998:102). This is represented by the innermost circle of the model. The symbolic concentric circles facilitate a sense of interconnectivity of all the components and suggest the cyclical (as opposed to linear) nature of Technology Education. The supportive role of focused practical tasks and investigative, disassembly and evaluative activities combined with the fields of knowledge necessary for concept development and understanding are represented in the second circle symbolizing the overarching relationship these have to the making of products. These two circles form the core of the realization processes but associated with these are important linkages to communication and curricular considerations, to value and attitude dimensions, and to industrial partnerships.

Breckon (1998) makes the observation that the focus in the past has been on **hand-crafted methods** but that this dominance should be balanced with the use of appropriate **new** processes and equipment which "can liberate the process of manufacturing components and also raise the quality of the outcomes". The shift to a more liberated process away from a mere manufacture focus to one with a more inclusive and integrated agenda is, I feel, not reflected in the model and needs to be made more explicit. In current debate it is often assumed that simply referring to a 'technological society' implies new processes and a liberation from the manufacturing one. This is naive and too 'positivistic' in the sense that referring to a technological society, or a technopoly as suggested by Postman (1996), does not necessarily point to a liberation of the manufacture process, but simply reinforces the notion of technical progress and ultimate self-destruction.

4.3 CONCLUSION

To come back to the questions in 4.2.2, it is interesting to note that Eisenberg's model, which was to a large extent conceived in and informed by the South African educational

context with minimal Technology Education experience, was developed and articulated to a large extent in theory. The DATA model, on the other hand, emerged as a direct result of an evaluative process which focused on Technology Education in practice. The former can therefore be interpreted as a situation in which a model for Technology Education, developed in theory, is attempting to inform the practice. The latter situation, however, is an example of the practice informing the model, that is, the model reflects the practice.

Both models have common elements and are comparable in their main features and objectives. Both reinforce the practical focus of Technology Education and emphasize the core business of 'making activities' which take the form of projects, tasks and activities. Eisenberg's interpretation, however, is more up front about the interrelationships of content, context and methodology, and recognizes the diverse dimensions that make up these features. The distinguishing aspect of DATA's model, on the other hand, is its explicitness in recognizing quality products.

In the South African situation, the DATA model falls short in a number of areas and these, together with aspects of Eisenberg's model and the lessons learnt from IRTEP and its associated research, will be considered in the development of the interactionist model in chapter 13.

CHAPTER FIVE

A GLOBAL OVERVIEW OF TECHNOLOGY EDUCATION

5.1 INTRODUCTION

It is important to distinguish between **'technical'** education and **'technology'** education at this point, as this distinction will inform the description that follows and also clarify the frame of reference for this thesis.

'Technical' education can generally be viewed as being firmly embedded in vocational and skills-based training. It is rooted in institutions whose objective is to train specialized skills for the place of work. **'Technology'** education, however, developed in an attempt to establish a non-vocational technology education as an "independent subject", according to Hansen (1997:49). It aims at the general education level and seeks to facilitate a far broader technological awareness and understanding (as articulated in the previous two chapters) and in this way afford the learners an opportunity to be more participative and effective members of a community. The focus of Technology Education is on general cognitive abilities as opposed to specialized technical skills or "tacit knowledge" (Hansen, 1997) about a specific industry and its associated industrial and technical activities.

It is useful to trace the development of Technology Education in various parts of the world in order to get an overview of the origins of some of the influences on its development in South Africa. To remain within the relatively narrow scope of this thesis, I will initially only provide thumbnail sketches and descriptions of developments of Technology Education in the western world and look at how Britain has pioneered the inclusion of Technology Education in its curriculum. I will then focus on North America and Australia in an attempt to show how other needs and 'western' contexts have reacted and interpreted a more cognitive stance to technology. The East Asian situation will then

be highlighted to provide a perspective from an 'non-western' understanding. Before analysing the South African context I will look at other countries on the African continent and describe developments in Nigeria, Malawi, Cameroon, Botswana and Lesotho.

5.2 TECHNOLOGY EDUCATION IN NORTH AMERICA

When looking at the American situation, Means and Olson (1994:16) observe that "technology is a valuable tool ... it has the power to support students and teachers in obtaining, organizing, manipulating and displaying information." This concurs with my understanding that the American education system has traditionally been firmly entrenched in viewing technology as a utilitarian concept, limited to hardware and software usage and applications. Tools, in the context mentioned above, mainly refers to computers, calculators and other "high-tech electronic tools" (Peck and Dorricroft, 1994:11). The popular definition of technology in the American context includes two components: a *product* - the tool that embodies technology, which is the computer; and a *process* - the information base of the technology (Peck and Dorricroft, 1994). Technology Education has had a strong and focused bias towards an industrial curriculum culminating in courses that are to a large extent "vocational in nature, and as such, provide specific work-related skills and competencies for entry into the labour market" (Sharpe, 1996:24).

This is largely consistent with the South African situation (as articulated in 6.2) which not only involved the above-mentioned vocational agenda but was also imbedded in political and ideological issues.

As for the ranges of Technology Education (presented in 4.2.2), the American approach largely encompasses a 'high-tech' approach emphasizing information technology and as Banks (1996) suggests, it "looks ahead into the future". It also incorporates a 'key-competence' approach as articulated in 4.2.1

As there are no federal guidelines in the United States regarding Technology Education, various states have developed their own interpretations and Sharpe (1996) suggests that there has been a move away from the industrial arts bias towards a broader Technology Education emphasis. In a number of states however, this has resulted in a mere re-labelling exercise but in others there have been real structural changes. A technology model which is enjoying widespread attention is one which comprises communications technology, physical (production and transportation) technology, and bio-related technology to be taught through an "input-process-output model that addresses human needs and wants through the identification of problems and opportunities" (Sharpe, 1996:25). This call for a more comprehensive approach is echoed in the rationale of the 'Technology for All Americans Project' which says that "Technology is human innovation in action. This involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities" (Dugger, 1997:126). De Vries (1996) sees this shift, which implicitly incorporates a social dimension to technology and a sense of accessibility, in the American understanding, as a significant move away from a 'science for all' attitude.

These recent developments, in realizing a broader conceptual framework for Technology Education, can largely be attributed to curriculum developments across the Atlantic. Over many decades a model has developed in Britain which seems to be taking a global hold in the evolution of a Technology Education programme which has a solid pedagogy on the one hand, and which addresses the realities of an ever-changing global economy on the other.

5.3 TECHNOLOGY EDUCATION IN BRITAIN

Over a century ago, when Technology Education was formally introduced into the British elementary curriculum for the first time, its focus was entirely on manual skills. The eminent Manchester industrialist, Sir William Mather, when addressing the British Association for the Advancement of Science in 1887, noted that the education in public schools then did not satisfy the wants of the nation (Penfold, 1989). He, of course, referred to the notion that the curriculum was too 'literary' and not 'practical' enough. The Victorian school boards' response to that was, albeit with varying degree of enthusiasm (Penfold, 1989), an introduction of 'workshop' subjects such as woodwork, metalwork and industrial design (art) to the general curriculum. This 'innovation' naturally only applied to boys and soon gave rise to a very divisive system. The 'workshop' subjects catered mostly for the academically less able and this only served to reinforce social division and the division of labour.

Whether manual instruction served to resuscitate the ailing British Industry of 100 years ago is debatable, but it is significant that current demands on education reflect very similar sentiments. The 'workshop' subjects developed into insular activities and according to Penfold (1989), the Crowther Report of 1959 addressed the issue of rehabilitating the word 'practical' and argued the case for more equity and a more comprehensive attitude if the country were to benefit fully from the capabilities of *all* its learners. The thrust of the reform as a result of the Crowther Report and Project Technology of 1966 was a broader view of Technology Education and the acceptance that it should "help *all* children to come to grips with technology as a major influence in their lives." (Penfold, 1989:151). Many in the science establishment however opposed this move and criticized the reforms as being too 'craft' based and not 'science' based. The situation was further exacerbated by the fact that the vast majority of handicrafts departments in fact did not embrace the reforms, and as a result nothing changed. Penfold (1989) suggests that the 'handicraft empire' only started to decline when the

strong design-education movement of the 1960s and 1970s made in-roads into the thinking of the bureaucrats of the time. He contends that the effective lobbying of this movement coupled with the newly formed craft reform movement spearheaded by John Eggleston of Keele University finally succeeded in transforming the stale 'handicraft' status quo into a dynamic problem-solving-based movement. Penfold (1989:153) describes the newly developed situation as one where pupils are "encouraged to employ analytical and synthetical criteria which moved from need identification to optimized solutions and their evaluations".

A further boost to the Craft, Design and Technology Education movement of the early seventies was the 1975 Sex Discrimination Act which finally allowed for admission of girls into a previously all-male domain. This had the desired effect of making technology accessible to a far wider band of the population and also sowed the first seeds for a multidimensional and cross-curricular approach to Technology Education. Traditionally all-male domains such as woodwork and metalwork had no choice but to integrate with traditionally all-female domains such as needlework and fabric technology. Technology Education began to reflect and address the needs and the demands of society. Penfold (1989) further observes that the involvement of the primary schools in the eighties led to a further maturation of Technology Education in the general education band. By virtue of the inter-disciplinary methodologies of primary schools, it reinforced the concept of Technology Education stretching across the curriculum. The transition from 'craft' to 'technology' was firmly entrenched when Technology Education became increasingly "enmeshed" (Penfold, 1989:160) in education - industry links and the perception that Technology Education addressed the needs and to some extent reflected the place of work, boosted the credibility of this learning area.

Technology Education is now firmly placed in the British national curriculum under the name *Design and Technology,* contributing to the following nine areas of learning: aesthetic and creative; human and social; linguistic and literacy; mathematical; moral; physical; scientific; spiritual; and technological (Penfold, 1989). This approach, which

goes across discipline boundaries, is congruent with the 'problem-solving approach' as articulated in 4.2.2.

In my view, Penfold (1989) is an interactionist who stresses the interdisciplinary nature of technology and views the social interconnectivity of the subject as crucial and fundamental. He however naively paints a picture which reflects a consistent and unproblematic development and growth of Technology Education. He glibly maintains that Technology Education has simply adapted to change and modified its objectives as the need arose. Other researchers and writers will contest this notion and indeed Smithers and Robinson (1994:37) state that "Technology in the national curriculum is a mess." Their main criticism and disgust revolves around their assertion that in its objectives and content, Technology Education is pitched at such a high level of generality that it lacks shape and substance. They maintain that Technology Education in its present form "can include almost anything" and further assert Technology Education lacks identity and it is not " delimited, so we do not know what counts as technology" (Smithers and Robinson, 1994:37). This narrow view, in my opinion, is consistent with a 'technicist' interpretation and indeed the criticism alluded to above has its their origins in the Engineering Council, which naturally has to look after its own needs and those of its constituency. In terms of Technology Education, however, which after all is a cognitive activity, the above view is not very helpful. It merely reinforces the isolation of technology as a practical enterprise, relegated to the 'workshop' that will once again cater mostly for the 'non-academic' student.

In his justification for including a broad Technology Education in the curriculum, however Penfold (1989) notes that not many institutions entertain an interdisciplinary approach - very few departments have in fact liaised across the subject boundaries. He also makes reference to the fact that Technology Education has a very thin philosophical underpinning. Penfold (1989) refers to work done by Dr. Bernard Down from Brunel University who on numerous occasions has attempted to attach some philosophical meaning to Technology Education. At the expense of "preparing children, morally and

politically for understanding and being critically aware of the social issues of technology", Down, quoted in Penfold (1989:163), however also warns of 'over-intellectualizing' Technology Education. In my view, it can become counter-productive to attempt to place Technology Education in a fabricated 'philosophical box' to merely justify its inclusion in a general curriculum.

Although I agree with the need for a suitable philosophical underpinning of Technology Education, there is a danger, in my experience, of the philosophical underpinnings merely reflecting a political order. As Shield (1996) notes, the expectations of the political right, in the concept entrepreneurship for example, will have a different philosophical dimension to that of a marxist. The former may see entrepreneurship in the light of profit and the philosophy will be informed by that understanding, whereas the latter may see entrepreneurship vis-à-vis a practical endeavour to sustain life. Of course it is often very difficult, and indeed sometimes undesirable, to divorce the political agenda from the philosophical intentions and vice versa, but the proponents, policy-makers and developers of Technology Education need to guard against falling prey to passing fashions.

5.4 TECHNOLOGY EDUCATION IN AUSTRALIA

The observed tendencies in Technology Education in Britain are echoed in many ways in the Australian model. The objective concept of technology is being replaced by a "broader understanding of technology as a process that happens within a social context" (Williams, 1993). Historically, however, this move has also been a result of political and economic pressure on the education system to address perceived needs of economic decline and unemployment. According to Williams (1993), the Australian education system embraced the Technology Education movement not only as a result of political demands, but also in recognition that Technology Education is vital for all students. Consequently, in many areas of Australia, Technology Education is now a compulsory

subject in high schools. The main organizing principles underlying Technology Education are based on:

- an academic rationale;
- a utilitarian rationale;
- intellectual processes;
- personal relevance;
- social reconstruction. (Williams, 1993)

The rationale above, in my view, is appropriately reflected in the Technology Education framework adopted by Victoria state (see figure 5.1) which explicitly refers to the cognitive, social and technical aspects of the subject. It suggests an integrative approach which emphasizes process.

Williams (1993) points out that in reality, however, large discrepancies occur in schools across Australia in terms of embracing the 'new' Technology Education philosophy. He summarizes the status quo by saying that some schools learn *about* technology, others learn *with* technology, and other learn *through* technology - but a few do all three (Williams, 1993:47).

WHAT IS TECHNOLOGY STUDIES ?

An area of the curriculum in which all students learn about:

materials	(what it is made of)
structures and mechanisms	(putting it together and making it work)
energy	(what makes it go)
systems	(the whole, not just the parts)

by being involved in a process of

designing it
making it, building it, doing it
testing it

which gives them:

a body of knowledge and a repertoire of skills;
personal enrichment and self esteem;
an enhanced ability to cope in society;
an orientation to the future and to change.

(The Technology Studies Framework, Ministry of Education - Victoria, Australia, 1988)

Figure 5.1 Features of Technology Education in Victoria, Australia

As South Africa, through the National Qualification Framework (see 6.3) is coming to terms with incorporating Technology Education in its curriculum, the lesson to be learnt from the Australian approach is to ensure a truly integrative approach. With its 'technical education' history and tradition, the danger in South Africa is for Technology Education to remain in the wood-workshops and within the realms of technical institutions. In the rural schools which historically have been marginalized and impoverished (as indicated in chapter 7), the challenge will be more one of overcoming financial and infrastuctural constraints.

5.5 TECHNOLOGY EDUCATION IN EAST ASIA

It is interesting to cast our attention briefly on East Asia as this region is often quoted as a role model for technological development in many different contexts. At the recently held 'First International Conference on Technology Education in Schools around Asian Countries' in Japan in September 1996, it became apparent that there is confusion in the use of terminology among *vocational education, technical education* and *technology education* (Ku, 1996). This confusion is consistent with early (and current) debates elsewhere, as was illustrated in the case of Britain and in more recent developments in the US. Although people use these terms loosely and interchangeably, they mean different things, as discussed above. The East Asian understanding seems to be confined to an interpretation that equates Technology Education with the developments of technical skills, knowledge, and attitude in the production and service industries to "prepare students for living and working in a technological world" (Ku, 1996:15). Ku, erroneously I believe, suggests further that this description is congruent with the definition of Technology Education in the US. Ku's view, in my opinion, is an over-generalization, as there have been initiatives in embarking on a reform programme which addresses the need to reconceptualize the technicist and vocational emphasis described above.

Man/woman-power needs and economic growth seem to have been the main reasons for the strong emphasis on industrial arts, homemaking and technical subjects in ***Japan*** since World War II. Ku (1996) suggests that the core elements of Technology Education revolve around coursework in metals, machine shop, electricity, carpentry, appliance repair and agriculture. There has, however, been a trend, for Japanese educators to view the environmental problems and the debate surrounding global issues in this context as part and parcel of Technology Education (Ku, 1996).

Technology Education in ***South Korea*** appears to have followed a similar route to that of Japan. It has been a compulsory subject for general education in secondary schools since 1970 and the content there focuses on technology and industry, energy and transportation, information and communication, manufacturing, construction, and occupational information (Ku, 1996).

In ***Singapore*** the thrust seems to be on *technical* education with a view to improving the pupil's application ability and exploratory and practical experimentation and innovation. Ku (1996) once again draws the analogy with his interpretation of the US definition of Technology Education. He also points out that the 'old' programme is undergoing reformation and that subjects such as woodwork and metalwork are under review.

Since implementing their nine-year compulsory education programme in 1986, ***The People's Republic of China*** have not included a clearly defined Technology Education programme in their curriculum. According to Ku (1996:18), the most comparable programme is the *labor technics lessons.* It is there that the pupils are prepared for "all-around development - using hands and brain". The focus is on the place of work and the worker with an emphasis on preparing the pupils to be productive citizens and useful in a socialist society (Ku, 1996). The skills learnt are rudimentary and equip the pupils for daily life and self-sufficiency. They include weaving, knitting, sewing, cooking, bamboo

work, bicycle repair, graphic arts, house cleaning, furniture repair, ditch digging and so on (Ku quoting Lan, 1996).

It is interesting to note that on the level of enhancing rudimentary skills, the intention of IRTEP (see chapter 10) echoes the Chinese model. It differs greatly though in terms of addressing professional, personal and educational development.

Ku (1996) draws attention to his own view that Technology Education is still in its infancy in Asia and that there is a profound lack of understanding of objectives and curriculum content. There is a lack of awareness amongst the parents and the population as a whole as to the implications of a well balanced Technology Education programme. He cites the example, which in my view epitomises the global attitude of the ignorant populace, where in Korea parents resist that their children are being taught how to use a band saw, because they do not want their children to become carpenters but lawyers and doctors. This resistance, I believe, stems both from ignorance and a perception of inferiority. It points to the traditional perception alluded to by Eggleston (1996) and mentioned in 1.1, that there exist social barriers between those who *do* technology and those who *use* technology. Whereas Technology Education is supposed to empower people with skills, knowledge, values and confidence to take ownership of their own destiny and be agents of change in their society, it is still widely perceived as an area for the academically weak pupil and hence an area for the 'second class citizen'.

In South Africa the perceptions mentioned above are well entrenched and stem, to a large extent from decades of educational policies that were driven by racist ideological and political agendas. In his speech to the Senate in June 1954, the then Prime Minister of South Africa, Dr. Verwoerd, was very explicit on the government's stance regarding the position of Black citizens: "there is no place for him [referring to the black population] in the European community above the level of certain forms of labour" (quoted in Rose and Tunmer, 1975:266). This statement formally endorsed the state's policy for an education for 'second class citizens'. It is no wonder, therefore, that for many, education does not

go beyond the vocational, and indeed is perceived as a vehicle for repression and exploitation.

5.6 TECHNOLOGY EDUCATION IN AFRICA

5.6.1 Nigeria

According to Balogun (1996), the Nigerian understanding of Technology Education is based on improving the living standards of its people in order for them to cope with a situation that is consistent with terrible deprivations - hunger, malnutrition, starvation, and diseases that derive from underdevelopment. It is not surprising therefore that the developments in education in general and Technology Education in particular echo this need by offering a programme which is essentially skills-based. The 'National Policy on Education' of 1995 articulates the national educational aims to "include the youth to understand the world around them; and equipping them with appropriate skills, abilities, and competence both mental and physical so that the individual can live in, and contribute to the development of Nigeria" (Balogun, 1996:7). The outcome in terms of curriculum development has been an integrated science-technology model with a strong 'technical' underpinning. The Nigerian model asserts that "only an intensive and extensive development of our scientific and technological capabilities can enable the country to achieve this national objective, because all wealth is created by human labour and this labour is enhanced by education and especially by the acquired scientific/technological skills" (Balogun, 1996:7). The equating of the concepts technical and technology has resulted in the following definition: "technical/technology education ... is that aspect of education which leads to the acquisition of practical skills as well as basic scientific knowledge" (National Policy on Education, quoted in Balogun, 1996).

In terms of reforming the understanding of technology and Technology Education and shedding the vocational, technical and scientific baggage, the Nigerian model as

described by Balogun (1996) is hugely problematic, in my view. The emphasis appears to be focused primarily on the acquisition of skills and knowledge at the expense of a more holistic cognitive process. It ignores the critical engagement of the learner and hence lacks the empowering element which is a crucial outcome of an effective Technology Education policy. In the eyes of Balogun (1996), the development of Technology Education in Nigeria is seen as a positive one because it has addressed and seemingly reversed the trend of under-enrolment of students in basic science courses, and it is catering for a "materialistic" Nigeria which is seeking occupations with a "high income". In my view, this is a very narrow-minded and superficial justification for Technology Education which lacks a solid theoretical underpinning and relegates Technology Education to the realms of the mere workshop. This is manifested in the curriculum which, described by Balogun (1996:7), at a primary level is an integrated one, organized in themes such as 'growing better crops', whereas at the junior secondary level Technology Education is designed to "provide pre-vocational orientation". This includes simple maintenance, food storage and preservation, building and so on. At the senior secondary phase there is a significant emphasis on workshop practice. The curriculum consists of topics such as automechanics, construction and electrical installations. Although one does not deny the importance of the development of the life-skills and knowledge mentioned by Balogun, as I see it, in terms of the reformed agenda of Technology Education it falls short of the cognitive and theoretical fundamentals.

5.6.2 Malawi

According to Mkandawire (1996), the Malawian education system is based on an "overemphasised" dependence on examinations. Examinations in Malawi are the "gate keepers" of the education system (Mkandawire, 1996:111). The result of this is that 'Craft and Technology', which has been removed as an examinable subject, has been relegated to oblivion. Although the Malawian national goals of education recognize the value of "giving students skills which will enable them to be good citizens, contribute to economic development, enter an occupation and have ethical socio cultural participation",

this however, according to Mkandawire (1996:110), is in direct contradiction to the low esteem that Technology Education seems to be enjoying at present. Mkandawire (1996) suggests that the intended education for "life, prosperity and development" has fallen prey to merely paying lip service to examinations and certificates. Those institutions advocating a rejuvenation of Technology Education are, however, still entangled in the grips of the science/technology debate and the emphasis to date has seemingly been towards an applied science bias. Mkandawire (1996) argues strongly that the two, science and technology, belong to separate "areas", yet he undeniably recognizes the links between the two.

5.6.3 Cameroon

As is the case with most independent African countries, the formalization of education, a relatively recent process, only occurred during or after liberation from the colonial powers. Cameroon, for example, only articulated its formal present-day school system in 1960s and according to Tchitnga (1996), much of its philosophy and aims were naturally modelled on the French and English systems. It is not surprising, therefore that the aims of Technology Education, which was introduced into the curriculum in 1970, took on a distinct European flavour of the time. Tchitnga (1996) suggests that because the economy of traditional Cameroon, as for many other African countries, was based on self-sufficiency and non-competitive production, there already existed a culture of 'technological awareness' long before colonialism. In Tchitnga's (1996) view only the participation of everyone in the social and 'technical' activities of a community ensured its survival, and typically each person learnt basic techniques through direct teaching, games, story-telling, tribal rituals and riddles. According to Tchitnga (1996), this took place irrespective of social status, and members of the community were required to satisfy elementary skills in cooking, housekeeping, babycareing, house construction, agriculture and so on. The teaching was gender related, however, both in execution and content. Activities demanding specialized skills such as wood carving and pottery were

the domain of master workshops where people were required to serve an apprenticeship (Tchitnga, 1996). Although a case is made for a technologically literate community by citing that a culture of 'technological awareness' existed, in my view this awareness remained relatively esoteric in that it focused only on the utilitarian and it revolved around the survival of a specific community.

When exploring the relationship between 'indigenous technology' and the issue of approaching Technology Education from a 'western' perspective, all the rural school teachers involved in this research (see chapters 11 and 12) suggested that the integration of 'their' culture into the current understanding of Technology Education was not problematic.

> One respondent claimed: *from my side it is not a problem ... because most of the time we adopt a western culture ....*

Another recommended that the nub of the 'traditional' skills and understanding of technology lay in the access to materials and the types of resources used:

> *you can take clay from the river to make balls and pots ... everything like that from the clay. And the roots from the trees we make snakes ... again we can take pieces of wood to make birds ....*

Tchitnga (1996) finds it regrettable that the traditional culture of technological awareness was largely ignored when the 'modern' school system with all its ramifications was introduced. He asserts that the school system alienated children from learning the 'traditional' skills such as gathering crops at the expense of "non-productive" learning such as reading, writing and calculating. At the secondary level the school system was divided into the two traditional options: a vocational school and a general secondary school. The vocational school catered for those who wanted to become technicians, and Tchitnga (1996) argues that by virtue of that objective Technology Education has found

an obvious niche there - albeit that the frame of reference is one of technical skill development and vocational training. In the general secondary school the need for an overall technological literacy was recognized and Technology Education was 'grouped' into "Technology-related" subjects (Tchitnga, 1996:173). One of these subjects includes 'manual labour', which involves "all work done by hand" such as handicraft and rural work. This subject, according to Tchitnga (1996), has no concrete syllabus and consequently is often reduced to the cleaning of classrooms and the surroundings of the school. Another one of these subjects is 'technology' itself which includes technical drawing, notions of physics and elementary notions of agriculture, electricity and so on. The lack of resources and the over-emphasis on theory renders this subject ineffective, according to Tchitnga (1996:174), and there is a need to transform it into one which not only "enables the student to acquire a general knowledge, but also ...[provides the student]...with the ability to act and judge in a specific situation". As with the Nigerian framework, the Cameroonian model for Technology Education in my opinion is biased towards vocational training and confines the understanding of technology to the place of work. The 'ineffectiveness' of technology in the school system observed by Tchitnga (1996) can possibly be ascribed to the failure of a non-integrative system which compartmentalizes aspects of technology and fails to recognize the multidisciplinary nature of the subject.

5.6.4 Botswana and Lesotho

In a study done by David Kent and Peter Towse from Leeds University to research the state of Technology Education in Botswana and Lesotho, prompted by UNESCO and the International Council of Associations of Science Education (ICASE), it was found that the pupils in both countries showed a "high degree of technological awareness and are very positive about the role it can play in both their personal and national development" (Kent and Towse, 1996:189). This, they argue, can be attributed to the notion that both countries embraced the objectives of Project 2000+ (launched by ICASE) which stated:

a) Science and technology should be taught through a societal rather than an academic focus - introduced on 'need-to-know' basis.
b) There should be enough time for the science to be placed in its wider economic, ethical, social and political contexts.
c) More emphasis should be placed on problem-solving skills and planning skills.
d) Science and technology should be given a positive rather than negative image and promote gender equity.
e) A greater link should be established between the science and technology in schools and that encountered outside.

(Paraphrased from Kent and Towse, 1996:184)

The above framework, according to my understanding, is an attempt to acknowledge the multi-dimensionality of technology by recognizing various contexts and integrating science into the broader understanding of technology. It emphasizes the societal links and thus reinforces the notion that technology is an integral part of society. Kent and Towse (1996) suggest that there is a recognition in the Botswanan and Lesothan model that Technology Education is not just about 'making things work' but that it concerns 'solving everyday problems', 'making life easier' and 'controlling the world's resources'. This suggests, I believe, that there is a move away from a 'technical' perspective towards a more holistic one which sees technology in a wider context. The concept of 'controlling' the world's resources, however, suggests an imperialist and exploitative attitude. A truly holistic approach, I believe, regards the issue of managing the world's resources as a challenge of sustainability rather than one of control.

5.7 CONCLUSION

The global overview paints an interesting picture of diverse approaches and understandings of technology and Technology Education, and affirms Williams' (1996) stance against an overarching global premise, mentioned in 4.2.1, implying that each country will inevitably develop its own model. This has important implications for South Africa which is presently in the process of conceptualizing its own understanding and form of Technology Education.

CHAPTER SIX

TECHNOLOGY EDUCATION IN SOUTH AFRICA

6.1 INTRODUCTION

The traditional understanding of Technology Education in South Africa is firmly rooted in a technicist framework. A short review of the development of the technical institution in South Africa will therefore be presented initially, to contextualize the development of the concept Technology Education. A closer study will then be made of current policy regarding the inclusion of Technology Education in the general education band with respect to the National Qualifications Framework (NQF).

6.2 A SHORT HISTORICAL OVERVIEW OF TECHNICAL EDUCATION IN SOUTH AFRICA

Technical education in South Africa has its roots in the mining industry which established links with the South African College (now the University of Cape Town) in 1894 to provide theoretical training, and the South African School of Mines in Kimberley to provide the practical training. By 1922 these functions were incorporated into the Witwatersrand Technical College which became the largest technical trainer in South Africa (Behr, 1991). As industry demanded a more diverse professional population (and not only mining engineers and associated trades), a wider range of technical institutions opened their doors to apprentices and commerce students. Technical education under the aegis of the railways, for example, extended into all corners of South Africa at the turn of the century. The Cape Town Chamber of Commerce courses developed into the Cape Technical College (Behr, 1991). With the promulgation of the *Higher Education Act, 1923,* (Act 30 of 1923) all technical and vocational education was taken over by the then Union Education Department. Technical and vocational education exclusively catered

for whites initially, and it was only in the 1940s with the establishment of M.L. Sultan Technical College in Durban that technical education for Indians "was put on a sound footing" (Behr, 1988:140). This unfortunate and inappropriate terminology in my view, epitomizes the naive and uncritical acceptance of segregated education at the time. No technical education facilities 'existed' for the coloured communities until the 1960s and technical education for Blacks was non-existent. A result of the De Villiers Commission and the enactment of the *Vocational Education Act, 1955* (Act 70 of 1955) was the cementing of control of technical colleges under the Central Government Department of Education and the implementation of "the Afrikaner national character and philosophy of life" (Behr, 1988). In the course of the 1960s technical institutions were divided into technicons and technical colleges. The former were in the main tertiary institutions which in the 1980s, through the *Universities and Technicons Advisory Act, 1993,* (Act 99 of 1983) and the *Technicons Amendment Act, 1986,* (Act 89 of 1989), gained autonomous and equivalent status to the universities. The latter were essentially secondary schools and catered for the non-academic pre-tertiary market.

Throughout its history, the function of technical education has been to "develop the mixture of skills needed by the **career field** for which a person is preparing himself" (Rautenbach, 1992), and in the words of the De Villiers Commission in 1948, it was designed "to meet the specific demands of a particular occupation or group of occupations" (Behr, 1988:140). Despite the attempts, mentioned earlier, to equate the status of technical education with academic education, in my experience as an educator in the technical field and the academic field, it never achieved that. As Rautenbach (1992:358) observes bluntly, the tendency has always been to see technical and vocational education (often referred to as 'training', as opposed to 'educating') as "suitable for the less mentally endowed people of society". Technology Education, as defined in the previous chapters, which does not carry any explicit vocational baggage with it, can therefore, in my view, well provide the bridge between technical education and academic education. The global trend of incorporating and integrating a technological consciousness into the hitherto academic realm of education is I think, a

manifestation of the desire to broaden the narrow understanding of technicism and facilitate broader participation in and access to the world of technology. It is thus not surprising that the introduction of Technology Education into the South African education system, coupled with a transformation process which aims to bring together education and training, has become a much debated issue.

6.3 TECHNOLOGY EDUCATION AND THE NATIONAL QUALIFICATION FRAMEWORK (NQF)

6.3.1 Origins and theoretical perspective

The NQF is a new enabling framework in the South African education system with the intentions of providing:

- mechanisms to achieve the transformation of the education and training system,
- for the registration of national standards and qualifications (RSA, 1998).

Amongst others, the objectives of the NQF are:

- to create an integral national framework for learning achievements,
- to facilitate access to and mobility and progress within education, training and career paths (RSA, 1996b).

With reference to the debate on academic versus technical, referred to in 5.1, I feel that both the above objectives play a crucial role in contextualizing the introduction of Technology Education into the South African general curriculum. The former points to a recognition that a framework is envisaged which facilitates the integration of the diverse modes of education that presently exist in South Africa in order to establish a truly integrated and comprehensive model of equitable education. This has implications for

the separate and distinct co-existence of present technical and academic education. Very little mobility is as yet possible between the two modes and there is very little evidence of a shared and compatible theoretical platform. Technology Education can contribute towards fusing the dichotomy by providing a theoretical 'compromise'. It has both strong elements of cognitive and practical aspects to its underlying frame of reference.

The latter objective not only suggests a very profound and explicit shift towards integrating education and training, but also advocates a mechanism which will facilitate movement between academic education and technical/vocational education, and make them more equivalent and compatible in status. In that context, Technology Education appears to be well placed to play a integrative role.

Isaacman (1996:6) suggests that the NQF is a "new approach" to education and training which recognises that education is a "life-long" process that not only takes place in a "formal school" situation but also consists of "life experiences". The NQF therefore, "makes it possible ... to achieve national qualifications through both formal and informal learning situations". The implication of this is that education is no longer viewed as an activity exclusively restricted to the school environment, narrowly focusing on academic pursuits. The NQF recognizes that education is part of a broad process which includes all aspects of life. The classroom therefore needs to 'open up' and take cognizance of this broader context. Technology Education with its emphasis on problem solving within a social context can thus fulfil an important role in the facilitation of such an education. How Technology Education will achieve this will in my view depend to a large degree, however, on the theoretical underpinnings and understanding of Technology Education.

It is asserted that the NQF is committed to facilitating change and reform in order "to normalise and transform teaching and learning" (RSA, 1997b:1) by moving away from the "traditional aims and objectives approach" to "outcomes-based education - OBE" (RSA, 1997b:1). OBE, the vehicle by which the intentions of the NQF are intended to be achieved, has as its cornerstone the following set of "Critical Outcomes":

1. Identify and solve problems and make decisions using critical and creative thinking;
2. Working effectively with others as a member of a team, group, organization and community;
3. Organize and manage oneself and one's activities responsibly and effectively;
4. Collect, analyse, organize and critically evaluate information;
5. Communicate effectively using visual, symbolic, and/or language skills in various modes;
6. **Use science and technology effectively and show responsibility towards the environments and the health of others;**
7. Demonstrate an understanding of the world as a set of related systems by recognizing that problem solving contexts do not exist in isolation.
8. In order to contribute to the full personal development of each learner, and social and economic development at large, it must be the intention underlying any programme of learning to make an individual aware of the importance of:
   a) reflecting on and exploring a variety of strategies to learn more effectively,
   b) participating as a responsible citizen in the life of local, national lobal communities,
   c) being culturally and aesthetically sensitive across a range of social contexts, and
   d) developing entrepreneurial opportunities.

(RSA, 1997b:10, own emphasis)

These outcome are generic and intended to apply to education across the board. Although explicit reference is made to **technology** in Outcome 6, it is important, in my view, and consistent with the discussion in 3.3, not to view science and technology as synonymous

- as may be erroneously interpreted from the framework above. Reference to environmental and health consideration is a step in the right direction in placing technology within a broader and more appropriate context. Reference to "showing responsibility" suggests a recognition of the social processes involved in technology and allludes to the links that ought to occur between technology, society and the environment.

Outcome 7 strongly implies a holistic world view in terms of contextualizing knowledge and the process of problem solving within society at large. This is consistent with official sentiments intimating that the Critical Outcomes will "ensure that learners gain skills, knowledge and values that will allow them to contribute to their own success as well as the success of their family, community and the nation as a whole" (RSA, 1997b:10). It needs to be stressed however that statements of intent do not necessarily translate into achievements attained. This is appropriately illustrated by the recent TIMSS (Third International Mathematics and Science Survey) study which shows that in many countries there is a huge discrepancy between the "intended curriculum" , the "implemented curriculum" and the "attained curriculum". The intended curriculum in this context refers to the statements of intent (the outcomes), the implemented curriculum to what happens in the classroom, and the attained curriculum to what was actually achieved. In terms of TIMSS, despite legitimate and valid mathematical outcomes and objectives, South African students fared very poorly in mathematics and science (Howie, S.J. and Hughes, C.A, 1998) suggesting, amongst other things, that intent and outcomes alone are not enough to "ensure" the successful implementation of a curriculum.

Eight "learning areas" were identified to form the conceptual framework of the General Education Band (Grade 0 - Grade 9) and technology was seen as one of the elements of this framework. The eight suggested learning areas are:

1. Natural Sciences
2. Arts and Culture

3. Economics and Management Science
4. Life Orientation
5. Mathematics Literacy, Mathematics and Mathematics Sciences
6. **Technology**
7. Human and Social Sciences
8. Language, Literacy and Communications.

(RSA, 1997a, own emphasis)

The inclusion of technology in the **General** Education Band indicates a movement towards the inclusivity of technology for every learner and a move away from isolating it in technical institutions only. The underlying principle of technology within the NQF framework is informed by the following definition which views technology as:

> *the use of knowledge, skills and resources to meet human needs and wants, recognise and solve problems by investigating, designing, developing and evaluating products, processes and systems* (RSA, 1997b:83)

The outcomes which are intended specifically for this learning area are articulated as follows:

Learners will be able to:

1. Understand and apply the Technological Process to solve problems and satisfy needs and wants;
2. Apply a range of technological knowledge and skills ethically and responsibly;
3. Access, process and use data for technological purposes;

4. Select and evaluate products and systems;
5. Demonstrate an understanding of how different societies create and adapt technological solutions to particular problems;
6. Demonstrate an understanding of the impact of technology;
7. Demonstrate an understanding of how technology might reflect different biases and create responsible and ethical strategies to address them.

(RSA, 1997b:83)

Once again the above outcomes, in my view, need to be seen as an enabling framework and a guideline within which to operate. The successful implementation to realize these outcome will depend on individual institutions and teachers. The outcomes are broad and vague enough to allow for individual interpretation and design for a specific curriculum to satisfy the needs of individual institutions. Yet they point towards a clear direction that technology needs to be seen as a process which involves skills and knowledge within a social context that carries with it ethical, environmental and social responsibility.

6.3.2 Implementation

The phasing in of the NQF and its new Curriculum 2005 was announced by the Minister of Education in March 1997. The process started in 1998 with Grade 1 and will continue until all grades have incorporated the new curricula. (Pretorius, 1998). In order to provide support for the introduction of Technology Education specifically, the Technology 2005 Project was launched by the Heads of Education Committee (HEDCOM). This project is envisaged to be driven by a national task team with the support of its nine provincial task teams who will work with practitioners in selected pilot schools to develop learning materials and sample project work for schools, develop sample assessment materials for schools, support teacher education institutions in the

development of teacher education programmes, facilitate ongoing in-service training of teachers in the pilot schools, and translate the intentions of the NQF into learning programmes (Sherwood, 1996). In its vision statement, the national task team asserts that: "Technology Education will be part of the education of **every** boy, girl, teacher and adult learner, by the year 2005, with a view to becoming creative, adaptable, critical, autonomous, entrepreneurial, and employable citizens, who can contribute meaningfully and responsibly to their own communities, South African society, the natural environment, and the economy" (RSA, 1996a:1).

The national task team and its provincial teams commenced with their tasks in 1996. From my perspective, experience and involvement (I was invited to attend some of the deliberations of the Eastern Cape provincial team in my capacity as a stakeholder in the field and a potential service provider for teacher training), the financial and administrative inadequacies coupled with inexperienced and unqualified personnel greatly hampered the intentions of the original vision. The geographical considerations, sheer vastness of number of schools and pupil population, and the enormity of the task soon proved too big a challenge for many of the provincial teams. Apart from identifying pilot schools, facilitating a smattering of teacher courses, and grappling with severe financial limitations, the Eastern Cape team, for example, has all but collapsed and been rendered defunct. Their main initial success was restricted to creating an awareness within a relatively small circle of schools and stakeholders.

Parallel and prior to this state initiative, many other schools, mostly independent schools with an adequate resource base and in partnership with industry, had embarked on their own Technology Education programmes. One of the private secondary schools in Grahamstown widely regarded as a pioneering school in Technology Education in South Africa between 1988 and 1994, for example, started exploring the inclusion of Technology Education in its curriculum in the late 1980s. This culminated in the employment of specialist staff, the building of a dedicated state-of-the-art Technology Education Centre in 1992 at great expense, and the ultimate incorporation of Technology

Education into the curriculum of the junior secondary level. The funding of this project was realized through partnerships with certain companies and as a result of a massive fund-raising drive within the school's constituency. Although its mission statement advocates an integrated approach "to develop an integrated, holistic approach and understanding of society at large, the technology it employs, the role of the designer within that world and the environment in which we live" (van Winkel, 1994), Technology Education is presented as a discrete subject within the formal timetable of the school. The facility is also made available to all pupils as an extra-mural venue hosting a range of technology-related clubs such as kite-making, photography, wood-turning and an electronics club. The sustainability of the programme, in both the formal and informal aspects rests on the financial contributions of the parent body. The formal aspect is incorporated into the general budget of the school, whereas the informal programme is directly and additionally charged out.

On the other end of the social (and geographical) spectrum of the Grahamstown landscape a more modest approach to launching a Technology Education programme in a converted classroom and toilet of a 'township' school was facilitated by a donation by a big funding agency in collaboration with the ORT-STEP Institute. According to the headmaster, the aim of the programme is to expose the pupils of this primary school to technology skills and to incorporate Technology Education into the broader outcome of the curriculum. The co-ordination and development responsibilities will fall on existing staff, some of which are qualified Technology Education teachers. The sustainability of this programme is also based on the contributions of the parents and their capacity to pay for equipment used by the pupils. Although this school is a government-aided school, no assistance from the provincial education is envisaged and financial support will have to come from other sources, says the headmaster.

Many other schools have embarked on similar initiatives, but according to my observations these are mostly insular projects with very little co-operation between the schools. The overall implementation strategy has been incoherent and restricted to those

institutions which were able to support their own Technology Education initiatives with the appropriate financial and human resources. This has resulted in a fragmented scenario with a plethora of unique Technology Education brands scattered all over South Africa within the mostly private and semi-private school landscape. Many of these schools use their Technology Education programme as a marketing platform and as a show-case for 'progress and development.'

In view of this fragmented approach and the failure of a coherent governmental strategy, much can be learnt from the Lesotho model illustrated in 4.6.4 where it was asserted that science and technology should be taught through a societal rather than academic focus - introduced on a 'need-to-know' basis. This, according to my understanding, will encourage a decentralized approach where individual institutions and communities will be empowered to develop their own programme and curriculum depending on their needs and their requirements. The 'need-to-know' basis will, by its very nature, be community- and environment-specific. Further, this approach can encourage problem-solving and planning skills that are appropriately contextualized and relevant, reinforcing the Lesotho model which states that more emphasis should be placed on problem-solving skills and that enough time should be placed on the wider economic, ethical, social and political context.

6.4 CONCLUSION

Despite the intentions of the NQF and the national Technology Education Task Team, and apart from pockets of individual initiatives, there is relatively little tangible evidence of Technology Education happening in schools in urban South Africa, let alone in rural schools. Although the implementation strategy is intended to be all-encompassing: "Technology Education will be part of the education of **every** boy, girl, teacher and adult

learner" (RSA, 1996a:1) - in my observation, very little attention and thought has been afforded to rural schools in that context.

CHAPTER SEVEN

EDUCATION IN RURAL AREAS

7.1 INTRODUCTION

In order to place Technology Education in rural areas, this research project and the Winterberg Schools Trust (WST) into a national context it is necessary to take a closer look at rural education. I will review the state of rural education in South Africa by briefly analysing some general perceptions and issues before focusing on the Eastern Cape in particular. Although education in rural areas is usually associated with poverty, neglect and lack of resources, there are many initiatives such as the WST which are making a difference, often under difficult circumstances, in addressing the needs of teachers, schools, pupils and the community.

As in many developing countries there exists a pronounced divide in South Africa between those citizens who live in the cities and those in rural areas. The divide in South Africa is deeply rooted in historical and political ideologies where, according to the findings of the Second Carnegie Inquiry into Poverty and Development in Southern Africa, the interests of the black rural sector have been systematically neglected (Hartshorne, 1992). This has manifested in the state of rural education which in my view and experience is grossly inadequate and ineffective.

7.2 FARM SCHOOLS

Rural education has been shaped historically by political forces in this country. In Hartsthorne's (1992:11) view, most people in the rural areas "are where they are and what they are" because of state policies. Gordon (1997) suggests that prior to the passing of the South African Schools Act of 1996, other than schools in small towns, rural areas were serviced by two categories of school: farm schools and schools in the

former 'homelands'. Farm schools in essence served the farm worker community and the Regulations of 1955 stipulated that farm schools "provide facilities for the children of *bona fide* employees on the farm concerned" (Hartsthorne, 1992:137). The responsibility for the running of farm schools which included such aspects as developing and maintaining facilities, enrolment, hiring and firing of teachers and administration, fell squarely on the shoulders of the farmer on whose property the school was situated. The state merely provided the salary for the approved teaching post and, for some schools, token grants for the building of toilets, rudimentary structures and the supply of drinking water. The resultant reliance on the farmer for his 'generosity' in terms of financial commitment and provision of resources was hugely problematic and in my opinion merely reinforced a culture of false dependence and subservience. It also led to the disempowerment and demotivation of rural school teachers who desperately needed a professional support system in order to cope with problems peculiar to rural education such as isolation, multigrade schooling, poverty and lack of resources. The system articulated above also placed unfair pressure on many farmers who, with all due respect, knew precious little about education and the needs of a school. Just as the school was used as a means to further political ideals of the regime, so were the farmers used (abused) in furthering these ideals. Hartsthorne (1992) asserts that the Regulations of 1955 developed as a result of the Eiselen Commission which recommended that rural education fall under the management of farm owners in order to remove the influence of the mission schools over education (particularly those from the English speaking tradition). This was consistent with apartheid ideology which also insisted that black migration to the urban areas be curbed. This was explicitly articulated by Dr. Verwoerd, replying to the Eiselen Commission in his now infamous speech when he addressed the Senate:

> *...if 'fundamental' education can also be obtained on the farms the trek from the farms will be combatted, more especially if the training contributes towards more remunerative employment in the farm work, owing to the greater skill and usefulness of labourers. Bantu mothers can, in accordance with local methods, erect walls where farmers allow it, and the Department will provide windows,*

doors and roofs. If the farmer withdraws his permission these can be removed. (quoted in Rose and Tunmer, 1975)

Some farmers succumbed to their own greed and exploited this situation for their own gain which resulted in the dreadful reality of farm school dependence and a situation of absolute power of the white farmer leading to a situation of ruling class paternalism and working class deference (Nasson and Samuel, 1990). Gordon (1997) further intimates that the farm school primarily served as a labour mechanism to retain workers on the farms. Many farmers, however, were committed to 'their' schools and provided as much support as they could afford. Thus resulted an uneven distribution of facilities and as Hartsthorne (1992:138) suggests "buildings, facilities and equipment at farm schools vary from some of the best to be found in the schooling system through to the most primitive". This distinction is important as it would be naive and simplistic to suggest that no farm workers had access to the outside world and means to resist oppression. Hartsthorne (1992) quotes Graaff's (1988) observation that it is not the schools which make the difference in the rural context, but the social and economic environment in which they find themselves. Many of the farm school teachers involved in this research project confirm this. One of the pre-primary teachers for example often spoke very enthusiastically of her 'manager' who supported her efforts not only through providing materials and resources, but also through financial help. Others however lamented the neglect and the seemingly uncaring attitude of their 'farm managers' whom they would also refer to as 'boss'. They often felt scared and not confident enough to approach them for assistance. In my view it was significant, however, that many did not see the farmer as the main problem in rural education. When asked whose responsibility it was to look after rural education most teachers thought it was the responsibility of the 'department', meaning the provincial education department:

It is the responsibility of the department ... because they brought us the syllabus and modules and all these things ... and even the timetable for the examination.

In the same breath, however, most teachers thought that the 'department' delivered very poorly in terms of fulfilling that responsibility. This perception is consistent with the view of Graaff (1988), quoted in Hartsthorne (1992), which suggests that the major problems of rural education lies not in the 'cussedness' of individual farmers, but in the unwillingness and incapacity of the State to assume full responsibility for farm schools. Although Graaff's view referred specifically to the 'old' apartheid government, the perceptions of the teachers involved in this project, pointed directly at the present provincial structure.

The 'dependence factor', mentioned earlier, often ascribed to the legacy of the apartheid system in South Africa but according to Kaluba (1997) also prevalent in other developing nations, often leads to a 'cultural apathy' towards education. This apathy, in my experience, ranges from an often indifferent attitude amongst teachers to the lack of support and participation of parents.

The marginalization of farm schools has been recognized by the reform process as a crucial issue and according to Vinjevold (1997) several of the post-1994 provincial education departments have seen the urgency to address the needs of this sector of education. With the implementation of the South African Schools Act (SASA) in 1996/97 and associated transformation programmes, farm schools have been accorded the same rights, governance procedures and financial status as all other public schools. This bodes well for the farm schools, but the transformation process has yet to make any significant impact on farm school education. Gordon (1997:7) suggests that critical financial constraints are hindering reform programmes and "in the main, the same or similar problems which faced schools in disadvantaged communities during the apartheid era, continues".

7.2.1 The Eastern Cape context with special reference to the WST

The Winterberg farm schools and the WST need to be seen against the backdrop of the above perceptions and realities. Although one wants to guard against overgeneralizations, the situation in the Winterberg up until recently represented a microcosm of the South African situation. Farms schools were isolated institutions serving a poor community, dependent on the grace of the local farming community, neglected by the state and offering an ineffective education which only perpetuated a cycle of hopelessness. State intervention in teacher development and support had been minimal. The provision of capital for the improvement and upgrading of facilities had been negligible and the provision of basic consumer goods such as stationery and textbooks had only been sporadic. Many of the teachers involved in this research (see chapters 11 and 12) intimated that if it were not for the efforts of the WST not much support and upliftment would have been forthcoming anywhere:

> *... there was nobody who came to do ... as you ...* (referring to INSET programmes such as IRTEP) ... *if the resource centre was not there I'm definitely sure you would not have come here ... to us to teach Technology ... It's because of Barbara - the whole Trust.*

Kaluba (1997) notes that Africa as a whole has a very dismal reputation as far as rural education is concerned. He observes that schools in remote areas throughout Africa suffer similar hardships as a result of factors such as:

- financial crises, such as cutbacks in expenditure;
- deteriorating facilities;
- expensive and unaffordable resources;
- inadequate teacher-training resources;
- overcrowded classrooms;
- inaccessibility, pupils having to walk large distances to school;

- difficult, sometimes impossible communication infrastructure.

The above points, in my view, need to be seen as interrelating issues conspiring against untenable educational conditions. In my experience, many other factors such as:

- corruption
- authoritarianism
- nonparticipatory curriculum development
- inappropriate teacher recruitment and placement
- ideological agendas

further contribute to an already dismal picture of rural education.

Fundamentally the WST, which perceived the rural community as an interdependent system consisting of the farmer community and the worker community, embarked on an initiative to improve and contribute towards rectifying the lot of the farm schools in their area. This coincided to a large extent with other reform projects and the post-1994-election decentralization process of the national education system to provincial administrations. Most farm school development projects were initiated and conducted by NGOs and other service providers. The Eastern Cape, which according to Gordon (1997) has a poverty rate in excess of 75% and in which 24% of South Africa's poor live, has enjoyed an unprecedented amount of teacher upliftment programmes in the 1990s. Most of the Eastern Cape population, 62,7% according to Gordon (1997), live in rural areas. This places enormous pressure on rural schools which constitute 86% of all schools in the Eastern Cape. 'Rural schools' is a generic term that encompasses a host of different types of schools in rural areas and on closer analysis of the classification of schools it becomes apparent that there is a plethora of schools which do not fit into any one category. Gordon (1997) attempted to classify rural schools and suggested a five-part division:

1. Church schools
2. State schools
3. Community schools
4. Private schools
5. Farm schools

The above delineation is not very precise, however, as many schools fall into more than one category. For example, Sosebenza School, one of the schools served by the WST project, fulfills the criteria of a community school, a farm school and a state school. It is not the intention of this study to clarify a clearly diffuse classification of rural schools but to focus on farm schools which, for the purpose of this study, simply are schools that are located on farms and which exclusively serve farm worker communities. They form a significant component of all the types of schools in South Africa, as figure 7.1 illustrates.

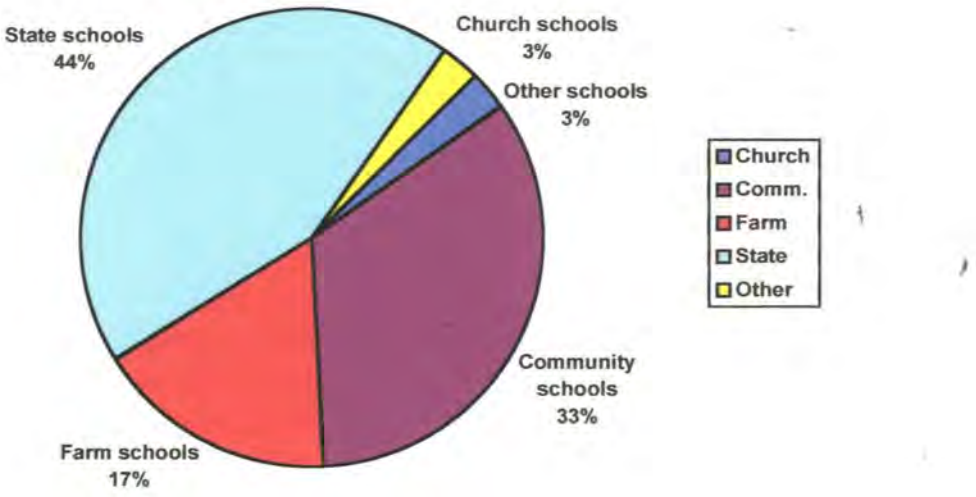

Figure 7.1 Proportion of schools in South Africa. Total number of schools 27 249 (after Gordon, 1997)

Of the rural schools in the Eastern Cape, farm schools also form a significant proportion. See figure 7.2.

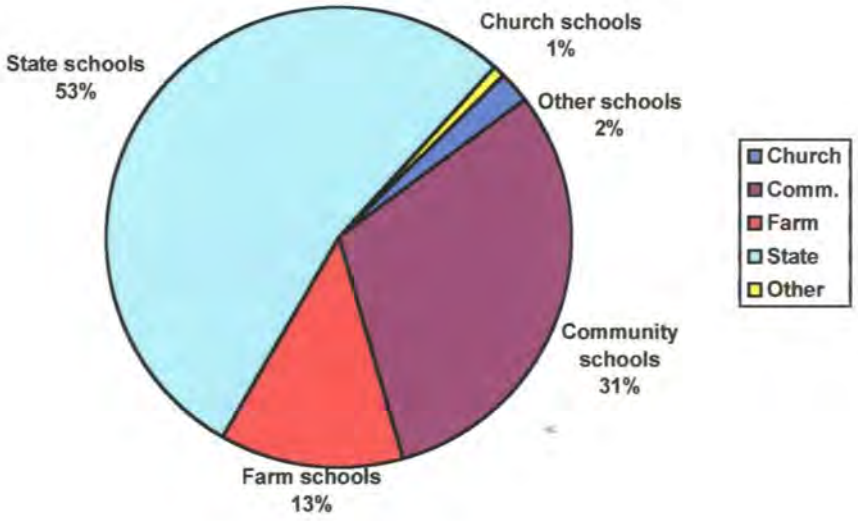

Figure 7.2. Proportion of rural schools in the Eastern Cape. Total number of rural school 5 031. (after Gordon, 1997)

7.3 MULTIGRADE CLASSES

A feature of rural schools in general, and farm schools in particular, is the extensive use of multigrade classes. All the farms schools in the Winterberg area, with the exception of Sosebenza Community school, operate with multigrade classes. Vinjevold (1997) uses this term for classes in which "students from two or more grades are taught by one teacher in one room at the same time". From table 9.1, for example, it can be seen that a school like Highlands Home accommodates 6 grades and is serviced by only two teachers. This has implications for the teachers in terms of both classroom management

and teaching strategy. For the implementation of Technology Education, with its emphasis on activity-based learning and the use of diverse tools and equipment, the multigrade system needs careful consideration and planning. The situation is made even more complex by the inconsistent age distribution of scholars within single grades. It is very common in the Winterberg schools to find single grades which consist of young pre-adolescent pupils and teenagers. This makes for challenging planning and organization on the part of the teacher. In the case of Technology Education, the teacher will have to take into consideration the fact that the level of hand-skills competence will differ dramatically within the same class, as will the level of contextual understanding.

Most farm schools had adopted a strategy of teaching the same topic to all grades at any one time. This was convenient for the teachers and was seen as 'killing two birds with one stone'. In terms of generating an ethos of learning and contributing to the learning process of the pupils this approach was very problematic. From my observation and experience, it ignores the needs of the individual pupil and assumes that all learners learn at the same rate. It ignores the notion that pupils of different ages learn things at different levels of complexity. Particularly in the farm school situation, where the age range is so pronounced within the grades, this approach must rate as highly inappropriate. All the Winterberg schools were entrenched in this mould of teaching when the WST started its work, and one of its first objectives was to introduce a multigrade system which accommodated the needs of individual grades. This involved splitting the classes into groups according to grades and teaching those groups according to appropriate cognitive levels. This included supporting the teachers managing a truly multigrade class with courses in time-management, appropriate lesson preparation, multigrade class management, teaching strategies and assessment.

According to Vinjevold (1997) surprisingly little research, particularly in developing countries, has been done on multigrade classrooms despite the common occurrence and wide distribution of this practice. Her literature review suggests that even on a global level little attention is paid to this sector of schooling. This ignorance includes ministries

of education and teacher education institutions. Even in countries such as Wales, Norway and Sweden, where more than 30% of their primary schools have multigrade classes (Vinjevold, 1997), there is a distinct absence of specialized teacher training which caters r specifically for the multigrade teacher. Vinjevold (1997:9) quoting Solstaad from Norway writes that "teacher training and the production of teaching materials seem to be solely directed to meeting the demands of the normal mainstream situation" that is, serving the demands primarily of single grade classrooms. From my observations, the same can be said of South African teacher education institutions.

In-service and pre-service teacher education courses need to cater for the multigrade teacher and offer support, advice and training in coping with an approach which is fundamentally different from the traditional single grade classroom. Thomas and Shaw (1992) assert that teachers who have received no training in multigrade classroom-teaching inevitably teach as though they were teaching independent classes. This usually implies that they teach one cohort while the other remains neglected. This often results in dropping interest levels and a degeneration of discipline. As the WST has recognized, teachers of multigrade classrooms need to develop skills that will enable them to cope with student diversity and not simply peg the level of teaching to the middle of the class. Thomas and Shaw (1992) recommend that the teacher be trained in organizational and co-ordination skills. The classroom organization needs to be such that it facilitates independence and interdependence, responsibility for self-directed learning, and peer tutoring (Vinjevold, 1997).

The multigrade classroom has been a significant feature of education throughout the 19th and 20th century all over the globe. From my observations and reading, the history of the multigrade classrooms has been shaped by essentially two factors. One, it developed out of educational policies which attempted to make education accessible to rural communities (for whatever reasons) within financial, budgetary and infrastructural constraints; and secondly, it flourished as a result of the more 'open educational' approach to schooling of the 1960s and 1970s which saw multigrade classes fostering

models of cooperation, democracy, innovation and student-centred reform. Miller, cited in Vinjevold (1997), intimates that the current increasing trend in multigrade classrooms in the USA is a result of modern development theories of learning. In South Africa, however, multigrade classes are generally associated with rural and remote areas characterized by poverty, inadequate resources and infrastructure, un- and under-qualified teachers, exploitation and neglect.

Very often the cultural gap between the teacher and the local population can cause frustrations and contribute to misunderstandings within the classroom and with the school community in general. This point was reinforced by one of the respondents in this study who grew up in an urban environment and trained for a traditional classroom situation, when she said:

> For the first time when I started teaching in a rural environment, I found it soo difficult for me to communicate with my learners, it was not easy for them to express their feelings, to understand what you are expecting from them.

Vinjevold (1997) uses Solstaad's study (1996) of Norwegian rural teachers, which illustrates that the cultural gap between the local population and the teachers leads to high turnover rates, to suggest that multigrade teachers need to be prepared for the cultural, social and economic condition of the school environment. This has particular significance for South Africa which has such a high level of contrast between urban and rural conditions.

When asked whether their teacher-training adequately equipped them with appropriate skills to cope with the demands of being a teacher some of the respondents answered:

> I found it so difficult to relate the classroom situation with [my] training, especially in a disadvantaged classroom where there are no facilities ....

> My training was definitely not the same as the experience I got from the Winterberg. Since I joined here I feel like I am in an urban school, because facilities and equipments are at a very good reach.

Two ways of overcoming Solstaad's concern is either to decentralize teacher education and move some of the traditional teacher-training colleges into rural areas or to provide support structures in the rural areas which will take into account the demands of the local environment. Such programmes will reflect the realities of the particular rural environment and prepare teachers to deal effectively with that reality. The latter option forms the basis of the WST which sees itself as an integral component of the local community. Wolforth (1997), with his extensive experience with rural teachers in the Andean mountains of Peru, argues that teacher education programmes need to be based on the realities of the environment that the teachers will ultimately work in. This was an important consideration when IRTEP was conceptualized and designed.

The positive features and benefits of multigrade classroom are manifold. The overarching advantage for governments and support agencies is that multigrade schools facilitate mass access to education for communities in remote areas. Vinjevold (1997) cites a multigrade school project initiated by the Colombian government in 1976 which increased pupil enrolment by 800 000 in 10 years. This project was however coupled with extensive teacher support and resource provision.

Thomas and Shaw (1992) see multigrade schools as an effective way of preserving a small but remote local community. These schools ensure that pupils remain in the community and hence keep family and community life intact. Buston cited in Vinjevold (1997) argues from a sociological point of view that these schools provide a continuum between school and home. Further, the school can act as a node for social development and interaction. The latter has proved very problematic in the Winterberg area, however, as most parents do not get involved in school activities and the schools have remained insular institutions. See the respondents comments under parental involvement in chapter 12.5.5.

In terms of academic development, the literature from developed nations is inconclusive and inconsistent, according to Vinjevold (1997). Some studies suggest that pupils in multigrade classes outperform single-grade pupils both in social and academic development, while others suggest the opposite. In my experience, no conclusive and systematic study and analysis has yet been done in South Africa which indicates whether or not multigrade classrooms contribute to 'better' academic achievement.

Although governments, some researchers and other international agents, and society as a whole, have previously often viewed the multigrade school as a "deficit form of provision" (Vinjevold, 1997), I concur with the growing view of accepting these schools as legitimate models of education.

7.4 CONCLUSION

Purely in terms of demographics and statistics, education in rural areas in general and farm schools in particular, forms a very significant sector in South Africa. The marginalization of this sector by means of political and ideological policies has resulted in a hugely neglected area of the South African educational landscape which needs massive support to remedy it in all levels of operation. The implications for the transformation process, including the introduction of Technology Education, are that to be effective, cognisance must be taken of the unique needs and conditions of rural schools. The historical context, the poverty, the limited resources and the multigrade system are all important factors to be considered in the planning and implementing of development programmes. In-service teacher training (INSET) forms an integral aspect of development and can be a pivotal means of facilitating transformation and growth.

CHAPTER EIGHT

IN-SERVICE EDUCATION AND TRAINING (INSET)

8.1 INTRODUCTION

INSET in the context of this thesis is seen as a vital link between the needs of rural education on the one hand, and the transformation process of South African education on the other. The introduction of Technology Education is an integral part of this process, and in my view its successful implementation will depend largely on the role of the teachers who after all are the chief implementers of any curriculum. It is through effective in-service education that the transformation process and its associated curriculum innovations will gain momentum and hence have the desired impact on South African education.

I will first take a broad look at INSET and raise the issue of in-service education being a continuous process, before analysing two theoretical models of INSET. A discussion of teacher education is not complete without a theoretical exploration of the cognitive process. In this context, the theories of constructivism will provide interesting insight into a possible approach for INSET.

8.2 INSET

The traditional notion that the initial training a student-teacher receives will equip the teacher for a lifetime career in the educational profession is being challenged more than ever before. Changes and transformation in education as a whole have become inevitable components of the profession and teachers are increasingly called upon to keep abreast of current developments, reform and growth. For schools and other educational institutions to keep up with educational innovations and methods, and remain competitive, teachers

are under increasingly serious obligation to improve their expertise, knowledge and skills through improving their qualifications or attending staff development courses. Bagwandeen and Louw (1993) suggest that there is no upper limit to a teacher's preparation. A teacher's career should surely be seen as a continuous process of development, adjustment, progress and adaptation. The facilitation of this process can be achieved through INSET which can take on many forms such as formal upgrading courses through a university or college, or informal workshops and seminars through other agencies such as NGOs. INSET is a global phenomenon which, according to Bagwandeen and Louw (1993) ranks high on educational agendas. In South Africa in the last five years, however, INSET I believe has been viewed mainly as a means of 'upgrading' the underqualified and the so-called 'disadvantaged' teacher. This myth of INSET seems to suggest that well qualified teachers in well resourced schools do not need INSET. Bagwandeen and Louw (1993) recommend that INSET should be viewed as one of the necessities of educational life for all educators.

The extent of South Africa's un- and under-qualified teachers amongst black teachers, in my view, has exacerbated and falsely reinforced the 'exclusive' attitude that INSET be regarded mainly as a tool for 'upgrading' the disadvantaged. Bagwandeen and Louw (1993) appropriately warn against the view that INSET should be regarded as crisis management or restricted to a crisis situation. INSET needs to be seen in the broader context of teacher development and used more inclusively than before. Indeed, current trends in the restructuring of education in South Africa indicate an explicit shift from viewing INSET as characterized by short sporadic workshops with a remedial agenda to one that makes INSET "part of a teacher's career" (RSA, 1997c: 124) and an important part of continuous professional development. Shifts in thinking suggest that INSET and teacher development should be seen as a key element in 'life-long learning'. Current reform initiatives point towards a reconceptualized vision of consolidating *formal* professional development, such as 'qualification INSET' offered by institutions such as universities, and *in-formal* 'short-course INSET' provided by institutions such as NGOs, into a more cohesive, coordinated and streamlined structure. The intention is that this will

result in more flexibility and mobility in terms of accreditation and accumulation of 'credits' towards a recognized qualification. The *Discussion Document on Norms and Standards for Teacher Education* explicitly suggests that through INSET and teacher development "students will be able to combine ... modules of work appropriately to achieve a *whole qualification*" (RSA 1997c:128). Hendersen (1982) adopts the view that INSET includes all aspects that contribute, directly or indirectly, to how a teacher executes his/her duties. The intervention programme that forms the core of this research project is based on the INSET philosophy that not only sees teacher development as an essential component of any teacher's career, but also regards it as an ongoing process of reflection and growth. 'INSET' and 'teacher development' will therefore be seen as synonymous for the purpose of this study.

8.3 THE DEFECT AND GROWTH MODEL

Jackson (1971) cited by Bagwandeen (1993) suggests two classifications of INSET which provide a useful overview of the philosophical spectrum serving this aspect of teacher development. Firstly, the **defect model** is based on the assumption that "something is wrong with the way practising teachers now operate and the purpose of INSET is to set them straight - to repair their defects, so to speak" (Jackson, quoted by Bagwandeen and Louw, 1993:69). This approach reinforces the notion of inequity and implies that some educators know more about how teachers should operate than others. This may be true in certain legitimate cases, but not only can this approach lead to a prescriptive programme, in my opinion, it can also strengthen the misperception of seeing teachers as "assembly line workers implementing programmes decided upon at higher levels" (Gilroy and Day, 1993). This is contrary to the fundamental spirit of this thesis which views the learner, young or old, pre-SET or INSET, as a dynamic participator and creator of meaning.

Jackson's second model, the **growth model,** is more consistent with the principles of this thesis. The growth model is based on the notion that "teaching ... [and learning] ... is a

complex and multifaceted activity about which there is more to know than can ever be known by any one person.....the motive for learning...[and development]...is not to repair a personal inadequacy as a teacher but to seek greater fulfillment as a practitioner..." (Jackson, cited by Bagwandeen and Louw, 1993:71).

As Hargreaves (1994) suggests, few would disagree that the nature and demands of the teaching profession have changed profoundly over the years. As learners are having to meet the ever increasing demands of a sophisticated economy and social order, so do they place an ever increasing load on education to provide the basis upon which to build understanding to cope with these demands. Teachers play a significant role (very often the pivotal role) in facilitating education and hence share the responsibility to create an appropriate environment where dynamic and challenging learning can take place. It is therefore my view that INSET forms the crucial link between new expectations of a teacher and his/her current practice. Particularly in the context of the WST which claims to have very close links with the community, stakeholders other than educators, administrators and colleagues need to be considered. The parent body, for example, and its needs and demands are important considerations which should not be neglected in any teacher development programme that purports to be all-inclusive and democratic.

Effective INSET and other teacher development programmes need to work in a comprehensive framework that embraces the personal and professional needs of the teacher and, as Fullan and Hargreaves (1992) argue in their preface, teacher development must actively listen to and sponsor the teacher's voice. It must establish opportunities for teachers to confront the assumptions and beliefs underlying their practices. It must guard against entertaining 'flavours of the month' and blindly embrace 'buzz' concepts to justify blanket implementation of favoured new instructional strategies. Fullan and Hargreaves (1992) strongly argue that teacher development needs to create a community of teachers who discuss and develop their purposes together and, I would add, takes ownership and responsibility for their own growth. The conceptualization, implementation and

evaluation of any INSET programme therefore needs to be consultative and include as many role-players as possible.

Although the growth model referred to above appears to advocate a more open attitude towards teacher development than the defect model which is very linear and 'top down' in its approach, I think it needs to be made explicit that the teacher's own involvement in all facets of any intervention programme is crucial to its success. In justifying the growth model, Bagwandeen and Louw (1993:71) suggest that the "nub of the growth model is to familiarise the teacher with developments in his field". This suggestion, however, once again implies a top-down tendency which the defect model favours. The growth model should facilitate programmes through which the teacher will **implicitly** grow into a more critically aware, and hence more effective practitioner. If INSET is to work it needs to take a holistic look at the teacher and consider that individual as a whole. Fullan and Hargreaves (1992) note that the teacher as a person is often neglected in teacher development initiatives. Teachers are often treated as if they were all the same, or categorized into stereotypes such as resisters, disadvantaged, ignorant and the like. Fullan and Hargreaves (1992), on the basis of recent research, maintain that aspects of the total person, such as age, stage of career, life experience and gender factors, affect people's interest in and response to innovation and their motivation to seek improvement. In exploring the concept of the 'total' person, Fullan and Hargreaves (1992) suggest that the following elements be considered:

- The teacher's purpose,
- The teacher as a person,
- The real world context in which the teacher works,
- The culture of teaching: the working relationship that teachers have with their colleagues inside and outside the school.

The teacher's purpose refers to the **reasons** why a particular teacher is involved in a development programme - the agenda in the mind of the teacher. Further, the teacher as an **individual** person with peculiar needs and problems should be considered. This teacher operates in a **unique context** and has a unique world view based on experiences, values and opinions. The professional context is associated with the relationships and interactions between colleagues.

The recognition therefore that people come to an event laden with 'baggage' has theoretical and philosophical implications that will underpin any form of intervention and teacher development programme. Constructivist theories, in particular, stress "the importance of what learners bring with them to the learning situation" (Driver and Oldham, 1986) and see the learner as maker of his or her own knowledge (Brown *et al.*, 1996).

8.4 CONSTRUCTIVISM

In terms of Fullan and Hargreaves' concept of the total person, aspects of the theories of constructivism can be very useful and appropriate in the context of INSET.

The core epistemological principles that underpin constructivism can be summarized as follows:

- Knowledge is actively constructed by the learner, not passively received from the environment (Matthews, 1992);

- The function of cognition is adaptive (Von Glaserfeld, 1990, cited by Taylor *et al.*, 1993). This process organizes one's experimental world; it does not discover an independent, pre-existing world outside the mind of the learner

(Matthews, 1992).

- The cognition process is not personal and insular, but one that relies on social interaction in general and, according to Vygotskian thought, on language in particular.

An elaboration of the above principles:

Knowledge is actively constructed by the learner

The notion that cognition is an active process and not a passive intake of information expresses a clear contrast with traditional didactic and expository teaching based on the metaphor of "teaching as transmission of knowledge" (Taylor *et al.,* 1993:3). In his earlier writing, Von Glaserfeld (1988), often labelled as a proponent of 'radical constructivism', makes the observation that in traditional theories of knowledge the activity of 'knowing' is taken as a matter of course, "an activity that requires no justification and functions as an initial constituent" (Von Glaserfeld, 1988:208). The learner is seen as a passive recipient of knowledge with very little say in his/her cognitive destiny. The "knowing subject" is conceived of as 'pure' entity "unimpeded by biological and psychological conditions" (Von Glaserfeld, 1988:208).

At face value, the above may suggest a crude dichotomy, that knowledge is either constructed or passively received. It is my assertion that learning is complex and continuous and incorporates a diversity of processes. Construction of knowledge and passive reception therefore need not be mutually exclusive. Some learning, for example, may well be accomplished initially by mere passive reception and only at a later, and perhaps more appropriate, stage be assimilated and intertwined into past experience and on that basis be constructed into 'new' knowledge.

The function of cognition is adaptive

More recent researchers (Driver and Oldham, 1986; Kuiper, 1991; Ernest, 1994) widely accept that learners develop understanding, ideas and beliefs about the natural world outside the 'formal' learning environment, and as Driver and Oldham (1986:105) suggest, "long before they are formally taught". Further, it is asserted that learners develop a sense about the world, albeit a 'wrong' sense sometimes, and move towards a cognitive perspective based on their past experiences. Driver and Oldham (1986) therefore maintain that an individual's knowledge is not considered a set of discrete 'bits' but a series of structures, and learning involves the development and change of such structures. In my view, learning occurs over a continuum and develops on the basis of continued reflection and evaluation within one's own experiential context - it is a cyclical process of continuous modification and adaptation, and I therefore concur with Taylor *et al's.* (1993) deduction that the learner's new understandings can be formed on the basis of his/her own prior knowledge and experience. The process of making sense of one's experience, the genesis of the individual's knowledge, can be a result of the individual's "purposeful and subjective interpretation of his/her experience of the physical and social world" (Taylor *et al.,* 1993:4).

The cognition process is not a personal and insular one

Ernest (1992) emphasizes the 'social' dimension in the cognition process and suggests that social constructivism regards the individual subjects and the realm of the social as "indissolubly interconnected". It is the social reality that creates or constrains the shared experience underlying physical or social understanding. This development in constructivist thought is strengthened by the work of Vygotsky who sees language as a key component in the cognition process. When considering the formation of concepts, Vygotsky (1986:107) suggests that "real concepts are impossible without words, and thinking in concepts does not exist beyond verbal thinking. That is why the central moment in concept formation, and its generative cause, is a specific use of words as functional tools." The above assertion appears dogmatic in its implication that the

cognition process cannot be a personal and insular one. This in my view needs to be questioned, as it assumes that **all** cognition is based upon social interaction.

The implications that constructivism has for classroom practice, teacher education and teacher development are huge, but Lerman (1992) warns against merely replacing one rhetoric for another. Although the debate around constructivism has succeeded in questioning and replacing the transmission metaphor with one that sees students constructing their own knowledge, the practical implications for the teacher need careful consideration. Lerman (1992) laments the emergence of terminology such as 'the constructivist teacher', the 'constructivist classroom' or of inservice courses that convince teachers to become 'constructivist' when the implications of 'constructivism' are not clearly understood. Although a supporter of constructivist theory, Solomon (1994) identifies with the dilemma that understanding the nature of 'constructivist teaching' is still difficult.

I identify with Lerman's (1992) reservations and the dangers of replacing one dogma with another. As I see it, constructivism has much to offer education in general, and the understanding of cognitive processes in particular; and a learning environment that facilitates learning in terms of constructivist thought is one where, amongst others:

- learners can interact and communicate with each other;
- learners can share and enrich the learning situation with their own experiences;
- the teacher is no longer the only determinant of the cognitive destiny of the learner;
- the learning contexts are accessible to the learners in terms of their own experiences and those of others;
- teaching is no longer only an act of persuasion but one of participation, facilitation and interaction.

The embracing of constructivism on the part of the teacher involves a paradigm shift both in terms of understanding one's pupils and one's practice. Prawat (1992) sees the central issue in this paradigm shift as one of empowering the teacher. Whereas practitioners in the traditional transmission mould were cast as passive receivers of innovation and curriculum, current thought views teachers as important participants in policy implementation and curriculum reform. Teacher empowerment, according to Prawat (1992), encompasses political and epistemological agendas. From a political perspective, empowerment implies an increase in teachers' professional authority and autonomy and therefore an increased role in the development of curriculum and in the decision process of policy implementation. From an epistemological perspective, Prawat (1992) argues that being provided with a new set of theoretical and conceptual ideas, such as constructivist theory, can be empowering for teachers in that it implies a dramatic change in the focus of teaching. In order to change, however, Posner *et al.* (1982) argue that the following criteria must be met:

- the teacher must be dissatisfied with his/her own existing belief in some way,
- the teacher must find the alternative both intelligible and useful,
- the teacher must be able to figure out some way to connect the new beliefs with his/her earlier conceptions.

The criteria above, particularly the first and last ones, refer explicitly to past experiences and cognitions, strengthening the notion that what happened in the past is crucial to learning and development in the present. This 'constructivist' understanding has implications for the planning of an INSET programme, in that the past experiences of the teachers and participators of a desired programme, must be recognized and integrated into the conceptualizations of such a programme. An important point in facilitating recognition of past experiences is to engage in a participative process of consultation and reflection. In my opinion, too many intervention programmes which advocate and support a constructivist approach to teaching, themselves are not conceptualized in the

spirit of constructivism! They are imposed, often imported and merely repeated, on the basis of an existing programme from elsewhere. A truly constructivist initiative, one that takes cognizance of prior experiences and recognizes what the learner brings to 'the party', will by nature be unique and 'tailor-made' for a specific community. This does not mean that every programme indulge in a never-ending process of 're-inventing the wheel', but due consideration needs to be given to the uniqueness of the context and the individual participants.

Citing Brooks and Brooks when reinforcing the notion of applying the theory of constructivism, Brown *et al.* (1996) suggest the following set of descriptors that best represent tenets of constructivism:

1. Constructivism encourages and accepts student autonomy and initiative. Course implementers will therefore have to share essential decision-making about the course with their students.
2. Constructivism allows student responses to drive lessons, shift instructional strategies, and alter content.
3. Constructivism requires active student investigation.
4. Constructivism engages students in experiences that might engender contradictions to their initial understanding and then encourage discussion.
5. Constructivist teachers enquire about students' understanding of concepts before sharing their own understanding of those concepts.
6. Constructivism encourages interaction.
7. Constructivism encourages reflective thinking.

The above descriptors strike me as too dogmatic and rigid. It would have been more helpful to classify them in terms of *past experiences* and *possible techniques* that facilitate constructivism. Further it needs to be recognized that a number of the descriptors are not unique to constructivism. Tenet 3 above, for example, is not

necessarily peculiar to constructivism. Even in a behaviourist approach one might find extensive elements of investigation. I therefore suggest the following re-arrangement:

In terms of recognizing past experiences, constructivism:

- engages students in experience that might engender contradictions to their initial understanding and then encourage discussion;
- encourages teachers to enquire about students' understanding of concepts before sharing their own understanding of those concepts.

The following techniques and aspects **may** facilitate a constructivist approach:

- active investigation;
- student interaction;
- reflective thinking;
- student involvement in driving lessons;
- recognising student autonomy;
- making use of student initiative.

The above descriptors can form part of a useful framework against which the effectiveness of an INSET programmes, approach and underlying principles can be gauged. This project will use some of the above descriptors to comment on IRTEP.

8.5 INSET AS A SOCIAL PRACTICE

Although the overarching objective of any INSET programme is to facilitate change and development, it is critically important to keep the context of the programme and its participators in mind. An INSET programme does not happen in a vacuum - it should

not merely be an isolated 'quick-fix' intervention exercise. It involves individual human beings with diverse needs and 'baggage'. Just as teaching and learning, in the context of social constructivism, is seen as a social activity, INSET should be viewed as a social practice. Education is not viewed as culturally neutral. Knowledge, skills and values are seen as sited within contextual, cultural and ideological circumstances. Baker (1996), in his work on mathematics education, proposes that 'mathematics practices' should be seen as having four components - content, context, culture and ideology. In my opinion this view can be extended to 'practices' in general and to INSET in particular. According to Baker (1996), *content* is the aspect of a programme that consists of activities, techniques, knowledge and skills that participators are engaged in. *Context* is the occasion and the purpose pertaining to a programme. *Culture* involves the beliefs and values of the individuals, and *ideology* includes the power relationships involved. In my experience, all too often *content* is the only focus of an INSET progamme. This is particularly the case with intervention programmes that are institution-based and/or operate on a 'one-off' basis where the providers run a predetermined, transferable and package-like course is devoid of classroom and professional support. The *context* component is intended to provide an explicit recognition that purpose and practice form a constituent part of educational growth. Baker (1996) suggests that context and purpose may vary from one person to another. The *culture* aspects will affect the practice that any individual adopts and impact on the decisions that the individual will make concerning his/her practice. The *ideology* component revolves around the relationships between the people involved. This will impact on the legitimacy and the status of a programme.

INSET programmes by their very nature mostly involve communities of people. Lave and Wenger (1991) assert that a person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice. This social practice includes, indeed it subsumes, the learning of knowledgeable skills (Lave and Wenger, 1991). The analogy is drawn that learning 'evolves' through a process of apprenticeship, whereby learners participate in communities of practitioners, and that the 'mastery' of knowledge and skills involves a

continuous progression through being exposed to a host of role models (usually experienced practitioners). Lave and Wenger (1991) refer to this process as "legitimate peripheral participation" and cite traditional models of classic apprenticeship such as craft apprenticeship as examples of that process. In terms of the more conventional understanding of cognitive and educational development, the term apprenticeship is used more metaphorically but nevertheless reinforces the notion that learning is an integral and inseparable aspect of social practice. In my view, however, the use of the 'apprenticeship' metaphor is problematic in this context as it inevitably conjures up images of a 'master and servant' relationship which by its very nature is often based on a top-down, transmissive and prescriptive approach. Although the intention may be one of mentoring and role-modelling, the implementation has very little to do with participation, interaction and social constructivism. So when talking of 'apprenticeship' in the sense that Lave and Wenger (1991) do, it needs to be qualified in its ideological form so as not to confuse it with the transmissive reality.

8.6 CONCLUSION

Effective INSET is based on meaningful interaction between professionals and colleagues. The effect of role modelling and mentoring in terms of 'legitimate peripheral participation' cannot be overemphasized. For Technology Education - a new learning area and a foreign concept to many educators - to find its way into a school environment successfully and effectively, INSET on a large scale will have to be facilitated. The financial implications of this are huge and the already cash-strapped Provincial Education Department will find it difficult to sustain support in this context. Voluntary contributions from the private sector and other sectors of the national and international economy therefore need to be sought.

CHAPTER NINE

THE WINTERBERG SCHOOLS TRUST (WST)

9.1 INTRODUCTION

This chapter briefly analyses the site of this research project and contextualizes it in terms of its history, geography, facilities, staffing and enrolment. The data for the graphical representations came from the regular reports on progress which the WST publishes to inform its funders and other stakeholders. The period in question runs from September 1994 to February 1998 and is subdivided into the following sub-periods:

P1 September 1994 - March 1995
P2 April 1995 - September 1995
P3 October 1995 - February 1996
P4 March 1996 - August 1996
P5 September 1996 - March 1997
P6 April 1997 - August 1997
P7 September 1997 - February 1998

These sub-periods coincide with the administrative subdivisions of the WST.

9.2 A BRIEF HISTORY

The WST emerged out of the 1986 unrest situation as a result of the farm worker community expressing dissatisfaction about the education their children were receiving (or not receiving). Amongst a plethora of difficulties such as poverty and lack of resources, families could not send their children to a secondary school because the local farm schools only catered for primary education. They were faced with a situation where they had no option but to send their children away to boarding school after the completion of their Std 5 year. The expenses that boarding school would entail plus the

forced rift in family life motivated the worker and farming community to seek an alternative solution. The WST was formed and registered in 1990. It consisted of six elected members of the farm worker community and three elected members from the farmer community. With money raised from industry and with the assistance of the local farming community the WST bought a piece of land and built a secondary school - the Lindela secondary school. The WST ensured that its policies and objectives did not conflict with those of the Provincial Education Department. The Lindela secondary school formed an integral part of the National Education Department's vision to consolidate farm schools and establish centralized 'nodal' secondary schools in rural areas. Parallel to the building of Lindela secondary school, the existing feeder farm schools of the area were renovated and given a new lease of life.

Apart from facilitating the upgrading of buildings and other physical resources, the WST identified the profound need to upgrade teachers, establish pre-school education in the region and set up an effective resource centre to support teachers and schools. To this end the WST project was conceived and in November 1994 three full-time staff were employed. The WST project, spearheaded by Barbara Scott, a qualified educator married to one of the local farmers, needed to be housed. A resource centre comprised of a multi-purpose room, housing a library, an office, a kitchenette and toilet facilities was built adjoining the Lindela secondary school, which by then had been renamed Sosebenza community school. The WST project initially focused on four areas:

In-service programmes

These run on a regular basis. Service providers such as NGOs, universities and other sources of expertise are contracted in to run courses and offer support.

The early child development programme

This programme focused its attention on the establishment of eight pre-schools and the training of their teachers. All the pre-school teachers were women from the area who had no previous training or knowledge regarding their new positions.

The Sosebenza secondary school

After this school began it became apparent that consistent support in management, resource development and staff development was required.

The resource centre

This centre evolved into the heart of the WST project. All the courses are administered and run from here. It houses all the resources and materials required for the entire range of programmes the WST project is facilitating.

In order to meet the needs of the community and empower it to determine and articulate those needs, the Communities' Representatives Forum was established in 1995. This forum facilitates communication between the community and the staff of the WST project, participation of the community, and ensures a transparent process. It is as a result of this forum that the WST project has expanded its service to include adult programmes such as sewing courses and other self-help initiatives. Communication with the community is enhanced by regular newsletters and informal gatherings.

9.3 THE SCHOOLS

At present the WST project serves 14 schools: six pre-schools, seven primary and one secondary. The criteria for their selection into the WST project was based entirely on geographical factors. All these schools fall within the Winterberg rural area which covers 1 009 km^2 and is situated between Tarkastad and Fort Beaufort in the Eastern Cape. Each school is located on a 'host' farm and serves the immediate surroundings. Approximately 35 farms are involved in all. Figure 9.2 shows a map of the Winterberg rural area and illustrates the distribution of the schools in relation to the farms they 'service'. The bar graph in figure 9.1 draws attention to the changing number of schools involved in this project in the period September 1994 to February 1998.

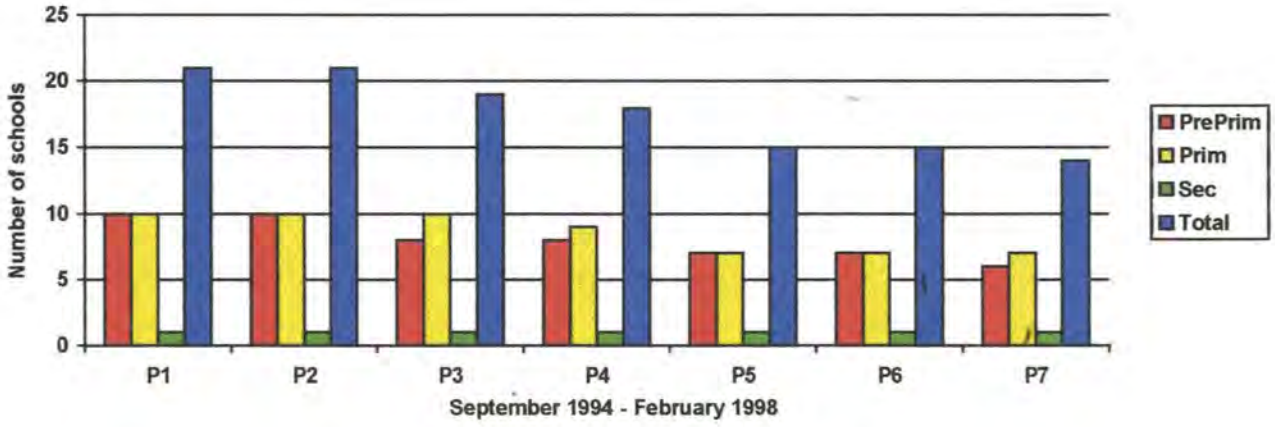

Figure 9.1 Number of schools involved in the WST project in the period September 1994 to February 1998

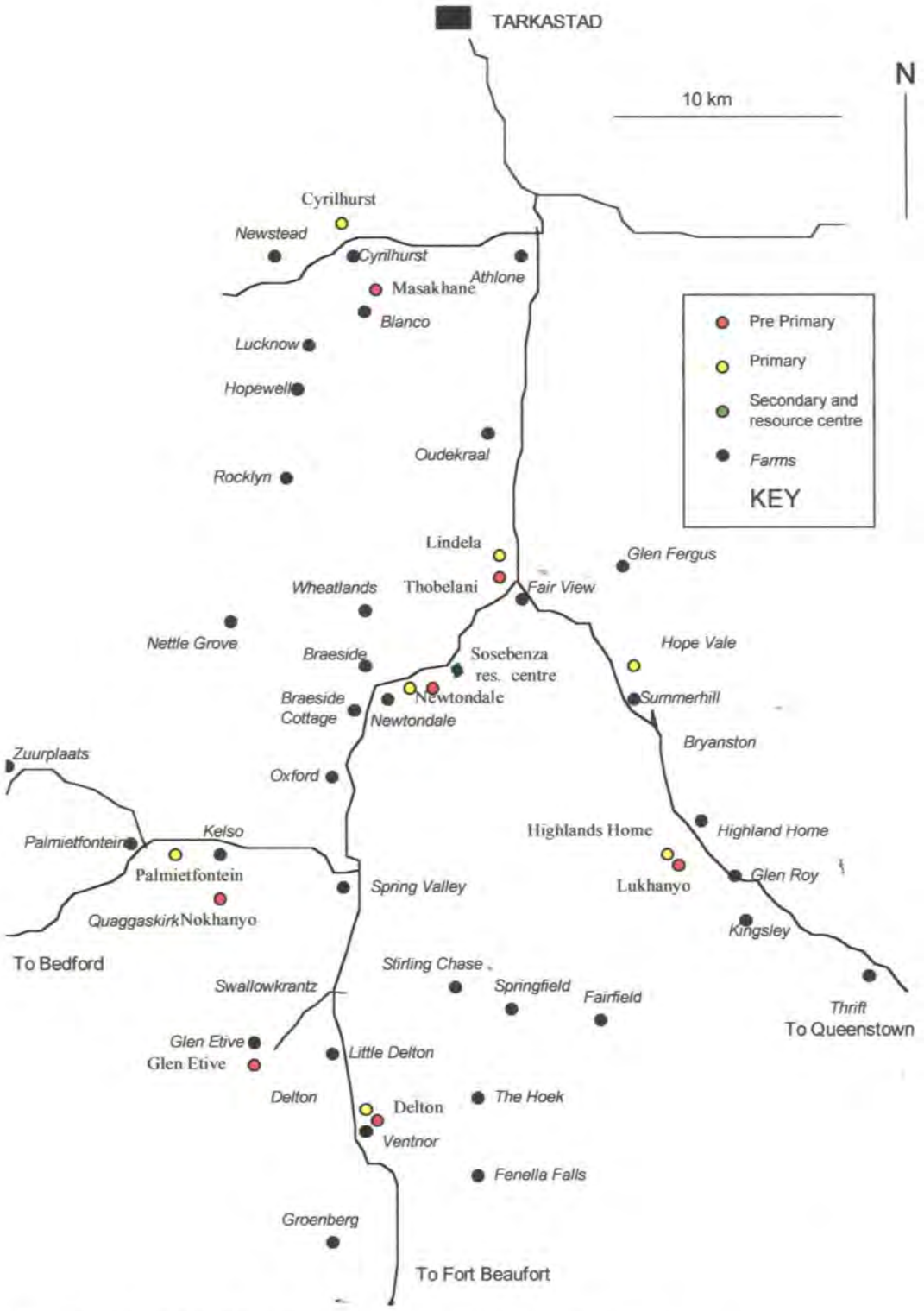

Figure 9.2 Map of the Winterberg area showing the WST schools, 1998

The decrease in the number of pre-primary schools over the period P2 to P7 was due to the amalgamation and rationalization of the pre-primary facilities in order to offer a more effective network for that sector of the population. The present Newtondale pre-primary school, for example, combines the old Nokhanyo pre-primary at Palmietfontein and the old Newtondale pre-primary. The pupil population was relatively small, so amalgamation doubled the teacher capacity without compromising student numbers significantly. The incorporation of many senior primary pupils into the Sosebenza school caused a reduction of primary schools over the period P3 to P5.

Most of the schools consist of very rudimentary structures and serve as mere shelters against the elements. The pupils are usually housed in one room where they are grouped according to the grade. Many of the schools are in disrepair and lack the most fundamental facilities normally associated with a school building. Approximately one half of the schools have traditional 'daga' flooring of a hardened paste of cow-dung and mud whilst the other half have concrete floors. The walls are all in a very poor and vulnerable state, maintained with extremely sparse materials which usually consist of waste material and equipment found lying around the farmstead. Most roofs are rusted through and leak. The conditions in winter are bitterly cold and most teachers make use of an open coal fire in a perforated tin placed in the middle of the classroom.

These structures were all built by the local community with the assistance of the 'host' farmer. The quality of the school facility varies according to the 'generosity' of the farmer on the one hand, and the involvement of the local community on the other. Only one school was provided with electricity whilst another has a solar panel which is never used. All the others have no source of energy other than the sun either to light up their classroom or provide warmth in winter. The state is not involved at all in the maintenance or development of the farm schools in the Winterberg area, and the dependence on the farmers community to provide means for development is very tangible indeed. Coupled with an inherited system of non-tenureship of land, extreme poverty and low professional self-esteem, the motivation for teachers to get involved in the

maintenance and development of their school buildings is very low. This legacy of 'dependence' has been a self-perpetuating phenomenon in the South African context which has reinforced mass stagnation and stifled any form of growth in education in the rural areas.

See table 9.1 for a summary of the profile of the schools in terms of structural facilities, enrolment and staffing as at November 1998.

Table 9.1 Profile of schools

DEMOGRAPHIC DETAILS						DETAILS REGARDING THE SCHOOL BUILDING							
School	Grades	Number of pupils	Number of Grades	Number of teachers	Number of farms serviced	Elec-tricity	Brick	Stone	Concrete floor	Daga floor	Zinc roof	Thatch roof	Solar panel
Delton	1 - 4	15	4	1	5		*		*		*		
Palmietfontein	1 - 4	5	4	1	3			*		*	*		
Newtondale	1 - 2	20	2	1	11			*	*		*		*
Lindela	3- 4	21	2	1	2		*		*		*		
Cyrilhurst	1 - 3	20	3	2	4			*		*	*	*	
Highlands Home	1 - 6	26	6	2	7		*		*		*		
Summerhill	1 - 4	8	4	1	3	*		*	*		*		
Delton	Pre-School	9	1	1			*			*		*	
Glen Etive	Pre-School	5	1	1			*			*	*		
Newtondale	Pre-School	19	1	2				*	*		*		
Thobelani	Pre-School	8	1	1			*			*	*		
Lukhanyo	Pre-School	12	1	1				*		*	*		
Masakhane	Pre-School	8	1	1			*		*		*		
Sosebenza Sec.	5 - 10	129	6	6	All	*	*		*		*		

9.4 THE TEACHERS

At present there are 22 teachers in the Winterberg schools and all are involved in the upgrading programmes run by the WST project. Apart from the six pre-school teachers, most teachers have a formal teaching qualification. These qualifications range from category B (two-year diploma) to category C (three-year diploma) status. All the teachers, except the pre-school teachers, are employed by the Eastern Province Education Department and are accountable to that Department.

The pre-school teachers are all unqualified and in some instances only semi-literate. They were mostly chosen by the community to attend to their pre-school offsprings and take part in the education programmes of the WST project, as Mandisa, one of the pre-school teachers, articulates:

> I was asked by the managers and parents of the children to be a teacher.

The commitment of the teachers to participating in the WST development programme varied from school to school. On the whole, the initiatives of the WST were received with enthusiasm, interest and acknowledgment of the importance of INSET.

Some of the responses:

> I gain a lot in the courses that the WST run. It is important that teachers are subjected to extra programmes such as those organised by the WST because one day these courses will be fruitful and these will be useful for their lives. It keeps us aware of what is happening and what are the changes.
>
> INSET at the WST are making us grow professionally, physically and broaden our knowledge in every aspects of teaching.

> The WST had a wonderful miracles for me in terms of upgrading myself. The WST built the resource centre that I am using all the time for collecting my resources in order to be able to develop materials for my classroom.
>
> Teachers need training and they should develop themselves of the changes that we have here in the country.

From my observation, the younger generation of teachers, who are more acutely aware of educational issues, participated with more passion and sense of purpose. The insights of these teachers were characterised by a strong sense of empathy and awareness of their situation, politically, socially and economically.

The older generation of teachers, however, were far more cynical and complacent about what is going on in the Winterberg. They saw the WST initiatives as helpful and useful, yet failed to grasp the agenda of empowerment. The alternative and innovative methodologies were greeted with skepticism and a sense of apathy. The implementation of these innovations therefore took a long time affect their practice. Despite this apparent negativity, the attendance of the WST courses is always very high. The peer-pressure factor is very strong and few teachers are willing to criticize or question the WST initiatives openly. All the teachers are deeply aware of the community's involvement and its mandate to them.

More explicit and detailed insight is provided in chapter 12, where an analysis of interviews with five of the teachers is made.

Figure 9.3 shows a gradual decline in the numbers of teachers in the period September 1994 to February 1998. This is attributed to natural attrition and turnover. The consolidation of schools also meant that posts became redundant.

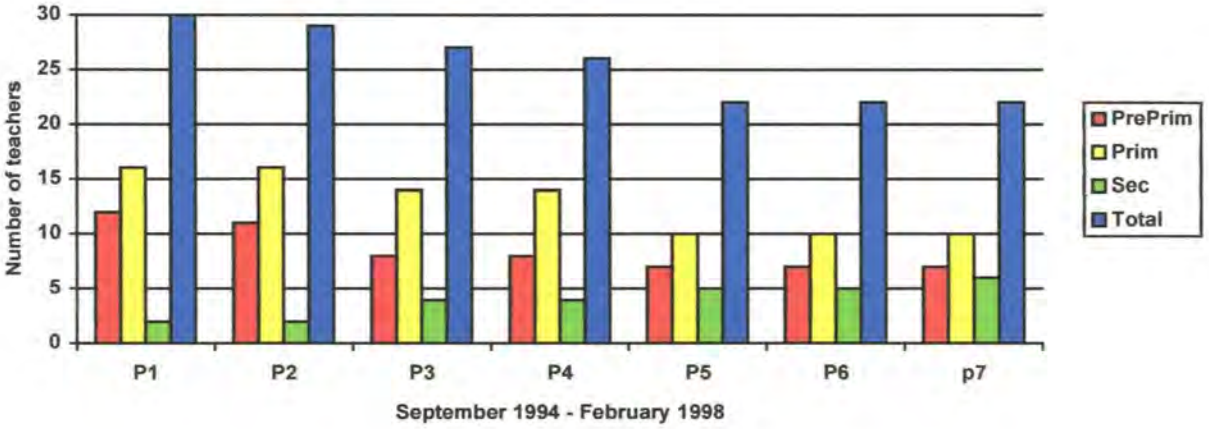

Figure 9.3 Number of WST teachers in the period September 1994 to February 1998

9.5 THE PUPILS

Each farm school serves the community of the 'host' farm and the surrounding farms that lack a school. The six pre-schools cater for 53 children and the reception age is usually five years old. The language of instruction in the pre-schools is in the vernacular. The demographics are exclusively 'black' or 'coloured' with the exception of one white farmer family who send their young son to one of the pre-schools. The children are mostly from farm worker families.

The seven primary schools and Sosebenza secondary school cater for the remaining 247 pupils of the area.

As a rule all the pupils walk to and from school with the exception of those at Sosebenza secondary. The pupils there are transported in buses donated to the WST project. The

average distance that a pupil covers daily varies from school to school. Table 9.2 shows the farms that each school serves.

SCHOOLS	FARMS	
Delton	Ventnor	Delton
	Fenella Falls	Little Delton
	The Hoek	Glen Etive
	Groenberg	
Palmietfontein	Palmietfontein	Kelso
	Quaggaskirk	Zuurplaats
Newtondale	Newtondale	Lucknow
	Wheatlands	Hopewell
	Rocklyn	Braeside
	Braeside Cottage	Nettle Grove
	Oxford	Swallowkrantz
	Glen Etive	Stirling Chase
Lindela	Fair View	
	Oudekraal	
Cyrilhurst	Newstead	Cyrilhurst
	Blanco	Athlone
Highlands Home	Kingsley	Glen Roy
	Highlands Home	Bryanston
	Summerhill	Hope Vale
Summerhill	Hope Vale	Summerhill
	Evening Sun	Glen Fergus

Table 9.2 Primary schools and the farms they serve in the Winterberg area, 1998

Enrolment in the Sosebenza secondary school has increased steadily, which can be attributed to a number of factors:

- the facilities and resources of that school have improved significantly over time and hence have attracted more and more pupils;
- transport is provided, making it more accessible for pupils;
- the general education has improved attracting more pupils.

There has been a general decrease in the number of primary school pupils particularly in the periods P2 to P3 and P6 to P7. These periods coincided with end of school years; the loss of pupils can be ascribed to pupils leaving school for the work place and also moving from primary to secondary level. The pre-primary schools have, however, experienced a steady decline in the number of children which reflects the demographic change of the area during the period P1 to P7. Figure 9.4 reflects the enrolment of pupils in the Winterberg schools up to and including February 1998.

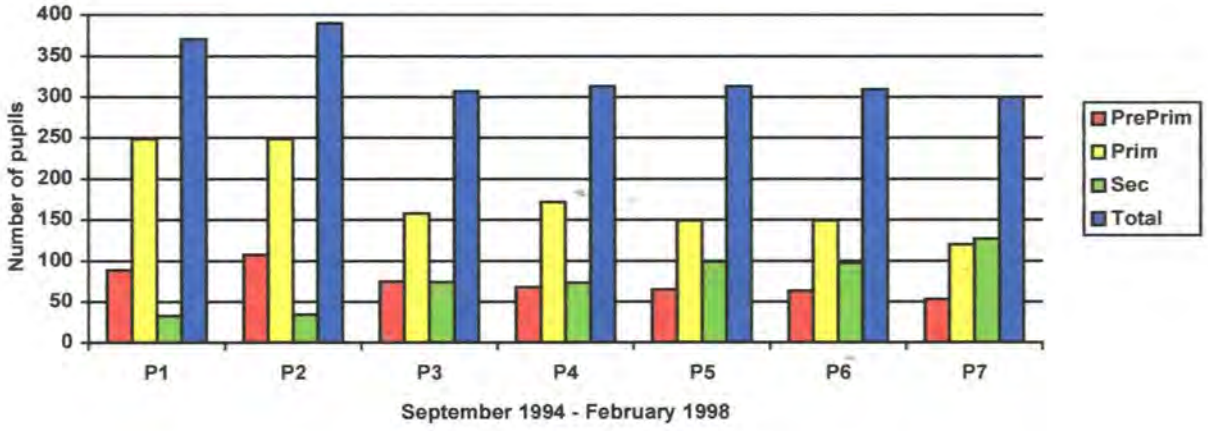

Figure 9.4 Enrollment of Winterberg pupils in the period September 1994 to February 1998

9.6 WORKSHOPS

These occur on a regular basis and usually take place in the afternoon. Although there is a tremendous need for the upgrading of rural school teachers, care is taken not to remove them from their classrooms and work in the morning. This is consistent with national policy which insists that teachers remain in their classrooms and attend in-service courses in their 'free' time. The teachers are transported to and from the resource centre. The local community is called upon to provide catering and other support systems. The frequency of workshops, illustrated in figure 9.5, depends very much on other activities,

commitments and 'pressure periods' such as examinations and preparation time. As a rule the workshops address standard[grade]-specific needs and hence the teachers are divided into appropriate groups: pre-primary, junior primary, senior primary and secondary. Issues that concern the group as a whole are addressed in combined workshops. Many of the workshops are facilitated by the WST staff, but expertise from 'outside' is brought in to complement the programme. Some service providers from whom expertise has been drawn include:

RUMEP	- Mathematics
PSP	- Science
CENCE	- Computer Literacy, Evaluation
READ	- Language and reading
ORT-STEP	- Technology Education
Provincial Department	- General workshops.

These partnerships form an integral part of the vision of the WST and have resulted in a range of interesting spin-offs for the project and its participating teachers. It has, for example, led to exchange opportunities for the teachers. Two teachers have taken part in a course at Canterbury University in England for upgrading skills and methodologies. The establishment of computer facilities at the Resource Centre and their envisaged link-up to the Internet have arisen out of close networking and collaboration with other institutions.

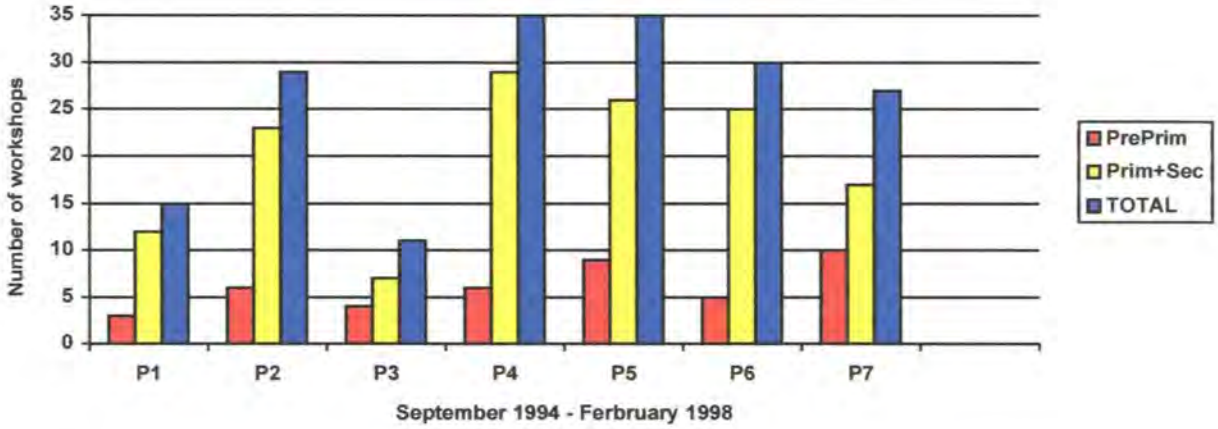

Figure 9.5 Frequency of WST workshops in the period September 1994 to February 1998.

9.7 SCHOOL VISITS CONDUCTED BY THE WST

The WST is committed to supporting its teachers in their own environment - their place of work. This commitment forms an integral part of the upgrading strategy and objectives of the WST. These visits are conducted on a regular basis and the focus of the visits are synchronized with the objectives of the workshops the teachers attended. This reinforcement ensures continuity and also provides crucial support for the implementation of different ideas or methodologies. The school visits are mostly conducted by the staff of the WST, although some of the service providers have included school visits as part of their programme. This, however, has tended to be the exception. The frequency of the schools visits, shown in figure 9.6, has depended on the INSET programme and the availability of staff.

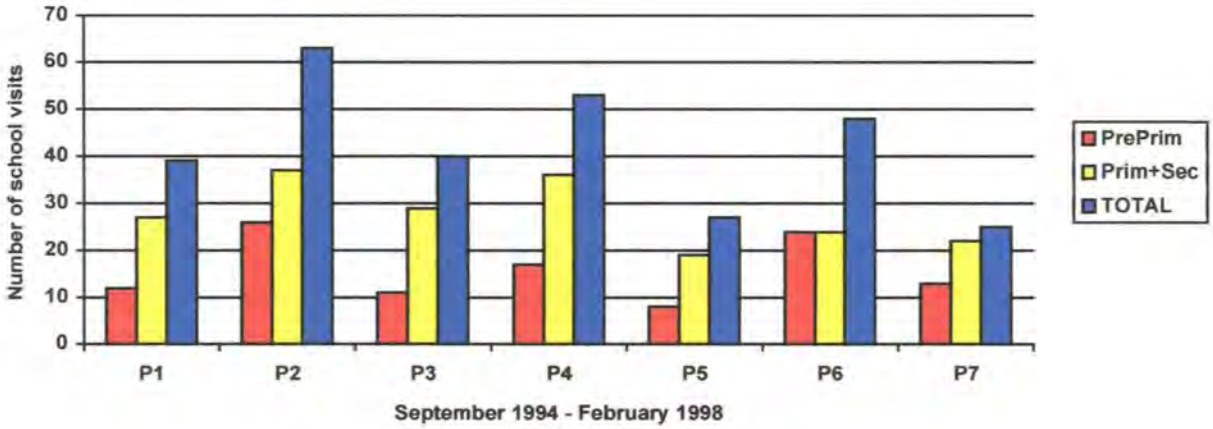

Figure 9.6 Frequency of WST school visits in the period September 1994 to February 1998.

9.8 THE STAFF OF THE WST

The WST project has expanded its programme to include other courses that address a wide range of needs in the community. It facilitates modules such as sewing and literacy on a regular basis. Although the focus is primarily on the poverty stricken sector of the community, desire has been expressed by the farmer community to receive courses such as computer literacy.

The pressure on its capacity to deliver the courses and provide effective support for the schools and the community at large has resulted in a steady increase of staff. The complete staff presently totals 18 which includes 11 part timers. Figure 9.7 shows the building of capacity of the WST since 1994.

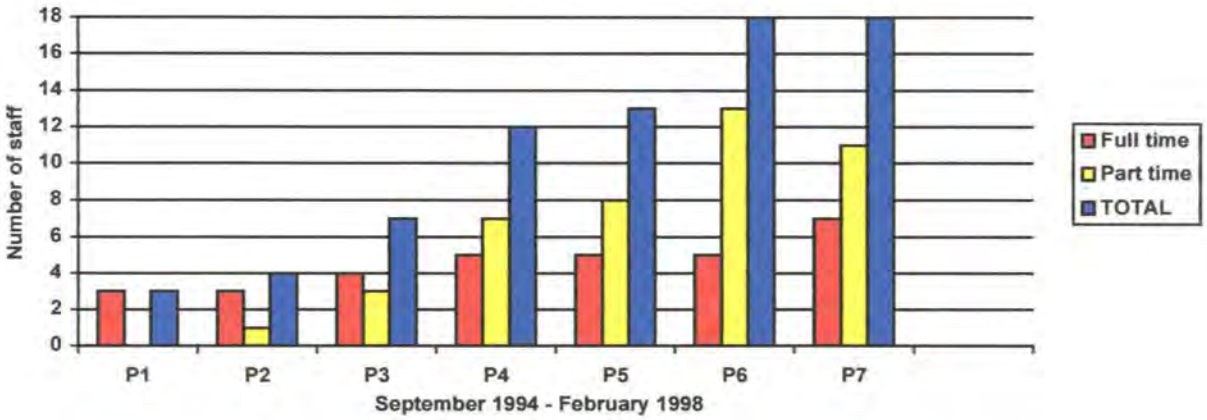

Figure 9.7 Building of WST staff capacity in the period September 1994 to February 1998.

9.9 CONCLUSION

Since its inception in 1990 the WST has grown into a sophisticated organization with extensive infrastructure and resources. The financial backing for sustaining the staff of the WST and its facilities has all come from the private sector and funding agencies. INSET is an expensive undertaking and the WST initiative can serve as a role model for other INSET programmes. The solid infrastructure and good resource base in the form of the resources centre at the Sosebenza secondary school has proved a very convenient venue for IRTEP as it is central and familiar to the teachers.

CHAPTER TEN

THE INTRODUCTORY RURAL TECHNOLOGY EDUCATION PROGRAMME (IRTEP)

10.1 INTRODUCTION

This chapter will present an outline of the aims and contents of IRTEP linking those to the theoretical and historical perspectives of the previous chapters.

In consultation with the teachers and the co-ordinators of the WST, and within the context of rural education and teacher development articulated in chapters 7 and 8, coupled with the vision of introducing Technology Education into the farm schools of the Winterberg, the need to introduce a course in Technology Education for teachers in the Winterberg area was identified. In terms of the aims, objectives and outcomes of Technology Education in the global and national context it was suggested that the teachers of the Winterberg area first needed to participate in a programme that would initially develop their own fundamental craft and creativity competencies on the one hand, and address aspects of creative empowerment, confidence and personal development, on the other, before embarking on introducing Technology Education into the schools. Hence, the focus of IRTEP was primarily directed at the development of personal skills and empowerment as opposed to explicitly developing professional competencies. Naturally it was hoped that the development of the personal dimension would affect the professional side. One aspect of the research for this thesis is to establish the extent to which IRTEP, with its personal focus, has contributed to the professional growth of the teachers concerned. The ORT-STEP Institute, an NGO with its central mission of training teachers in Technology Education, had established itself in the Eastern Cape and constantly sought partnerships and opportunities for developing teachers. After initial contact and exploring a potential working relationship with the WST, the idea of IRTEP was conceived. This idea was then circulated to the various

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stakeholders of the WST (teachers, council and community) and through subsequent consultation and negotiation with the management and leadership of the WST a workable programme for IRTEP was established.

The perception that the teachers of the Winterberg first needed to be exposed to a programme that focused on personal growth and development was strengthened during an initial introductory workshop where the teachers were given the popular brief of designing and making a device out of six straws, two kebab sticks, one sheet of A4 paper and four coins that would transport the four coins over a certain distance using the energy of a blowing vacuum cleaner. It became painfully apparent that the teachers were very insecure in their craft techniques such as cutting, gluing and in their designing techniques such as planning and drawing. The open-endedness of the problem caused much frustration and although the teachers worked in groups they found it very difficult to work co-operatively and come up with original and innovative ideas. Clearly this type of situation was foreign to them and the experience was perceived as alienating and inaccessible. On interviewing them it became evident that many of them felt inadequate on two levels. On one level many commented that they did not have the skills, techniques and experience to cope with such a problem, and on the other it was suggested that many did not have the confidence in themselves and in their creativity ability to tackle such a task. In later interviews, when probing the reasons why these skills were perceived as 'lacking', one interviewee remarked that very little skills development was done during her teacher training:

> *... we were not given any information at the College so it is my first time to come into it ....*

The perception of not being '**given** any information' during their initial teacher training period illustrates the need for INSET programmes that I believe will not only empower teachers to be more innovative and effective, but also redress the inadequacies of teacher-training in the past. With the passing of the *Bantu Education Act* of 1953, the gradual

removal of teacher education from mission schools and the introduction of the doctrines of Christian National Education coupled with the principles of apartheid, teacher education, according to Hartsthorne's (1992:236) uncompromising perception was dominated by a closed, narrow, ideological approach that "failed to produce teachers of quality and commitment". Clearly this view is an overgeneralization as many excellent teachers came through this system despite its dubious ideology. Nevertheless, the point is that teacher training, in my experience, was inadequate and the associated principles of fundamental pedagogics associated with Christian National Education did not contribute much to ensure a generally healthy cadre of motivated and committed teachers in South Africa. The principles of fundamental pedagogics was steeped in the transmissive and behaviouristic paradigm of teaching and learning - hence the reference above to "not being **given any information**". It is therefore important, in my view, when redressing inadequate teacher education through INSET programmes, that elements of social constructivism, as analysed in chapter 8 be incorporated in that programme. To many implementers and participants this may imply a total paradigm shift whereas for others it may mean a re-alignment of methods, perceptions and ideas.

10.2 AIMS OF IRTEP

On the basis of the above considerations and in consultation with the WST who represented the needs of the teachers of the Winterberg, IRTEP developed into a two-pronged programme. Phase I of IRTEP (the prime aspect of this thesis) focused on developing:

- technology skills, which included:
    a) fundamental drawing skills and graphicacy
    b) design
    c) fundamental hand and tool skills
    d) craft and making skills

- life skills, which included:
    a) building confidence
    b) teamwork
    c) creativity
    d) solving problems
    e) thinking skills
    f) innovation
    g) communication
    h) critical thinking;
    i) professionalism

- developing an awareness of materials under the headings:
    a) types
    b) uses
    c) manipulation
    d) appropriateness.

Phases II of IRTEP had a narrower Technology Education focus and aimed to use the skills and values developed in phase I for a more advanced and sophisticated approach to problem solving in the technological context analysed in chapters 4 and 13.

10.2.1 Technology skills

These involved a range of skills related to building a good foundation for creating and making simple artifacts.

a) Fundamental drawing skills and graphicacy

An essential component in the technological process (discussed in chapters 4 and 13) is the capacity to design. This involves sketching and drawing skills. The former refers to *freehand* sketching used to illustrate and delineate initial ideas on paper. The latter refers to a more formal process of design and draughting which includes accurate diagrams, lettering, constructions and plans. Drawing and sketching are essential graphic means of recording ideas and thoughts on paper and communicating those to other people. The metaphor of 'thinking on paper' or 'thinking with one's pencil' is an appropriate illustration of the intent of this aspect of IRTEP. The following components form the core of this aspect of skills development:

i) The use of hands and fingers

The initial focus is on hand and finger co-ordination and the effect that different ways of holding a pencil will have on the resultant sketch. Tasks include the sketching of simple geometric shapes using:

- finger movement only
- finger and hand movement only
- finger, hand and arm movement only
- finger, hand, arm and entire body movement.

ii) Angles, pressure and grades

Other tasks involve observing the effects on a sketch of holding the pencil at different angles and applying different pressure to the pencil. This is coupled with experimenting with different grades of pencils and appreciating the effects of 'soft' and 'hard' pencils.

iii) Lines - parallel, horizontal, vertical and diagonal

Tasks here initially include experimenting and exploring with freehand straight lines. The combination of straight lines lead to the creation of grids and shapes and this is extended to sketching common geometric shapes such as triangles, squares and other quadrilaterals.

iv) Enlargements and reductions

The use of square grids is used to produce enlargements and reductions of simple drawings. See figure 10.1.

v) Lettering

The combination of the dominant shapes (circles, triangles, quadrilaterals) is used to create letters of the alphabet. See figure 10.1.

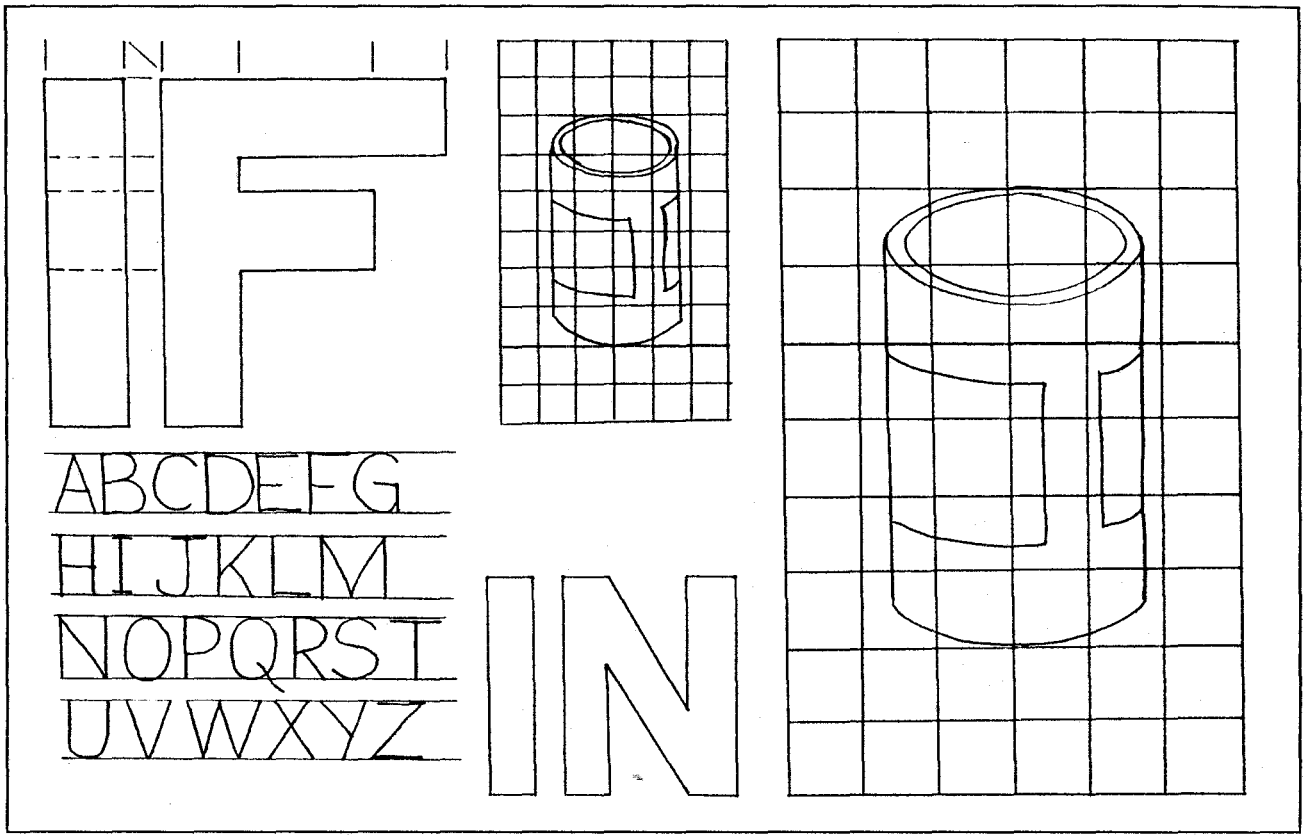

Figure 10.1 Lettering and the use of square grids to enlarge

vi) Oblique drawing

This is the entrypoint for creating three-dimensional effects. An oblique drawing consists of one side of an object drawn as a true shape and the others projected from it at 45^0. The advantage of oblique drawings is that they can be produced quickly and the lines can be measured accurately, but the drawings are often not very realistic and look awkward. See figure 10.2.

vii) Perspective drawing

This technique produces a realistic three-dimensional effect by giving a sense of depth. Instead of projecting the sides of the drawn object at 45^0, the sides appear to converge at a 'vanishing point'. One-point and two-point perspective techniques are considered. See figure 10.2.

viii) Isometric drawing

This involves the drawing of views with one corner of the object at the front. The sides of the isometric view are angled at 30^0 and use is made of a pre-drawn isometric grid to assist with the sketching. See figure 10.2.

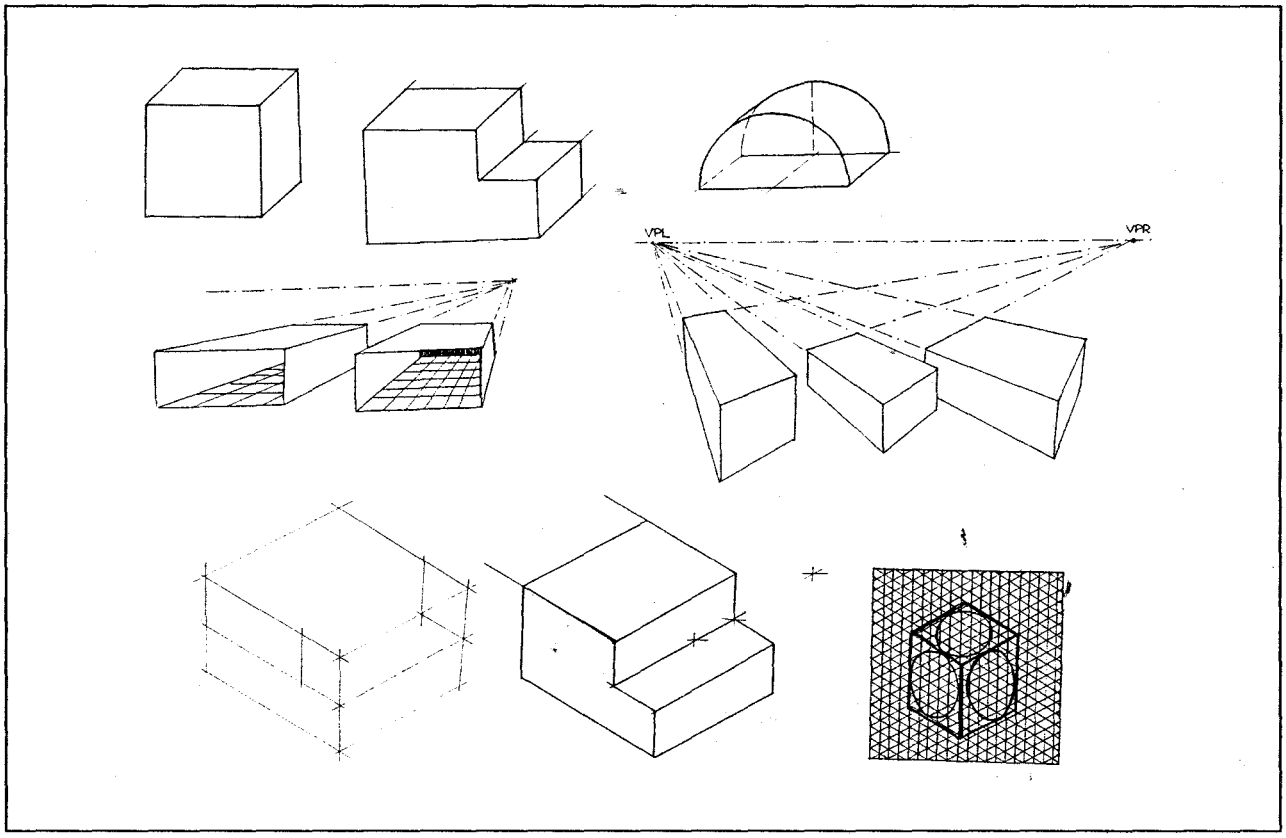

Figure 10.2 Oblique drawing, perspective drawing and isometric drawing

ix) Rendering - shading and colouring

These techniques are used to enhance a drawing or sketch and improve the visual impact. Techniques include line shading, tone shading and texture shading. See figure 10.3.

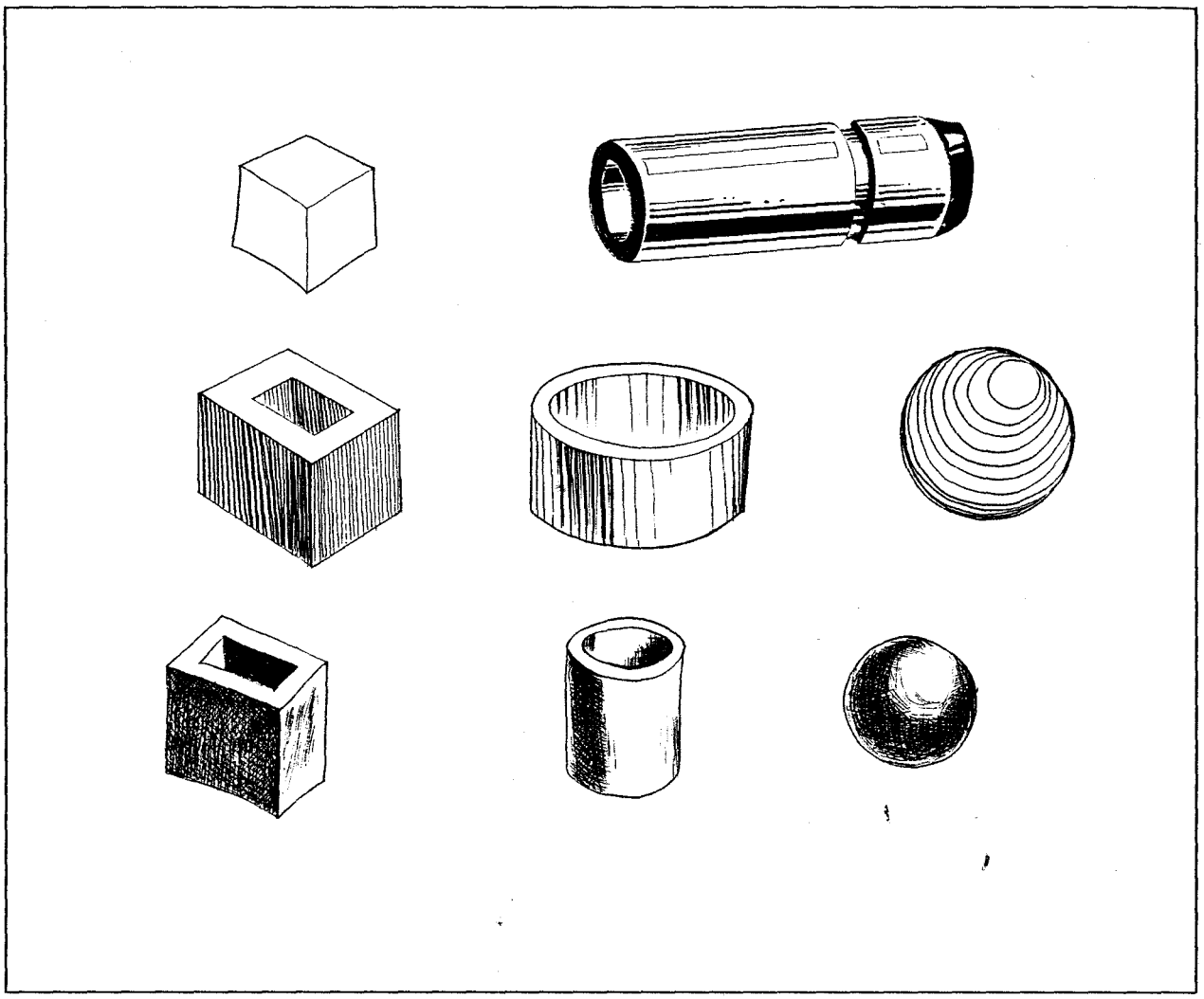

Figure 10.3 Rendering

All the above aspects are reinforced with tasks and activities such as drawing posters using headings with different lettering and creating various designs using perspective techniques.

b) Design

The idea of design not only focuses on skills and technique aspects of effective and efficient sketching and drawing, but also incorporates elements of aesthetics, planning, accuracy and appropriateness in terms of ergonomics, economics and resource availability.

c) Fundamental hand and tool skills

Apart from using a variety of obvious drawing tools such as *pencils, crayons, felt-pens* and *markers*, other graphic tools such as *rulers, try-squares, dividers* and *set of compasses* are employed. The appropriate use of these tools require other skills such as *measuring* and *calibration*. The manipulation of paper involves *folding* and *bending,* as well as *cutting* which requires proficiency in the use of *scissors* and *craft knives* whereas cutting harder materials such as wood and metal involves skills in using *saws, pliers* and *tin snips*. *Saws* that are used include *tenon saws* and *junior hacksaws.*

The joining of materials demands skills in the use of *adhesives* and in the use of appropriate joining techniques. When joining pieces of wood, for example, skills in driving in *nails* with the appropriate *hammer* and screwing in *screws* with the appropriate *screwdriver* requires specialised dexterity. The use of *pincers* is required when removing unwanted nails. The fabrication of more sophisticated joints such as mitre joints demands the use of *tenon saws* and *mitre boxes.*

The manipulation and joining of wire needs skills in using different *pliers* such as *combination pliers* and *snipe nosed pliers.* See figure 10.4.

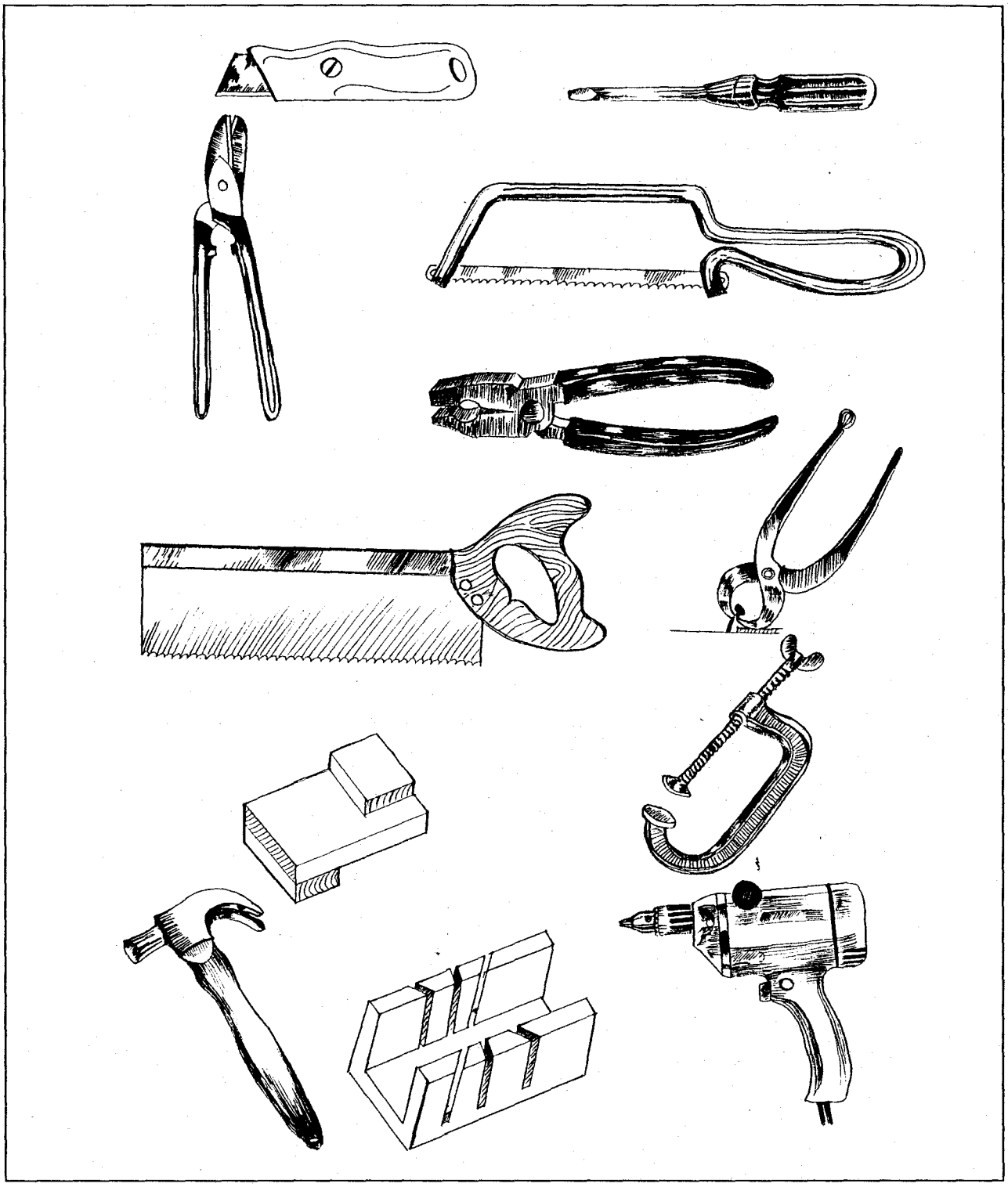

Figure 10.4. Some of the tools used

d) Craft and making skills

These skills are essentially associated with the tool skills mentioned above and relate to the appropriate manipulation of material with the appropriate tools and equipment to create a desired result. This often involves the combination of a variety of mediums and material and hence requires a multitude of skills and techniques. These skills are not all utilitarian though, as the making process often requires the creation of 'special' effects often associated with aesthetic factors and the like. Here the craft skills demand a more lateral and open approach to making, and require a shift from a 'follow the instructions' mentality to a more liberated attitude of creativity.

10.2.2 Life skills

According to Hopson (1984:9) self-empowerment is a process "by which we increasingly take greater charge of ourselves and our lives". This understanding formed a core element of IRTEP, as its quintessential purpose was ultimately to contribute towards the teachers' empowerment process in terms of their emancipation from poverty, lack of resources, under-qualification, perceived lack of creativity, and isolation. Self-empowerment requires skills and an understanding of oneself in terms of values, competencies which are transferable, and interests. Values here refer to aspects and things one holds as dear and important, transferable skills refer to those one can use in various circumstances for an array of purposes, and interests refers to activities which one enjoys irrespective of competency level. The skills referred to as *life skills* include being able to communicate effectively, and work in a team, manage one's time and assert oneself with confidence, think critically and not accept things at face value. These competencies are encouraged, developed and harnessed through activities that involve problem-solving, thinking and creativity skills. These activities are characterized by the technological process, referred to in chapters 4 and 13, and involve strong elements of designing, making and evaluating. By virtue of one of its objectives to develop fundamental

technology skills, phase I of IRTEP is biased towards the 'making' component of the technological process and emphasizes the notion of production and manufacture. The intention of phase II of IRTEP is to use the 'acquired' skills of phase I and incorporate them more integratively in the design process in order to develop a more advanced sense of innovation and originality.

Professionalism forms an important 'life skill' in IRTEP and deserves closer attention. It has become a 'buzzword' in educational discourse and has acquired a host of different meanings in different settings. Professionalism is not to be confused with professional knowledge which relates directly to content, the skills of teaching (the 'praxis') and the facilitation of cognition and learning. Professionalism is about how one relates to one's professional knowledge and according to Carlgren (1996) it is about the quality in teachers' work which includes keeping up an ethical code; about how professional knowledge is organized and used; and about the relationship between theory and practice. Professionalism is a dynamic concept which implies growth based on evaluation, reflection and appropriate 'improvement'. Professionalism is also about being a 'reflective practitioner' who sees the classroom as but one small aspect of a teacher's career. Carlgren (1996:20) appropriately reminds us that "teachers do more than teach". Teacher professionalism is complex and manifold and embraces the multiple roles of a teacher's professional knowledge.

When asked what their perception of professionalism was, some teachers replied:

> *It's a determined teacher, one who is always showing initiative and open to learn new things. You don't wait for a second person to tell you what to do. You have to be creative.*
>
> *It means to be organised, to plan ahead, to be exemplary....*
> *The way you approach your work .... and that would include the attitude that you give off in terms of how important your job is ... to me it is the whole embodiment of work, attitudes, values and principles that you apply to your work..*
>
> *....a sense of pride as well ... t portraits what you think of your profession.*

Calgren's (1996) metaphor of the theatre, where teachers are not only expected to perform, direct and stage design but also write the script is very apt in this context. Through its central agenda of personal development, IRTEP aims, albeit implicitly, at not only enhancing and enriching the teachers' professional knowledge, but also creating an awareness and a sense of professionalism.

10.2.3 Awareness of materials

Materials central to the IRTEP are:

- Paper
- Wood
- Plastics
- Textile
- Metal

The extent of researching the different types of materials in terms of their properties, functions and appearance is on a rudimentary and intuitive level. More emphasis is placed on fundamental processing and manipulation of materials. It is through manipulation that the skills mentioned above are explored and applied. The relationship between appropriate tools and materials is investigated as are the different bonding and joining techniques.

Further, aspects of wastage and recycling form an important ingredient of this course, particularly in light of the scarcity of teaching and making resources, the widespread ignorance of materials in terms of their recyclable properties and the widespread lack of environmental awareness in issues such as pollution and waste management.

In terms of the different ranges in Technology Education cited in chapter 4, a multitude of approaches can be identified in IRTEP. There is a strong element of the *craft-oriented approach* in that much emphasis is placed on handling tools and materials in manufacturing an artifact. The relatively accentuated initial emphasis on drawing skills points to *design approach* reinforcing the notion of pre-planning and conceptualization of ideas. The underpinning of core competencies in its focus on life-skills such as teamwork, creativity, solving problems and innovation directs IRTEP to the *key-competence approach.* There is a notable absence of the *high-tech approach* and the *applied-science approach* as the aims of phase I were directed at facilitating personal growth in areas of fundamental technological competencies. In this regard IRTEP incorporated aspects of the *technological-concepts approach* characterized by a theoretical underpinning of technological concepts.

Aspects and key features of IRTEP were used in the development of the interactionist model for Technology Education discussed in chapter 13. The extent of IRTEP's contribution to the teachers' personal and professional growth were explored through interviews and constitutes the focus of chapter 12.

10.3 STRUCTURE AND FRAMEWORK OF IRTEP

Although IRTEP had its own objectives and discrete agenda, it was important that it contributed to the broader picture of the WST. It needed to dovetail with the other programmes by adding value to the existing menu of activities. The 10 IRTEP sessions were each held over two days. They would typically start at 13:30 in the afternoon and run until 17:30 that evening and resume again the following afternoon at 13:30 for another 4 hours. This structure was in keeping with the spirit not to disturb the daily school routine and not taking the teachers out of the classroom. The 10 sessions spanned a period of 18 months and was funded by monies received from commerce and industry. Table 10.1 illustrates the basic framework of IRTEP in terms of what each session

achieved. All the artifacts and products created were taken home by the teachers except for those made in the last session. These were used as exhibits for the WST in their newly constructed building which houses two new classrooms, an exhibition hall and a toy library. Figure 10.5 shows photographs of some of the products created during IRTEP. An initial basic tool kit was put together by the WST and the more sophisticated equipment was brought in from the ORT-STEP Institute for every session, as well as all the materials such as wood, and the consumables such as adhesives. Refer to appendix 4 for details regarding budgets and costs for phase 1 of IRTEP.

All the sessions were held at the resource centre at the Sosebenza school, and all the teachers were bussed in from their respective schools and home again. Catering was provided by the local farm community in the form of tea and sandwiches. This was done for other development sessions as well and is a way of ensuring that the local community not only remains involved, but also takes ownership of this project.

SESSION	ACTIVITY AND SKILLS
1	FUNDAMENTAL DRAWING SKILLS AND GRAPHICACY: 2-DIMENSIONS • Free-hand sketching • Sketching techniques • Shapes and lettering • Enlargements and reductions
2	FUNDAMENTAL DRAWING SKILLS AND GRAPHICACY: 3-DIMENSIONS • Oblique drawings • Isometric drawings • Lettering
3	FUNDAMENTAL DRAWING SKILLS AND GRAPHICACY: 3-DIMENSIONS • Perspective drawings: single point and double point perspective • Lettering
4	FUNDAMENTAL DRAWING SKILLS AND GRAPHICACY • Free-hand 3-dimensional drawing • Rendering: line shading, tone shading, texture shading • Chalk shading
5	MATERIALS: PAPER • Folding, cutting and gluing • Making containers
6	MATERIALS: PAPER MAKING • Making of recycled paper
7	MATERIALS: WOOD • Construction of own wooden frame for paper making
8	MATERIALS: PLASTICS • Manufacture of toys and vessels using waste plastic containers • Crocheting using plastic strips from plastic bags
9	MATERIALS: TEXTILES • Weaving, using self-made weaving frame
10	CONSOLIDATION • Project using combination of above activities

Table 10.1 Framework of phase 1 of IRTEP

10.4 CONCLUSION

The Eisenberg model in 4.2.3 and the interactionist model in chapter 13 make reference to the urban-rural divide and acknowledge different approaches for different sets of circumstances. In view of the historical context of teacher education, the circumstances under which farm school teachers operate, the isolated and neglected nature of rural education and the needs in terms of implementing a Technology Education programme into farm schools, IRTEP's aims were dedicated to the teacher community of the Winterberg. IRTEP aimed to empower the teachers to incorporate Technology Education into their praxis in their own terms. In as much as it attempted to make teachers aware of the issues of technology it also attempted to enrich them personally. It is in this context that any change and development needs to be seen.

CHAPTER ELEVEN

THE DEVELOPMENT OF THEMES AND THE PERSONAL PROFILES OF INTERVIEWEES

11.1 INTRODUCTION

This chapter follows the development of the themes that informed the interviews and introduces the reader to the participants of the interview process by providing short personal profiles.

11.2 THE DEVELOPMENT OF THEMES

The most fundamental level of interview analysis does not go beyond the descriptive. It lets the readers draw their own conclusion, but as Merriam (1998) suggests, this risks misinterpretation. LeCompte and Preissle (1993) believe that ethnographers who simply describe what they see fail to do justice to their data. This particular research attempts to move beyond the descriptive and provide a narrative that also conveys a meaning that the researcher has derived from the situation. Researchers such as Merriam (1998) and Weiss (1994) suggest that the challenge is to construct themes that capture the recurring patterns in the interviews. The devising of these themes, Merriam (1998) asserts, is an intuitive process based on the systematic and informed purpose of the study, the researcher's orientation and knowledge, and the meanings made explicit by the participants themselves. The themes that developed in this study were based on the overall framework that held the interviews together. This framework, which guided the interviewer in obtaining relevant information, had its foundation rooted in the research question or in the overarching goal of the research which was to establish whether, and to what extent, the IRTEP facilitated change in the professional life of the participating teachers. Although the interviews were of the loosely-structured and in-depth type, which allowed for broader exploration, the central objective was never forgotten.

The themes which informed this overall framework were:

- The teachers own PERCEPTIONS of what they think IRTEP was all about
- The IMPACT that IRTEP has had on their TEACHING
- The IMPACT that IRTEP has had on their PERSONAL lives
- The PROBLEMS that the teachers have encountered

All the transcripts of the interviews were then re-arranged and re-assembled under the headings of the above four themes. Weiss (1991:56) refers to these collections of excerpts dealing with the same issue as "excerpt files". Within my four excerpt files I was able to organize and integrate the teachers responses by identifying further sub-themes. These sub-themes were classified into two groups. Group A consisted of those perceptions and responses which were tangible, obvious and immediately recognizable, whereas those in group B were less tangible and pointed to a deeper understanding. Throughout this analysis I was aware of, and concerned about this structured, 'pigeon-holing', essentially descriptive and quasi-quantitative approach to understanding the transcripts of the interviews. To some extent this preconceived approach appeared to contradict an emergent model and spoke against the assumptions of qualitative research. I was torn between a qualitative approach to gathering data and a quasi-quantitative, in the sense of categorizing, compartmentalizing and quantifying, way of analysing this data. The two are, however, not mutually exclusive - many researchers (Wilmot, 1998, Swann, 1994) have successfully integrated them and let a quantitative analysis inform a qualitative approach. My supervisor suggested, however, that I attempt a more emerging style by distancing myself from the pre-conceived themes and letting the interviews 'speak' for themselves. This was achieved by revisiting the interviews after a long gap. The resulting **emergent themes** were not significantly different from the **'preconceived'** themes. This is not surprising as the interviews were originally shaped and conceived with the four themes in mind. This latter process did, however, allow for anomalies and unique statements to surface. With the 'preconceived' approach there is the tendency to simply group together statements and utterances that are congruent and consistent with

the central agenda or theme, very often at the expense of the more interesting and peculiar comments. The danger with the recurring pattern approach, suggested by Weiss (1994), is that the analysis is reduced to a mere frequency count, ignoring the comments that were made only once or only in passing. Table 11.1 is a synthesis of the preconceived themes and the emergent themes. To facilitate a narrative of the interview transcripts and avoid compartmentalization of what the teachers said, I will, however, not differentiate between the emergent and the pre-conceived. This approach is further strengthened by the fact that the themes that crystalized out from the two methods of analysis are not significantly different.

Table 11.1 Analysis of interviews: preconceived themes and emergent themes

THEMES				
PRE-CONCEIVED THEMES			EMERGENT THEMES	
	A Tangible	B Non-tangible		
PERCEPTIONS OF IRTEP	About doing things About making things Using hands About skills Upgrades knowledge	About life skills. About confidence. Encourages thinking-skills and creativity. Creates awareness about environment and waste.	IRTEP AS A WHOLE	Has given us skills to make things. Has encouraged creativity. Has been about teacher development - about making better teachers and making teaching aids. Has been about life skills and entrepreneurship. Has made us aware of waste a, recycling and the environment.
HOW IRTEP HAS HELPED ME AS A TEACHER	The skills enable me to make things. Use my hands. Make my own teaching aids.	Encourages creativity. To do my best and think critically. Affected my self-worth. Given me better quality of life. Better able to make decisions.	SKILLS THAT WILL ASSIST MY TEACHING	Making own teaching aids and resources. Have learnt new techniques to work with different materials. Has improved my fine-motor skills. Made me more organised. Enables me to make my classroom nice. Affected my confidence and thinking skills.
HOW IRTEP HAS AFFECTED ME PERSONALLY	Am able to use the skills at home. I can sell the things that I have made. Make my own artefacts.	Helped to improve myself. Improves my self-esteem. I am now better equipped than others. I can help others. I feel empowered. I have grown inside me. I am able to use all my senses. I want to improve.	SKILLS THAT I CAN USE AT HOME	Help and support my children. Decorate my home and make my own things. I can sell the things that I have made. I can teach/show others in the family. I can mend things. I now have technical skills. Encourages me not to throw things away.
PROBLEMS	Lettering, sawing, Lack of tools. Lack of materials. Finance.	Time. Not enough consolidation.	LACK OF RESOURCES	No electricity. Can only work at the resource centre. Limited funding. Still lack the skills.
			ASPECTS TO CONSIDER FOR THE FUTURE	More follow up. More time. More sessions. Trainer must experience problems. More skills and knowledge. Would like to be compared with other teachers - be part of a bigger group.
			CULTURE ATTITUDE	Reference to own culture - own children were not encouraged to play - were never exposed to basic craft skills as children - not part of their culture. The Department does not provide. Never acquired these skills in their training and their general education.

11.3 THE INTERVIEWEES - PERSONAL PROFILES

The goal of writing, according to Rubin and Rubin (1995:261), is to represent the world of the interviewees "accurately [in the sense of being consistent with what they said], vividly and convincingly". This, in my opinion, includes insight into the more personal aspects of the interviewees. By virtue of the ethnographic nature of this study, the interviews can also be described as conversations and to some degree represent life histories (Wood, 1985) in that they have subjective depth to them. All the responses are imbedded in a personal world view and hence need to be contextualized within the person or the individual. The narrative of this thesis essentially is a journey of personal perceptions and opinions - it is a report that communicates what the interviewees have described and articulated about their experiences. To make sense of these opinions and feelings it is therefore important, I believe, to place them alongside personal profiles. These profiles will not only enrich and support the responses, but also enable the reader to attach a personal dimension to the narrative. Although the intention is for the conversations essentially to speak for themselves, it is helpful to contextualize them against a personal and socio-historical backdrop. The profiles will also further strengthen the qualitative agenda and underline the importance of the 'human factor' of this study and hopefully assist in making the data more accessible.

NOLUTHANDO

a good teacher is someone who learns
everyday, everyday, everyday,
and shares ideas among other colleagues

Noluthando was born in the Winterberg region in 1963 and was brought up by her grandparents who lived near the school she attended. Her parents lived on a farm far from the village. She says that one of the most important qualities a teacher should possess is *the ability to promote and maintain good personal relations and contact with people.* Noluthando believes that she has this quality and that conviction inspired her to become a teacher. After matriculating she attended the Griffiths Mxenge College of Education near Kingwilliamstown and qualified as a Biology and English teacher. She is married to a policeman and she likes to watch television and read magazines such as *You*, *Pace*, *True Love* and *Bona.* Her home is in the Hewu district near Queenstown which means that she lives in the Winterberg district only during term time. One of the highlights in her career was being chosen to take part in a teachers' enrichment course in England which focused on language and classroom issues: *it was a wonderful time in my life.* Noluthando embraced IRTEP in all spheres of her life - she has incorporated the skills in her home and in her classroom. *I enjoy and I like Technology because it is where I can use my hands.* The one particular aspect of IRTEP which she singled out was the drawing module. *I was very poor in drawing but now I'm glad I can try to make something beautiful..* Some of her work is illustrated in chapter 12 which focuses directly on the transcripts of the interviews.

MANDISA

to be a good teacher you must love people...
you must be just like the children at school...
when they are playing, you must play with them and
when they are sleeping you must sleep with them

Mandisa was born in 1960 in Adelaide and is married to a farm worker. She completed her standard 9 but she has no formal teacher qualification. She was elected by the parent community to look after the pre-school children of her community. She has participated in the pre-school training programme of the WST since its inception with much enthusiasm and interest. *I like to share ideas with other people...and I also like to deal with children. I like to talk!*

Her family is central to her life and she insists on their involvement in her learning. She has integrated the technology skills into her family life and shares them with her husband and her children. Her husband assists her in making apparatus such as swings and climbing structures for her pre-school. The lack of parental involvement frustrates her enormously: *the parents are not co-operative. They play hide and seek when I want school fees, and when I ask them to help me at the pre-school they refuse to mend broken windows and doors.*

For the interviewing process Mandisa insisted that I come to her house so that she could show me her work and her environment. Apart from the acquisition of new skills, Mandisa specifically highlighted the drawing module as having made the greatest impact on her. Some of her work is used in chapter 12.

FUNEKA

professionalism means to be organized, to plan ahead,
to be exemplary and to make your job...
to accept criticism and to criticize where you want
and to want to learn more.

Funeka was born in 1966 and grew up in a one-parent home. Her mother played a pivotal role in her life and ... *even now she is my model.* Funeka who sees herself as *kind, discipline and hard-working* ascribes her achievement to her mother who motivated and inspired her. After matriculating she spent some time in the Winterberg district as a teacher-aide on one of the farm schools when she attracted the attention of a school inspector who encouraged her to become a qualified teacher. She studied at the Good Hope College and returned to the Winterberg area to take up a full-time position. She likes to be part of a team and work in collaboration with her peers: *I like to help my colleagues at school and I like it when they help me. I don't mind if one criticizes me as long as it is a positive criticism, I really appreciate that.* Funeka feels strongly that her initial teacher-training did not adequately equip her for the classroom. That is the reason why she thinks that the INSET received through the WST is so valuable. *Since I joined here, I feel like I am in an urban school, because facilities and equipments are very good.* The lack of parental involvement is one of the main issues that frustrates Funeka: *the parents are not educated and therefore all the job lies to a teacher to educate children inside and outside the class.*

Funeka found the paper-making module particularly stimulating and interesting.

ZOLEKA

a good teacher must be lively and
your attitude must not be dull... you must have
a good and exciting attitude

Zoleka is one of the older members of the Winterberg team having taught for 40 years and retirement is very much on her agenda. She was born in 1934 in the Middelburg area and her childhood memories are dominated by hardship and struggle. When her father died her mother took sole care of the family and the available resources only allowed her to complete standard 6 [grade 8]. She recounts that during the 1940s *the teaching profession was the easiest profession to choose and had a shorter period to be qualified.* She was further motivated to become a teacher by her desire to *have my people educated.* She qualified at the Gore Brown Training School in Kimberley.

Zoleka lists the following as her main frustrations in dealing with a rural educational environment:

- *lack of facilities*
- *teaching 4 to 5 different classes in one classroom*
- *parents are not interested in pupils' school work*
- *parents do not support and encourage the teachers.*

On the positive side she finds a rural school rewarding because *there are no disturbances such as school boycotts and violence.*

NONDUMISO

A determined teacher who

always has initiative

and is open to learn new things

... that is professionalism.

Nondumiso who was influenced to enter the teaching profession by her mother and one of her sisters, is the last born of four daughters. She was born in 1968 an her initial professional curiosity pointed her towards dentistry, hence her interest in subjects like mathematics, science and biology. Although *family members take part in making decisions about your career.... I don't regret my decision because I think this is where I belong.* She graduated from the Cape College of Education in Fort Beaufort and started teaching in 1994. She is currently registered with the University of Natal for an FDE (Further Diploma in Education), an achievement she is very proud of.

She is very much aware of the deprivation in rural education and the neglect suffered by schools and teachers in those areas. *The thing that doesn't make me happy is when I realise the problem that my country is experiencing. It's a good thing to make change but no one from the Department of Education is responsible for seeing whether schools are managing.*

Initially she found teaching in a rural environment very difficult because *it was difficult for me to communicate with my learners ... it was not easy for them to express their feelings, to understand what you are expecting from them.*

Through the WST she has found the support she desired and she feels *that the Trust had a wonderful miracle for me of upgrading myself.*

BARBARA

professionalism to me is the whole embodiment
of work, values and principles
that you apply to your work

Barbara, who married one of the Winterberg farmers and originally hails from Zimbabwe, sees herself as a *social person who enjoys working with and having contact with people from all ages/interests and social classes.* She was born in 1960 and completed her tertiary and teacher education at Rhodes University. Her initial professional interest was in the field of physical education, but as she involved herself more and more with farm school teachers in general and the primary science programme in particular, this interest shifted to teacher development.

She describes rural education as *inadequate - in terms of resources, competent teachers, support from government and parental attitudes* and she sees her main role centred on addressing these inadequacies. She values family life, meaningful relationships and the outdoors.

JO

it has made them realize their abilities
and that is why it has improved them ... they can see
what they are able to do ... so they have become more professional

Jo also moved into the Winterberg area by marrying a local farmer after completing her teacher training at Mowbray Training College and the Port Elizabeth Teachers College. Although she regards her teacher training as a *happy and fulfilling experience*, she ascribes her positive relationship with her peer support group in her first school as the most influential and contributory factor to her teaching career. She holds very dear her closeknit family and aspires to *provide my children with the close wonderful family life that I had.* She loves working with small children *as I love their innocence and honesty.* Jo taught in a farm school in the Winterberg district for a while and this experience sensitized her to the needs of rural education. She regards herself as *a creative and conscientious teacher*, and this enabled her to cope with a multigrade system of teaching.

She characterizes rural education as *deprived and disadvantaged*, surrounded by *abuse, social problems, ignorance and a lack of dedication on behalf of the teachers.*
Her role centres on the junior primary teachers and she sees the WST function as:

- *providing necessary resource materials at a central venue*
- *providing teachers with classroom support*
- *opening doors to many new creative ideas through teacher training programmes.*

CHAPTER TWELVE

INTERVIEW AND QUESTIONNAIRE ANALYSES

12.1 INTRODUCTION

This chapter presents an analysis of the transcriptions of the interviews based on the four dominant themes referred to in chapter 11:

- **Perceptions** of IRTEP;
- Impact that IRTEP had on **the teaching**;
- Impact that IRTEP had on the teachers' **personal lives**;
- **Problems** that have been encountered.

A further theme which crystalized out of the analysis, associated with the problems that the teachers encountered, revolved around any **recommendations** that the teachers had for future consideration.

After each theme a theoretical link is provided to integrate the interview analysis with the theoretical perspectives of earlier chapters. Photographs were used to illustrate and reinforce issues that the respondents had raised. Not all the comments that the teachers made were used in each theme. Towards the end of IRTEP an evaluation questionnaire was administered to all the teachers (refer to appendix 5). This is briefly referred to at the end of this chapter.

12.2 PERCEPTIONS OF IRTEP

Based on the information provided by the teachers, their perceptions of IRTEP are analysed under the following headings:

- skills in various contexts
- specific craft skills
- upgrading knowledge
- personal skills

These headings agree with the subdivisions of the themes that formed the framework of the interviews. See table 11.1.

12.2.1 Skills

IRTEP was clearly perceived by the teachers as a programme that focused on developing skills that enhanced their capacity to 'make' things and use their hands.

Zoleka comments on this in the context of recycling and using waste:

> [IRTEP] *upgraded our knowledge to do things for ourselves, by working and using plastics and waste material.* [It taught us] *to be thrifty ... everything you can use, you must know that you can use everything ... not only throw things away.*

This was strongly supported in the original acquaintance questionnaire she filled in, in which she wrote:

> [I use the ideas from IRTEP] to teach my children to make use of waste material ....

Nondumiso, on the other hand, connected the development of skills with the making of teaching aids and resources for the classroom:

> *usually* [in the past] *when we did the teaching aids we did not know the skills, did I make this thing presentable? ... so as we started this technology we at least could see the difference from what we were used to before ... I am using the plastics ... It makes my work so easy ... So to me it makes a difference in the classroom ... and I can see that the children are keen to do practical things.*

Funeka related the development of skills to life skills and to Curriculum 2005:

> *I think it* [IRTEP] *was trying to incorporate life skills since there is this Curriculum 2005. It encourages one to have life skills which are to be implemented to children later.*

Life skills, in her words, refer to:

- *measuring ... which is fundamental to making things.*
- *drawing and shading*
- *counting.*

12.2.2 Specific skills

Although many specific skills were listed by the teachers, I will refer to them throughout this analysis in their diverse and appropriate contexts. The development of drawing skills was isolated by many of the respondents as a highlight of IRTEP.

Noluthando recounted with much enthusiasm:

> *I was so pleased with phase I because I did not know how to even draw a chair ... then you cam and show us to draw a chair ... I was able to draw it ... and as we continued drawings I got to three dimensions ... hey it is very important because now I can draw a cupboard....*[laughs].

As evidence of the development of drawing skills that took place refer to figure 12.1. It illustrates the work and progress of Noluthando (figures 12.1b and 12.1c) and Mandisa (figures 12.1d and 12.1e). The task that was set consisted of a 'still life' which was made up of three common shapes placed in the middle of the classroom: a cylinder (the tin), a rectangular prism (the white box) and a more complex cylinder (the bottle). This task was set for all the teachers at the very beginning of IRTEP and the same task was repeated at the end of the course.

Figure 12.1a 'Still life' consisting of a rectangular prism and cylinders

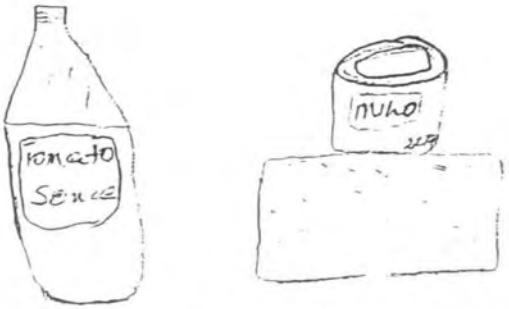

Figure 12.1b Noluthando's initial attempt

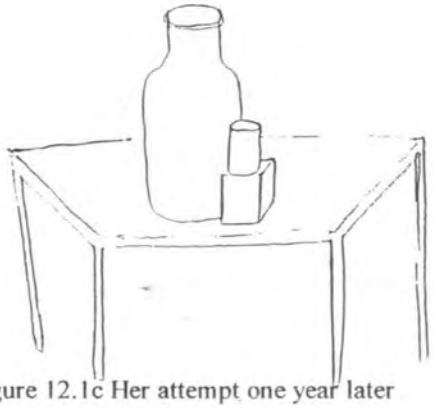

Figure 12.1c Her attempt one year later

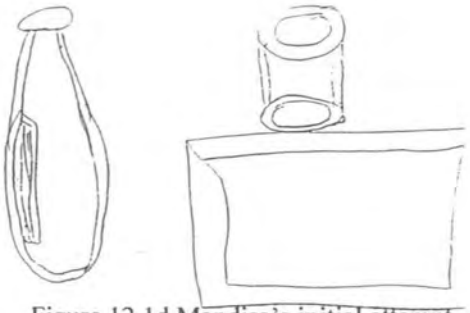

Figure 12.1d Mandisa's initial attempt

Figure 12.1e Her attempt one year later

Figure 12.1 The development of drawing skills

12.2.3 Upgrading knowledge

Reference to knowledge was made on numerous occasions.

Zoleka suggested that:

> [IRTEP]... *upgraded our knowledge ... not to know one thing only, but to know many things ... to put our knowledge to work. ... to make it broader ....*

while Funeka believes that:

> *this technology has broadened my knowledge and mind like not having to buy everything at the shop, but to think I can make all those things ....*

To her 'broadening' your mind means:

> *I can do things myself ... whenever I come into contact with something like that* [referring specifically to drawing skills] *I think of the workshop ... what can I do? ... where did I see this and how can this help me in future?*

12.2.4 Personal skills

Barbara and Jo perceived IRTEP to be a programme that focused primarily on developing personal skills. They clustered the skills and making aspects of IRTEP under the concept of creativity and personal growth:

> *For me, firstly, [IRTEP] was to give the teachers an opportunity to develop their own personal skills in things like cutting, measuring, drawing, designing, making, gluing, painting and whatever. They had not been exposed to that in their own schooling so they had an inadequacy in their level of skills ... and secondly, to increase the teachers' level of confidence by making them realise that they actually can do them, I think that IRTEP did that well ... I think it gave them lots of opportunities to develop skills that they did not have before*

> [IRTEP] *really was to make the teachers feel more confident, to be creative in the classroom ... so the technology, for me, that is how I saw it, that you were coming in giving them ideas to be more creative with themselves.*

> *It specifically was NOT intended to be classroom related ... because we did not want to put pressure on the teachers, we wanted them to be able to relax and enjoy themselves and develop those skills and any spillover into the classroom at this stage was a bonus.*

Central to the teachers' perception of IRTEP was the notion of skills development. It is interesting to note that the teachers did not view skills in the narrow sense of manipulative craft skills only, but recognized the significance of personal skills and life skills. The appropriate use and development of skills is central to any Technology Education activity. The richness of the activity will largely be determined by the extent and the variety of the use of these skills.

12.2.5 Theoretical consolidation

To contextualize IRTEP within the broader framework of Technology Education, it is important to link it to the theoretical models and discussions of earlier chapters. The theoretical considerations and process of contextualization will form the basis of the development of the interactionist model in chapter 13.

Eisenberg's model of Technology Education (refer to chapter 4) identified **skills** and **knowledge** as two of the three components constituting the 'content' dimension of the model. Although the model was not specific in listing the extent and the types of skills, such as drawing and sawing, it referred to the more generic and 'non-tangible' skills such as problem-solving, communication and decision making. This is a strength of the model as it allows for individual interpretation in curriculum development and programme design. The specific skills that the respondents referred to above need to be seen in this context. Although the development of specific skills is an essential aspect of IRTEP, their contribution to the development of more generic skills (or life skills) is crucial. All the respondents linked the acquisition of specific skills to some element of life skills. Zoleka's reference to waste and thriftiness is a case in point. **Knowledge** in Eisenberg's model refers specifically to materials, energy and information, whereas the respondents

saw knowledge in broader terms. Funeka relates knowledge to empowerment in the sense that she is able now to make things on her own and is no longer dependent on having to purchase certain items.

The DATA model only refers to skills and knowledge in very general and vague terms. This allows for flexibility and adaptation. In the context of IRTEP, however, with its agenda of INSET and upliftment, the development of skills needs to be explicit.

The explicit recognition of the development of skills which to many of the respondents were novel concepts, needs to be reflected in a model which is to represent Technology Education on all levels. The interactionist model developed in chapter 13 explicitly indicates the development of skills in the curriculum.

The Australian model referred to in 5.4, succinctly and effectively, in my view, integrates the development of skills and acquisition of knowledge with the broader agendas of personal enrichment, self-esteem and an enhanced ability to cope in society.

12.3 IMPACT OF IRTEP ON MY TEACHING

All the teachers were very explicit in explaining how and in what context the IRTEP course has affected their life in the classroom. Some used the skills developed in IRTEP to enhance their own teaching by incorporating the projects and craft skills of the programme into their own lessons, while others also adopted and adapted strategies and certain aspects of Technology Education into their own models of teaching. Still others identified more personal dimensions such as confidence and self-esteem. In the interviews we also explored the notion of professionalism and their perceptions of a good teacher, which provided an interesting platform from which to further explore how the skills and knowledge developed in IRTEP related to these perceptions.

The following headings were used to analyse IRTEP's impact on the respondents' teaching:

- Enriching of lessons and enhancing the classroom environment
- Teaching methods
- Empowerment, confidence and self-worth
- Compensation for inadequate training and experience

Once again the above categories crystalized out of the themes which emerged as illustrated in table 11.1.

12.3.1 Enriching of lessons and enhancing classroom environment

> *Yes, it* [IRTEP] *has been of help ... because I do it in the classroom and the children can now do the boxes and the drawings and the paper folding* (Zoleka).

> *Yes, colouring and using different pencils for shading ... I show them how to make drawings light or darker. We* [integrate Technology] *in our lessons like biology, history or geography* (Noluthando).

> *It helped me in my school to make things, like cupboards, tables, chairs and posters ...* (Mandisa).

> *Yes, I really think that these teachers can do things now that they couldn't do before ... You can look in their classrooms to start with and see the kind of activities that they are letting the kids do. Like making models of things ... they are doing science experiments, they let the kids do the paper making* (Barbara and Jo).

> *In my teaching I used it in my art periods ... we did free-hand drawings and enlargements ... also in maths I give them waste boxes to get parts and fractions ... and also for different shapes ... they will explore how the shapes are being made* (Funeka).

Funeka confirmed her multi-use of technology in the acquaintance questionnaire in which she wrote:

> Technology has also helped me in doing and writing charts for my classroom in a more advanced way. It has broadened my knowledge of doing things using other things. The one that interested me is recycling paper and using it to write on, it was really wonderful.

12.3.2 Teaching methods

Nondumiso, particularly, expressed herself strongly in terms of how she has assimilated the concepts of IRTEP into her broader teaching methods. For her, technology is one of the areas she uses to facilitate the change to a more outcomes based and process oriented methodology:

> *In the old curriculum we used to make teaching aids for the children, but not learning aids ... and as we compared NOW they must be doing things with their own hands and other things ... so from what I have received from the course it's nice not to be able to start things by myself ... I'm expecting them* [the children] *to bring all the things ... I think it* [IRTEP] *is like this OBE which says that children must come with ideas ... not to tell them what to do ... yes we are always underestimating these kids..*

Apart from a good teacher being *somebody who learns and wants to know more, who explores and wants the pupils in class to practice what they are going to be in their life-long ...* Funeka also thinks that *... good teaching is to prepare, plan and be punctual in whatever you are doing.* In this context, IRTEP has *... played a role in planning, because when you are given an assignment you have to set aside time so that you can plan to solve the problem.*

The transference of the skills learnt during IRTEP to the classroom and the teaching situation is manifested in the many more activities that the learners are involved in:

> *the kids are doing a lot more stuff now than they have ever done and I think I t's because the teachers have the confidence to let them go and do it. And the teachers have realized how important it is for those skills to be developed when you're a kid* (Barbara).

Mandisa struggled to articulate how she assimilated aspects of IRTEP into her methodology. She saw the practical aspects as important:

before I didn't know how to make things by myself, I have asked the fathers to help me, but now, I am telling you, I make my own, everything ... at my school. So it helped me too much at school..

12.3.3 Empowerment, confidence and self-worth

Empowerment, for the purpose of this study, refers to a process whereby the teachers acquire the means and skills to be independent, autonomous, confident and self-sufficient in seeking problem-solving strategies and techniques. Self-worth refers to self-esteem which is about how an individual feels about him/herself.

When exploring the relationship between professionalism and IRTEP, Funeka suggested that: *everyone is trying to do the best ... I mean whenever you are here we want to show you and our colleagues the best we can do.* [IRTEP] *has made us aware of wanting to know more, exploring and building confidence in everyone, because the more you do it yourself the more you think I can do this on my own, or say to oneself what can I do to improve it ... that means you are involving yourself about learning more.*

Yes, I really think that these teachers ... really believe that they can do things now that they couldn't ... they wouldn't even try before ... was Jo's reaction when the issue of empowerment came up.

When asked what evidence there was to make such a statement, Barbara responded:

You can look in their classrooms to start with and see the kind of activities that they are letting the kids do. Like making models ... science experiments ... let the kids do the paper making...previously you could do something in a workshop and they would not take it into the classroom actually. I think they did not have the skills which gave them the confidence to take it into the classroom.

If we had to redo the whole thing from scratch, I would have to do the technology component right in the beginning because a lot of what we did in the beginning in terms of INSET did not go back into the classroom because they did not have the confidence to use their hands-on skills.

In the same breath, however, Barbara also pointed out, quite rightly, that IRTEP needed to be seen in context with other input:

> *you can't actually say that it's only been the technology education that has caused this kind of change because there has been a lot of other input ... but the technology programme has been more focused and what it has done which others haven't is made the teachers conscious that they have learnt those skills ... and that has given them the confidence.*

In terms of empowerment, Nondumiso emphasised the opinion that it is very significant for her to be one step ahead of her peers who have not been exposed to any Technology Education programme:

> *We are teachers of the New South Africa ... and we are few when we are attending this new course and OBE stuff ... and we will find that everybody is so confused ... but this Technology helped us ... It makes you different to your colleagues ... whenever I am moving around I can compare myself to my college colleagues where they remain ... they are disadvantaged to be in a public school in the location doing nothing and to be in a town school where they are getting no help ....*

Her reference and use of 'disadvantaged' points to an interesting departure from the stereotyped notion which is generally limited to a socio-political interpretation. Referring to other colleagues as being 'disadvantaged' clearly implies that she sees herself as being not 'disadvantaged'. Her implication suggests a sense of being empowered in her knowledge and skills base in terms of Technology Education and its place in the new education landscape. She further articulates her perceived advantage over others by referring to the problems of language:

> *Technology is a big word for them .... Technology is very complex for second language teachers ... so it is worse for someone who is not prepared in this field, because you have to sit down for yourself and prepare it for yourself ... so when I think about the technology we have started, to me when I open that preparation book of mine, things are so familiar and I can simplify the complex words and get the words that I can use inside my classroom ....*

For her own professional growth she feels that:

> the technology programme really makes my life so superb. I've developed the confidence, self-esteem and encouragement by using the technology for my classroom practice.

On numerous occasions, Mandisa expressed a sense of empowerment and achievement:

before I did not have enough equipment, and I could not make these things by myself, but now, when I see something here, I make by myself and every children have enough equipment, because I can do it. So it helped my teaching.

12.3.4 Compensation for inadequate training and experience

Numerous teachers spoke passionately about the feelings of regret they experienced about their own inadequate teacher training and their lack of experience in the desired skills and awareness.

Mandisa remarked that ... *before we didn't know about this Technology, so now we know a little bit ....*

and Noluthando said that ... *I did not get that chance when I was at school.*

Funeka was quite specific when she suggested that ... *we were not given any information at the college so it is my first time to come into it.*

So for many, IRTEP had an impact in their teaching in the sense that it redressed missed opportunities of the past and compensated for imbalances and inadequacies of their past teacher training.

Barbara and Jo had a more patronizing view about the teacher's past. Their rationalization was based on general and broad observations and opinions which identified 'inadequacies' in the teacher's training and experiences at home.

Jo commented:

There are different schools of thought and we [the people at the Winterberg Schools Trust] *argue about this ... I believe because they never went through proper foundation phases ... there were no pre-schools here in their day ... so they never ... in their homes they don't have scissors, glue, rulers and measuring things and those type of things ....*

Barbara argued that the relationship between 'work' and 'play' was the key issue:

> *There is this whole thing about work and play ... I'm not 100% certain, but I think that in their culture there is not a great deal of emphasis on play ... I think there is a lot that revolves around work that needs to be done ... so for instance even when you are a little four year old, you don't sit and make little things in the mud, or cut things, you go and sit in the field and you watch the sheep and then you bring them in ... I mean, everything seems in their lives to revolve around getting a job done ... things aren't done just for fun ....*

I asked Funeka to comment about this perceived 'inadequacy':

> *when we are at home the pupils do ... for instance when it is play time, no one is interested in what they are doing, or they are doing those toy cars ... It only adds to their playing time - at home we don't encourage them ... what can I say.*

It appears that although there is play time, there is very little 'educational' agenda in terms of parental support and involvement and hence the children grow up with very little exposure to activities that require skills, such as cutting, crafting, making and drawing. The problems associated with the lack of parental involvement will be highlighted under problems and limitations.

Both Jo and Barbara are of the opinion that physical development and cognitive development are inextricably linked and that the 'lack' of fine-motor co-ordination may explain the perceived lack of skills:

> *there are various levels of physical development, you are not only talking about gross motor development ... but if the fine motor co-ordination is totally lacking and that has an impact cognitively ... hm ... so I'd put skills in the physical development category which it does, in terms of hand-eye and fine-motor and all that stuff, you know then it is very important. And you know these people are all wanting to participate in a world that is very much directed by western culture and western philosophies, they don't want to stay in the huts and all that ... so if they want to compete in that world they need to achieve the same skills that western families have .....*
>
> *even if you look at the adult literacy ... they hardly can hold a pencil ... they are genuinely unable to copy a pattern. And it is because their fiine-motor movement is so lacking and so undeveloped .....*

Although it is not within the scope of this thesis to investigate the extent of fine-motor development in rural communities, the above assertions are questionable. It is my view, based on limited observation and interaction with rural folk, that they have had as much opportunity to develop fine-motor skills as any other community. The issue is possibly one of developing certain **types** of fine-motor skills as opposed to fine-motor skills in general. The analogy of a musician comes to mind. On a superficial and technical level, a competent musician who has mastered his instrument has done so not because of the better development of fine-motor skills in general, but because of the endless repertoire of a certain type of fine-motor skill.

12.3.5 Theoretical consolidation

Although the different models of Technology Education referred to in chapter 4 do not specifically relate to teacher education and development, many of their features can be applied to teacher education. In the Winterberg context this is particularly true as the teachers there have never been exposed to the type of Technology Education under consideration. The same can be said of teacher education as whole in South Africa.

Under Attitudes and Values in Eisenberg's model specific reference is made to **self confidence** and the **place of work**. This is of special interest in this context as the teachers, who are situated in 'their place of work' see the particular relevance of IRTEP to their professional environment. Perhaps the notion of relevance in terms of links and interconnectivity of Technology Education and 'the place of work' takes on a more realistic meaning when doing Technology Education 'in situ' as opposed to merely referring to 'the place of work' superficially and theoretically in a classroom situation. The responses above suggest that Eisenberg's model needs to be expanded in order to accommodate issues of empowerment and self-worth. Eisenberg's model limits itself to self confidence, responsibility, teamwork and the world of work.

The interactionist model reinforces and emphasises the notion of Attitudes and Values by identifying and suggesting a dedicated and explicit element within the curriculum.

The DATA model identifies the place of work as an important element of Technology Education. Under Industrial Partnerships it makes explicit mention of economic and industrial understanding as well as work-related activities. Although IRTEP had no explicit professional agenda, albeit that it was designed for practising teachers, it is significant to note the links that the respondents made to their practice.

In terms of constructivist theory (see 8.4) the role of the learner is a dynamic one and learning (and teaching) is seen as a process. This is reinforced by the respondents when reflecting on their own learning (and teaching) situation in the context of IRTEP. It is significant to note that Thulama in particular identified and linked the objectives and methodology of IRTEP with a more process-oriented approach to education. The specific reference to producing 'learning aids' as opposed to 'teaching aids', in my view, illustrates a shift in understanding and perception.

A constructivist approach to education implies that the teacher needs to create space for learners to construct meaning actively and interact with each other (see 8.4). This in my experience requires a certain level of confidence and belief in oneself. The teacher needs to trust her role as a facilitator and she needs to believe that the environment she has created will facilitate learning. She has to liberate herself from the textbook and interact with the dimensions that are generated from the pupils. Barbara suggests that IRTEP has facilitated this by indicating that much more activity on the part of the pupils is taking place. She suggests that the teachers now have the confidence to operate in an environment that encourages and supports interactive processes.

When addressing the issue of inadequate teacher training, it is significant to note that none of the teachers regarded **themselves** as 'inadequate' or 'deficient'. It is my perception that they saw INSET in general (and IRTEP in particular) as a process of

development and growth as opposed to one of 'rehabilitation' and 'therapy'. This strengthens the view expressed in 8.3 that INSET needs to operate on a premise of growth and not of deficiency. This ties in with the principles of constructivism which suggest that learning is a growth process that builds on past experiences, adaptations and assimilations.

12.4 "HOW HAS IRTEP AFFECTED YOU PERSONALLY?"

All the teachers have identified a strong personal element in the IRTEP programme. Many have embraced the ethos of Technology Education in their home situation and have embarked on making their own artifacts and mending things they would normally have left for someone else to repair.

The following categories were used to facilitate analysis:

- Entrepreneurship
- Artifacts
- Family
- Role models and helping others
- Empowerment, self-esteem and growth

These categories grew out of the conversation with the teachers and developed as a result of observations of some of the teachers in their personal space.

12.4.1 Entrepreneurship

Some have identified the prospect of using their skills to produce artifacts and devices that are marketable and will hence provide a potential source of income.

Zoleka argues that she will put her skills to use in her retirement:

> *this technology programme has helped me when I retire ... I can make things and keep myself busy. I will sell them* [the things that she has made] *... I will sell them to other people ....*

while Noluthando has alreadysold some of her work:

> *yes I sell these things ... like the sugar bowls* [made out of old plastic Coke bottles] *... sold these at a meeting* [at the church] *for R10,00 ... yes I am going to make lots of things.*

12.4.2 Artifacts

Mandisa found IRTEP particularly suitable for her needs at home. She experimented with a variety of the skills and materials and produced artifacts which were decorative on the one hand and utilitarian on the other:

> *Yes I use* [the skills] *at home ... like those candleholders and those envelopes out of paper ... I made nice postcards for my sisters ... yo! it was wonderful... and working with plastics and weaving* [points to a row of cushions on her sofa which she made herself - see Figure 12.2] *I have made that on my own ....* [IRTEP] *has helped me in everything ... look at that bird ... I made that bird ...* [pointing to a carved bird on the coffee table - Figure 12.2] *... I find the branch of tree, and I cut this one off and with that one I make the head, and make the body with the other side, and I cut all the parts off and take the sandpaper and make it smooth ....*

Figure 12.2 Nomsi's cushion cover, and bird shaped out of wood

It was Mandisa who identified sources of raw material in her own environment:

> *You can take clay from the river to make balls and pots - everything like that from clay. And the roots from the trees and make snakes ... and we use sand-paper and varnish. From the trees again we can take the pieces of wood to make birds ... and the cones we can make guinea fowls.*

She and Noluthando would collaborate and make things together, as Noluthando recounted:

> *Me and Mandisa we are chopping the big wood and bore it out inside and do it so that we can stamp our mealies ... we used a hammer and something sharp to bore it inside, and we used hard wood which we found on Mandisa's farm.*

Zoleka started making ... *fancy glasses with waste bottles ....*

and Noluthando engaged her skills on numerous levels ... *in frames ... I learn a lot in that ... because I cut according to the measurements ... learnt how to measure ... I measure my ceiling at home ....*

12.4.3 Family

Many commented on how IRTEP has complemented their family activities.

and at home I teach my children how to weave ... we made our own frames ... not nice because we are cutting from reeds from the river ... we put reeds and make a frame and with reeds we weave in that frame ....

shares Noluthando, and continues:

even the drawings ... during my spare times ... I show my children ... even the one who is doing standard 6 ... Mama what did you do in technology lesson - I want to do it ... they like to copy to do it ....

Also Nondumiso specifically referred to her experience with her son when she described the influence that IRTEP had on her personal life:

Ja ... my child was so surprised when I brought home sketches when I was trying to draw a kitchen and he couldn't understand how I could make that picture I was doing and he could not believe ... I mean that his mother can make a plan of a kitchen without copying from anywhere [she is specifically referring to the module on single point perspective drawing] ... *so in his school - one of the multiracial schools in PE - for example during this holiday they did a project about food so he had to collect things and I helped him with the writing out ... you know the cover and the headings ... and I understand the teacher asked him ... who helped you with this project and he said: teacher it was my mum!*

12.4.4 Role models and helping others

Nomdumiso felt very strongly about feeling part of the greater educational scenario and being able to participate in its innovations and development:

whatever one hears about technology now I can listen of what he/she is saying ... I can participate in whatever now ... whatever they are talking ... and because I have attended technology I have got an advantage than those that have not done this ...

Funeka feels that she would like to get other people involved and she sees a role for herself to teach and help others:

If I had more material I would like to help people out of school to make interesting things ...so that they realise that what they do at school is not just

the end, but that it goes on ... I try and do it [technology] *with my Sunday school in town ....*

and Noluthando reflects:

and one of my cousins ask me that I show her how to do these things because they liked those things.

When asked in what other way IRTEP had helped her, Felicia tried to compare herself with others and said:

like ... other teachers have asked us about technology ... like this teacher from Uitenhage ... I've told her about this technology ... she was very interested. ... because in Curriculum 2005 technology is very important ....

Mandisa enthuses:

It has made me feel that I want to teach somebody, each other people too, to know about this technology, and try to show them how it has helped me, in my home and in my school..

12.4.5 Empowerment, self-esteem and growth

In the final evaluation forms that all the teachers filled in, significant reference was made to the 'self'. This, in my opinion not only points to acquisition and development of personal skills and knowledge, but also to the growth of a sense of self-worth and self-esteem. The teachers shared enthusiastically about their achievements and the things they had made. The fact that they openly talked about themselves points towards a feeling of confidence and empowerment and enablement.

I can make ornaments and decorate my home using ideas from IRTEP ... I can even sell them.

They [friends and family] were surprised when I showed them things we have done. They asked me to show them how to do these things.

'received', but are developed and acquired. Mandisa's transference of what she has learnt at IRTEP to her family surroundings is evidence of that. Through the applications of acquired skills she builds self-esteem and enriches her space. The Australian framework further suggests that technology studies enhances an ability to cope in society. This is confirmed by the respondents in numerous contexts on how they used newly learnt skills to enhance their position in society. This is no better illustrated than when Noluthando, for example, reflects on her role as a rolemodel *vis-à-vis* her peers and family.

Most theoretical underpinnings of Technology Education emphasize the strong links between technology and the economy. There is the assertion that Technology Education equips the learner with skills that make him/her more marketable. This marketability can refer to the person herself, or it can refer to the trading of artifacts and products manufactured by the person. The respondents in this study, particularly Zoleka and Noluthando, have attached an economic value to some of the artifacts they made. Zoleka sees potential to complement her future pension income by manufacturing products to sell. The entrepreneurial dimensions of Technology Education are referred to by all three models in chapters 4 and 13. Eisenberg's model places the economic ramifications of Technology Education under the headings of Skills and Context. The former implies that Technology Education will facilitate skills that are either directly marketable or will enable learners to use acquired skills to produce something that is marketable. The latter reinforces the notion that technology does not happen in a vacuum but is part of a broader context of which the economy is an integral part.

DATA's model also places the economic elements on two levels. On the one level an economic understanding, closely related to work-related activities, is linked to partnership with industry. This implies close collaboration with industry which in a rural setting as isolated as the Winterberg is not always possible and feasible. I believe it more appropriate to facilitate links with the informal sector of the economy which will facilitate trading and marketing in that context. It should be noted that the DATA model does not necessarily imply any notion of trading and economic enriching in the same

sense as the responses of the Winterberg teacher seem to imply, but rather a more sophisticated awareness of the relationship between industry and the Technology Education classroom. The other level that points to an economic link is the Values segment of the model, which suggests a more affective emphasis on the economic relationship between Technology Education and the economy.

Similar to the Eisenberg model, the interactionist one sees the economic link on an entrepreneurial skills development level and a context level. It also recognizes the economic relationship that exists in the establishment of links between industry and Technology Education.

12.5 PROBLEMS AND LIMITATIONS OF IRTEP

When confronted with having to articulate the problem areas of IRTEP, the respondents generally were very hesitant. They appeared shy and resisted being critical. This, in my view, can be attributed to a number of factors:

- they were genuinely shy and uncomfortable about focusing on the negative,
- they felt uncomfortable about being explicit in my presence in terms of critically reflecting on the problems of the programme,
- they were not familiar with and accustomed to reflecting critically.

The problems and limitations perceived by the teachers will be considered under the following headings:

- Critical thinking
- Specific skills
- Lack of materials and resources
- Time

Parental involvement

12.5.1 Critical thinking

Barbara and Jo commented that in terms of physical skills development and making decisions about their work, the teachers had a sense of critique and discernment, but in terms of a critical sense as part of a reflexive process, there was much room for development:

> *yes they have developed critical thinking skills in terms of being able to say they don't want to hand it in because the cutting is skew ... but I still think that this is one of the areas where there is the greatest need at the moment to improve and provide opportunities for them to develop ...* (Barbara).

> Jo adds: *Critical thinking was never part of their teaching profession because it was textbook teaching ... they didn't have to divert attention to any other...it was just route and the route only ....*

> Barbara continues: *making decisions, choices, you know all those kind of things are things that they have really never done a lot of, and in their classrooms they never encouraged to ask questions ... in their training I don't think they were either ... everything was always: this is it, spew it all out ... and you know we need to give them more and more opportunities .... now that they are confident with their physical skills ....*

12.5.2 Specific Skills

Some teachers were only able to identify problems that related directly to the explicit agenda of skills development.

Zoleka, for example, said .... *the only difficulty I had was doing the alphabet ... doing the letters ....*

Zoleka's sentiments were echoed by the responses to the final questionnaire which confirmed that the modules on lettering and drawing in general appeared to cause the most difficulty:

> Drawing skills ... oblique drawings, isometric drawing was really a problem at first, but later I enjoyed it ....
>
> Drawing very difficult ....
>
> Isometric drawing ....
>
> Lettering, because I could not get the basics ... 3-D perspective ....

12.5.3 Lack of materials and resources

Apart from the obvious problems encountered when faced with unfamiliar skills and tasks, the issue of lack of materials and the inaccessibility of resources was highlighted by many. Funeka expressed her frustrations at not being able to source similar materials that I used during the workshops:

> *You bring us good stuff but when I look around, I see the things I can use are not to the same standard. That is why I feel at least not to use the material around us ....*

This was echoed by Nondumiso who finds it difficult to ... *get the resources and the things ... we don't have electricity and sometimes when we have those ideas we don't have these practical things ....*

Mandisa disagreed strongly however, and maintains:

> *There's lots of material here ... like boxes, plastic bottles, papers and wood ... at my boss* [the farmer] *there is lots of it, in the store. There is the store with all the things ... and even in town you can go and ask for materials and you will find it ....*

Barbara agrees with Mandisa ... *I don't think that's a problem at all. ... all the farmers are very happy to give waste out in any form, plastics, magazines ... you just have to go and ask.... all of them have access to that stuff ....*

She did however suggest that the relationship between farmers and farm school teachers is an area which still needs development and exploration:

> *what really needs to happen is that there needs to be some discussion about that ... because we try not to interfere too much with the relationships on the farms, because we don't want to be seen to have all the answers and be the solutions to all the problems ... I try and say to the senior primary teachers that if they ask me something that their farm manager can sort out, I generally say to them that they must see thei manager about that. And sometimes they do and sometimes they don't. And there are no managers which have schools that turn teachers away, I think ....*

In warning about the dangers of simply providing everything for the teachers, Barbara says: *... and I think they maybe just want it on a plate ... maybe they want everything in their classroom and that kind of thing ... t takes too much forward planning for them to arrange to have material collected and for them to arrange to have the tools and whatever ... 'cause they are not very good at that. In other words they will get to the classroom and they say I was going to do this today but I haven't done anything about it ... and it is part of our agends which we deal with all the time ... you know at least one workshop a term focuses on planning in some form or another.*

Noluthando also thinks that ... *every person must bring newspaper and magazines ... and also from the forest ... and you can make a corner in the classroom so that you can keep all those things ... like a trashbox.*

The lack of tools was a concern for Zoleka and she suggested that ... *they* [the WST] *can help us ... we can borrow tools from the centre and we must know that those tools are not ours ... they must go back to them ... we must return them ... you know what I mean?*

This concept of a tool library was welcomed by Noluthando who also proposed that... *the managers* [the farmers] *can give the centre tools, maybe ... their old tools ....*

Mandisa also encourages the involvement of the farmers and recollects ... *I asked for one thing and I use it when I am here ... and then I bring it back..*

Responding to the question whether other farmers would also be as forthcoming as 'her' farmer she replied:

> *Oh yes ... they are all helping us ...*

which would confirm Barbara's sentiment expressed above, although she did express a concern with one farmer ... *who is worse, and it's not because they don't want to,*

they're just slack. ... they actually don't see the need to make any effort ... they'll promise to help her and then they would forget about it ....

The issue of tools and the availability of them will be resolved, according to Barbara

... when the skills training centre is built. There will be much more of a place where tools are...you know, which will make the perception that the tools are available a bit better.

12.5.4 Time

The issue of time was raised on numerous occasions in different contexts.

Noluthando, for example, commented that in some sessions she simply ran out of time and struggled to complete the tasks:

the time ... it was a short time ... like when you come early and we decide to do a frame ... sometimes we did not finish the frame ... yes at times it was rushed and we would have liked more time to do it ....

Funeka affirmed Noluthando's sentiments and said: *... I think it was time ... we did not have enough time ... it often ran out.*

In the final evaluation questionnaire the issue of time was raised under suggestions and recommendations:

If the topic is a bit difficult for the particular session then more time should be given to it.

Sessions should not be rushed, but should be given enough time for teachers to understand each session and enough time for implementing new skills.

Time must be longer so that we can finish everything during that time.

Time can be extended in the morning for the whole day instead of half days.

Technology periods must be longer ... whole day workshops.

Also Zoleka expressed concern:

Be careful about time ... sometimes in your lesson you explain everything clearly ... and show us ... but then when we finish it off we rush to finish off.

12.5.5 Parental involvement

According to Funeka the lack of parental involvement, which from my observation appears to be widespread, is a serious problem when trying to motivate children and their immediate community. Her comments are consistent with her earlier remarks where she was attempting to rationalize the apparent lack of craft and design skills in some of her pupils.

> *I think it is what I have explained to you ... what the pupils are doing is only playtime ... also at school. ... if they've done something at school - no parent is going to follow ... OK what have you done at school - then the child shows the parent ... the parent doesn't understand what is going on ... maybe it's due to the illiteracy that is around us ... so the parent is not curious of what is happening ... no encouragement and no praising.*

On exploring the issue of illiteracy she continues:

> *Yes, most parents are illiterate. They don't give themselves time to come to school ... to visit the school and see what is happening ... like the whites ... the whites get themselves to school and see what is happening ... they really help their children to learn and support them. The parents get bored of being asked questions: "Mom, can you help with this?" "Oh, I don't know - just leave me" ... there is no way of challenging the child. It is because some don't understand what is happening - what do these pupils ask? Like sometimes the child comes with a letter from the school and the parent doesn't know what is on the letter - asks the child to read it ... and then if the child tries to explain the parent gets bored.*

I believe that 'bored' in this context refers more appropriately to being disheartened or embarrassed.

12.5.6 Theoretical consolidation

Apart from the explicit difficulties with the subject matter and getting a handle on specific skills, the issue of resources and lack of materials dominated this section of the conversations. As the interactionist model points out, aspects of Technology Education which are regarded as resources can in fact change into constraints. Access to materials,

tools and other technologies may seem fundamental to a Technology Education course, but the realities in rural South Africa, for example, are such that assumptions of this nature cannot be made. Access to materials is a constraining factor, not only because of the financial implications but also in terms of physical access, and needs to be considered seriously in theconceptualization and planning of a Technology Education programme.

Another constraint that plagues and affects any Technology Education course is time. The interactionist model makes reference to it reinforcing the importance of its careful consideration in the implementation process of Technology Education. The practical nature and the emphasis on hands-on experience of Technology Education places a high premium on time. Time itself is a resource which in many school environments is scarce and precious. The time available can often determine the nature of the Technology Education programme in terms of the extent of integration within the existing curriculum. Availability of time and space in the school curriculum may allow for a dedicated Technology Education slot and facilitate a specialized programme. Where time cannot be compromised, Technology Education may well be interwoven across the subjects and simply form part of the existing links in the curriculum chain. Whatever model one follows, however, time to finish projects and tasks will remain, in my experience, a critical and often unresolvable issue. In a farm school with a multigrade system, a dedicated time slot for Technology Education may be most appropriate, in terms of organization and management. In a school like Highland Home, for example, with its six grades, a slot each day can be set aside for a particular grade to be engaged in a Technology Education task or activity. The other alternative of engaging all the grades in a similar technology task can become problematic and cumbersome to manage.

The issue of lack of parental involvement points to the linkage aspect of the interactionist model. The frustrations expressed by the teachers suggest that although this linkage is desired, it has not been successfully established. It is critical for linkages to be set up, not only for the sake of good communications, maintaining healthy relationships, fostering

community ownership and encouraging broader involvement, but also to get easier access to resources, materials, expertise and other technologies.

12.6 RECOMMENDATIONS

An alternative strategy to provoking critical reflection on IRTEP, was to focus on teachers' recommendations for the future and talk about issues that they would change for a subsequent phase of IRTEP. This proved quite revealing and the teachers seemed far more forthcoming in this context than talking explicitly about the problems. This was very interesting to me and highlighted the importance of the loosely-structured interview and the necessity to remain flexible. The fact that responses to the issue of the problems were relatively thin could easily have been misinterpreted and misconstrued. One could have come to the conclusion, for example, that there were very few problems, or that the programme was a huge success. On closer analysis and by asking questions slightly differently, there clearly emerged experiences and situations which were indeed problematic and which need to come to the attention of the WST and the IRTEP implementers. The recommendations fell into the following categories:

- Follow-up, consolidation and support
- Classroom-specific activities
- Contact with others

12.6.1 Follow-up, consolidation and support

Nondumiso expressed the desire that more follow-up visits be conducted in order to reinforce her practice:

> *the follow-up. Seemingly we have course here at the resource centre and you can see that we are making things on our own, but it would be nice if you can observe one of our lessons, even if it's one lesson per term ... to build that confidence ... and for the children to see ... for the correctness ... it will do so*

much for the confidence ... even if 70% is not the good thing ... because it seems that we are now going to transfer what you have done with us into the classroom ....

Allied to that, Funeka suggested that more careful consolidation should take place:

I was thinking of reinforcing what we did so that we don't do things again ... we don't just do the next things ... what if we have some feedback on what we did...and then give us a chance to say what our problems were ... what were the problems we encountered before the next session ....

In terms of support Barbara and Jo point out:

that the resource centre is available to them all the time ... and they know that, because they have come in off their own bat to do other work. ... they have access to other resources ... maybe they were just under the impression that you needed to be here or that we couldn't help them, I don't know. But they only needed to articulate it and the resource centre is open to them any time they like.

12.6.2 Classroom-specific activities

Both Barbara and Jo recommended that this first phase of IRTEP, which was explicitly skills and development focused, needs to be transformed into a more explicitly classroom directed second phase and incorporate more specific issues relating to classwork.

there has been a spillover into the classroom, but you need to be more specific with them ... they need to be shown that this is actually part of the whole curriculum and that they can use every little aspect in their curriculum, but it needs to be more tied to their classwork. ....

12.6.3 Contact with others

Consistent with her remarks about being able to compare herself with other practitioners, Thulama is concerned about the apparent isolation of the Winterberg teachers and would like to be part of a broader group:

For phase 2 I'm not clear if we are the only group in the rural areas ... if there was a second group I would like to be part of a big team ... like to join other people so that we already know each other now ... and similarly if we can see a

different stuff from what we develop, I think that will give us an idea of competence ... it is important to compare so that you can make the same level ....

12.7 QUESTIONNAIRE

Towards the end of phase I of IRTEP a questionnaire was administered to all the teachers who participated in the programme with the objective of gaining a global sense of the IRTEP programme (refer to appendix 5). The questionnaire consisted of four items:

Item 1

This was to establish a broad sense and perspective of IRTEP and consisted of general questions regarding the programme and their possible reactions to it. The teachers were asked to indicate the extent to which they agreed or disagreed with the 16 statements.

Item 2

This consisted of a 1 - 4 rating of each individual session of IRTEP.

Item 3

This entailed responding to five open ended questions in which the teachers were encouraged to share opinions and feelings.

Item 4

Here the teachers were simply asked to answer Yes or No to eight questions relating to specific IRTEP issues, and a space was provided for any open-ended comments.

Analysing the above, it was not my intention simply to add and average out the ticks and responses, comment on central tendencies and on the 'average' response, but to look at the anomalies, idiosyncrasies and contradictions, particularly about the interviews analysed earlier in this chapter. Not many anomalies presented themselves, however, and

the picture that evolved is hence one of generality interspersed with interesting individuality.

The questionnaire indicated that a almost all the teachers rated the drawing component of IRTEP very highly. This was commented on specifically in 12.2.2. It is interesting to note however that for two of the drawing sessions one teacher indicated that she 'hated' the drawing. This is consistent with the notion that although many found this aspect of IRTEP very enjoyable and valuable, a significant number indicated that they also found it very difficult, as they also expressed in the interviews. Specifically, isometric drawing, three-dimensional perspective drawing and lettering were isolated as problem areas. When enquiring about how far the skills developed during IRTEP affected their practice, many identified the drawing techniques as useful and helpful. It was significant that the pre-primary school teachers, especially, made extensive use of the newly acquired skills in their posters and charts. See figures 12.3a and 12.3b.

Figure 12.3a Example of a newly crafted poster

Figure 12.3b Example of a chart

Along with developing drawing skills, IRTEP explicitly looked at paper as a resourceful material to use in developing a technological consciousness. It is versatile, easy to manufacture, access and manipulate, and simulates and raises many of the problematic technological issues such as environmental factors, recycling and waste management. It was thus not surprising that many teachers perceived the session on Paper very positively. Particularly the making of recycled paper was isolated as a being very successful. In terms of rating individual sessions in item 2 of the questionnaire, the session on paper-making came the highest. Similar sentiments were expressed with one of the other materials that was explored, plastics. One teacher, however, indicated that she hated this particular aspect of the course. Apart from generating interest and enjoyment, the notion of recycling plastic bottles and containers was often mentioned the interviews and the open-ended part of the questionnaire. Empty plastic bottles and containers are easily reshaped into attractive artifacts which have utility and in some cases even commercial value. Many teachers used the skills with plastic in their homes to make containers, plastic mats and bags. Refer to figure 12.4. The mobility of skills (crocheting of wool to crocheting of plastic threads) was perceived as useful and meaningful.

Figure 12.4 Examples of artifacts using plastic bottles

The manipulation of wood was perceived as problematic, both in terms of skills development and in its use in the classroom. Half of the teachers either enjoyed that session only 'a little' or 'did not enjoy it'. Many found the sawing and the handling of wood difficult and others encountered problems in the preparation work such as measuring, the calculating of dimensions and angles. One of the 'homework' tasks, for example, involved the making of a similar paper-making frame as the one that was made during the course, except that the teachers had to use materials that were accessible to them. Most of them tried to make a wooden frame and found it very frustrating in not being able to manipulate it as they had done during the course. This was largely due to a lack of tools and equipment. Very few teachers went to the resource centre to use the tools there and only a handful of teachers used other materials that were available. Those that did use materials other than wood came up with interesting and original designs of frames as illustrated in figure 12.5.

Figure 12.5 Pāper-making frames using materials other than wood

The making of a wooden frame was repeated in the weaving session. This session was very positively received. The wooden frame in this situation was used as the weaving frame. See figure 12.6 for some examples of frames and the weaving that was subsequently created within them. The techniques were familiar and although many teachers still found it difficult to work with tools, such as the mitre saw, there was a significant improvement in the final product. The teachers were encouraged once again to use a variety of materials for the weaving. Very few of the teachers, however, used anything other than wool and textiles. I initially perceived this as disappointing, expecting the teachers to use a variety of 'indigenous' materials such as plant fibres, grasses, leather and other appropriate weaving substances. I came to realize, through observation and interaction with the teachers, that this expectation was falsely based on a very stereotyped perception of rural folk. I initially understood rural folk, in general to be 'in tune' with nature and make extensive use of raw materials.

Figure 12.6 Wooden frames with weaving

When I spoke to Funeka about her culture and explored the notion of her indigenous culture and the extent to which this should inform a Technology Education programme, she answered: *... from my side it is not a problem* [the notion that IRTEP has essentially 'western' expectations and agendas] *... because most of the time we adopt a western culture ... like what we are doing are the things that we most see around us ....* So my expectations and perceptions were based on over-romanticism and a false sense of a culture that very much aspires towards a 'western' consciousness.

The questionnaire, filled in by 20 of the Winterberg teachers, although indicating an overwhelmingly positive sense of IRTEP, revealed that some teachers did not identify with its objectives and intentions. Some of the teachers did not see the relevance of IRTEP to their professional development and expressed frustration at not coming to grips with all the skills. Although numerous teachers (particularly those interviewed) indicated that they had applied the experiences of IRTEP elsewhere (in their homes or in their classroom), many had not transferred these experiences outside the context of IRTEP. Most agreed that IRTEP had exposed them to new ideas and techniques, but not all had assimilated those into their practice. When asked to indicate whether IRTEP had helped them to become better teachers, most of the teachers ticked in the affirmative, although three teachers were not sure and one teacher disagreed.

12.8 CONCLUSION

Although it was the intention to let the conversations speak for themselves, it was necessary to order (re-order) the transcripts according to themes in order to facilitate interpretation and inform the research questions. The danger of compromising the original ethos and spirit was always present and it is hoped that the natural and original flavour of the conversations was nevertheless preserved.

The analysis of the interviews was guided by the four themes:

- **Perceptions** of IRTEP;
- **Impact** that IRTEP had **on their teaching**;
- **Impact** that IRTEP had **on their personal lives**;
- **Problems** encountered.

The analysis revealed that all respondents saw IRTEP as having played a significant role in their professional lives and to a certain degree in their personal lives. The development of new **skills** was central to their conversations. These skills were seen in different contexts. Some teachers focused mainly on specific skills such as drawing and handcraft in their reflections on how IRTEP has impacted on them. Others remarked on the wider context and recognized the role that the newly acquired skills played in their own personal growth. Many commented on how they had grown in confidence and how empowered they felt.

On a professional level the respondents felt that IRTEP had inspired them on many levels. One respondent commented extensively how IRTEP has complemented her teaching methods in her efforts to apply outcomes based-education and Curriculum 2005. Others suggested that IRTEP had empowered them to construct their own teaching and learning resources. Some said that IRTEP had exposed them to new ideas and put them in a 'class of their own'. They felt that they could serve as role models to other teachers. Many felt that IRTEP had addressed and compensated for their inadequate teacher training by exposing them to alternative teaching methods and developing new skills.

On a personal level all the respondents identified practical ways of how the principles of IRTEP can be transferred to their home environment. Numerous artifacts produced in the workshops had direct practical value in the home, and many teachers had started making their own. Some saw the technology skills as a new avenue for making money, while others linked the objectives of IRTEP to enriching their own family life. They felt they

were better equipped now to help their own children with their school work and also to help others. In the conversations, continuous reference was made to the self, suggesting that IRTEP had significantly impacted on the personal aspects of the respondents' lives.

The issues which dominated discussions on the problems of IRTEP revolved around aspects of time, lack of resources, lack of access to resources, and apathy amongst parents. The respondents were generally hesitant to reflect critically on IRTEP but nevertheless made many suggestions for improving subsequent phases of IRTEP. Recommendations included a more careful consolidation process, a more explicit focus on classroom-related activities, and a process that facilitated more contact with other communities and practitioners.

The questionnaire, which gave a more global sense of how IRTEP was perceived, revealed that not all teachers embraced the objectives and intentions of the programme to the same extent. It showed that many teachers had not yet transferred the experiences of IRTEP to their workplace or their home environment.

CHAPTER THIRTEEN
CONCLUSIONS AND RECOMMENDATIONS

13.1 INTRODUCTION

This chapter briefly describes the main elements of the study in an attempt to consolidate and bring together the diverse deviations (refer to 1.1) of the intended journey. In terms of the theoretical analyses of technology and Technology Education (chapters 3 and 4) and on the basis of the insight gained through the empirical research (chapters 11 and 12) an attempt is made to develop a model for Technology Education that embraces a spirit of interaction and is meaningful for the South African situation in general and the rural context in particular. Further, this chapter reflects on the research process and comments critically on the limitations of this study. It then offers some recommendations for implementing Technology Education in the South African curriculum.

This study evolved in two parallel phases. The first phase explored and an engaged with the international literature. The concept of technology was critically analysed *vis-à-vis* traditional understandings of science and technology. This analysis then informed an in-depth look at Technology Education and the diverse understandings of this 'new' subject in the curriculum. A global analysis formed the backdrop of a broader contextualization in terms of international trends and developments. A critical review of two Technology Education models, the Eisenberg model, and the DATA model facilitated an analysis of key features. The focus on the South African situation initially centred on a brief historical review of technical education in the context of apartheid ideologies before looking at current policy on Technology Education within the newly established National Qualifications Framework and Curriculum 2005.

Parallel to the above research, the second phase of this study involved developing and implementing an introductory Technology Education programme for a community of farm school teachers in the Winterberg region who were faced with the task of

introducing Technology Education into their own curriculum as outlined by *Curriculum 2005*. This programme (IRTEP) primarily focused on developing technology and life skills to enrich personal capacity and in so doing contribute towards professional empowerment and upliftment, particularly in the field of Technology Education. The research that ensued to explore the extent to which IRTEP contributed to change, both on a personal and professional level, was of a qualitative nature and involved elements consistent with case studies, action research, phenomenology and ethnography. Loosely structured interviews were the dominant techniques used to gather data and although the intention was to let the conversations speak for themselves, the interviews were analysed and interpreted in themes that formed as a result of a combination of a preconceived structured and an emergent process. A questionnaire was also used to gather data of a more general kind. This proved revealing in terms of what the teachers, other than the interviewees, thought about IRTEP. In conjunction with the development, implementation and evaluation of IRTEP, issues surrounding rural education in general and farm schools in particular were analysed and explored. This naturally involved a detailed study of INSET which served not only to contextualize the teacher development agenda of IRTEP, but also formed the basis for a theoretical investigation into cognition and education as a social practice.

13.2 TOWARDS AN INTERACTIONIST MODEL

The model illustrated in figure 13.1 is my attempt to integrate all the features of an effective Technology Education programme, yet facilitate flexibility and adaptability. The experience with IRTEP has shown that a high degree of flexibility is needed in rural areas where the conditions and the needs are very diverse and unique. Access to materials and resources, for example, is highly problematic, and innovative strategies are required to overcome this constraint. This may well lead to compromises with the intended curriculum. Linkages and interaction with other organizations and institutions are therefore crucial and fundamental.

Although this model supports an interactionist philosophy and a constructivist approach to learning and teaching (chapter 8), it does not necessarily assert one teaching methodology over another. It leaves room for different teaching and learning interpretations, but emphasizes the central theme of interaction. Further, it allows for an open agenda in terms of knowledge and skills, for example, yet it points towards the interconnectivity of different disciplines and learning areas. The model is not a prescriptive one and caters for different approaches and understandings depending on issues such as availability of support, access to resources, local contextualization, facility and interpretation of curriculum.

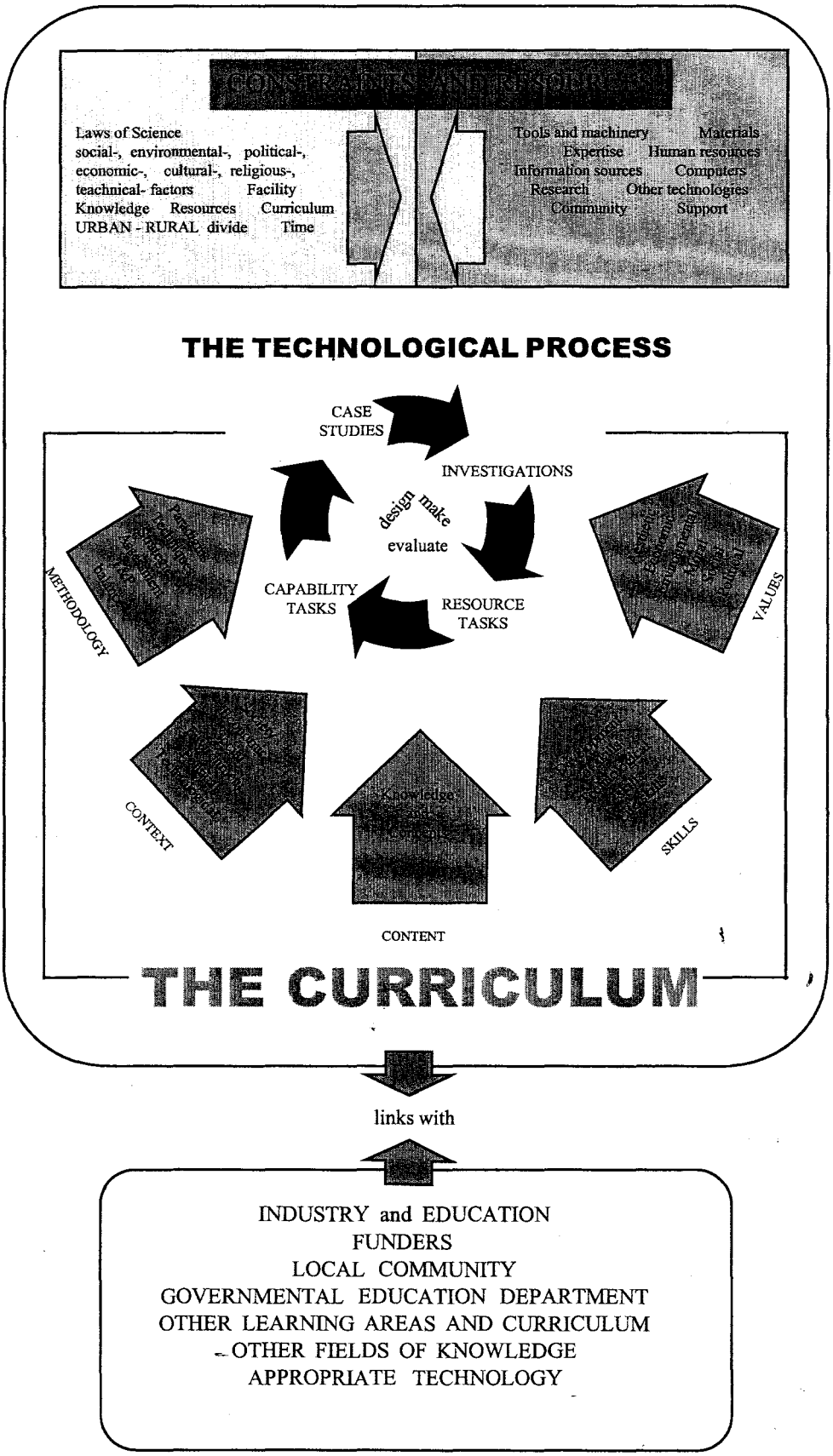

Figure 13.1 An interactionist model for Technology Education

13.2.1 The curriculum

It is proposed that the curriculum consists of five elements:

- the methodology
- the context
- the content
- the skills
- the values

Many of these elements feature in some of the models and theoretical frameworks analysed in chapters 4 and 5. The Australian framework illustrated in figure 5.1, for example, recognizes the importance of a repertoire of skills and the significance of developing values in a social context. The discussion below will refer back to relevant theoretical indicators upon which this model is built.

All five elements need to be seen as interlinking concepts with the following features:

The methodology

This is largely informed and underpinned by the practitioner's stance to a teaching and learning **paradigm**. This will determine and influence the **techniques** used and the **strategies** followed. Further, the overarching theoretical perspectives coupled with the understanding of one's own techniques and practice will underpin the global **assessment** strategy which forms an integral part of the overall methodology. Eisenberg's model (see 4.2.3) lists the technological process, systems approch, spiral approach and the integrated approach as possible methods. This suggests a certain discreteness of method. The interactionist model, however, asserts a more cohesive approach and sees Eisenberg's list as an interrelated strategy where one style may well be integrated with another. The

theoretical-practical balance (T&P balance) suggested in Eisenberg's model also applies to the interactionist one.

The context

This is a crucial component of the curriculum and will form the frame of reference of everything that goes on in the classroom. Important contextual considerations should include an understanding of the **environmental** issues at stake (Postman, 1993), both as a consequence and integral part of the technological process. The **economic, social and political** context is important as it, amongst others, will to a large extent inform the restraints of the intentions of the curriculum. The **technological** context itself is obviously a vital consideration. The wider context which perhaps encapsulates all of the above is the **society** within which the intended Technological Process occurs.

In rural areas this aspect has many ramifications. Due to the historical neglect (refer to chapter 7) and the current difficulties (refer to comments made by the teachers in chapter 12) the context within which these schools, and hence Technology Education, operates is one of poverty, neglect and deficiency. The curriculum needs to take cognizance of that fact and facilitate a technological process that is both accessible and meaningful. A high-tech approach such as the one in North America (refer to 5.2) would therefore not be appropriate, whereas one that utilizes local materials and incorporates local needs would be far more achievable and relevant.

The content

This aspect of the curriculum revolves around the tangible and explicit 'facts' and 'concepts' of the learning and teaching programme - what is traditionally called 'syllabus content'. The DATA model (refer to 4.2.4) identifies Control, Health and Services,

Materials and Components, Quality, Structure and Systems as 'fields of knowledge' whereas Eisenberg's model lists Information Technology, Food Technology, Textile Technology, Transport Technology, Health Technology, Systems and Control, Structures and Mechanisms as its 'knowledge' components. The interactionist model once again adopts a less prescriptive stance to reinforce the notion of a holistic approach and recognize the possibility that for different institutions certain aspects of a prescribed list of 'knowledge components' may be inappropriate. In farm schools, for example, where electricity as a source of energy can at present not be taken for granted, the use of computers and hence a course on Information Technology is not feasible. Particularly in the South Africa situation where Technology Education is generally still a mere concept and where access to resources is unsure, it is highly problematic to prescribe a list of content. The interactionist model supports a system with a differentiated content curriculum depending on the availability of resources (physical and human) for different institutions in different areas.

Skills

Unlike the Eisenberg model (refer to 4.2.3), the interactionist model has not included skills as a component within content but allowed for a discrete position within the broader conceptualizsation of the curriculum. The reason for differentiating so strongly is to reinforce the notion that the development of skills in a novice Technology Education situation, like the one in South Africa, is crucial and fundamental. This was strongly confirmed in this study: when dealing with a farm school situation, it was found that fundamental craft and manufacturing skills were lacking. The interactionist model distinguishes between **technological skills** which include hand and tool skills, drawing skills and craft and making skills; and **life skills,** which are skills associated with teamwork, communication, confidence building, creativity, problem solving, professionalism and critical thinking.

Values

As above, values are an integral component of content, but for the purpose of emphasizing their importance, the interactionist model accentuates them as a discrete element of the curriculum. Values include critical attitudes towards aspects involving aesthetics, morals, politics, environment and economics. Values are intricately linked to any activity and enterprise that involves a social milieu and hence they are crucial considerations for technology, particularly in view of a reformed outlook on technology as articulated in chapter 3.

13.2.2 The technological process

The curriculum feeds directly into the core business of Technology Education, the technological process which comprises an integrated process of **designing, making** and **evaluating**, facilitated by various **tasks** such as capability tasks, case studies, investigations, and resource tasks.

13.2.3 Constraints and resources

These are crucial to any Technology Education implementation process and careful consideration needs to be given to them. They may not all apply simultaneously and may well change direction as a resource develops into a constraint and vice versa. For example, access to a facility such as a workshop or technology centre may well be the factor determining how far a Technology Education programme can be applied. So although the facility is a fundamental resource it also acts as a determining constraint.

13.2.4 Links

Although the role of context is made explicit under curriculum, the model emphasizes the inherent links associated with Technology Education. These links are crucial to the interactionist model and they form two-way channels between what goes on in the Technology Education classroom and the outside world, the one often informing the other.

Once again the context of the South African educational landscape is important. The lack of resources (financial, physical and human) facing the present provincial education departments and the resulting lack of support that the departments are able to give to schools, make links to industry crucial and essential. These links can be manifold in nature and have different agendas. They may be driven by:

- financial considerations, in raising funds to build facilities and equip these facilities;
- a need for expertise;
- a need to forge partnerships in developing products and designs.

The multidisciplinary nature of Technology Education makes links with other disciplines, learning areas and fields of knowledge inevitable and fundamental.

Links with 'appropriate Technology' refers to the appropriateness of linkages within a given context. A Technology Education programme in a school situated in a forestry region, for example, would appropriately form links with the forestry industry, interact with its social and environmental context and develop its activities accordingly.

13.2.5 Conclusion

In order to facilitate technological capacity in terms of skills, values, attitudes and understanding, it is important that Technology Education as a school activity encompasses the multidisciplinary and integrative nature of technology. Through the curriculum and the central technological process it needs to empower the learner to operate responsibly within a social context. The interactionist model of Technology Education is an enabling framework that takes cognisance of the diverse resource base of individual schools in South Africa and allows for flexibility and innovation when implementing a Technology Education programme.

13.3 SOME REFLECTIONS ON AND LIMITATIONS OF THE STUDY

In terms of the overall goal of exploring the underlying concepts that underpin Technology Education within an innovative programme in a rural environment (refer to 1.2), this study explored numerous issues central to technology and Technology Education. The diverse approaches to Technology Education in the global arena, for example, has reinforced the notion that as an element of the school curriculum it needs to cater for and address the unique needs of a particular community. This implies an approach to Technology Education which is flexible and adaptable.

The exploration of the concept *technology* provoked an interesting re-look at traditional perceptions and stereotypical opinions about science (refer to 3.3). At the start of this study I was comfortable to pigeonhole science and technology into compartments, yet as the research unfolded and progressed, the need for a more progressive interactionist approach became apparent. This change in attitude ultimately informed the interactionist model which reinforces interconnectivity, linkages, integration and interaction.

In coming to terms with a conceptual understanding of INSET (refer to 8.2), I was able to explore my own world view in terms of cognition and the learning process. The unpacking of constructivism in the context of IRTEP and INSET (refer to 8.4) raised the crucial issue of social interaction in the learning process and informed the conceptualization of IRTEP. On reflection I question, however, the extent to which the planning and implementation of IRTEP was consistent with constructivist theory. Paying lip-service to social interaction does not necessarily ensure the type of learning envisaged by constructivism. One of the central principles is the adaptation of past experiences (refer to 8.4). IRTEP struggled to take cognisanze of those experiences and in my view did not use the 'prior' knowledge extensively enough.

The qualitative nature of obtaining insight into the extent to which IRTEP facilitated change in the professional and personal life of a group of rural teachers opened many doors for investigating other issues and exploring perceptions that would otherwise have possibly gone unnoticed. Although the language issue was problematic and in many instances inhibited free conversation (refer to chapter 12), it nevertheless enabled teachers to express themselves and provided an opportunity for reflection. Nondumiso had this to say about the process:

> *Thank you for giving an opportunity of expressing my feeling by answering your questions ... it's been a wonderful experience for me ....*

On reflection, I should, with the assistance of an interpreter, possibly have conducted some of the interviews in the vernacular in order to facilitate an easier flow of conversation from the teachers. I believe that in the case of Mandisa in particular (refer to the conversations with her in chapter 12), a conversation in Xhosa would have led to even more interesting deliberations.

Although the action research element of the empirical research gave rise to opportunities of reflection and modification of the initial intentions of IRTEP, I feel not enough was made of those opportunities. The process of IRTEP could have been more cyclical,

taking into account the feelings and the perceptions of the teachers on a more continuous basis. Although initial perceptions and experiences were taken into consideration in the design of IRTEP, the ongoing experience and the extent of development did not play an important enough role in the reflexive process of the programme. In terms of planning and designing, the teachers participated very little, and hence the constructivist descriptor that course implementation and the structure of a course should be characterized by a shared decision-making process was not fulfilled. This, however, raises a dilemma which was pertinently illustrated when Zoleka responded to a question of mine relating to her role in the design of technology sessions:

> *... the Technology is new to us ... so I can't say what to tell you what to do ... because it's new to me - so I do not know what falls under technology.*

The dilemma is to what extent teacher participation is useful in the planning of a course that is totally novel, like Technology Education. Action research, with its reflexive and cyclical loops consistently feeding in and informing the implementation process, can contribute greatly to ensuring appropriate participation. The recognition also that Technology Education, as suggested by the interactionist model, is underpinned by recognizing local conditions will go a far way towards incorporating personal experiences and knowledge.

It is acknowledged that the findings of this study, in the form of the interview and questionnaire analyses in the previous chapter, are tentative and limited for a number of reasons. Firstly, the focus of the empirical study was relatively narrow in that it was limited to one rural area only. The resulting recommendations made and the interpretations inferred therefore limit themselves to the Winterberg area alone. This does not mean however that the Winterberg experiences and the lessons learnt from this study do not have applications elsewhere.

Secondly, the empirical research was based on the interviews of four teachers (plus two co-ordinators) only. The views expressed and inferences made are therefore not representative of the entire Winterberg community.

13.4 FURTHER RESEARCH AND RECOMMENDATIONS

The implementation of Technology Education in South African schools in general and rural schools in particular, needs careful consideration on numerous levels. There is the obvious level which concerns itself with issues such as finance, staffing and facilities. Then there is the less obvious, more difficult and theoretical one, which concerns itself with the conceptual issues of technology, education, Technology Education, INSET, curriculum and implementation strategies. Associated with that is an understanding of the complexities of the South African situation with its diversity in schools, its past legacy, its contrasting distribution of wealth, resources and infrastructure, and its present transformation process. Both levels require massive research in order to make informed policy decisions. In the context of this study and the questions that it raised, further specific research is needed to provide insight into the needs and support structures required in the areas of:

- rural education (refer to chapter 7)
- multigrade classrooms (see 7.3)
- INSET with reference to Technology Education (refer to chapter 8)

In terms of Technology Education specifically, research into the following is needed:

- curriculum development in Technology Education
- developing a South African Technology Education consciousness
- an analysis and audit of current initiatives

- teacher education in Technology Education
- cultural construct and Technology Education

I feel that qualitative research is a particularly appropriate methodology to use as the social setting forms an integral part of this approach. Hoepfl (1997) claims that a quantitative and statistical approach is not able to take full account of the many interaction effects that take place in such a social setting. Qualitative enquiry accepts the complex and dynamic quality of the social world. As the earlier part of this work showed, technology itself cannot be viewed in isolation as a phenomenon devoid of human interaction and social complexities. Research in that field and in that context therefore needs to reflect and accommodate the human factor.

The following tentative recommendations are suggested when considering the introduction of Technology Education into the curriculum of rural schools. They need to be seen within the limited context of the research in the Winterberg area and the objectives of IRTEP:

- the Technology Education programme, whatever approach it aspires to (refer to 4.2.2) needs to be accompanied by extensive and consistent teacher education support;
- access to local materials and resources needs to be considered carefully;
- financial support from local and provincial governmental structures is minimal - external assistance will need to be sought;
- the involvement of the broader community such as the parent body and farmers needs to be harnessed;
- the Technology Education curriculum should initially revolve around the development of fundamental skills such as drawing and hand-craft skills;
- the Technology Education programme needs to be perceived as being personally enriching and empowering;

- the curriculum should be integrated within the existing curricular framework and interact with the broader curriculum;
- the curriculum needs to take into consideration limited access to tools and facilities;
- sources of energy other than electricity will need to be investigated.

13.6 CONCLUDING REMARKS

Although it is acknowledged that the findings and the research as a whole are tentative and limited due to the relatively narrow focus of this study (22 teachers in the Winterberg area), this thesis has illuminated the problems associated with Technology Education, and raised some of the issues surrounding its implementation in the South African curriculum. This research, with its interaction techniques, has afforded a glimpse into the realities of a community of farm school teachers, and has provided insight into the extent to which an INSET programme can make a difference.

This research is a mere drop in the ocean of a potentially new and exciting field of research in South Africa, and hopefully forms part of the beginnings of many more research projects in this area. It has attracted the attention of the media (see appendix 6) and it is hoped that with this thesis, further discussions, debates, investigations and deliberations will be forthcoming so that the intentions of a truly appropriate Technology Education component within Curriculum 2005 can be achieved.

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APPENDIX 1

FONTS USED

For the body of the thesis, Times New Roman font was used.

When quoting the interviewees directly, Graphite Light Italic font was used.

When quoting the teachers from the questionnaire and the final evaluation sheet, the Graphite Light font was used.

APPENDIX 2

QUESTIONNAIRE 1

Rhodes University
Winterberg Rural School Research Project

QUESTIONNAIRE

Thank you very much for agreeing to take part in this research project.

It is important that you are completely honest and comfortable with all your responses. There are no correct or incorrect answers - your responses will give valuable insight into what is going on in the Winterberg. This is very important if we want to learn about understand the needs of education in South Africa.

The aim of this questionnaire is to set the scene and provide you with an initial opportunity to share some insights with me. Your written responses to this questionnaire will enable me to set up a meaningful discussion/interview with you at a later stage.

Please read through all the questions first and write your responses after careful thought and reflection.

Thank you

Marc Schäfer

QUESTION 1

Please give a short description of yourself - include any aspects of your life which you think I should be aware of to enable me to form a realistic and appropriate picture of you.
(You may want to include aspects such as family background, particular interests, things that make you happy, things that make you unhappy etc.

QUESTION 2

Why did you become a teacher?

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QUESTION 3

How did you become a teacher?

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QUESTION 4

Thinking back a few years; what can you say about your teacher-training experience?
Were you adequately equipped with the appropriate skills to cope with the demands of being a teacher?

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QUESTION 5

How did you end up teaching in the Winterberg?

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QUESTION 6

What makes teaching in a rural school rewarding?

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QUESTION 7

What frustrations and problems have you encountered teaching in a rural school?

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QUESTION 8

In what way (if any) has the Winterberg School's Trust affected your teaching?

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QUESTION 9

In what way (if any) has the Technology Awareness Programme affected your teaching?

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QUESTION 10

Do you think it is important that teachers are subjected to extra programmes such as those organised by the Winterberg School's Trust? Why?

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QUESTION 11

Which programmes organised by the Winterberg School's Trust have, in your opinion, been worthwhile? Why?

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APPENDIX 3
TECHNOLOGY EDUCATION WORKSHOP EVALUATION

DATE: ..... **SESSION:** .....

NAME OF LEARNER: .....

WHAT DID YOU LEARN TODAY? .....

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HOW WILL THIS HELP YOU AS A TEACHER? .....

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HOW DID YOU FEEL ABOUT TODAY'S WORK?
(Circle the word which best describes your feelings)

1. **happy** ..... **sad**
2. **nervous** ..... **confident**
3. **want to re-do this work** ..... **want to go on to new work**
4. **enjoyed the work** ..... **did not enjoy the work**
5. **work was: very difficult.....difficult.....manageable.....easy.....very easy**

WHAT DID YOU FIND DIFFICULT? .....

.....

WHAT DID YOU FIND EASY? .....

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WORK DONE: not familiar....some done before....familiar

ANYTHING ELSE YOU WISH TO SAY: .....

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APPENDIX 4

BUDGET FOR IRTEP, PHASE I - 10 SESSIONS

Budget per session

1. Workshops: These will be held in the Winterberg Resource Centre. The teachers will arrive at the Centre from school at approximately 13h00 and will need to be provided with lunch and tea. Sessions run over two days

   a) Catering:
   30 participants @ R7,00 per head for lunch
   @R3,00 per head for tea

   R 600,00

   b) Travel:
   The participants will be collected and returned to their homes each afternoon of the programme. The fule costs of such a trip will be R 70,00 per day.

   R 140,00

   c) Materials:
   Photocopied notes with which to complete their training files.

   R 100,00

2. Training: a) Implementer's fee. Presentation and preparation.
   R 80,00 per hour

   R 1 280,00

   b) Travel:
   The mileage from Grahamstown is 300km.
   80 cents per km

   R 480,00

   c) The Implementer will stay overnight in the Winterberg

   R 102,00

3. Material Development:

Each workshop will require materials for participants to work with. These will vary from workhsop to workshop.

R 300,00

4. Tools: One off basic tool kit

R 1000,00

APPENDIX 5

IRTEP EVALUATION QUESTIONNAIRE

INTRODUCTORY RURAL TECHNOLOGY EDUCATION PROGRAMME
(IRTEP) EVALUATION QUESTIONNAIRE

The first phase of our TECHNOLOGY EDUCATION PROGRAMME has now come to an end and it is important for us that you evaluate this programme openly and honestly. Your feedback provides valuable information for planning Phase II of the programme. Thank you for your time in filling in this questionnaire.

ITEM 1

Place a tick in the appropriate box to indicate the extent to which you agree or disagree with the statements below. Each statement refers to an aspect of *IRTEP.*

	strongly agree	agree	not sure	disagree	strongly disagree
1. Technology Education is a useful subject for schools					
2. The lecturers of IRTEP were helpful					
3. IRTEP was well organised					
4. All teachers should attend IRTEP					
5. I am interested in Technology Education					
6. IRTEP has made me more confident					
7. IRTEP is relevant for rural schools					
8. I enjoyed IRTEP					
9. IRTEP was too difficult for me					
10. I have already made many new things for my classroom					
11. I have already made many new things for my home					
12. I have used the ideas from IRTEP to make and sell things					
13. IRTEP has helped me to be more creative					
14. IRTEP introduced me to new teaching techniques					
15. IRTEP has helped me to be a better teacher					
16. IRTEP taught me new skills					

ITEM 2

Rate the 10 sessions on a scale of 1 to 4:
1 - enjoyed immensely
2 - enjoyed a little
3 - did not enjoy
4 - hated it

SESSION	RATING
1. Drawing skills - free hand, lettering, enlargement	
2. Drawing skills - oblique drawing isometric drawing	
3. Drawing skills - perspective drawings	
4. Drawing skills - rendering, shading	
5. Paper - folding, glueing, making containers	
6. Paper making	
7. Wood - making frames for paper making	
8. Plastics - making toys and vessels from waste plastic containers - crocheting with plastic bag strips	
9. Textiles - making weaving frames and weaving.	
10. Consolidation - combination of above sessions.	

ITEM 3

Under this item we are interested IN YOUR OPINIONS and FEELINGS.

What, in your opinion, was IRTEP trying to achieve?

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In what ways did IRTEP affect your teaching? Provide details:

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In what ways has IRTEP had an effect in your home? Provide details:

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What problems did you encounter during IRTEP?

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What suggestions do you have that, in your opinion, will contribute to the planning of Phase II of IRTEP?

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ITEM 4

Simply tick the appropriate YES or NO block:

	YES	NO
1. I was pleased to receive a certificate at the end of the IRTEP		
2. It is important that certificates are awarded at the end of courses such as IRTEP.		
3. We received enough support during IRTEP to try out ideas that we learnt at IRTEP.		
4. I am going to teach Technology Education in my class.		
5. I am interested in furthering my qualifications in Technology Education.		
6. I would like to do an FDE (Further Diploma in Education) in Technology Education.		
7. After Phase II of IRTEP, we should give Technology Education a break and do something else.		
8. Do you think IRTEP should be offered to the parent community?		

Any other comments:

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APPENDIX 6

MEDIA - NEWSPAPER CLIPPINGS

38 teachers pioneers in technology education

A GROUP of 38 teachers received the country's first-ever certificate in technology education for rural areas at Rhodes University this month.

The certificates were conferred by Rhodes University and world-renowned institute Ort-Step, a science and technology education-oriented non-governmental organisation formed to protect Jews from oppression in Russia at the turn of the century.

The teachers, most of whom came from Eastern Cape areas which fell under the former Ciskei and Transkei homelands, completed the two-year course, which was run from Rhodes by the Grahamstown branch of Ort-Step.

In a further presentation, 21 students from Sosebenza Community School in the Winterberg, which is rapidly making a name for itself, received certificates for completing their first year of the two-year introductory rural technology education.

The project is run under the auspices of the Winterberg Trust by Rhodes Education Department lecturer and former Ort-Step East Cape director Mr Marc Schaefer.

Ort-Step's South African CEO and former St Andrew's College headmaster Mr Arthur Cotton told the teachers they were pioneers in the campaign to take technology education to rural schools.

Cotton lauded two rural-based groups, the Winterberg Trust and the Stutterheim Development Foundation, for supporting both the teachers and the campaign.

Stagnation

He said the teachers were on a life-long mission and urged them not to give up.

"All too often certification is followed by stagnation. Don't let that happen," he said.

Ort-Step has branches in Gauteng, Cape Town, East London, Port Elizabeth, Grahamstown and KwaZulu-Natal.

The Grahamstown branch was originally based at the St Andrew's College design and Technology Centre and moved to the Rhodes Department of Education in 1997.

The institute's Further Diploma in Education is accredited by the University. – *ECN.*

SOWETAN
17/4/98

Sosebenza is "amazing"

Sosebenza farm school in the Winterberg mountains was featured in _Grocott's Mail_ last Friday.

'It's an amazing project. Farmers find themselves learning too,' says academic.

by Mike Loewe

BIG Marc Schäfer's eyes light up behind a mane of curly grey hair and thick grey beard when he hears the words Winterberg Schools Trust.

The senior lecturer in the Rhodes education department says bluntly: "It's an amazing project. It is participatory, it is expanding, and even white farmers have expressed an interest in taking part in the computer literacy courses being offered."

Marc Shäfer

Schäfer is the former head of mathematics at St Andrews college and former East Cape director of Ort-Step and a small-scale farmer himself.

He says: "Traditionally, farm schools were perceived as being for the 'poor little blacks'. Now they (white farmers) can see how development applies to everyone."

He says laughing: "The irony is that traditionally farmers generally saw farm schools as a mechanism to maintain labour on farms. Now here comes along a project which trains farm workers to become marketable in cities. Here they are supporting a project which will deplete their labour force."

He says black teachers at the school "are very aware of their lot. They see the area as their home and are giving the project their full support".

However, he says they are loathe to criticize the East Cape education department which gives the project almost no support.

"Their loyalties are torn."

He believes that community-driven projects, such as *Sosebenza* are the way to go, as state-driven schools still suffer from massive neglect and lack of funds.

"We can't rely on government to support these schools," he says.

He says *Sosebenza* is a prime example of how the private sector can get involved. "If it was not for them (the private sector) the project would not be running at all."

Mr Schäfer has been so excited by the project that he is basing his master's thesis on it.

As former director of Ort-Step in the region, he has been deeply involved in training *Sosebenza* teachers. - ECN Weekend Service

GROCOTT'S MAIL, Friday, April 24, 1998

A FARM SCHOOL IN THE EASTERN CAPE IS ACHIEVING WONDERFUL THINGS

Breaking with the past

Mike Loewe

My late grandfather would not have approved at the breaking of the ancient Eastern Cape rural rule of master-servant relations. For this is the land where my family used the R30 monthly wage, a bag of mielie meal and the occasional flathand to maintain our white authority. And we were no boere, we were of 1820 English settler stock.

Despite it all Sosebenza (We work together) Community School is educating 145 children of black farm labourers. Sosebenza — a conglomerate of seven farm schools run by 16 teachers — was created by a community of 30 white farmers and is largely run by their wives — 10 of whom teach at the school while others provide lunches and other kinds of back up.

The Winterberg Trust, which runs the school, has become symbolic of local political integration with three farmers regularly meeting three of their labourers — all elected representatives — on an executive committee which plots the course of school.

"There is no recipe. If you have the right kind of people you will achieve something"

Sosebenza is a somewhat radical project, given the school's conservative origins. From being a shambles it was revived in the 1980s in order to keep the farm children away from the nearby townships like Lingelihle outside Cradock where a brilliant teacher and school principal called Matthew Goniwe was churning out black youths with A symbols in maths, science and — informally, you understand — revolution.

Ironically, the Winterberg farmers say Sosebenza was the result of pressure from black labourers who saw the school boycotts "in town" as a threat to their children's chances of getting an education.

Sosebenza has blossomed from a farm school "project" into a full-scale educational centre and is drawing a great deal of attention.

The school is not much to look at — a complex of flattish-roofed, face-brick buildings — a row of 10-odd classrooms, two modest flats for teachers and a large white-painted building made of shipping containers.

The containers are the latest addition, housing a teacher-training centre, a pre-school with a well-stocked toy library, an adult literacy centre for 60 workers and an adult micro-enterprise training centre where 30 unemployed women are taught sewing and crafts. A closer look reveals that the uniformed teenagers playing soccer outside during break are all girls.

The school's co-ordinator Barbara Scott is a farmer's wife through and through. Grahamstown academics involved with the school say it is her drive which has seen the school grow from two classrooms built from the ground up by the farmers, to a school which has attracted the interest of 11 organisations, a clutch of top companies, international funders and academics from two universities and two top private schools.

She says: "What we have is a First World resource centre in a place that could be Third World. We saw non-governmental organisations were taking staff for training but nothing was happening, so we said: Let's localise and build a resource centre."

Since then, training has been going ahead with help from Mark Schaefer, a senior lecturer in the education department at Rhodes University, and Paul Webb, based at the University of Port Elizabeth's centre for continuing education.

This year pupils will be able to study up to grade 10 and seven pre-school teachers — formerly all unemployed — will pass level two of a pre-school teacher's diploma.

Word is getting around that this is the place to be and numbers are growing with children of rural squatter camps in the former Ciskei starting to come over the mountains to find a place in the classrooms. Scott says the problem for the youth is that there will be no jobs for them. "We will only be able to employ 5% of school leavers on the farms," says Scott.

Nonetheless, she says it is possible that the first black Winterberg farm manager will be produced from the school's ranks. She says that although farmers assist with carrying and fetching pupils and adult learners, the three Sosebenza vehicles — two bakkies and a bus — work hard to cover a 30km radius of hilly country. "We have one driver — and I do a lot of driving too," she says.

The entire Sosebenza operation costs R370 000 a year and Scott has been able to sell the school to funders with little difficulty. "We have the track record," she says. Help from the provincial education authorities has consisted of a lot of goodwill but not much else, however.

In order to stave off the idea that the school is a place for "free handouts", the trust charges an annual fee of R45 per child. Scott says she knows of no other farm school in the province similar to Sosebenza. "I'd hate to think of what is happening in [farm schools] in other parts of the province," says Scott.

On the prickly question of social integration between white and black staff, she says everything is done together. "Sosebenza has changed the fabric of life here with people becoming much more considerate of who you are."

One of the biggest problems facing the school is found among the parents in the 800-strong community who have felt threatened by high-quality education being given to the kids. However, she says the adult literacy school is broaching the problem.

Broadly speaking, she says Sosebenza has created a better understanding between farmers and labourers.

"Before you had a boss-worker situation, now you have white guys seeing the potential for the school producing black managers. They are much, much more considerate of the aspirations of their workers. Two or three guys have come out of the adult learning centre with the potential to be trained as managers."

Nonetheless, she happily concedes that there are problems in the trust with a "whole dynamic" taking place. The 50/50 racial split on the trust had been criticised. She says efforts are being made to target black people to put on the trust, but the aim is not to simply put people on the trust because it is politically correct.

Scott says she will be only too happy to see the control of the project entirely in the hands of black people. In four years she sees the training centre turning into a small factory and her role being reduced to one of a teacher — her original qualification.

"There is no recipe here. If you have the right kind of people with no hidden agendas you will achieve something. This is a needs-driven educational project. We have worked hard as a community. This did not happen overnight. We have had our ups and downs." — *Eastern Cape News Magazine Service*

Future farm managers? Sosebenza farm school is nurturing its pupils' potentials. PHOTOGRAPHS: ORT-STEP GRAHAMSTOWN

Multi-grade classes do work

Mike Loewe

There is nothing wrong with the class system used in farm schools — the problem lies with the teachers and the people who teach the teachers. This defence of the multi-grade class system prevalent in farm schools, where teachers deal with a range of classes in one session, comes from Rhodes education department senior lecturer Mark Schaefer. He says the multi-class system works very well — even better than single-grade teaching — in developed countries.

"Research there is showing that in terms of academic achievements, there is evidence that multi-grade pupils achieve better results." He says that 35% of Swedish primary schools use the multi-grade system and 30% use the system in Welsh primary schools.

The conditions faced by rural educators are "special" and the multi-class system is an excellent way of teaching in remote areas. The people to blame for the popular prejudice against multi-grade classes are mostly heads of teacher-training departments who place rural education in the same pot as urban education when planning their teaching courses.

This is also reflected by a dearth of research into the nature of teaching in South Africa's rural schools. They see multi-grade classes as a huge problem, but find it difficult to say why that is so. The problem is one of poor teacher training."

His research into teacher-pupil ratios in former white farming areas is showing very healthy ratios. The highest on his list is 33:1. However, the picture is different in areas incorporated into the former Ciskei and Transkei where there is often a total lack of resources.

It will take better preparation: teachers will have to think about presenting single topics which provide multi-level learning opportunities; about techniques for breaking up a class into groups of classes; and how to move between the groups when teaching.

Schaefer says the broad benefit of multi-grade classes is that the whole class is treated as "one cohort" and that pupils are trained with how to deal with this. "Pupils are simulating what the real world is all about and having to deal with people at all levels." — *Eastern Cape News Magazine Service*