TECHNOLOGY EDUCATION AND CURRICULUM 2005: STAFF DEVELOPMENT THROUGH INSET

by

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SUMMARY

Curriculum 2005 together with its learning areas has been introduced in South Africa in 1998. All learning areas, except Technology Learning Area, are not new. Technology is growing so rapidly that it gives so many challenges to people. These challenges include making technology part of our curriculum, formulating and adapting technological solutions to problems people may experience. We have to ask ourselves what technology or Technology Education means. Therefore, this study provides the meaning and the rationale for Technology Education in our curriculum. This study also attempts to shed light on the form of training educators should attend for Technology Education.

Although there are different methods of training, for example PRESET and INSET, this study concentrates on various forms of INSET. INSET is chosen because it is a means through which the present need for Technology Education educators can be solved. The percentage of educators involved in part-time study will increase in relation to the number in full-time education. The closing down of some of colleges of education in South Africa reduces the use of PRESET and increases INSET as a means of educator training. The advantages of using INSET instead of PRESET are provided in this study.

The National Teacher Audit of 1995 has shown that the quality of INSET in South Africa is poor. In addition, it seems the present *ad hoc* way of running INSET will not cope with challenges of training educators for Curriculum 2005 and Technology Education. Normally, INSET is the prime strategy for addressing problems in PRESET. Unfortunately, INSET has to train educators for Technology Education (Technology Learning Area) which was never touched by PRESET before. For this reason, this study provides an INSET model, guidelines and recommendations to make the suggested model of INSET work successfully.

KEY TERMS

Technology Education;	Curriculum 2005;	Outcome-based Education;
Staff Development;	In-service Education;	Pre-service Education;
Teacher Centres;	Distance Education;	Cascade training;
School-based INSET;	School-focused INSET;	Course-based INSET;
INSET Model;	Technology 2005;	Appraisal.

LIST OF ABBREVIATIONS USED IN THIS STUDY

ABET	Adult Basic Education and Training
AC	Assessment Criteria
CO	Critical Outcomes
CUMSA	Curriculum Model for Education in South Africa
DoE	Department of Education
ECD	Early Childhood Development
ET	Educational Technology
FET	Further Education and Training
GET	General Education and Training
GETB	General Education and Training Band
GETC	General Education and Training Certificate
HEDCOM	Heads of Education Department Committee
IA	Industrial Arts
ICHED	Interim Committee of Heads of Education Departments
INSET	In-service Education and Training
IT	Information Technology
ITEA	International Technology Education Association
LA	Learning Area
LAA	Learning Area Adviser
LP	Learning Programmes
NED	National Education Department
NGO	Non-Governmental Organisations
NQF	National Qualification Framework
OBC	Outcomes-Based Curriculum
OBE	Outcomes-Based Education
OECD	Organisation for Economic Co-operation and Development
PRESET	Pre-service Education and Training
RDP	Reconstruction and Development Programme
SAIDE	South African Institute for Distance Education
SAQA	South African Qualifications Authority
SO	Specific Outcomes
TE	Technology Education
TLA	Technology Learning Area
UK	United Kingdom
VE	Vocational Education
WOCATE	World Council of Associations of Technology Education

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CHAPTER ONE
ORIENTATION

1.1 BACKGROUND TO THE PROBLEM

1.1.1 The need for curriculum change

At the inauguration in 1994 of the new South African government, a prosperous, democratic country, free of discrimination and violence was envisaged. However a political change alone is not enough to drive the country to complete democracy (DoE, 1997b:2). Beane (1990:54) indicates that although education is not solely responsible for the development of a democratic way of life, it has a large part to play in achieving this ideal. This is certainly the case for South Africa. The values and attitudes of most South Africans were formed in the old and divided South Africa. Therefore, education is important in changing such values and attitudes. The previous education system is not likely to bring about this change as it treated people differently. At the centre of this change is the introduction of a new curriculum - Curriculum 2005 - planned and developed by the National Department of Education (DoE, 1997c:2). South Africa has to build a national system of education, which can make a real contribution to educating all South Africans to face an increasingly challenging future (Bengu, 1997:2).

Curriculum 2005 was phased in from 1998 for the Grade one classes. This curriculum is based on the ideal of life-long learning for all South Africans. It therefore, marks a shift from the traditional curriculum, which has been content-based, to one that is outcomes-based. Curriculum 2005 aims at providing all learners with the knowledge, competencies and orientations needed for success after they leave school or have completed their training (Bengu, 1997:2).

According to the DoE (1997c:10) the existing curriculum can be regarded as irrelevant for most learners because it does not accommodate the perspectives of particular sub-groups to the extent that it should nor does it fully cater for the need of

a successful modern economy for citizens with a strong educational foundation so that they can move flexibly between occupations.

South Africa has never had a truly national system of education because the existing education system promoted a racially and culturally segregated and differentiated education. In addition, before the new education dispensation, different education departments in South Africa functioned separately and there was no significant indication of a common curriculum followed by all (DoE, 1997c:8). With this in mind, one realises why curriculum change in South Africa is imperative.

In addition, the old curriculum encouraged learners to be passive. Rote-learning denied learners the opportunities to think critically, reason, reflect and act (DoE, 1997b:6-7). The old education system viewed the curriculum as rigid and non-negotiable. There was no provision for public participation in the curriculum decision-making structures. There were no opportunities for educators to participate in curriculum decisions (DoE, 1997c:12). On the other hand, the learner-centred approach exemplified in the new curriculum should promote active participation by all stakeholders in curriculum decision-making structures.

1.1.2 The rapid expansion of technology

De Vries & Van Schalkwyk (1992:3) point out that no one could fail to notice the rapid expansion of technology in all areas of life. It permeates every aspect of public and private life, of work and play. Furthermore, technology is one of the cornerstones of productivity and economic competitiveness (Dyrenfurth, 1995:4.2). It follows, therefore, that Technology Education must be present in the schools of any nation that wishes to be a serious economic competitor, and that seeks to enhance the quality of life of its citizens (Dyrenfurth, 1995:4.2). Although technology enhances quality of life, it also creates certain problems such as pollution (Brighouse, 1983:17). Waks (1994:39) points out that the problems created by technology can also be solved by means of technology.

Technology Education was first started in the United Kingdom (UK) in the 1960s as the subject Design and Technology (Eggleston, 1992:13). Over forty countries have joined the UK by offering Technology Education at all levels of schooling. UNESCO, has set up the World Council of Associations of Technology Education (WOCATE) and the International Technology Education Association (ITEA). The latter played an important role in promoting Technology Education internationally (Kramer 1996:7).
The initiative in South Africa was taken by the then Interim Committee of Heads of Education Departments (ICHED) set up in 1994. This committee set up a steering committee, which was entrusted with the task of investigating the possibility of Technology Education in South Africa. The then Heads of Education Department Committee (HEDCOM) converted the steering committee to a project committee called Technology 2005. According to this project Technology Education will be part of the education of every learner by the year 2005. The committee also assisted in setting up provincial committees for Technology 2005 in all nine provinces (Kramer, 1996:7). These are all efforts of the government to introduce technology as one of the learning areas of Curriculum 2005. Curriculum 2005 consists of eight learning areas adopted by the South African Qualifications Authority (SAQA). These are (DoE, 1997a:8):

a. Language, Literacy and Communication
b. Human and Social Sciences
c. Technology
d. Mathematical Literacy, Mathematics and Mathematical Sciences
e. Natural Sciences
f. Arts and Culture
g. Economics and Management Science
h. Life Orientation.

1.1.3 The need for staff development for Curriculum 2005 and Technology Education

An important part of introducing Technology Education is the training of educators. The hard and daring work that has been undertaken to promote Curriculum 2005 and

Technology Education must be continued in respect of educator training (Cronjé, 1996:12). Hofmeyr (1994:35) states that "educator development is one of the most vital components of education reconstruction because educators are a most critical and expensive education resource ..." Guiding children in the interactions with technological tools and encouraging constructive play with such tools is not an easy task, and it therefore places a heavy responsibility on educators (Bowman, 1990:124). Murphy (1985:1) states that traditionally and historically, educators have been recognised as agents of educational change. For this reason, there is a need for staff development.

The recent changes in education have increased the need for schools to train the administrators and educators needed to deliver quality education. Tipton (1990:3) states that well-trained staff will be better able to provide quality services. No matter how complex staff development may be, it remains a necessary professional responsibility. It is a way of relating learner and curriculum needs to staff competencies and programme development. Staff development focuses attention upon the delivery capability of all instructional personnel - administrator, supervisor, educator and other supporting persons (Saludades, 1983:13).

Staff development includes consulting, project work, and the presentation of courses, seminars and workshops to teach staff members (Chalam, 1991:5). Staff development can either be in the form of In-service Education and Training (INSET) or Pre-service Education and Training (PRESET). These concepts, especially INSET, will be fully discussed in chapter 4.

1.1.4 In-service education as part of staff development

At this moment, Pre-service Education and Training (PRESET) cannot be considered as an immediate solution to staff development since the demand for Technology Education educators is more urgent (DoE, 1997a:18). PRESET as a long-term effort will be unable to provide help to educators who are to initiate Technology Education. INSET will, therefore, be an alternative to utilising the present staff without withdrawing them from their work for a long period (Rae, 1992:26). The Minister of

Education emphasised that much of the government's effort will be focused on providing the necessary support in the form of in-service educator training (DoE, 1997b:1). Spelling (1981:4) emphasises that there is a close relation between INSET and the concept of life-long education, which the educator should benefit from as well as contribute to. Implementing INSET will be important since Curriculum 2005 is based on the ideal of life-long learning for all South Africans. As indicated above, INSET will be detailed in chapter 4.

1.2 STATEMENT OF THE PROBLEM

The use of INSET to introduce Technology Education to educators is not an easy one. INSET has been widely used to supplement subject matter (Mellish, 1978:8). This means that INSET is responsible for closing gaps left by PRESET. In the context of this subject, therefore INSET is facing the unusual task of introducing a new learning area such as Technology Education. For this reason, a research of this nature should be conducted to make the present INSET for Technology Education bear fruits for educators and learners. Various types of INSET models have already been used in South Africa to train educators in various fields of education but had limited success. A research of this nature is, therefore, necessary to reduce problems leading to limited success of the present INSET. A quick introduction of any INSET models without a research is bound to fail (see also paragraph 1.4.3).

In view of the context and source of the problem as discussed above, the problem addressed by this study is therefore formulated as follows:

1.2.1 Is Technology Education a feasible learning area in Curriculum 2005?

1.2.2 Who are possible providers of INSET programmes for Technology Education?

1.2.3 Which categories of INSET can be used in training educators for Technology Education?

1.2.4 Which INSET Model can be used to training educators for Technology Education?

1.3 AIMS OF THE RESEARCH

The broad aim of this study is to achieve the following objectives with a view to using INSET programmes for Technology Education:

1.3.1 Determine the feasibility of Technology Education as a learning area in Curriculum 2005.

1.3.2 Determine the possible providers of INSET programmes for Technology Education.

1.3.3 Determine categories of INSET programmes that can be used in training educators for Technology Education.

1.3.4 Provide INSET Model that can be used to train educators for Technology Education.

1.4 MOTIVATION FOR THE RESEARCH

The reasons for undertaking this research include interest, experience and the need for research.

1.4.1 Interest

After attending two International Conferences on Technology Education at the University of Pretoria (10 & 11 August 1995) and in Cape Town (14-17 October 1996), I developed an interest in Technology Education. This interest was further nourished by the government's aim of introducing Curriculum 2005, in which technology is an integral learning area. As an educator, I appreciate that INSET offers a means of enabling educators to implement Technology Education.

1.4.2 Experience

Most of the INSET that the researcher attended in the past has had modest results. The organisers of such INSET courses concentrated on course-based models. These models emphasise taking educators out of their schools and instructing them at an

INSET centre. Models such as school-based and school-focused models, which are implemented at school level, are ignored. The two models (school-based and school-focused) are important because they can enable educators to share information. Chapter 3 deals with how these various models of INSET can be used to complement each other.

1.4.3 A need for research

As an educator who has already attended several INSET courses, I realised that research is needed to contribute to the improvement of the present INSET. One cannot assume that INSET as presented in its present form will be suitable to prepare educators for either Curriculum 2005 or Technology Education. As indicated in section 1.2, INSET is mostly used to close gaps left by PRESET. For this reason, it has to be modified to cope with the new demand of new learning areas, including Technology Education.

1.5 RESEARCH METHODS

This study provides an overview of what HEDCOM and other interested bodies or NGOs are suggesting about Technology Education and what is done to introduce it in our new education system. This study is therefore exploratory and descriptive. It deals with new fields such as Technology Education, Curriculum 2005 and Outcomes-based Education in South Africa (UNISA, 1999:33). The following methods will be used to explore and describe these new fields.

1.5.1 Literature study

A study will be made of the literature on aspects of Technology Education (TE) as a learning area in Curriculum 2005 (chapter 2), the providers of INSET programmes for Technology Education (TE) (chapter 3), the categories of INSET programmes (chapter 4) as well as INSET model for Technology Education (chapter5). Relevant books, articles and journals will be studied.

1.5.2 Interviews

Since not enough has been written on Technology Education in South Africa, the development of a Technology Education curriculum and INSET for Technology Education, the literature will be supplemented with interviews with Grade 1 educators of the N4 district in Gauteng Province. These Grade 1 educators are from pilot and ordinary schools. Interviews will also include educators who obtained Technology diplomas at the ORT-STEP Institute and government officials who are involved with TE or INSET. The interviews were taped and transcribed. Comprehensive field notes were kept. Interviews were used as additional sources. Although possible questions were provided before hand, were not followed biblically as situations and people differ from one another.

1.5.3 On-site observation

Institutions such as schools and the ORT-STEP Institute has been visited in order to assess the situation in which Technology Education is offered. The visits also assisted in finding out whether the training centres for Technology Education simulate the typical classroom situation in which Technology Education is taught.

1.5.4 Own experience

As an educator at a secondary school in South Africa, the researcher has access to different educational institutions and individuals where aspects concerning INSET in South Africa can be observed. Especially in chapter 3,4 and 5, personal experience was crucial in dealing with modes of INSET, new initiatives of the government of South Africa, the evaluation of INSET for Technology Education and the recommendations made in chapter 6.

1.6 DEFINITIONS OF CONCEPTS

1.6.1 Curriculum

1.6.1.1 General description of a curriculum

There are many and diverse definitions of the term curriculum, which is often confused with syllabus. Some contemporary theorists have formulated complex definitions of a curriculum (Brubaker, 1982:2). A curriculum includes content, aims, goal and objectives, learning activities and evaluation procedures (Print, 1989:3). The DoE (1997b:10) regards curriculum as everything planned by educators to help develop the learners. Print (1989:4) maintains that curriculum is "all the planned learning opportunities offered to learners by the educational institution".

The DoE (1997c:36) defines the curriculum as "the total structure of ideas and educational experiences making up any one educational system or its components". Smith (1995:2) indicates that a "curriculum is interpreted as embracing everything that occurs within the school programme". According to Robin, Ross and White (1985:18) the term means "the total set of stimuli deliberately brought to bear during a designed time period with the intention of producing growth in valued human qualities". Hameyer, Frey, Haft and Kuebart (1986:12) note that the specific meaning of the term curriculum is rather obscure, as it is used differently by various authors.

For this study I prefer a simple definition which interprets curriculum as embracing everything that happens within the school programme.

1.6.1.2 Curriculum 2005

The definition of Curriculum 2005 will be based on the context of the new curriculum of South Africa. As indicated above, the curriculum embraces everything that occurs within the school programme (DoE, 1997a:12). This new curriculum is a shift from one which is content-based to one which is based on outcomes (DoE, 1997b:1). Curriculum 2005 is commonly taken to be synonymous with outcomes-based

education (OBE). This is not the case, since the former is a national educational curriculum, while the latter is a teaching and learning approach used in Curriculum 2005.

DoE (1997c:17) defines outcomes-based education as a learner-centred, result-oriented approach, based on the belief that all individuals can learn. It further indicates that outcomes-based education (OBE) means "organising for results: basing what is taught on the outcomes to be achieved" (DoE, 1997c:39).

This brief exposition of Curriculum 2005 and OBE, may lead to the conclusion that the former is an outcomes-based curriculum (OBC), while OBE is the approach that will be used in different learning areas of Curriculum 2005 (DoE, 1997c:28). The next section will look at the definition of Technology Education, one of the learning areas of Curriculum 2005.

1.6.2 Technology and Technology Education

1.6.2.1 General description of technology

There are many definitions of technology. A few of these are supplied in this section. According to Gillet (1973:2) technology means "the science of construction" and this definition has been extended to include the use of tools. More generally, it covers applied science or science in support of the practical arts. Naughton (1981:8) is of the opinion that "technology is the application of scientific and other organised knowledge to practical tasks by hierarchically ordered systems that involve people and machines". Treagust and Mather (1990:53) define technology as "the know-how and creative process that may utilise tools, resources and systems to solve problems to enhance control over the natural and man-made environment in an endeavour to improve human conditions". Gwinn (1990:451) defines the study of technology as a systematic knowledge of techniques of making and doing things. He further indicates that by the 17th century, technology meant applied art only. By the 20th century, technology included processes and ideas in addition to tools and machines. Waks (1995:2.2) regards technology as a "human knowledge applied to the solution of

existential and practical problems". According to the DoE (1997a:84) technology is the "use of knowledge, skills and resources to meet human needs and wants, and to recognise and solve problems by investigating, designing, developing and evaluating products, processes and systems".

The above definitions include words such as knowledge, skills, processes, designing, making, tools, resources and systems. Accordingly, in this study technology is defined as the use of scientific knowledge, skills, techniques and creative processes - which include investigation, designing, making and evaluation - to solve practical problems and to have control over nature and the man-made environment with an intention of satisfying human needs and wants.

1.6.2.2 Technology Education (TE)

Like technology, there are various definitions of Technology Education. Ter-Morshuizen (1994:2) defines Technology Education as a process of thinking and doing, by which products are developed to satisfy recognised needs. According to HEDCOM (1996a:16) "Technology Education concerns technological knowledge and skills, as well as technological processes, and involves understanding the impact of technology on both the individual and society". It is also defined as a "disciplined process using knowledge, skills and resources to meet human needs and wants by designing, making and evaluating products and processes" (Ankiewicz, 1996:5). In addition, a previous curriculum proposal, Curriculum Model for Education in South Africa (CUMSA), sees these processes as inclusive of problem identification, design, execution and evaluation (DNE, 1991:31). These processes are used in making and doing things. After going through the definitions of Technology Education one realises that it simply takes technology into the classroom. It is Technology Education that will provide students with the processes of solving problems.

It is important to note that the DoE (1997a:9) often refers to Technology Education (TE) as the Technology Learning Area. For example, in the General Education and Training Phase, the relevant learning area is given as *technology* or the Technology Learning Area (TLA). For this study Technology Education will be used to refer to

the Technology Learning Area (TLA). Technology Education and the Technology Learning Area are basically the same.

It is necessary to define Educational Technology (ET), Information Technology (IT) and Vocational Education (VE), as these concepts are confused with Technology Education. According to the National Council for Educational Technology (1973:2), the concept of educational technology embraces a range of activities, including the systematic selection and use of learning materials, equipment and techniques to serve the newer patterns of learning that are developing in education. To Gillet (1973:2), educational technology refers to the continuing changes in educational procedures that grow out of applied scientific research. In common usage, this concept means all the newer media used for instructional purposes. In the broad sense, Gillet (1973:2) defines it as a systematic way of designing, applying and evaluating the total process of teaching and learning. Page (1996:12) regards educational technology as a branch of technology, and specifically technology used to enhance, improve and assist education.

The use of the media in the classroom is reflected in all the above definitions. ET is more concerned with the use of the technological artefacts in education, while Technology Education emphasises design processes as a field of study. On the other hand, one should admit that although ET embraces equipment, it is much more complex and dynamic than the mere devices used to aid teaching and learning (Gillet, 1973:2). A simple clarification is required to show the differences between TE and ET. ET is that field of study which involves the use of aids (such as computers, overhead projectors, blackboards) in the teaching and learning situation while Technology Education is a field of study that involves the use of knowledge, skills and attitudes and the design process to solve problems.

A discussion of Technology Education cannot proceed without reference to Information Technology (IT) as the two concepts are often confused. According to Page (1996:12) IT refers to "technology used to communicate, store and access information in the form of words, pictures and sounds". Page (1996:12) further indicates that Information Technology includes electronic hardware such as computers and information network which range from a small business computer

network to satellites and the Internet, as well as software applications and techniques such as word processors, desktop publishing and multimedia presentations. Treagust and Mather (1990:53) also define IT as the application of computers and how these affect the world of leisure and work.

While Technology Education is the use of knowledge, skills and processes to meet human needs, IT is concerned with the communication, storage and access of information. These differences do not mean a complete split between the two. For example, the knowledge that is used by Technology Education can be stored in a computer for learners to retrieve later during their learning process.

Since Vocational Education (VE) is sometimes confused with TE this study should also indicate the differences between VE and TE. Page (1996:12) states that VE refers to "the group of school subjects which have a content specific to certain occupations such as motor mechanics and carpentry". According to this definition VE is education that is job-directed and for that reason aims at providing skills for a particular occupation. TE, as a broader field than VE, provides technological knowledge and skills that can be used in any situation.

Staff development and in-service education and training (INSET) will be defined in the following subsections.

1.6.3 Staff development

Saludades (1983:13) maintains that "staff development is a way of relating learner and curriculum needs to staff competencies and program development". The concept embraces all educational and personal experiences that contribute towards an individual being more competent and satisfied in an assigned role (Saludades, 1983:6). According to Adams and Battersby (1987:5) "a comprehensive definition of staff development would include provision of the means for the development of individual competency in academic knowledge and understanding; research skills; procedure design and application; teaching; administration; and serving the community". Jones (1993:11) on the other hand defines staff development as a

"planned process which enhances the quality of pupil learning. At the heart of this process is the identification of the needs of teaching staff within the context of the school as a whole".

From the above definitions, one may conclude that staff development refers to activities that focus attention on the competency of all instructional personnel such as administrators, supervisors, educators and other supporting personnel.

1.6.4 In-service education and training (INSET)

Some writers (Siedow, Memory & Bristow, 1985 and Edelfelt, 1978) prefer to use the term in-service education while others such as Webster and Putman (1972:6) prefer in-service training. Bude and Greenland (1983) prefer the term in-service education and training, which will be adopted in this study. Hsieh (1990:9) maintains that "in-service education is a programme of planned activities designed to improve the quality of service rendered by employees". Mellish (1978:7) indicates that "in-service education is designed to retrain people; to improve their performance and their communicability". Mellish (1978:9) maintains that "in general terms, in-service education could be defined as educational activities planned and organised by the employer for the employees, to assist them in learning and or furthering the knowledge and skills required for the achievement of the specific purpose of the employing agency or organisation". More specific to educator education, Bude and Greenland (1983:11) note that "by in-service education and training (INSET) we refer to all measures enabling educators to carry out their job in schools and contributing to their professional development".

INSET within the context of educator training and education are planned activities aimed at improving the performance of educators and thus enabling them to carry out their job. I decided to adopt this definition of INSET as it aims at improving the performance of educators to cope with the demands of Technology Education in our schools by enabling them to teach learners to apply technological knowledge, skills and resources to solve problems. In this context INSET can be used to educate and train educators regarding problem-solving processes.

1.7 CHAPTER DIVISION

An orientation to the present study is given in chapter 1. The research problem, aims and methods are explained, and relevant concepts are defined.

Technology Education as a learning area is discussed in chapter 2 with reference to the rationale for Technology Education in Curriculum 2005. The chapter also indicates how Technology is included in the new curriculum.

Chapter 3 is concerned with the providers of INSET programmes for Technology Education.

Categories of INSET programmes for Technology Education is discussed in chapter 4.

INSET Model that can be used to train educators for Technology Education is discussed in chapter 5.

The last chapter includes a summary of the findings of the study including the findings and conclusions derived from the literature study, the interviews, on-site observations of the teaching of Technology Education and a discussion of the training of educators. This is followed by recommendations for further research.

It is important to note that chapters 2, 3, 4 and 5 build into an INSET model shown in figure 8. The discussion of these four chapters is based on figure 8. A variety of views from relevant persons and observations are considered throughout all these chapters.

CHAPTER TWO
TECHNOLOGY EDUCATION
AS A LEARNING AREA IN CURRICULUM 2005

2.1 INTRODUCTION

TE and Curriculum 2005 are already part of our educational system. Both of these initiatives are to be phased in from grade 1 to grade 9 by the end of 2005. During this trial period (1998-2005), research must be conducted to help reveal the weak and strong points, to assist remedying any problems that may jeopardise the success of TE and Curriculum 2005.

With this in mind, Chapter 2 will focus on the following questions:

- What is Curriculum 2005?
- What is the relationship between TE and other study fields such as science, vocational education and industrial arts?
- Why has TE been incorporated as a learning area in Curriculum 2005?
- How is TE included in Curriculum 2005?

The following sections attempt to address these questions.

2.2 CURRICULUM 2005

Curriculum 2005 is the new national education curriculum for South Africa, which has been phased in since January 1998. One of the reasons for this new curriculum is to change the face of South African education away from a curriculum that promoted race, class, gender and ethnic divisions (DoE, 1997d:1). Some take this view to be one-sided, but the reality is that the Department of education was divided according to race and colour. Gender was also a problem since women were not encouraged to be engineers or even to study mathematics or Agriculture in a classroom.

2.2.1 The distinction between the present curriculum and Curriculum 2005

It will be important for INSET providers for either Outcomes-based Education (OBE) or Technology Education (TE) to note the differences between the present curriculum and Curriculum 2005 since these need to be communicated to educators who be training. A new curriculum can be understood if it is compared with the old one. This will help educators realise the new emphasis and directions given by the new curriculum.

The differences between Curriculum 2005 and the present education system are that (DoE, 1997b:6-7):

- The present approach to education encourages learners to be passive while the new approach makes them active.
- The present approach leads to rote learning while the new approach encourages critical thinking, reasoning, reflection and action.
- The syllabus in the present approach is content-based and broken down into subjects while in the new approach learning programmes integrate knowledge and learning with real-life situations.
- The present approach is textbook/worksheet-bound and teacher-centred while the new approach is learner-centred, and the teacher is a facilitator.
- The present approach sees syllabus as rigid and non-negotiable while the new approach sees learning programmes as guides that allow teachers to be innovative and creative in designing programmes.
- The present approach puts more emphasis on what the teacher hopes to achieve while the new approach is more concerned with outcomes.
- The present approach places content in rigid time-frames while the new approach uses flexible time-frames which allow learners to work at their own pace.
- The present approach does not allow public comments on the curriculum development process while the new approach allows comments and inputs from the wider community.

- The present approach is exam-driven while the new approach emphasises continuous learner assessment.

Curriculum 2005 cannot be discussed without reference to *Outcomes-based Education* (OBE), *the National Qualifications Framework* (NQF), *the South African Qualification Authority* (SAQA), the *learning areas* and *learning programmes.*

2.2.2 Outcomes-based Education as an approach in Curriculum 2005

The underlying philosophy of Curriculum 2005 is an *outcomes-based approach* to education and learning. Outcomes-based education (OBE) is *learner-centred.* OBE does not stress what the educator wants to achieve, but rather what the learner should know, understand and be able to do. Educators and learners are guided by certain predetermined outcomes, which are to be achieved by the end of each learning process. The determination of these outcomes is based on real-life needs. The outcomes also ensure that there is an integration of knowledge and competencies needed by learners to become thinking, competent and responsible future citizens (UNISA, 1999:4).

OBE will be discussed in detail in section 4.8.2.3 because OBE is an approach used in Curriculum 2005 and in TE. Section 4.8.2, which deals with methodology, includes a discussion of OBE.

2.2.3 The National Qualifications Framework (NQF)

To ensure an integrated and truly national approach to education and training, national outcomes have been determined to which all education and learning processes, including training in Technology Education, must conform. For this reason, a NQF was developed. The NQF includes levels, bands and types of qualification and certificates envisaged in education and training. The following diagram shows all the levels, bands and qualifications. The diagram also shows that NQF is an eight- level

framework with three bands. Technology is included in these different levels (see section 2.5.2).

At the bottom of this diagram is NQF level 1 with a general education and training band. This band includes a pre-school, foundation, intermediate and senior phase (Kruger, 1999: Personal interview). Like ABET levels 1-4, these phases lead to the *General Education and Training Certificate.* Education at this level will be compulsory and free. At the middle of the diagram are NQF levels 2, 3 and 4 with a further education and training band. This band includes grades 10-12 and training at colleges and other educational institutions. This band leads to a *Further Education and Training Certificate.* Education at these levels will be voluntary. At the top of the diagram are NQF levels 5, 6, 7 and 8 with a Higher Education and Training Band parallel to the present tertiary education (UNISA, 1999:7).

Figure 1: Structure for NQF

SCHOOL GRADES	NQF LEVEL	BAND	TYPES OF QUALIFICATIONS & CERTIFICATES	
	8	**Higher Education and Training Band** TE is optional	Doctorates Further research degrees	
	7		Degrees, Diplomas & Certificates	
	6			
	5			
	Further Education and Training Certificates			
12	4	**Further Education and Training Band** TE is optional	School/College/NGOs Training Certificates, Mix of units	
11	3		School/College/NGOs Training Certificates, Mix of units	
10	2		School/College/NGOs Training Certificates, Mix of units	
	General Education and Training Certificates			
9 8 7 6 5 4 3 2 1 R	1	**General Education and Training Band** TE is compulsory	Senior Phase Intermediate Phase Foundation Phase Pre-school	ABET 4 ABET 3 ABET 2 ABET 1

(UNISA, 1999:6)

2.2.4. South African Qualifications Authority (SAQA)

SAQA sets the standards for the different levels and the certificates for each of the three NQF bands. In addition, SAQA identified a number of critical outcomes, which

serve as a base for the development of the new curriculum. SAQA also provided critical outcomes for Technology Education. These outcomes provide guidelines for learning activities at all levels of education (UNISA, 1999:7). These outcomes are provided in chapter 4 section 4.7.

2.2.5 The Learning Areas (LA) and Learning Programmes (LP)

The National Education Department (NED) has already planned and started to implement Curriculum 2005. This curriculum is in line with the requirements of the NQF. The NED started by identifying broad areas of related knowledge called *learning areas* (see section 1.1.2).

Subjects such as history, geography, biology, to name but a few, will no longer be taught and learnt as distinct subjects in the GET band. All learning will be based on eight learning areas identified by the SAQA (DoE, 1997a:8). These learning areas are clustered into three *learning programmes* in the foundation phase and five learning programmes in the intermediate phase. In the senior phase they are treated as separate learning areas (UNISA, 1999:9). TE is clustered with life skills in the foundation phase, while in the intermediate phase the learning area technology is combined with the natural science learning area. TE is treated as a separate learning area in the senior phase.

2.2.6 Conclusion

The first part of section 2.2 above indicates the distinctions between the present and the new approaches to education in South Africa. Unlike the previous approach of the former undemocratic government, the new approach is aiming at ensuring that learners, educators and the public are actively involved in curriculum development. The involvement can be discussed as follows:

- **Learners**

  The learner should be recognised as a unique person with own capabilities and background, which may differ from those of others. According to DoE (1997b:6-7)

content will no longer be placed in rigid time-frames but will be made flexible to allow learners to work at their own pace. According to the new approach, learners will no longer be passive but will be actively involved in their own learning.

- **Educators**

  Educators of Grades 1 and 2, who are already teaching the new curriculum, should no longer be treated as instruments. They should be allowed to become innovative and creative in designing learning experiences for learners (Venter, 1999: Personal interview). Educators are provided with learning programmes, phase organisers, learning programme organisers and planning charts providing Specific Outcomes (SO) and Assessment Criteria (AC) classified under all learning areas, to plan their learning experiences (DoE, 1997e:10-20). This indicates that educators are allowed to be innovative and creative. In addition, as teaching is no longer educator centred, educators will be facilitators of learners who will be working either individually or in groups. The problem that educators are facing is the type of training that they are to undertake.

- **Members of the public**

  People who are neither educators nor learners will also be allowed to make comments on curriculum development. The new approach encourages comments and inputs from the wider community.

The second part of section 2.2 discusses the main teaching approach as the Outcomes-based approach. This approach needs every action to be based on or directed to specific outcomes by the South African Qualification Authority (SAQA). At the end of each learning experience, learners must know, understand, and be able to perform certain functions to become a useful person in future.

In as far as the role of NQF and SAQA in Curriculum 2005 is concerned, the above discussion shows that SAQA assists in setting standards for the various levels and certificates for each of the three NQF bands. In addition, SAQA identified a number of critical outcomes for all learning areas on which the development of Curriculum 2005 had to be based. SAQA developed the NQF, which will be used as an instrument

with which to realise an outcomes-based integrated approach to education and training.

The next section will discuss TE as a learning area and its relationship with other learning areas.

2.3 TECHNOLOGY EDUCATION AS A NEW LEARNING AREA AND ITS RELATIONSHIP WITH OTHER LEARNING AREAS

2.3.1 Technology as a learning area in Curriculum 2005

The concept of technology as a separate learning area in education is comparatively new in South Africa. For this reason, the following questions are unavoidable: What do we mean by TE? Why is TE an autonomous learning area in Curriculum 2005?

A partial description of TE has already been provided in the first chapter (paragraph 1.6.2). According to D'Cruz (1990:21) technology is often defined in terms of only its more obvious artefacts such as technological equipment. This is unfortunate since it directs attention towards technological products rather than to the techniques and intellectual processes necessary to implement a certain technology. In a broader sense technology relates to the systematic thinking, planning and implementation necessary to produce goods and services of value. TE, therefore, should take this systematic thinking, planning and implementation into the classroom (Ruckard, 1995:8).

Williams and Williams (1996:37) maintain that TE should be treated as a separate learning area:

- to achieve a level of academic credibility for this area of study
- to provide the boundaries within which TE can be contained.

It is sometimes argued that TE with its external non-academic focus cannot be regarded as a scientific discipline. The argument is that TE does not permit reflection,

contemplation, detachment and those other cerebral qualities that produce true learning. According to Williams and Williams (1996:38), this rejection, which wrongfully divides thinkers and craftsmen, is in fact a powerful argument for the academic validity of TE. The combination of both theory and practice in TE leads to a more thorough understanding of reality.

McCade and Weymer (1995:40-1) note that some writers suggest that attempting to establish TE as a learning area is too limiting, because TE involves a wide spectrum of activities and professions. They go on to argue that "some people use technology, others design technology, still others dispose of the artefacts of technology. Focusing on any one of these professions, or activities, would inappropriately de-emphasise the others". For this reason, a curriculum should not limit the study of TE to a single level of technological knowledge defined by employment status (McCade & Weymer, 1995:41).

TE as a learning area in Curriculum 2005 will bring advantages to learners' daily lives by helping them to acquire the skills needed to investigate, design, develop, evaluate and communicate effectively with a view to solving technological problems. Through TE, learners will be able to apply current and future technological knowledge, skills and values to solve problems. In addition, TE will help learners to work as individuals, as group members and in a variety of technological contexts. It will also enable learners to gain a critical knowledge of the interrelationship between technology, society, the economy and the environment. The understanding of technology, society, economy and the environment will assist learners to perform effectively in their changing environment and will stimulate them to contribute towards its development (DoE, 1997a:84). In this way learners will be citizens who are innovative, critical, responsible and effective (DoE, 1997a:85).

To take the argument further, the next section will discuss the relationship between TE, science, vocational education and industrial arts. The selection of these areas of learning, is based on the fact that they are sometimes confused with TE.

2.3.2 The differences between Technology Education and other fields of study such as science, vocational education (VE) and industrial arts (IA)

This section attempts to address the question: What are the differences between TE and other study fields?

2.3.2.1 Technology Education and science

A practical example is used to elucidate the problematic link between TE and science to people who do not understand the former. A radio presenter visited Winterveldt High School with an aim of interviewing any teacher who has information on technology as part of Curriculum 2005. Although the contact teacher knew that there were teachers (who do not teach mathematics or physical science) who were interested in TE, he directed the radio presenter to a science teacher who did not even know that the technology learning area is part of the new curriculum. This episode reminds one that many people, at least in South Africa, do not know what TE is all about. The educator who welcomed the radio presenter was trying to separate technology from TE because for him technology means nothing but science.

Science and technology are separate but related learning areas. De Vries and Van Schalkwyk (1992:10) state that "originally science and technology developed separately. Science became a process of abstraction and analysis while technology became a process of concretisation and synthesis. Science yields universal knowledge while technology yields specific products. Technology is based on experience, passed from one generation to the next".

In developing TE, it is important to relate to and distinguish it from science. This will help us to distinguish TE from science (Williams & Williams, 1996:37). In addition, Pucel (1995:38) maintains that there is confusion about the programmes that should be delivered in TE. One source of this confusion is a failure to realise the differences between science and technology. Often, people also mistakenly believe that TE is merely the teaching of applied science (Pucel, 1995:39).

Despite the distinct differences between TE and science, there is a close relationship between the two. Custer (1996:8) emphasises that "the relationship between science and technology is so close that any presentation of science without developing an understanding of technology would portray an inaccurate picture of science". De Vries and Van Schalkwyk (1992:11) also maintain that there is a close interaction between the two since technologists require scientific knowledge to help them improve their products. Here are a few examples (De Vries & Van Schalkwyk, 1992:11):

- lens makers require knowledge about the way light behaves in the transition from air to glass and vice versa to be able to make better lenses; and
- steam engine builders drawn on the science of thermodynamics to improve their machines.

The growing relationship between technology and science has had consequences for the nature of TE in that it changed from concretisation and synthesis alone to a combination of abstraction, concretisation, analysis and synthesis (De Vries & Van Schalkwyk, 1992:11).

2.3.2.2 Technology Education and vocational education (VE)

Raat (1993:5-6) maintains that in the past, TE was seen as part of vocational education. Technological vocational education was divided into electrical engineering, construction engineering and many similar career categories. This indicates confusion, not only between TE and science, but also between TE and vocational education. Raizen, et al (1995:136) note that TE focuses on problem-solving and design and seeks to develop an understanding of the nature of materials and systems, while vocational education emphasises a routine approach to developing psychomotor skills and standard operating procedures for work. TE is not the same as vocational education in that it is neither specific to any field of technical study nor specifically vocational in focus. TE provides a platform and support for education in other fields of study. In some countries TE is seen as pre-vocational or even

vocational education (Salinger, 1996:38). According to Balogun (1996:7) in Nigeria, TE is confused with and defined as technical education that leads to the acquisition of practical skills as well as basic scientific knowledge.

2.3.2.3 Technology Education and industrial arts (IA)

Zargari, Patrick and Codding (1996:181) maintain that there is a transition from Industrial Arts into TE. Gradwell (1986:19) also shares the idea that Industrial Arts changed into TE. This change was reflected by the fact that the American Industrial Art Association has voted to become the International Technology Education Association (Gradwell, 1986:19). Zargari et al. (1996:181) maintain that this change took place in response to the needs of an industrial society. This means that TE attempts to meet the needs of a technology-driven information society and will therefore undergo continuous change because the objectives of education must change with the needs of society. The ever-changing nature of technology demands that TE programmes be constantly revised, updated, and developed (Zargari et al., 1996:181).

Other writers hold that far from becoming TE, industrial arts and TE still co-exist as distinctly separate fields. According to Eddy (1991:54), industrial arts is the field of study that has traditionally dealt with materials-specific subject areas. For example, a "student in a wood-working class would construct projects primarily out of wood, following a specific plan provided by the instructor" (Eddy, 1991:54). The focus of industrial arts has been the end product. TE, on the other hand, emphasises the "process of manufacturing from the early stages of research and design through to the finished product" (Eddy, 1991:54). Because there are no restrictions in choice of materials, pupils at schools may arrive at solutions that involve the use of wood, metals, plastic, or other materials they deem appropriate (Eddy, 1991:54).

2.3.3 Conclusion

It is evident from the preceding section that some writers argue that TE with its external non-academic focus cannot be regarded as a scientific discipline. However,

more writers accept that TE must be a learning area on its own. The above discussion indicates the advantages of TE as a learning area in Curriculum 2005.
Section 2.3.2 also discusses TE in relation to other fields of learning such as VE and IA. As indicated these fields are discussed because they are sometimes confused with TE. TE is always associated with other learning areas. For example it has been integrated with other learning areas in the foundation and intermediate phases. The discussions show that there is a close relationship between TE, Science, VE and IA.

The next section deals with the rationale for including Technology Education in Curriculum 2005

2.4 THE RATIONALE FOR INCLUDING TECHNOLOGY EDUCATION IN CURRICULUM 2005

2.4.1 The rationale for Curriculum 2005

The introduction of Curriculum 2005 has triggered a national debate as to whether there is a need for change (Moore, 1997:81). The background of those who participate in this debate plays an important role in their pronouncements on the new curriculum (Ankiewicz, 1996:2). It is important that every person attempting to interpret the debate should take note of such backgrounds (DoE, 1997b:7-8). The DoE (1997a:20) acknowledges that there are always discrepancies in the way a new curriculum is interpreted by educationists. The discrepancies are made worse by the fact that education in our country is experiencing a major shift to Curriculum 2005. To indicate the discrepancy, Raat (1993:17) warn that a country's education system does not change just because there is a change of government. Raat (1993:17) further maintains that the notion that the existing education system will be replaced at a stroke with a new ideal one is false.

To defend this shift to Curriculum 2005, the Department of Education stresses that "the old paradigms or ways of thinking have the surprising power to blind people to the benefits that can come as a result of the new paradigm" (DoE, 1997b:7). People

tend to be comfortable with what they know and are afraid of the new and unknown. A paradigm shift was made inevitable by a number of factors:

- **The need for a common curriculum**

  The various education departments in South Africa functioned, to a large extent, independently of one another, with the result that there was no significant indication of a common curriculum followed by all (DoE, 1997b:8). Curriculum 2005 will serve as a common curriculum and this will put an end to the discrepancies between various education departments.

- **Need for a curriculum that does not discriminate according to race, gender or skin colour**

  Before the early eighties, education for Blacks within the borders of the RSA was regarded as a general affair and was placed under the jurisdiction of the Department of Education and Training (DoE, 1997b:8). The racially exclusive departments, provinces, homelands and self-governing territories have contributed to the division of the South African education system into 19 different education departments (DoE, 1997b:9). Although efforts were already taken to remove the discrepancies in education, political unity in South Africa will also assist to put this fragmentation to an end. Curriculum 2005 is aiming at removing remnants of discrimination that kept South African society divided and to make sure that discrepancies of the past decades do not repeat themselves.

In addition to the above, Du Plessis and Traebert (1995:72) acknowledge that there is a need for more relevant education in South Africa as the present education system is inadequate for other sections of society. Its inadequacy is evident from the following problems:

- **The continuous poor results**

  Results remain poor, especially in schools servicing the Black communities. The examination results of December 1994 indicated a pass rate not more than 50% of candidates in the final Black school-leaving examination (190 340 out of 392 434). Only 12% obtained matriculation exemption. On the other hand the pass rate for Coloured students was 87%, for Indians 93% and for Whites 97% (Du Plessis &

Traebert, 1995:73). Evidence from literature shows that the disparities indicated above came as a result of unbalanced allocation of resources. Most of the traditional black schools did not have resources and this affects the results (DoE, 1997g:2).

- **The low rate of employment among school leavers**

  The low rate of employment among school leavers is a sign of an irrelevant education system. Less than 10% of school leavers could be absorbed by the formal sector (Du Plessis & Traebert, 1995:74).

- **Key fields were not made accessible to all racial groups**

  The education system did not make certain key fields of study accessible to all racial groups. The majority of professional or skilled Blacks, for example, ended up being teachers, nurses or policemen (Du Plessis & Traebert, 1995:75).

Despite the continuing debate on the introduction of Curriculum 2005, the political change in South Africa warrants a change in the education system. Just as education was used to promote and spread the ideas of apartheid, so it should be used now to uplift and spread the democratic ideas that will benefit all South Africans. However, we cannot conclude that all aspects of education under the apartheid regime were bad. Good things can still be adopted from it to reinforce the new curriculum. For example, the teacher-learner ratio of the previously so-called white schools could also be adopted by Curriculum 2005 for all schools. In addition, the success of Curriculum 2005 will probably depend on the educational facilities that were previously used by the traditional white schools.

One of the learning areas of Curriculum 2005, TE, needs more attention as it is a new comer in the South African curriculum. This chapter will therefore be largely centred on TE as a learning area in Curriculum 2005 and the next section will deal with the reasons why TE is necessary in our education system.

2.4.2 The rationale for the new technology learning area (TLA)

The rationale for integrating a technology course in the curriculum is based on the belief that while technology and culture has changed, education about technology has not. Since technology serves as a multiplier of productivity and as a means of preparing people for a better tomorrow, its study remains central to education (Zargari, Patrick & Codding, 1996:27). In addition, the study of technology crosses many traditional disciplines and integrates knowledge from mathematics, physics, history, literature, and other learning areas into a much broader interdisciplinary perspective (Queensland Government, 1997:viii-xi).

The aim of Technology Education is to empower individuals to live productive lives, to provide a coherent and comprehensive understanding of human knowledge and culture and to develop an orderly mind. In order to meet society's need for technologically literate people, educational institutions should include the study of technology as an integral part of a liberal education curriculum (Zargari et al, 1996:28).

Zargari et al (1996:178) state that "technology has provided and can provide the knowledge, energy and materials necessary to solve the society's problems of ecological damage, occupational and social dislocations, hunger, threats to privacy, the feeling of political insignificance of the individual, population growth, poverty and the depletion of the resources". In response to the changing needs of the technology-based society that we live in, TE has emerged as an important field of study because it has the potential to help in solving some of our social problems. It is a common belief amongst TE exponents that technology as a learning area can solve most societal problems by providing new information and designing programmes based on new knowledge (Zargari et al, 1996:178).

Students need to understand the forces that shape and influence their lives, and technology is one of those forces (McLaughlin, 1996:16). TE may thus have a greater responsibility than most learning areas since it is a cultural universal. Technological advances have caused a perception that the world is growing smaller and its people

closer together. TE should therefore provide students with perspectives and experiences that cross national borders and penetrate beneath the surface of foreign societies.

ORT-STEP (1995:7) provides the following reasons for the development of technology in the primary school curriculum:

- Technology is an important part of our daily life. TE will help us to understand technology and its impact on our life.
- Technology provides the work force with entrepreneurial, innovative and creative thinking skills (Kruger, 1999: Personal interview). TE is therefore essential to provide learners with these skills, which are good for the economy.
- A basic knowledge of technology is indispensable, not only for technical jobs, but also for all professions. TE will therefore provide such basic knowledge of technology.
- To survive in a technological world and cope with the technological products that surround us, technological literacy is needed. TE will provide technological literacy to assist us to cope with technological products.
- To have control over our technology, we need to have insight into its nature. TE can help pupils to be better informed when making choices in their further technological education.
- To develop problem-solving skills that can be used in all walks of life (Smart, 1999: Personal interview). TE is concerned with the technological process, which assists in problem solving.

In contrast to the above reasons, Du Plessis and Traebert (1995:207) provide objections to the development of technology as a learning area. These objections include the following:

- Technology is a threat to human life. For example, the atomic bomb and the Vietnam War strengthened the image of technology as anti-life and out-of-control. The radio-active poisons from nuclear tests, the run off into rivers of nitrogen fertilisers, the smog from automobiles, the pesticides in the food chains, and the

destruction of topsoil by strip mining are examples of the failure to foresee and control the results of modern technology (Waks, 1994:39-40).

- The impact of pollution on the natural environment.
- The drain on natural resources.
- The transfer of human abilities to technical systems and instruments, leading to a loss or devaluation of existing skills. This may jeopardise economic bases as well as personal orientation.
- The loss of the natural and traditional value system as technology is neutral to existing values. The protection of value system will have to be provided by the education system itself.

Despite these objections, Du Plessis and Traebert (1995:207-8) also indicate that technological development has brought about many benefits for humanity, which made it necessary for societal life. This has also paved the way for the teaching of technology at school. Du Plessis and Traebert (1995:208) also point out that, because of technology it was possible:

- to free people from hard and dangerous work;
- to combat or eliminate a large number of diseases;
- to achieve at least a satisfactory standard of living;
- to protect ourselves from climatic influences;
- to improve communication; and
- to multiply cultural and leisure facilities.

The impact of technology differs from one society to the next. Learners should be taught to appreciate the positive and negative impacts that technology may bring to their life. They have to be introduced to activities designed to review, research and analyse such impacts. The learning activities that are designed to achieve the outcomes dealing with the impacts of technology (see section 3.3.2) should permit learners to review the technological impact in different contexts (Potgieter, 1999:16).

2.4.3 Conclusion

The previous section (2.4.2) discusses the rationale for Curriculum 2005 and Technology Education. Writers who are in favour of Curriculum 2005 provided the following as reasons:

- a need for a common curriculum;
- a need for a curriculum which does not show discrimination;
- a need for a curriculum which will have some outcome for all citizens in South Africa;
- a need for a curriculum which will increase the rate of employment among our school leavers; and
- a need for a curriculum which will expose all South Africans to key fields of study.

The main aim of this new curriculum must be to satisfy all aspects mentioned above if it needs to serve all South Africans equally.

As far as the rationale for the new technology learning areas is concerned, the discussion in section 2.4.2 indicates that technology pervades every aspect of our lives. It is therefore important that TE be included in the education of all learners. Another reason is that TE is practical problem solving. The problems concerning, for example, clothing, housing, transport and communication can be solved by means of TE. In addition, TE programmes in schools commonly use technological processes in solving problems. With technological processes as the central focus of TE activities, it becomes easier for learners to assume ownership of their learning.

The next section attempts to discuss how TE can be integrated into a curriculum in general and specifically in Curriculum 2005.

2.5 THE INCLUSION OF TECHNOLOGY EDUCATION IN A CURRICULUM

2.5.1 Two approaches

When looking at TE in general it can be deduced from the literature that TE can be taught as an autonomous learning area in the curriculum, on a voluntary or compulsory- basis or it can also be treated as a topic or a theme within other learning areas. TE topics could for instance be linked with the philosophy of the learning area in which it is integrated (Treagust & Mather, 1990:52). The question of integrating technology education with other learning areas or keeping it as a separate learning area, is still being debated. In some countries where TE is already part of the curriculum, however, technology is still seen as a lesser area of activity taking place in workshops and studios with a predominantly practical nature and largely unrelated to the other learning areas in the curriculum (Eggleston, 1992:15).

Those who do not favour TE as a cross-curricular activity (Raat, 1993:94) argue that:

- when integrated, technological knowledge is presented disjointedly;
- good classrooms are unavailable for TE;
- non-technology teachers are inadequately trained; and
- integration may result in technological misconceptions.

A proposed Curriculum Model for Education in South Africa (CUMSA) shared the idea that TE be introduced as a separate learning area on the grounds that although technology is addressed in all the learning areas, it implicates knowledge, skills and attitudes which cannot be accommodated in other learning areas (DNE, 1991:32).

In contrast, Du Plessis and Traebert (1995:209) are not in favour of TE as a separate learning area in South African schools. Citing valuable lessons learnt from Germany, Du Plessis and Traebert (1995:205) claim that:

- There are few qualified teachers available to teach technology education in South African schools.
- It is feared that the introduction of TE as a separate subject would place a heavy burden on the financing of education.
- It is sometimes argued that technology education together with science be consolidated into one syllabus on the grounds that technology and science are natural partners (Du Plessis & Traebert, 1995:210).

These concerns will be discussed in detail in chapter 4, which deals with educator training.

To address the question whether TE should be a compulsory or voluntary curriculum, one may cite examples from other countries. TE in England (UK) is one of the compulsory subjects of the national curriculum in primary education. This means that there are prescribed attainment targets for TE, but the way these are realised is left to the schools (Raat, 1993:73). In the Netherlands, there is no formal technology in primary education but it is a compulsory subject for the first three years of secondary education in Dutch schools (Raat, 1993:83). In France, teaching is entirely technology centred, which brings together all disciplines. In the UK, TE is not taught as a separate subject in primary schools but is integrated into other subjects. This is also the case in the Netherlands and Belgium (Raat, 1993:19,66,73). For these reasons, it can be concluded that TE is good and relevant to all learning areas of the curriculum. Including TE in a learning area means adding problem solving which will make that subject more relevant to the present situation.

After indicating how TE could be integrated, the next section will discuss how it has been integrated in the phases of the General Education and Training Band (GETB).

2.5.2 Technology Education in the different phases of the General Education and Training Band in South Africa

In the General Education and Training Band of the NQF the school curriculum called Curriculum 2005, includes the foundation (ECD and grade 1-3), intermediate (grade 4-6) and senior (grade 7-9) phases (Kruger, 1999: Personal interview).

2.5.2.1 Technology Education in the foundation phase

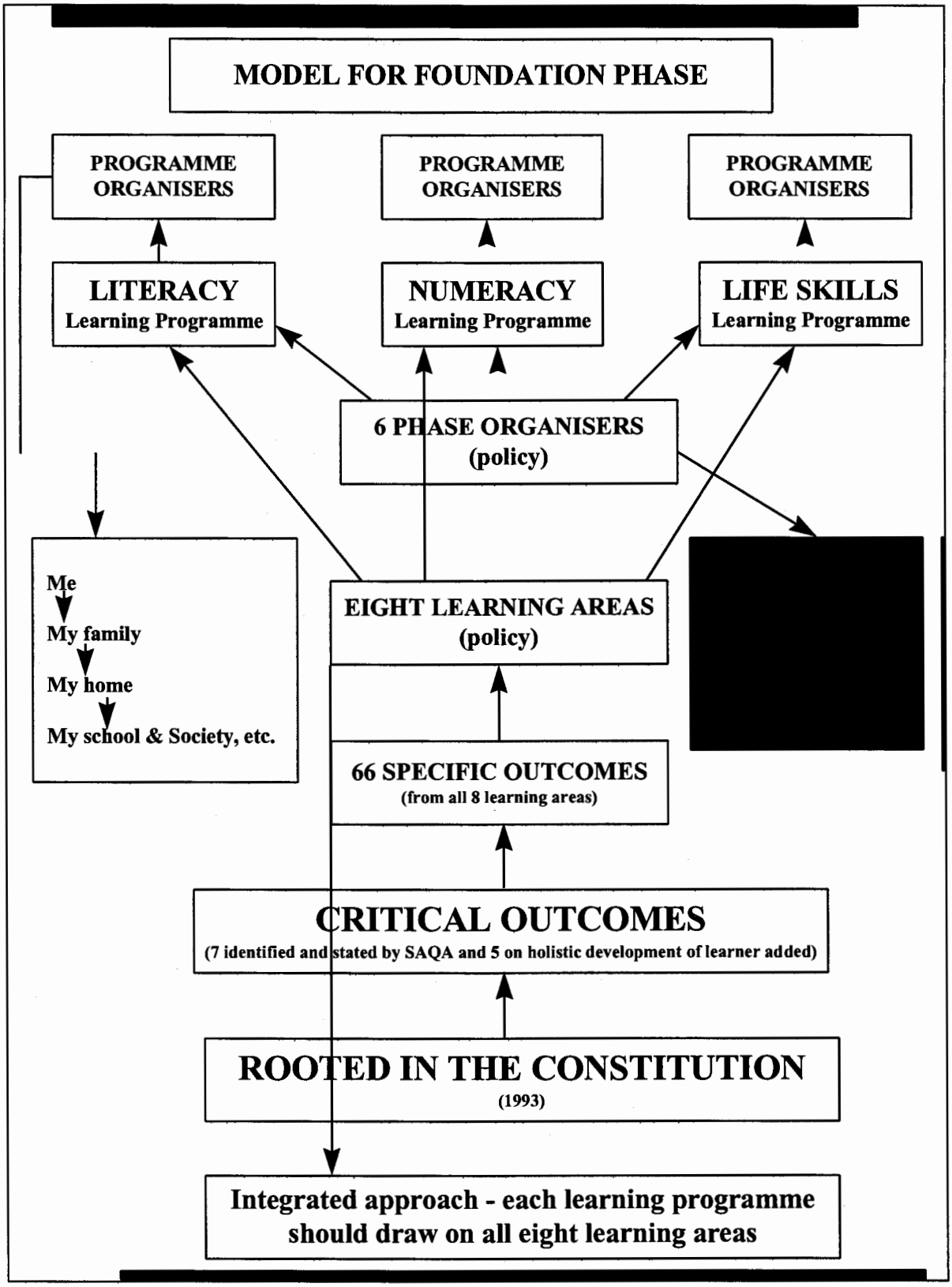
As indicated above, the foundation phase includes Early Childhood Development (ECD) and grades 1 to 3. "Foundation phase" is "an umbrella term which is applied to the processes by which children from birth to nine years grow and thrive, physically, mentally, emotionally, morally and socially" (DoE, 1997d:4).

a) Learning programmes in the foundation phase

A learning programme is a means through which the new curriculum is implemented at various learning sites such as schools. They are a set of learning activities that will involve the learner in working towards specific outcomes. Figure 1 shows that in the foundation phase there are three learning programmes, namely literacy, numeracy and life skills. The DoE (1997e:10) organises these learning programmes as grids. A grid is a grouping/ clustering of possible specific outcomes and assessment criteria from each learning area that is relevant to the learning programme and six phase organisers of the foundation phase (figure 2). A grid is developed for each learning programme and carries the same six phase organisers. These phase organisers are taken from the policy document and they may not be changed, as they are part of policy (DoE, 1997e:10).

In addition to the phase organisers, *learning programme organisers* are developed and used as the learner support material for the foundation phase. The six phase organisers and the learning programme organisers are included in the model for the foundation phase depicted in figure 2 (DoE, 1997e:8).

Figure 2: Model for foundation phase



(DoE, 1997e:8)

In the foundation phase the eight learning areas are integrated in each of the three learning programmes. Examples of these eight learning areas are shown in section 1.2.2 of chapter 1. In the foundation phase, the TE curriculum in particular is integrated with all the other learning areas into the three learning programmes (literacy, numeracy and life skills) (HEDCOM, 1998:3).

As shown above, ECD is an integral part of the foundation phase. There are those who think that including design and technology (as TE is sometimes called) in a pre-school setting is to take TE too far because children will not be able to participate in technological activities. In contrary, Stead (1995:8) maintains that pre-school lays the foundation for social skills, special concepts, perceptual skills, language, reading and writing, to name a few. On the other hand, at pre-school children come across materials such as the woodwork bench, hammer, saw, nails and wood that can be used in technology. Although Mitchley (1995:9) says that TE is not especially about craft skills, woodwork, metalwork, home economics or following a pattern or designs, he agrees that TE encompasses all of these. According to this view the essence of TE in pre-school is exposure to a variety of materials, effective tools, a facilitator and a challenge (Stead, 1995:8). Burchfield, Berry, Cave, Harpine, Monk and Pollard (1996:19) maintain that one goal for kindergarten children is for them to become creative, divergent thinkers who can work independently or as a team, which also indicates the applicability of TE at this level.

As TE has been included in Curriculum 2005 it is the responsibility of teachers to see to it that TE is given the attention it deserves along with the other learning areas in Curriculum 2005.

2.5.2.2 Technology Education in the intermediate phase

This phase includes the last part of primary school, that is grades 4 to 6. The intermediate phase is a transition where learners move from the foundation phase with three cross curricular learning programmes to the senior phase with eight separate learning areas (DoE, 1997f:33-34). The learning areas of the Intermediate phase are clustered into five learning programmes. The Technology Learning Area and the

Natural Sciences Learning Area are clustered together as one of the five learning programmes (DoE, 1997f:35). Although the Technology Learning Area is clustered with the Natural Science Learning Area in this phase, teaching and learning begins to move in the direction of separate learning areas.

The following are arguments to support the importance of the Technology Learning Area in the intermediate phase:

- Young children enjoy activities and for this reason, they find TE stimulating and exciting. At this stage children have not developed an aversion to technology and attitudes towards technology are formed at a young age (Raat, 1993:82).
- Technology is an essential part of culture and therefore must be included in the primary school curriculum (Raat, 1993:82).
- Learners must become acquainted with the working world at an early age (Raat, 1993:82).
- The primary school is a formidable and essential frontier for TE (Foster, 1996:7).

Unlike South Africa, in some countries TE presentation is cross-curricular, that is in conjunction with all the subjects in the intermediate phase. At Ottobine elementary school (Virginia, USA), for example, the curriculum for all the grades (1 to 5) integrates technology topics into subjects such as language, arts, maths, science, social studies, health, music, to name just a few (Burchfield et al., 1996:21). One example of cross-curricular activities in primary schools are offered by Willard Model Elementary School in Virginia, USA. One of their technological activities is related to an English novel. After reading the book, the learners discuss the time, era, methods of transport, environment and issues of the time. They are given the challenge of developing a method of transportation that would float, carry three people, and have one movable part. They work in teams to design their method of transportation. During the designing phase, learners are forced to use their maths and science skills. Skills of measuring or estimating motion and weight are used (People, 1996:5).

In section 2.5.1, it is indicated that TE in the UK is compulsory in the primary school while in the Netherlands it is compulsory in secondary schools. In South Africa TE is compulsory in the foundation, intermediate and senior phases.

2.5.2.3 Technology Education in the senior phase

The senior phase of the General Education and Training Band includes grades 7 to 9 (Std 5 to 7) and must not be confused with senior secondary schools. This phase is sometimes called the Middle School (DoE, 1997a:5-7).

Learning programmes are developed separately for each one of the eight learning areas in this phase. The learning content offered in this phase would be more learning area specific than in the previous two phases (DoE, 1997d:5). This means that TE is treated as a separate learning area in the senior phase (DoE, 1997g:14). The notional time for TE in the senior phase is 10% of the total time (DoE, 1997g:31-32).

2.5.2.4 Technology Education in Adult Basic Education and Training (ABET)

Adult Basic Education and Training (ABET) consists of three levels below the General Education and Training Certificate (GETC). ABET covers levels 1 to 4. Level 4 for TE is equivalent to NQF level 1 (see figure 1). Unlike formal schooling, the ABET programme is divided into eleven unit standards for ABET level 2 and 3. At the end of the unit adult learners will obtain the General Education and Training Certificate (DoE, 1997g:8). Each unit standard has a unit title and specific outcomes. These unit titles of TE in ABET correspond with specific outcomes in formal schooling.

Where training is concerned, HEDCOM (1998:4) maintains that since 1997 Technology 2005 project staff have played an important part in supporting the Department of Education in the development of ABET unit standards in TE at levels 2 to 4. Project staff are reportedly also involved in the development of ABET placement tests and will become part of teams developing pilot programmes for training during

1999 - if the project is extended to allow this. Project staff may also be asked to assist with the training of provincial ABET trainers. It is important to note that, despite all these efforts, TE has yet to be included in ABET programmes.

2.5.2.5 Technology Education in Further Education and Training (FET)

Further Education and Training (FET) comprises NQF levels 2 to 4. This band is not compulsory. Various providers of education and training in the FET band are (DoE, 1997d:6):

- senior secondary schools;
- technical colleges;
- NGOs;
- regional training centres;
- private training centres;
- private providers and private colleges;
- private companies;
- industrial training centres; and
- community colleges.

The developmental task for FET is to design, implement, monitor and continuously improve an integrated approach to learning (DoE, 1996b:34). TE shares this developmental task and encourages learners to investigate, design, produce and evaluate (Jakab, 1996:2). Designing, implementing and monitoring form part of the technological process (see chapter 3, section 3.4.2.1.

The rise of the knowledge society has led to the requirement that all learning programmes and qualifications incorporate knowledge, skills and values that are transferable to different work and learning contexts. To ensure continuity between GET and FET learning outcomes need to be end products of the learning process. These learning outcomes should include knowledge, skills and values (DoE, 1996b:34). In this way, outcomes of FET will include important aspects of TE such

as: problem-solving skills, teamwork ability, research skills, communication skills, learning skills and entrepreneurship (DoE, 1996b:35). Chapter 3, section 3.4 shows that these outcomes are the essential characteristics of TE (Eisenberg, 1996:36). This chapter confirms that TE fits well in the FET band although it is not yet included.

The South African Qualifications Authority (SAQA) identified the following 12 fields (DoE, 1998b:36):

- Agriculture and nature conservation
- Culture and arts
- Business, commerce and management studies
- Communication studies and language
- Education, training and development
- Manufacturing, engineering and technology
- Human and social studies
- Law, military science and security
- Health sciences and social services
- Services and sciences
- Physical planning and construction
- Physical, mathematical and computer sciences.

These 12 fields are the basis for the development of curricula, learning programmes in GET, unit standards in ABET and qualifications for FET. In these 12 fields technology will be clustered with manufacturing and engineering (DoE, 1998b:36).

2.5.3 Conclusion

From the above section (2.5) it is clear that there are two approaches to integrating TE in a curriculum. Writers differ about these two approaches, but in South Africa TE has been included in the curriculum as follows:

- In the foundation phase, TE has been clustered with other learning areas into three learning programmes such as literacy, numeracy and life skills.
- In the intermediate phase, TE and the Natural Sciences Learning Area are clustered together as one of the five learning programmes.
- In the senior phase TE, like other learning areas, is a separate learning programme on its own.
- TE is not yet integrated into the curriculum of the FET band and ABET.

TE is made compulsory in the foundation phase, intermediate phase and senior phase. IT will not be made compulsory for FET and ABET. The advantage of making TE compulsory in the GET Band is that all learners will have basic knowledge of how to cope with the technology which pervades every aspect of their lives.

The next chapter will discuss how the TE curriculum was developed in South Africa. The important components of a curriculum will also be discussed and the chapter will indicate whether the TE curriculum of South Africa covers the general essential characteristics discussed.

After providing reasons why TE should be made a learning area in Curriculum 2005 and also to show how it can be included in a curriculum, the next chapter will discuss imported providers of INSET for TE. All the chapters are based on the INSET model shown in chapter 5.

CHAPTER THREE
POSSIBLE PROVIDERS OF INSET FOR TECHNOLOGY EDUCATION

3.1 INTRODUCTION

This chapter examines the responsibilities that have to be assumed by someone in order to ensure that INSET for TE is actually undertaken. The first responsibility is that of the *government,* then of the learning area advisers operating from *teacher centres* and *schools*. In addition to these providers, there are possible contributors to INSET delivery for TE. These include *educator unions*, *individual educators* and *private sector*. Each of these categories will be discussed. This chapter is also based on the INSET model indicated as figure 8 in chapter 5.

3.2 VARIOUS PROVIDERS OF INSET FOR TECHNOLOGY EDUCATION

3.2.1 THE GOVERNMENT AS INSET PROVIDER FOR TECHNOLOGY EDUCATION

The vast majority of educators in South Africa are employed by the state while the rest are employed by private institutions. Through the provinces, regions, districts and local education authorities, the state can now provide non-award bearing INSET to its educators through distance education, schools and teacher centres (Gilroy & Day, 1993:143). This means that the government has the responsibility to come up with a policy which distance education institutions, schools and teacher centres can follow in training educators.

The national approach to INSET funding should be an important priority to the government (Beyers, 1999: Personal interview). This is based on the view that the teaching profession is a national resource and, therefore, requires national provision

(Gilroy & Day, 1993:143). The implementation of a TE programme or INSET programme for TE cannot be successful unless it has the full support of the government (HEDCOM, 1999:167). The government has to spend money to use INSET for training educators (Mellish, 1998:169). The OECD (1982:41) echoes this claim, that the central government's finance must be aimed more at a new and innovative programme such as TE. Hofmeyr (1994:37) also indicates that it is necessary to ensure an adequate budget for INSET finance in national priorities. The government should provide grants for school-focused INSET and allow state contracts with NGOs and private agencies for INSET services. The OECD (1982:41) states that the government should provide funds to maintain educator centres, and that the it must also support INSET indirectly through more general grants to local educational authorities and through financial support to colleges and universities.

There is no way in which the government can ignore its responsibilities towards INSET and expect the implementation of TE programme to be successful. Government (both national and provincial) should provide a plan for INSET. The plan should supply the framework to include design, implementation and evaluation of the programme. A plan that leads to efficient INSET should conduct needs assessment, define goals, identify resources and establish tentative design (Leahy, 1981:20). INSET is more likely to be effective and successful when there is a sincere commitment to it from the state. This commitment, if it is to be more than words, has to be shown through active support and encouragement of INSET activities, and through the provision of facilities and resources, both financial and human (Ashley & Mehl, 1987:11).

In addition to the responsibilities mentioned above, the government should also provide incentives for INSET participation. There are many incentives that can be undertaken by the government. Leahy (1982:41) mentions incentives that include salary increments, credentials, INSET credits and many others. In South Africa no incentives were provided in the past except where an educator, by himself/herself, decided to further his/her studies through distance learning. Gilroy and Day (1993:141) call this type of learning award-bearing INSET. The power of this incentive has been reduced by the government's announcement that any further diplomas or degrees will no longer lead to a salary increase, but only bonuses will be

received. Another cheap incentive the government could use is to involve educators in planning and managing their own professional development and objectives. This type of incentive formulation is based on personal motivation rather than entirely on financial rewards (Ryan, 1987:149).

Other notable responsibilities of the government are follow-up support(see figure 8) for INSET and evaluation. Follow-up implementation helps to establish monitoring mechanisms that can be used to evaluate the various expected and unexpected outcomes of the INSET programme. Follow-ups can also lead to new and more specific needs that can help to plan another INSET programme (Browne & Ritchie, 1991:29). Follow-ups are very important for TE. Educators need continuous support because TE is a new learning area. An effective follow-up is one that provides feedback to participants who may need to modify the approaches they have learned. It is the responsibility of the government to encourage other INSET providers to provide these follow-ups and feedback in time.

In addition to the part that can be played by the government, the next section discusses distance education as the providers of INSET for TE.

3.2.2 DISTANCE EDUCATION AS INSET PROVIDER FOR TECHNOLOGY EDUCATION

Distance Education is also regarded as one of the INSET providers in this study and its discussion is based on figure 8.

Many exciting TE programmes have been developed and implemented across most of the European states. These and many other efforts to implement TE have aroused wide interest in some of the African states, including South Africa, Botswana, Malawi and many others. The process of implementing TE curricula is a complex undertaking that requires effective INSET programmes. In order for TE to improve educators, continually updated information is required on curriculum, methodology and technology to assist them to make meaningful changes that will supplement TE

(Boser & Daugherty, 1994:4). Educators' knowledge, skills and values can be updated through well-planned INSET.

INSET can be provided through higher education personnel in collaboration with the local education authority officers who include learning-area advisers (Gilroy & Day, 1993:143). Higher education personnel are experts from the colleges of education, technikons and universities, as well as other non-governmental organisations such as the ORT-STEP Institute. These Institutions must be able to run INSET courses for TE as distance education. It will always be advisable for these tertiary institutions to use lecturers who are experts in TE as INSET will be geared towards empowering educators for this new learning area (Meltzer & Sherman, 1997:23-32). Flexible, open learning programmes presented through distance education should be fully used and expanded to train educators for TE (DoE, 1998b:43). Unfortunately, most South African tertiary institutions have not yet started to assist educators in the field of TE. Nevertheless, ORT-STEP has assisted in training some few educators from twenty pilot schools (HEDCOM, 1999:2). ORT-STEP, on the other hand, is still giving support but only to educators who trained at their institution, provided such educators intend to introduce TE (Smart, 1999: Personal interview).

Although one discusses the responsibility of distance education for INSET, it is necessary to note that PRESET is also important to make sure that there is a PRESET-INSET continuum. This means that contact education and distance education should ensure continuity between PRESET (contact education) and INSET (distance education) (DoE, 1998:130). The Department of Education has negotiated with the South African Institute for distance education (SAIDE) to develop teacher education modules based on the concept of outcomes-based teacher education (Bengu, 1997:33). It is said that considerable progress has already been made with the formulation of these modules. In addition to negotiating with SAIDE, the Department of Education released the first document on norms and standards for distance education as a basis for policy formulation in 1997. Quality standards in distance education are necessary as they lead to quality delivery of education and training. According to the INSET model suggested in chapter 5, the formulation of the modules and the policy should involve other stakeholders such as learning area advisers and the schools as other providers of INSET.

Distance education may use institution-based INSET, issue-based INSET and course-based INSET to provide educators with modules of TE (see Figure 8). This will assist educators to use the outcomes-based approach in TE. Some institutions have been using distance education in providing their courses for many years. This indicates that unlike teacher centres, these institutions of higher learning will not experience problems in providing INSET. For this reason, institutions of higher learning must assist teacher centres in training educators for TE.

Distance education is not only concerned with the training of educators, but are also concerned with research. Research leads to the development of effective INSET programmes, which require extensive planning, careful delivery, and follow-up of the educator's success in the teaching setting. It is important that tertiary institutions make sure that INSET does more than providing information, demonstrating innovations or providing opportunities for educators to practice and receive feedback and coaching in the field of TE (Boser & Daugherty, 1994:5).

The next section deals with a school as a provider of INSET.

3.2.3 A SCHOOL AS INSET PROVIDER FOR TECHNOLOGY EDUCATION

The school has an important part to play in training its own educators for TE. Moonen (1989:8) states that INSET should be organised within each school. The school should be regarded as the unit that determines the structure and the content of training, as well as the sequence and duration of events, and who should be in charge and who can be participants. This applies specifically to what is known as school-based and school-focused INSET. Through these two types of INSET, the school could identify and tackle its own problems in a relevant and professional manner (Mutshekwane, 1992:31). Even though school-focused INSET is planned and directed from outside the school, it is the school that has provided its needs to the relevant agencies (Morant, 1981:42). If this is not done, INSET will be foreign to that particular school.

Even for those INSET programmes offered away from the workplace, the school still reserves the right to identify educators who will participate in such INSET (Mutshekwane, 1992:31). The part and position of the school as provider of INSET for TE has been shown in the INSET model (see figure 8). It is necessary to note that an individual educator is an important figure in a school as an INSET provider.

An educator is a manager of education who is involved in facilitating, stimulating, reinforcing, guiding, and evaluating the learners. His or her task is to draw the best out of learners and to help them grow. Prime (1985:9) envisages the following aims as the role of the educator that he/she has acquired during INSET training:

- To assist learners in the development of skills and techniques
- To stimulate learners to establish higher personal goals
- To promote better learner judgement and decision-making
- To promote increased learner resourcefulness
- To provide the materials and apparatus necessary for learners to achieve goals
- To instruct learners in the use of resources, apparatus and materials which will assist them in achieving goals
- To guide learners who need assistance in finding solutions to problems
- To encourage learners to find ways of refining their techniques of researching, constructing, communicating, analysing and problem-solving
- To help learners to evaluate their efforts and achievements

Rude-Parkings, Baugh and Petrosko (1993:45) identify three roles that predict when an educator is likely to adapt to an innovation. These roles are:

- Innovators: Educators who are willing to take an early risk even though they do not usually have a great deal of direct power or influence
- Resisters: Educators who take an active role as critics of the innovation and who may, in fact, have some very good reasons for caution

- Leaders: Educators who listen to both sides (negative and positive sides) and will champion the cause if it looks like an innovation. The leaders are the key to the growth of any educational exercises

The organisers of INSET should take note of these roles to be able to work effectively with various types of educators. These roles should also be considered at school level when educators are to run school-focused or school-based INSET for TE. Educators should also be consulted during the planning of INSET programme since they know the needs of their work situation. It is worth noting that the success of INSET for TE will depend on the commitment of individual educators. To support this idea, Mellish (1978:176) states that the employer can provide opportunities for INSET and the professional educator organisations can assist in producing programmes, venues, publicity and publications, but unless all individual educators realise their responsibilities in this regard, much effort will be wasted. There is a need for more involvement of educators in all facets of INSET. Experienced educators in TE who have received training may willingly assist in training others, especially during school-based or school-focused INSET (Hopkins, 1986:61&69).

The following section will deal with teacher centres as another INSET provider.

3.2.4 TEACHER CENTRES AS INSET PROVIDER FOR TECHNOLOGY EDUCATION

3.2.4.1 Introduction

When one thinks of centres, what comes to mind are leisure centres, entertainment centres, social centres, recreational or sports centres, health centres and many others. Despite the variety of centres in all these institutions the main aim is to encourage a coming together of people to share activities, experiences and expertise. Even when one turns from centres of a diverse nature to more specific ones dealing with education for educators, one still faces a variety of centres such as curriculum development centres, resource and technology centres, educational development centres, advisory centres, pedagogy centres, research and development centres, school

development centres and INSET centres (Redknap, 1977:IX). The latter, INSET centres and other categories of INSET, are the subject of this study.

Having focused attention on different types of centres, it may be helpful to provide a definition that has been used in connection with the subject of this study. An educator centre is an institution that is geared to respond to, and to satisfy the professional needs of educators in the area in which it is located (Redknap, 1977:X). In addition, Hapgood and Rogers (1975:29) say that educator centres are just what the term implies: local physical facilities and self-improvement programmes organised and run by the educators themselves for purposes of upgrading their performance in class. Mutshekwane (1992:33) refers to these centres as exciting brokers for new ideas and as networks for personnel.

In terms of this study, an educator centre has to respond to the needs of TE educators. TE as a curriculum initiative is a fairly radical departure from what has been traditionally taught in South African schools. This departure from tradition has two principal characteristics:

- TE, like other learning areas of Curriculum 2005, needs an outcomes-based approach to teaching and learning.
- TE represents a radical departure for most educators in the methods of teaching. The methods of TE emphasise process and context as well as content. The methods for group work as well as individual work is open-ended and centred on problem-solving.

In view of the above, there is a need for educator centres or any other kind of INSET to ensure that educators are able to teach TE with the aid of an outcomes-based approach and other methods which emphasise process and content as well as context. Methods that emphasise problem-solving should form an integral part of educator training.

After providing a short discussion of educator centres, the following section will discuss the essential requirements of an educator centre, such as the co-ordinator of

the centre, learning- area advisers (LAA), educators and schools, diagnosis of educators' needs, support offered by centres and governance of centres.

3.2.4.2 Essential requirements of an educator centre

a. A centre co-ordinator

It would seem that the success of a centre is largely determined by co-ordinators involved in almost every aspect of the centre. For this reason, the leader should make sure that the emphasis of the centre is on supporting the professional development of educators through the diagnosis of educators' needs and provision of INSET courses and curriculum groups (Weinding & Reid, 1983:163). It is important that these centre leaders be appointed on a full-time basis because those working on a part-time basis usually have other commitments which prevent them from offering the range of support which educators require. To be able to offer genuine support, the co-ordinator should preferably be knowledgeable in all the learning areas, especially TE. The leader should have an interest in TE or else, it will be ignored by educators already comfortable with the traditional learning areas.

A leader must be a member of staff who knows the institution, as one of his/her responsibilities is to encourage and co-ordinate INSET procedures within the institution. Some of the leaders may be unaware of strategies for need identification. Until some training has been given, institutions will have difficulties in responding to the requirements placed upon them (Burgess, Connor, Galloway, Morrison & Newton, 1993:52).

b. Learning-area advisers for Technology Education

HEDCOM (1999:167) suggests that if the implementation of a TE programme is to be taken seriously, there should be an individual who will be given the responsibility to bring about the desired implementation in a particular area. The relevant people who are always in touch with educators are learning-area advisers, currently known as subject advisers. The responsibilities of this learning-area adviser will include all

aspects of the implementation of TE such as the selection of schools, provision of resources, an on-going INSET programme and classroom support services (HEDCOM, 1999:167). Provincial task teams in all provinces implementing Curriculum 2005 have conducted initiatives to train advisers and other staff in TE (HEDCOM, 1999:3). The state has to set up training programmes for learning-area advisers. This will take the form of an information session where the learning-area is provided with an overview of the scheme and how the authorities' process of consultation was organised. The information session should be followed by a workshop session on matters such as conducting interviews with colleagues about staff development needs, strategies for establishing priorities, INSET record-keeping and evaluation of INSET (Burgess, et al, 1993:52).

During training, learning-area advisers should have an agreement with the co-ordinators concerning their role in the activities of the centres. If there is no agreement between the two parties, there is a possibility of overlapping of roles. A good working relationship has to be established because if we do not take note of this, tension could result between co-ordinators needing a degree of autonomy from the advisory service. According to Weinding and Reid (1983:163) the critical factors here include the line of reporting and control over finances. Whether co-ordinators report to a chief adviser, INSET adviser, education officers or chief education officers, what remains is that the centre co-ordinator still has to be responsible to someone (Weinding & Reid, 1983:164).

c. Diagnosis of educators' needs

One function of the educators' centre is to determine local educators' needs. Many surveys that have already been conducted have demonstrated that the diagnosis of needs is complex and problematic. To abate these problems, the centres have to use school representatives as their main formal link. These representatives can also assist as disseminators of the centre's information within the school. It will be the responsibility of the school to select someone who is experienced in educator centres (Weinding & Reid, 1983:167). It is going to be difficult to find experienced educators for TE since most of them have not been fully trained for it. Interested, flexible, tolerant, informed and hard working educators can be selected to meet the demands of

TE. Through INSET these school representatives can be trained before other educators are involved.

d. Support offered by centres

Centres should fulfil their role of supporting the professional development of educators. They should also provide an environment in which educators will be able to make a critical analysis of their teaching. For TE, centres should provide short INSET courses and encourage and support curriculum groups such as curriculum discussion groups and curriculum material production groups. Centres can also offer professional support, which includes equipment, photocopying, printing, books and other equipment relevant to TE (Weinding & Reich, 1983:168-9). Unlike other learning areas, TE will need continuous support from the advisers

e. Governance of centres

Each centre should have a centre committee consisting of a centre leader; LAA and a local school representation. The members of a centre committee should discuss how the centre should operate. The committee members should offer advice and support to each other. To be accepted by the schools, a centre's functions should be clearly and adequately defined. A centre's success will partly depend on the feedback it will be providing on its activities and the new means by which educators could control their own INSET at school level (Weinding & Reid, 1983:169-170).

The last statement above indicates that educator centres should mobilise their efforts in the form of course-based, school-focused, school-based INSET and other forms of INSETs discussed in chapter 4 section 4.6.

Before discussing the above forms of INSET, it is important to note that those responsible for selecting the LAA for these centres must surely have an idea of the basic purpose of the centre learning areas. Then the committee should consider how the centre should go about its daily functions of helping educators. Jose (1979:45) states that the manner in which the centre will run its business is rarely separable from the net result. Educator centres should therefore enlist the services of professionals

who are energetic, resourceful, self-reliant, resilient, collegial, sharing and modest (Jose, 1979:45). In addition, Jose (1979:45) indicates that the literature of INSET programmes confirms that more comprehensive educator participation results in more effective INSET. An educator centre can be a viable vehicle for organising this participation right within the schools.

3.3 OTHER POSSIBLE CONTRIBUTERS TOWARDS INSET FOR TECHNOLOGY EDUCATION

In addition to what have been discussed above, the next possible providers of INSET warrant attention.

3.3.1 Private sector

To ensure that TE is relevant and realistic, education for educators will have to draw examples from local, traditional and modern industry. Local industry is an excellent resource since it provides real contexts and genuine problems to be solved. Co-ordination between industry and educators will also help the former to understand how TE is taught in schools and thus develop confidence in their local teaching institutions. This will also encourage industries to provide funds for training educators for TE (Matlin, 1995:58).

In addition, the main aim of INSET is to broaden the experience of educators beyond the limits of syllabus work. Since the workplace is where technology is developed, used and manufactured, part of INSET for TE should include first-hand experience of the workplace. To meet this need, people involved with INSET have to make links with local industries in order to seek help from those engaged with new technology in industrial activities. At times, it is expected that experts from industries may provide lectures and seminars during which TE will be linked with what is done at the industry (Bevis, 1982:12-13).

In chapter 2 section 2.5.2.2, it is indicated that the fourth grade at Ottobine primary school incorporates and integrates a study unit based on a local poultry-processing

plan (Burchfield et al., 1996:21). This type of relationship should not be limited to the learners only but should also be done at INSET level. During the INSET session, at the ORT-STEP Institute, educators were instructed to bring empty packs to discuss packaging. Educators brought packs of bananas, cereal, tea, biscuits and chocolates. These packs were discussed. The discussion included aspects such as lettering and logos of different companies appearing on the boxes. Later trainees were instructed to draw and design their own packs that can hold three tennis balls (ORT-STEP, 1999: On-site observation). In addition to this exercise, trainees can also visit industries where they will be witnessing packaging practically.

3.3.2 Professional educator organisations

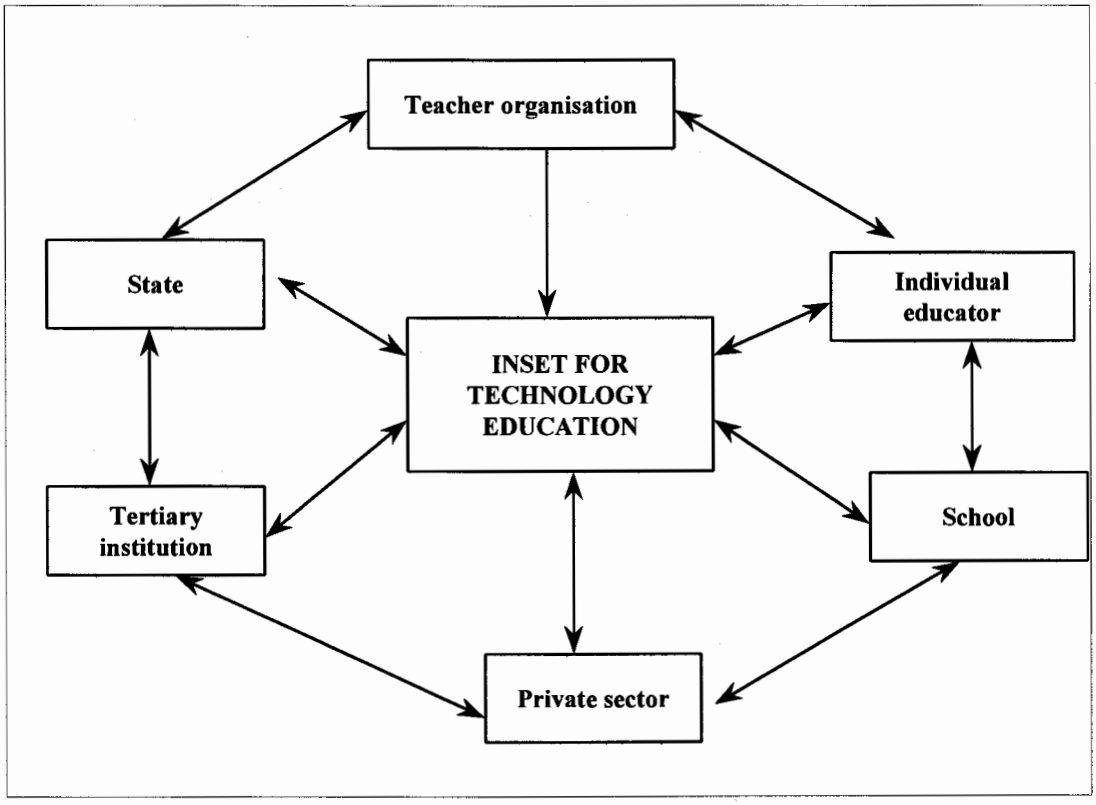
All professions have a professional association to which members belong (Mellish, 1978:172). Educators also belong to various organisations. These educator organisations have a significant role to play in training educators to TE by means of INSET. These organisations can also help in generating funds for the programme, most probably from the private sector.

In addition to the generation of funds, Mellish (1978:173-174) advances the following responsibilities of educator organisations:

- To strive for the growth of educational facilities
- To encourage the application of modernised methods
- To provide teaching literature based on South African conditions
- To explore needs and resources
- To provide guidance for wider educational development of the teaching profession.

On the other hand, Hopkins (1986:61) maintains that educator organisations should play an important role in educator training. They should play a part in the promotion of educator understanding of the nature of school, teaching and how learners continue to develop and learn. Educator organisations should be involved in research done in conjunction with universities and other research centres.

Figure3: Levels of co-ordination in INSET for TE



3.4 CONCLUSION

As depicted in figure 8, there is a close relationship between the role-players discussed in this section. For INSET to succeed there should be co-operation between government, tertiary institutions, private sector, educator organisations, the school and the educator. Figure 3 show the level of co-ordination for INSET for TE. Consultation should be the order of the day between all stakeholders shown in figure 3. A unilateral decision by one of these will lead to fruitless exercise. A unilateral decision will make INSET foreign to other stakeholders. Top-down controlling style will not lead to desired results of the entire group of stakeholders. INSET for TE should be plan from school level since every training aims at solving the needs of the school.

The next chapter attempts to discuss various forms of INSETS that can be used to train educators for TE.

CHAPTER FOUR
CATEGORIES OF INSET FOR TECHNOLOGY EDUCATION

4.1 INTRODUCTION

Bengu (1996:51) reveals in his annual report on the progress of the educational transformation in South Africa that the quality of the present INSET is poor. The resent INSET model used to train educators for TE also seems to be insufficient. Therefore, this chapter will provide *various types of INSET* that can be used in a complementary manner to train educators in TE. In addition, the chapter will attempt to discuss aspects such as *critical outcomes* for Curriculum 2005, *specific outcomes* for TE and *essential characteristics* of a TE curriculum. This chapter forms part of the *INSET model* discussed in chapter 5.

Before discussing the various categories of INSET, one would like to indicate the position of the resent INSET used by Technology 2005 in training educators for TE, its aims and requirements for effective INSET for TE.

4.2 TECHNOLOGY 2005 AND THE TRAINING OF EDUCATORS FOR TECHNOLOGY EDUCATION

Technology 2005 Project is a research and development project started by Heads of Education Departments Committee (HEDCOM). One of its functions is to facilitate the development of teacher education programmes in colleges of education. In addition, the project will support lecturers in the implementation of PRESET as a long-term goal. 72 staff from 39 colleges is said to be currently involved in this training (HEDCOM, 1999:2).

In as far as INSET is concern, the Department of Education, nationally granted a tender to a Teacher Trust, a training consortium under the leadership of certain Mr Kibi to conduct training for provincial officials. Three national training sessions were held in different venues such as Aventura and Warmbaths. The training was directed to the departmental officials from various provinces and other nominees such as teacher union representatives (Vinjevold & Roberts, 1999:7). It is important to note that this training of trainers was an effort of implementing Curriculum 2005 and not specifically TE.

The INSET model decided by Provincial Task Team (PTT) was that two educators from each twenty pilot schools would be selected for training at ORT-STEP Institute (HEDCOM, 1999:6). The courses at ORT-STEP focuses on technology materials and approaches developed in Israel. ORT-STEP training extended over two years and the cost of R5 000 per educator (Niblett, 1999: Personal interview). According to PTT, those educators who did not attend the ORT-STEP Institute courses were to be trained by the ORT-STEP trained educators in their schools using a cascade model.

The Department of Education also adopted a cascade peer-training model for provincial officials. One reason for the use of this model is that it does not remove educators from classroom and thus avoid disruptions of the classes. A cascade or peer-training was said to have the potential for providing educators with in-school back-up and support. In addition, it was said to be more feasible in terms of time and capacity for Provincial Task Team (PTT) to training a subgroup in TE rather than training every potential educator in the pilot schools (HEDCOM, 1999:6). According to cascade model, officials from the provinces were selected and trained. The trained officials will in turn be responsible for training educators in pilot schools or other officials who will provide provincial training (Vinjevold & Roberts, 1999:7). In this study, a cascade or peer-training is referred to as a school-based INSET (see figure 8).

Unfortunately, most educators reported that the cascade peer-training model did not work effectively in their schools. Educators who were supposed to provide peer training complained that they were overloaded and time for such training was not provided on the timetable. In some cases the TE co-ordinators at schools just passed the TE materials they received during training to other educators without training

them (HEDCOM, 1999:169). This is an unfortunate situation since the implementation of TE should include intensive training of educators. The workshops that educators attended were geared towards OBE as an approach in teaching. OBE is another area TE educators felt that they still need more training (HEDCOM, 1999:169).

A recent report by a committee set up by Education minister has found that curriculum 2005 is complicated for educators. In most cases educators did not know what to teach at what grade (Pretoria News, 2000:2). The review committee proposed that a revised curriculum, named Curriculum 21, be introduced and be made specific on learning areas. According to this committee, this will not affect OBE (Pretoria News. 2000: 2). In contrast, the education minister claimed during an interview with Radio South Africa that it was not Curriculum 2005 that is failing but OBE. The minister indicated that his department will have to re-look OBE (Radio South Africa, 2000). Lack of sufficient training and quality textbooks remain problems for educators (Pretoria News, 2000: 2).

An INSET model suggested in chapter 5 aims at intensifying and extending the training chain up to the school level. The school-based INSET will ensure that training in TE is extended to the schools. Through the invitation of an outsider by a school-focused INSET can be of outmost importance. The invitation of an outsider becomes important as soon as the school-based INSET fails to bear fruits. What we need to keep in mind is that a well planned, long-term in-service programme is the key to the successful implementation of an innovation such as TE.

4.3 CATEGORIES OF INSET AS PART OF STAFF DEVELOPMENT

In chapter 1, section 1.6.3 staff development is discussed as a way of relating learners and curriculum needs to staff competencies (Saludades, 1983:6). It is a means for the development of individual academic and professional competencies. According to Pink and Hyde (1992:7) staff development involves much more than INSET. Mellish (1978:155) indicate that INSET forms part of the staff development. Bagwandeen and

Louw (1993:25) illustrate the relationship between staff development and INSET, diagrammatically as depicted in figure 4.

Figure 4 shows that staff development is broader than INSET. Staff development as indicated in the diagram includes staffing and training. The training part of the staff development is done through INSET. INSET can improve education by enabling educators to do their work competently, especially in TE.

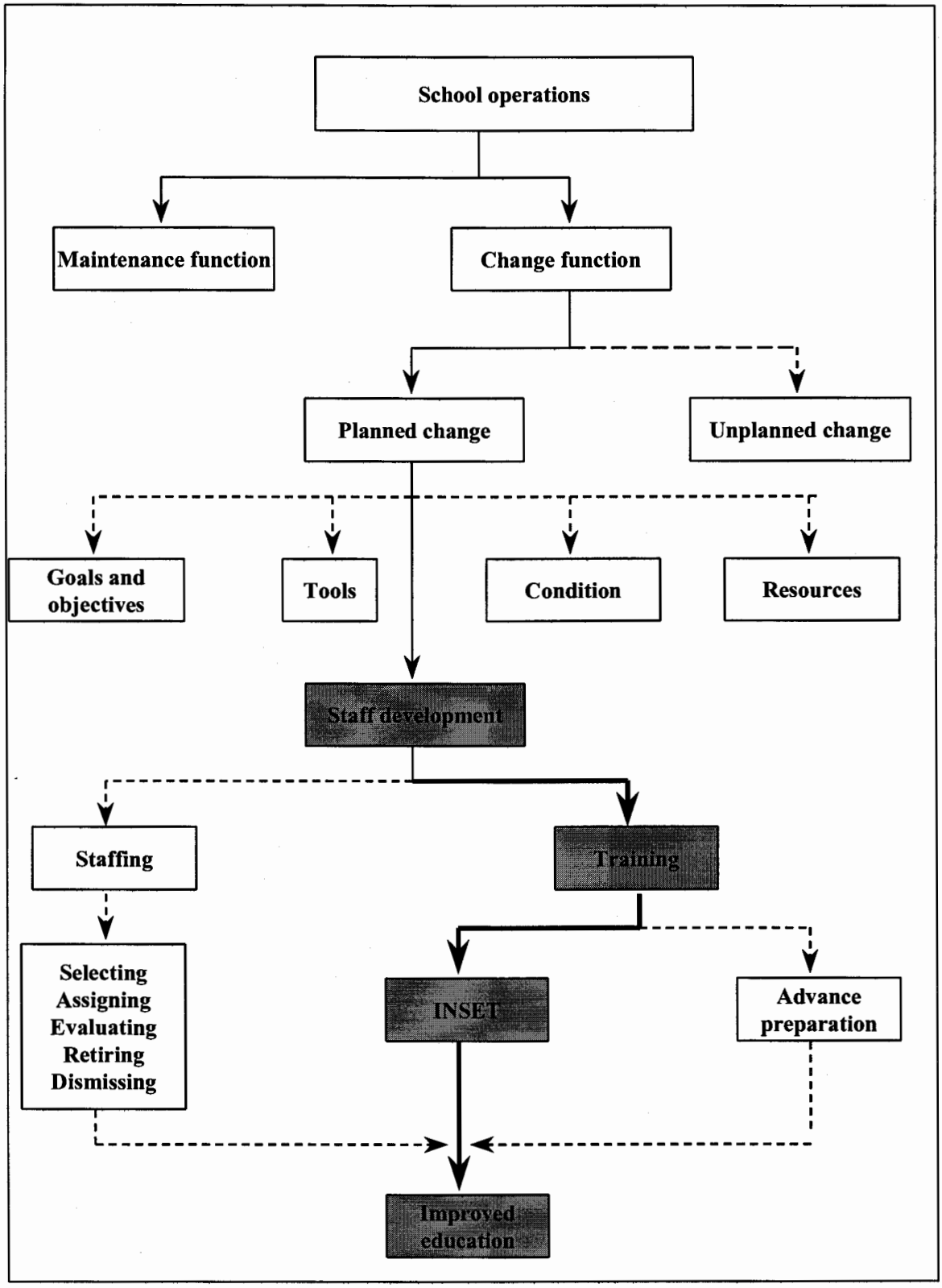
The next section will discuss the aims of INSET for TE.

4.4 THE AIMS OF CATEGORIES OF INSET FOR TECHNOLOGY EDUCATION

The fundamental aim of INSET is to educate and train educators to teach effectively in order to facilitate learning (HEDCOM, 1996:6). Effective teaching will require knowledge of the learning process and the acquisition of relevant knowledge, skills, values and attitudes (see chapter 4, section 4.8). The following aims for INSET were formulated
with this in view:

- To educate and train educators to teach TE effectively
- To enable educators to facilitate learning
- To assist educators to reveal their inherent ability to apply, extend and synthesise various forms of knowledge (see chapter 4, section 4.8)
- To enable educators to develop technological skills (see chapter 4, section 4.8)
- To enable TE educators to develop the values and attitudes which advance the development of learners' inherent potential: occupational competencies; economic independence and social harmony; civic responsibility; and awareness of environment (see chapter 4, section 4.8)
- To enable TE educators to use a variety of methods (see chapter 4, section 4.8)

Figure 4: INSET as part of staff development



(Bagwandeen & Louw, 1993:25)

- To ensure that TE educators are able to manage the classroom effectively
- To ensure that TE educators are able to assess learners' work properly by using the principles of assessment and different kinds of assessment (see chapter 5, section 5.3)

In addition to the aims and objectives indicated above, the following section will concentrate on matters relevant to the effective implementation of INSET for TE.

4.5 REQUIREMENTS FOR EFFECTIVE CATEGORIES OF INSET FOR TECHNOLOGY EDUCATION

To make INSET relevant to TE the following aspects must be included (Potgieter, 1999:7):

- The technological process
- Technological content Materials and tools
- Managing the technological environment and safety
- Teaching and learning methods for TE
- Teaching practice for TE educators

Dyrli (1996:7) recommends the following key elements for successful INSET for TE:

- It should offer a variety of options to TE educators
- It should emphasise development of skills needed for TE
- It should provide hands-on experience needed for TE
- Its programmes should be relevant to the local realities
- It should provide supporting materials to educators

Meltzer and Sherman (1997:23-32), on the other hand, provide what they call "ten commandments" for successful TE implementation and staff development. These commandments include the following ideas:

- INSET should have a clear vision
- INSET should also provide a plan for administrative support
- INSET should involve educators
- INSET should provide time for the course
- INSET should model teaching behaviours
- INSET should focus on real classroom situations
- INSET should promote learning transfer
- INSET should provide a technology co-ordinator
- INSET should provide equipment to educators
- INSET should allow educators to play an active part during the training session

These aspects provided by Meltzer and Sherman (1997: 23-32) are very much relevant to TE. Each INSET providers discussed in chapter 3 must take note of these aspects. All INSET programmes demand that there should be a vision, plan, educator involvement, relevancy, co-ordinator and equipments, to name a few.

Boser and Daugherty (1994:14) made the following recommendations for INSET practice:

- INSET providers should implement a more effective means of evaluation and follow-up.
- Providers of INSET programmes may consider varying the location and timing of programmes and offering workshops at nominal cost to attract greater numbers of educators and other interested groups in TE.
- Given continual pressure on institutional budgets, colleges and universities need to find ways of funding INSET for TE on a consistent basis, independent of institutional funding

Jones, O'Sullivan and Reid (1989:198-9) draw the following conclusions as necessary or desirable features for the management of INSET at all levels:

- Organisers need to develop specific policy frameworks for INSET.

- INSET must be seen as a continuous process including stages of needs identification, prioritising, negotiation, training delivery, monitoring and evaluation or feedback.
- The process should be actively managed at schools, colleges, universities and other educational institutions.
- INSET delivery should be related to the practical needs of educators, schools and local communities.
- INSET co-ordinators should be accountable via their monitoring and evaluation of the management and delivery of the process.

In addition, Bacon (1980:2) maintains that management issues affecting INSET should also include the following:

- Governing bodies and senior administrators must have a positive view of INSET for TE.
- Clear policy guidelines must be established.
- Staffing policies must regard professional development as important, to the extent that beginning educators should not have full teaching loads.
- There must be better co-ordination of the efforts of all the agencies to avoid duplication and to take advantage of what each agency is best equipped to do.
- Educators and other participants must be consulted regarding their needs.
- Evaluation of the effectiveness of INSET must be done to encourage improvement.

From the above information, it can be concluded that management in terms of policy, consultation, finance, venue evaluation and timing and duration of sessions is the most important requirement for the effective implementation of INSET. For effective INSET to take place a policy must be followed since it provides guidelines on how INSET can be used to train TE educators. The effectiveness of the policy framework depends partly on how consultation is conducted. Consultation is important during the planning and organisation stages of INSET. The success of any INSET programme

depends partly on how the balance is maintained between educators and the Department of Education.

In addition to policy and consultation, finance is another important requirement that cannot be ignored. Funds should be provided since educators dislike having to make personal payments for attending INSET which does not lead to better pay. This also applies to long distances and long tedious courses that offer very little as incentives. Educators dislike long courses unless such courses are award-bearing (Mutshekwane, 1992:20-23).

The next section will discuss various types of INSET programmes that may be used in a complementary way to help educators to teach TE (see INSET model in chapter 4).

4.6 VARIOUS CATEGORIES OF INSET PROGRAMMES FOR TECHNOLOGY EDUCATION

It is clear that there are a variety of programmes that educators can engage in for INSET. These INSET programmes may range from a one-day course to one-year or longer courses, in other words short courses and long courses. There is a wide spectrum of INSET and activities in which educators at all levels are involved. The categories of INSET courses discussed below represent a selective list from the vast variety of INSET strategies that will contribute towards the following considerations that make the suggested INSET model relevant:

- PRESET-INSET continuum
- Formulation of INSET
- Institutionalisation of INSET (DoE, 1998b:130-131)

4.6.1 School-focused INSET and related concepts

The term **school-focused**, together with other related concepts such as school-based and course-based, has become one of the key concepts in recent INSET research.

There is a great deal of interest in school-focused INSET because it is a relative concept (Bagwandeen & Louw, 1993:107).

Research has revealed that **course-based** INSET which is based on the notion of taking educators out of their schools and instructing them at educator centres (Mutshekwane, 1992:30) tends to be regarded as the solution for professional development (Bagwandeen & Louw, 1993a:107). Although this strategy for INSET has achieved some positive results, it failed to have an impact on practice in schools. One reason for its failure is that it generally takes place away from the real situation (Bacon, 1980:2). In the late 1960s and early 1970s literature shifted the focus to school-based INSET.

School-based INSET has been seen as an alternative to course-based INSET (Bagwandeen & Louw, 1993:108). School-based INSET is an activity run at a school level and it put more emphasis on courses. It can either be school-resourced or school-located. The school-resourced type is when the school makes use of its educators as tutors and equipment or materials for INSET on the premises. On the other hand school-located INSET refers to the premises. School-based INSET can also be referred to as school-directed INSET (Morant, 1991:41). It has been generally accepted that if INSET is physically within the school itself, the process of need identification would be easier, that it would be possible to match training to identified needs, and that the problems of implementation could be removed in this way. It is believed that through school-based INSET the school could address its own unique problems in a relevant and professional manner (Bagwandeen & Louw, 1993:108).

However, a purely school-based INSET has several drawbacks. According to Bagwandeen and Louw (1993:108) a school relying completely on its own resources for INSET could "degenerate into a parochial institution with a closed climate". This stems from the fact that no school is an island. It would be short-sighted for the staff of a particular school to think that they cannot learn from other schools or interested bodies concerned with education (Salisbury, 1986:87-88). Bacon (1980:2) states that emphasis should be shifted from school-based and course-based INSET to school-focused INSET.

Bagwandeen and Louw (1993:108), in total agreement with Bacon (1980:2) maintain that the school-based INSET model gave rise to school-focused INSET which is a synthesis of the course-based and school-based models. In theory, school-focused INSET combines the advantages and minimises the disadvantages of course-based and school-based INSET (Nixon, 1989:2). Hopkins (1986:37) maintains that school-focused INSET is that activity which takes place either on or off the job, and that it can be provided by outside agencies or by the school itself. These external agencies include educator centres, colleges of education, universities, non-governmental organisations (NGOs) and learning-area advisers (Bagwandeen, 1997:11-14).

The following assumptions can be made about school-focused INSET (Bagwandeen & Louw, 1993:109):

- School-focused INSET should be initiated by educators within a school.
- School-focused INSET should be well equipped to avoid unnecessary constraints that will hamper its development.
- School-focused INSET should be part of an on-going programme of INSET activities in which the school is involved.
- School-focused INSET should utilise experts from outside the school.
- School-focused INSET should be monitored and evaluated by members of staff involved.

One reason for the importance of school-focused INSET is that it acts as a powerful incentive for educators to participate. Like other types of INSET, school-focused INSET should be preceded by identifying the needs of the school, the development and implementation of relevant INSET activities to meets the needs and evaluation of the progression and results the training programmes.

Some of the examples of such school-focused activities include staff conferences, weekly sessions, mini-courses, simulation, role-playing activities and case studies (Bagwandeen & Louw, 1993a:109).

Although school-focused INSET represents an advanced approach in reaching educators in school compared with the more traditional methods, there are pitfalls that cannot be ignored. One of the problems is the possible danger that may come as a result of educators embarking on over ambitious programmes.

It is important for the staff of a school to develop their own expertise in school-focused INSET. Without the expertise the staff will base their INSET plan on a narrow range of professional needs. Another potential weakness is that the programme of school-focused INSET might be badly planned or carried out. This could negatively affect some members of staff who may already be dubious of the general benefits of INSET (Morant, 1991:49).

4.6.2 Issue-based INSET

This type of INSET programme includes *workshops* and *seminars*. During the workshops, hands-on activities are designed to cater for special professional development in terms of knowledge and skills (Matlin, 1995:8). Bagwandeen and Louw (1993:113) maintain that a workshop can mean "almost anything from a series of field trips or a scientific expedition to intensive study of educational problems". Consequently workshops remain a valuable INSET activity for TE. TE demands INSET, which will be able to satisfy the existing needs of educators. Workshops are flexible and adaptable to the requirements of diverse groups and situations. Workshops contribute to the development of individual and group skills, and they strengthen co-operation and working relationships among educators, irrespective of their status (Bagwandeen, et al. 1993:114).

Seminars, on the other hand, are discussions of short duration held on academic and/or professional issues and problems. They normally consist of talks or presentations followed by discussion in small groups (Bagwandeen, et al, 1993:8). Seminars can be used as a feedback activity where educators will be able to share experiences after implementing the methods obtained with the first training. The problems and successes in TE can be discussed during seminars.

4.6.3 Institution-based INSET

Institution-based INSET should not be confused with school-based INSET since it refers exclusively to institutions of higher education. Institution-based INSET programmes include *in-college activities* and *meetings* as well as *conferences*. Institution-based INSET can be organised by colleges. These will enable TE educators to exchange ideas and experiences and thus improve the quality of their teaching. This INSET programme can also apply to educator trainers (Matlin, 1995:9). In-college activities and meetings are not award bearing programmes. Award-bearing programmes are to be delivered by lecturers at college level. These tutors have to be utilised to train serving educators. Before taking this responsibility they have to be serviced. Conferences may be local or international. Conferences usually involve presentations by TE educators, and can be divided into two main categories:

- Short conferences: This may take a half-day, day, weekend or midweek. During this type of conference a need for residential facilities is reduced to a minimum.
- Long conferences: This type of conference can take a week or more.

The techniques used in both types of conferences are similar. In both cases, the speakers are invited to lead discussions or present keynote addresses on some interesting or controversial theme. A number of TE conferences have been held in Pretoria, Johannesburg and Cape Town. Those attending the conference question the main speakers and also make additional contributions (Bagwandeen et al, 1993:13).

Conferences may not be used to train educators but may serve as a platform where educators of TE may present their problems or give feedback on what they are implementing.

4.6.4 Visits

Although this seems to be an INSET programme on its own, it should be supplemented by other types of INSETS. During a discussion or conference, for example, educators can visit industries and other technology-based establishments such as science museums to acquaint themselves with the applications of science and technology principles in daily life. Visits may be for a day or may involve extended periods of attachment to an establishment (Matlin, 1995:9). TE is one learning area that emphasises close co-operation between classroom activities and the real workplace. An INSET programme should also have a close link with real situations. Visits during training sessions should lead to visits during learners' classroom activities by learners.

These categories of INSET have to be used in a complementary way to bring success to the present INSET. Figure 8 indicates various types of INSET that should be used by distance education and that should be applied by Teacher Centres. These categories of INSET are not new and some of them have already failed or succeeded to bring positive results to education. The aspects that will be discussed below are an attempt to reduce the possibility of failure.

4.6.5 Factors that can lead to positive changes to various forms of INSET programmes for Technology Education

As indicated in the introduction to the first chapter, South Africa is experiencing a transformation of its education system. This includes the introduction of Curriculum 2005. In addition this change also involves the inclusion of TE in the new curriculum. There should be some strategies that will assist development of this curriculum. As in the case of change strategies, there are a variety of factors that cause change. Bagwandeen and Louw (1993:76) provide four aspects of the knowledge diffusion and utilisation process through which knowledge can be disseminated throughout society.

4.6.5.1 Research, development and diffusion

According to Bagwandeen, et al (1993:76) these aspects describe "change processes from an earlier point in the evolutionary process of an innovation". These aspects are relevant to TE as it is also concerned with innovation. Research in any INSET will ensure that TE educators secure knowledge in their field of study. Development comprises invention and design in which the former generates solutions for the problems at hand. Concepts such as invention, design, solutions and problems are commonly used in TE. Diffusion in this aspect constitutes the spreading and demonstration of knowledge. The relevance of this aspect stems from the fact that TE knowledge must be disseminated and demonstrated to all educators irrespective of the field to which they belong.

4.6.5.2 Social interaction

This aspect describes a process, which is probably historically the earliest approach to knowledge diffusion. It involves the dissemination of knowledge by individuals along informal networks of professional colleagues and friends (Bagwandeen, et al, 1993:77). As a new learning area, TE needs all means of dissemination to South African educators.

4.6.5.3 Problem-solving

TE is a learning area that emphasises the problem-solving process. One of its rationales is that it seeks to develop in pupils an ability to solve technological problems by investigating and designing (Potgieter, 1998:7). When the problem-solving approach is used, the user will be able to conduct a meaningful investigation and retrieval of ideas and information to be used in formulating or selecting innovation (Bagwandeen, et al, 1993:78).

4.6.5.4 Linkage

This aspect can be used to unify and integrate the three preceding aspects (Bagwandeen, et al,1993:79). The first two are concerned with the dissemination of knowledge that may be gathered by means of research. The knowledge secured and spread can be used to solve a problem in real life. This confirms that all three aspects above can be used successfully in training educators for TE.

4.6.5.5 Conclusion

Technology 2005 has tried to train educators for TE but the evaluation made indicate that the training was still insufficient. This means that retraining is necessary. The problem may be that only one type of INSET, for example course-based INSET, was used. A course-based INSET must be followed by school-based INSET. If the later fail to bear fruits then the school must consider school-focused INSET where the outsider will be invited to come and assist. The school-based INSET should be a continuing process within the school run by teachers of that particular school depending on the TE knowledge they have. This indicates that no single type of INSET will be sufficient to train educators. All these types of INSET must complement each other.

As already said, the course-based INSET will be the starting point of training and this can be followed by either school-based or school-focused INSET. It is evaluation of the work of educators after training that will determine type of INSET needed as a form of retraining.

The next section deals with the critical and specific outcomes of Curriculum 2005 and TE.

4.7 CRITICAL OUTCOMES FOR CURRICULUM 2005 AND SPECIFIC OUTCOMES FOR THE TECHNOLOGY LEARNING AREA (TLA) THAT MAY BE CONSIDERED DURING THE USE OF VARIOUS CATEGORIES OF INSETS

Critical outcomes refer to what we want our learners to be able to do or to be like in life (DoE, 1999:4). Specific outcomes describes what learners are able to do at the end of a learning experience (DoE, 1997F:19).

4.7.1 Critical outcomes for Curriculum 2005

For Curriculum 2005, the DoE (1997a:10) provides critical outcomes, which are of a cross-curricular nature and are applicable to all learning areas in all phases. The object of these critical outcomes is to ensure that learners of Curriculum 2005 gain the skills, knowledge and values that will enable them to serve their own well-being as well as that of their community and the entire nation. SAQA proposed the following critical outcomes for Curriculum 2005 (DoE, 1997a:10):

- Learners will be able to use critical and creative thinking to solve problems.
- Learners will learn to work with others.
- Learners will learn to organise and manage their activities in a responsible and effective way.
- Learners will know how to collect, analyse, organise and critically evaluate data.
- Learners will be able to communicate their ideas through the use of pictures, symbols and language.
- Learners will be able to use science and technology to critically assess their impact on the environment and health of human beings.
- Learners will realise that problems cannot be solved without reference to the context in which they occur.

As indicated above, these listed critical outcomes are applicable to all learning areas, including TE, and they are listed here because they are close to the specific outcomes for the Technology Learning Area as well as other learning areas in Curriculum 2005 (DoE, 1997a:23-238).

Besides these critical outcomes HEDCOM (1998:6) provides the following outcomes for student teachers:

The ability to:

- develop a relevant scheme of work
- realise the importance of progression and differentiation in the development of a relevant scheme of work
- demonstrate an understanding of the issues to be considered when teaching TE as a cross-curricular activity
- develop budgets for specific projects
- be flexible in the selection and application of resources
- control and manage the use of tools and equipment to ensure safety measures.

4.7.2 Specific outcomes for the Technology Learning Area

The DoE (1997a:84) provides specific outcomes for the Technology Learning Area that apply to all phases in the GET Band. These specific outcomes have the object of enabling learners to apply the technological process in solving the real problems they will experience in the future. Activities devised for the Technology Learning Area are directed at designing products to be used to solve problems. Specific outcomes are therefore intended to enable learners to evaluate their own designed products and to understand the impact of technology.

In addition to the above critical and specific outcomes, curriculum development also includes technology-related themes such as housing, textiles, communication, water, transport, food, energy, health, tourism, agriculture, manufacturing, media, sports and recreation (DoE, 1997a:89-106). Kirsten (1996:166) notes that themes such as information, structure, mechanisms, pollution prevention, environment, people and

society are included in a new curriculum. Chamberlain and Mavhunga (1995:6.2-6.3), who maintain that a TE curriculum should be divided into modules, propose the following topics: soft drinks, housing, electrification, recycling and solar energy.

4.7.3 Conclusion

The aim of this chapter is to determine how a Technology Education curriculum has been developed in South Africa. As discussed in section 3.2, the Technology 2005 Project was charged with the responsibility of developing a curriculum within three years. This project works at a national level in collaboration with provincial task teams and the South African Qualification Authority (SAQA), which provided standard, critical and specific outcomes as part of the new curriculum. Critical outcomes were specified for Curriculum 2005 while specific outcomes were also devised for eight learning areas, each with its own specific outcomes. According to the critical outcomes, all learners must be able to solve problems, work in groups, manage their activities, evaluate collected data, communicate and assess the impact of technology to the environment and health of human beings.

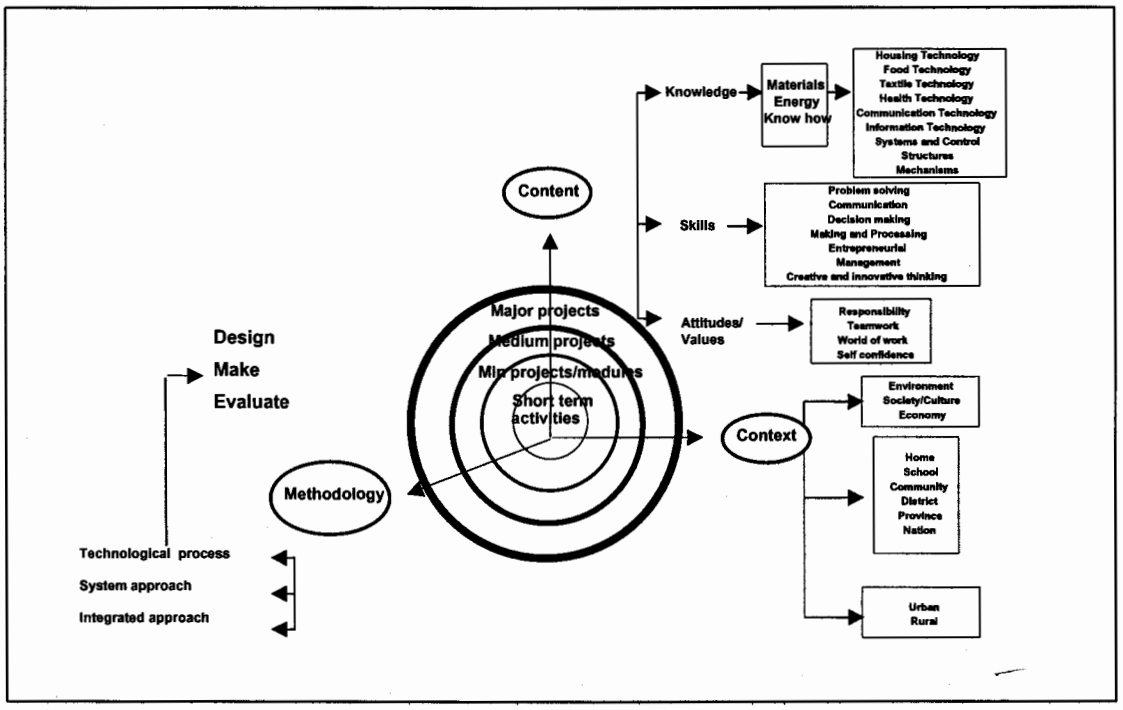
The next section deals with the essential characteristics of a TE curriculum.

4.8 ESSENTIAL CHARACTERISTICS OF A TECHNOLOGY EDUCATION CURRICULUM THAT NEED TO BE COMMUNICATED TO EDUCATORS DURING TRAINING

Various writers, conferences or workshops have identified the essential characteristics of a TE curriculum that have to be considered during the training of educators (Eisenberg, 1996:36 and Glover, 1996:12). To indicate the importance of these characteristics, Eisenberg (1996:36) classifies these characteristics into three categories, namely content, methodology and the context. It can be argued that any sensible curriculum is characterised by envisaged aims and objectives, called critical and specific outcomes in this case. For TE these critical and specific outcomes should be achieved through the specific content, methodology and context. HEDCOM (1999:169) states that INSET programmes "should contain a mix of subject

knowledge, subject pedagogical knowledge, OBE methodological practice and co-operative learning facilitation". This indicate that what is discussed in this section is important and should be part of what is delivered during training. The discussion of this section (4.8) depends on figure 5, which depicts the essential characteristics of a TE curriculum. This diagram is presented here because it shows the relationship between all the essential features of TE, but reference will also be made to it in other sections of this study.

Figure 5: Essential features of a Technology Education curriculum



(Eisenberg, 1996:35)

4.8.1 Content

According to Eisenberg (1996:36), "the content ingredient basically deals with the syllabus in the curriculum". The main components of the content are knowledge, skills, attitudes and values.

4.8.1.1 Knowledge

The knowledge consists of the technological concepts and principles. According to Eisenberg (1996:37) the inputs of any technology process or system are materials, energy and know-how. The most relevant areas of application for the Reconstruction and Development Programme (RDP) in South Africa should include housing, food, textile, transport, health and communication technologies (Eisenberg, 1996:37). Hill (1996:119-20) regards the development of systems, controls, structures, processing and communication as part of technological knowledge.

4.8.1.2 Skills

Another component of the content is skills (Eisenberg, 1996:37). A TE curriculum should enable learners to acquire a variety of skills such as problem-solving, decision making, entrepreneurial, making and processing, communication, creative and innovative thinking. In addition, there are management skills, which are important to TE or the Technology Learning Area (TLA) and include time management, budget management and human resource management, to mention a few (Custer, 1996:33).

Of all the skills mentioned above, problem-solving needs the most attention as the Technology Learning Area (TLA) is concerned with solving problems that occur in people's lives.

4.8.1.3 Attitudes and values

Much emphasis in education is centred on the acquisition of knowledge and skills, while little consideration is given to attitudes and values (Eisenberg, 1996:37). This may be due to the fact that attitude "is not measurable and not examinable" (HEDCOM, 1996b:18). It is necessary to show that TE involves the thought processes, making by means of hands, and attitudes and values (Eisenberg, 1996:77). It is important that educators in South Africa put more efforts into developing learners' attitudes and values. This will assist learners to develop self-confidence,

teamwork and responsibility. There are arguments that technology is value-free (Layton, 1993:31). However, it is impossible to separate TE from values because that means isolating TE from society. Technology cannot be viewed apart from its interactions with society and its values (Wiens,1996:23).

4.8.2 Methodology

The methodology for a TE curriculum emphasises the importance of the process rather than the product (Eisenberg, 1996:37). Many methods can be used in the Technology Learning Area. For this study the following methods will be discussed:

4.8.2.1 Technological process

The stages in the technological process are described differently by different authors. Treagust and Mather (1990:54) specify identification of a problem; analysis and investigation; framing of a design brief; information gathering; generation of alternative solutions; development work on the chosen solutions; prototype; testing and evaluation; redesign, and making as their technological process. DeLuca (1992:26) identifies the following stages: troubleshooting, scientific process, design process, research development and project management. Jakab (1996:1) identifies only four steps, namely investigating, designing, producing and evaluating. McCormick, Murphy and Hennessy (1994:11) say that educators should be aware of the process that should be taught to learners. The process includes identifying needs and opportunities; generating ideas; planning and making; and evaluating. Mitchley (1995:9) cites identification; research and considerations; first ideas; development and planning; making and doing; and testing and evaluation as the design process. Potgieter (1999:4) identifies the following stages: analysing the problem; identifying needs or wants; designing and developing alternative solutions; planning for the realisation of the optimum solution; making or manufacturing a prototype of the optimum solution; and presenting information for reporting and/or marketing purposes. According to Eisenberg (1996:36) the technological process comprises three main stages: design; planning and making: and evaluating, using and marketing. Lastly, HEDCOM (1996b:7) specifies identifying need/interpreting a brief;

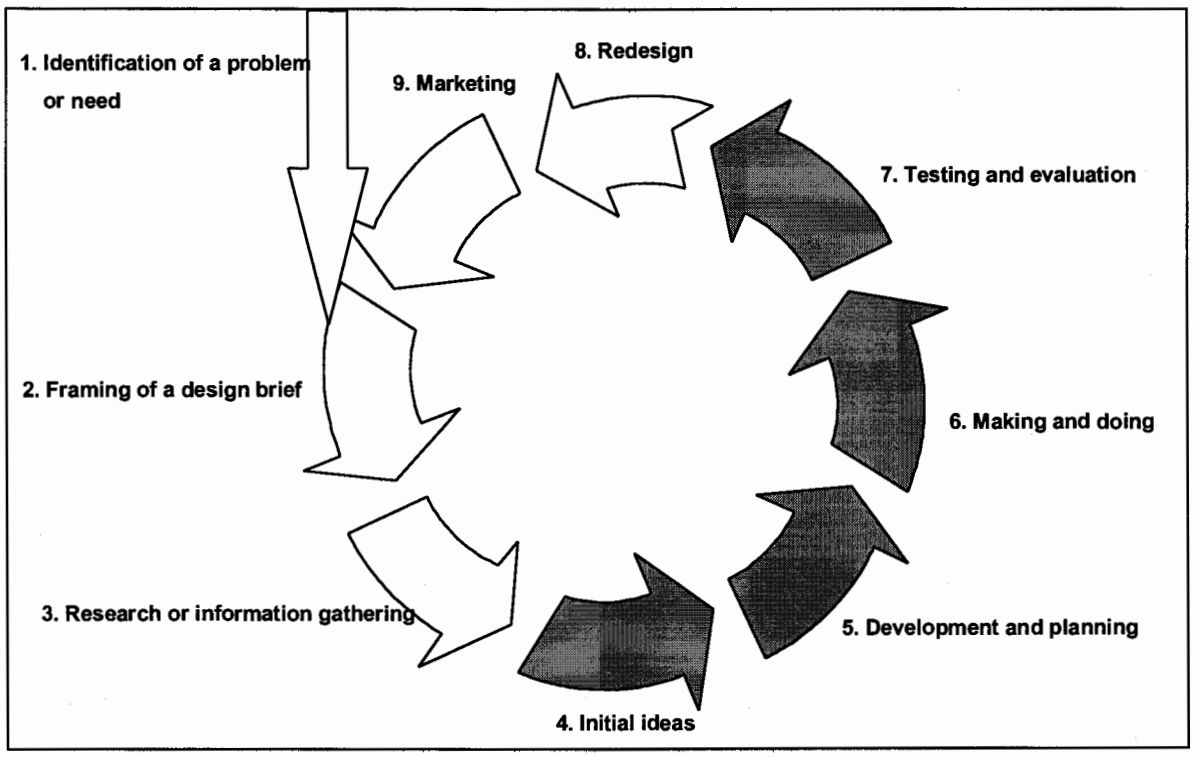
formulating ideas/solutions; research and development; modelling; designing in terms of design criteria; and making/realisation.

From the above stages, the following technological process can be formulated (see figure 5):

- *Identification of the problem or need*: A TE activity is inevitably aimed at addressing a particular problem or need.
- *Framing of a design brief*: This stage emphasises the drawing of diagrams which outline the thinking of learners.
- *Research or information gathering*: During this stage learners collect all the information and materials that will be used. The materials have to match the ideas formed in the above stage.
- *Initial ideas*: During this stage, learners must use their creative thinking to generate a number of ideas for a solution (Mitchley, 19959). This stage gives learners an opportunity to come up with alternative solutions if materials are not available for their first design brief or if the design brief is not appropriate (Treagust & Mather, 1990:54).
- *Development and planning*: From the above ideas learners choose and develop one idea by means of a drawing, specifications (such as colour of the product) and an assembling instruction.
- *Making and doing*: This entails the application of knowledge to shape and structure materials into practical objects (Mitchley, 1995:9). TE does not always require expensive material since waste materials can also provide valuable resources. In this way TE encourages recycling of waste materials (Cole, 1987:2-3).
- *Testing and evaluating*: The final artefact is tested and evaluated to ascertain the success or failure of the product. Improvements or modifications can be suggested during this phase (Treagust & Mather, 1990:54).
- *Redesign*: This phase is concerned with refining the product by implementing suggested improvements and modifications.
- *Marketing*: According to Treagust and Mather (1990:54) the product has to be presented to an educator in the best possible form for assessment. TE is also

concerned with providing entrepreneurial skills learners require to sell their products.

Figure 6: Technological process



4.8.2.2 The systems approach and the integrated approach

According to Eisenberg (1996:37) the *systems approach* is indispensable to the Technology Learning Area because it promotes learners' cognitive development. According to this approach, learners with newly acquired skill should be able to work from the system to its components, from the general to the specific, from the known to the unknown (Eisenberg, 1996:37).

The *integrated approach* is also important as it emphasises the interdisciplinary nature of the Technology Learning Area by interrelating with other learning areas in Curriculum 2005. The integrated approach should also highlight the importance of working as an individual and within a team. It should enable learners to develop a

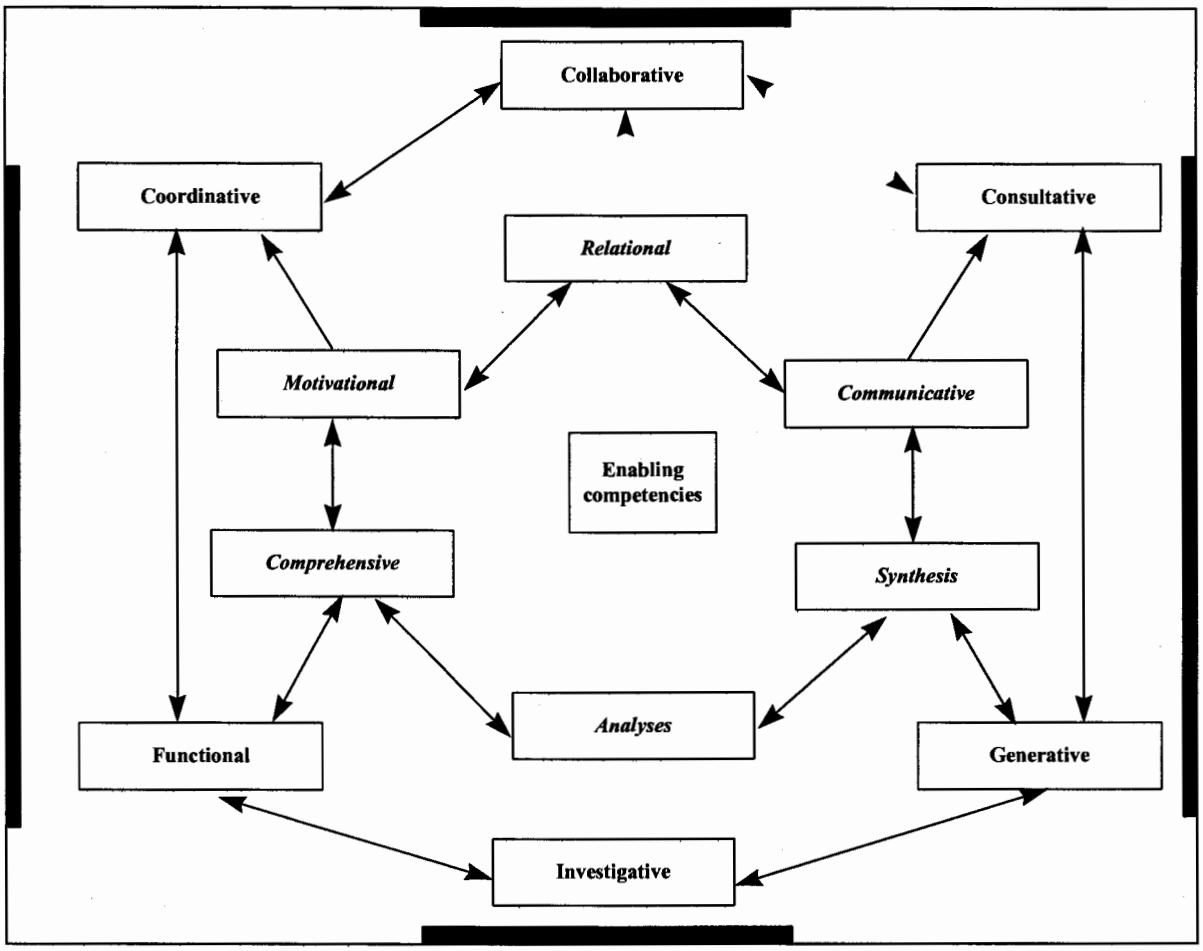
sense of personal and shared responsibility for the success or failure of the technological task (Eisenberg, 1996:37).

4.8.2.3 Outcomes-based approach

The aim of Curriculum 2005 is to shift from a "talk and chalk rote learning" system to a more flexible system which responds to learner's needs. TE as one of the building blocks of Curriculum 2005 shares the same aim of moving from a passive to an active way of learning. The aims of Curriculum 2005 and Technology Learning Area in particular, can be achieved by adopting an outcomes-based approach, which entails the use of methods and learning activities that involve learners actively and thereby exercise and develop their critical thinking, reasoning and reflection skills (see pictures 1, 2 and 3). Picture 1 shows a traditional classroom in which learners are passive, together with the new setting which encourages learners to be active. As a learner centred approach, Outcomes-based Education (OBE) should proceed by means of group work, and a variety of resources. An educator should be a facilitator (see pictures 2 and 3) whose methods facilitate the integration of knowledge and ensure that learning is relevant and based on real-life situations (Potgieter, 1999:9).

The outcomes-based approach emphasises the use of processes to determine what learners learn. To implement these processes educators have to draw on a body of research, a set of ideas and all kinds of information about future contexts. Learners have to describe problems or needs that characterise real life. According to Spady (1993:2) a set of culminating role performances can be derived from such problems or needs (see figure7). The focus is therefore on competence as well as content. An outcome is a culminating demonstration of learning which simply means that learners have to do something that demonstrates learning (Spady, 1993:4).

Figure 7: Culminating role performance and enabling competencies



(Spady, 1993:2)

What do these culminating role performances and enabling competencies mean to outcome-based teaching in South African education? Collaboration, co-ordination, function, investigation, generation and consultation are required to reach maximum efficiency in any teaching situation. The success of these activities will depend on:

- The relationship between the learner, the educator and other interested groups
- The motivation learners receive from the educator
- Learners' comprehension of the content
- Learners' ability to analyse the given knowledge
- Learner's ability to synthesis the given knowledge

- The ability of both the learners and the educator to communicate.

The culminating role performances and enabling competencies will enable learners to do something that demonstrates learning.

Spady (1993:6) identifies three major forms of OBE as traditional OBE, transitional OBE, and transformational OBE. For South Africa transformational OBE will be relevant as the country is experiencing a transformation in its educational system. In addition, transformational OBE is important because the traditional educational system puts more emphasis on the schooling structure and curriculum that makes youngsters good learners without equipping them to meet the practical demands of the future. Spady (1993:1:10) states that transformational OBE works towards predetermined outcomes and is future-oriented. It is concerned solely with students' success after they leave school.

TE and OBE or transformational OBE are in agreement in many respects. Claassen (1997:1-2) mentions the following as elements of a transformational approach to OBE:

- problem-solving
- group work (see pictures 2 and 3)
- knowledge and skills
- collection, analysis, organisation and critical evaluation of information.

These elements of transformational OBE are important for TE.

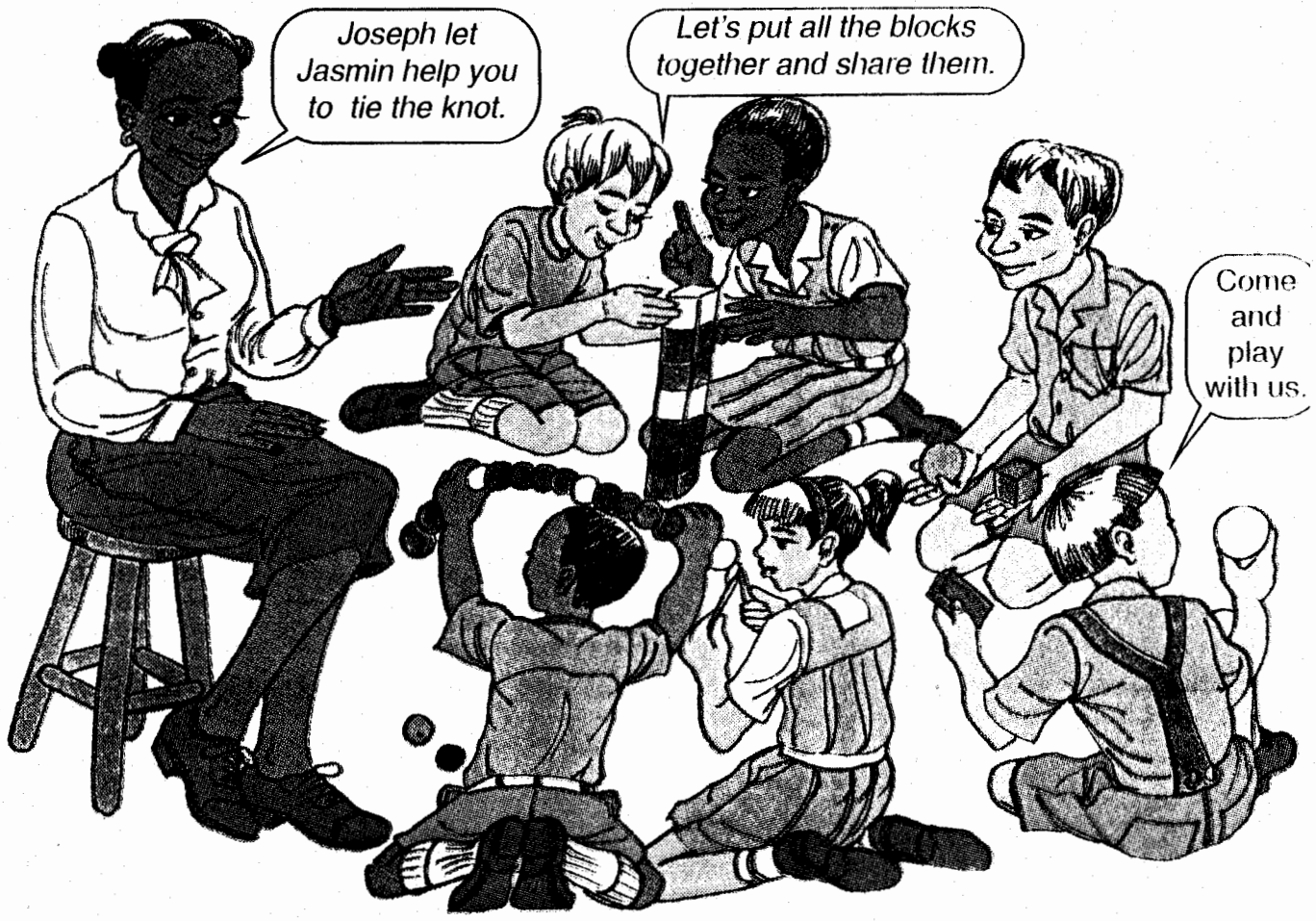
PICTURE 1: Curriculum 2005 classroom layout

THEN

NOW

SADTU (1989)

PICTURE 2: Group work and co-operative learning



SADTU (1989)

PICTURE 3: Division of a class into groups

SADTU (1989)

4.8.2.4 Problem-solving activities

Problem-solving is becoming an integral part of TE because the problem-solving activities in TE enables learners to solve today's problems and develop the adaptability they will need in the future. Problem-solving activities provide learners with opportunities to create and evaluate designs, to which end they have to seek, process and apply knowledge.

a. The nature of problem-solving

According to Blandow and Dyrenfurth (1994:357) there are two types of problem-solving:

- analytic, which includes investigation and experimentation; and
- divergent, which includes designing and constructing or making.

One should realise that within a single kind of technological activity, such as design, there will be analytic and divergent phases. Problem-solving activities in the traditional school have been largely concerned with the analytic phase alone which, though important, has to be supported by divergent problem-solving.

Means (1994:82) discusses problem-solving from a *constructivist view*. According to this model, learning is not seen as a transmission of knowledge from educator to learners, but as active problem-solving in which the learner builds on his or her prior understanding to construct new knowledge. Adherents of this view believe that the context in which the activity takes place contributes largely to the understanding of the learner. It is important to note that the chief goal of TE is to provide settings in which all children have an opportunity to engage in meaningful activities (Means, 1994:83).

Other writers approach problem-solving from the perspective of *behaviourist stimulus-response theory* whereby problem-solving is described as a trial-and-error application of common tendencies and habits. This view assumes that for every

problem situation there are responses that are selected according to the strength of the relation between the problem and the response. In a problem-solving situation, learners through a trial and error process, try various responses until an effective solution is reached (Blandow & Dyrenfurth, 1994:158).

Another perspective, which was popular between the 1920s and the 1940s, is based on the *Gestalt theory* of thinking. According to this view, problem-solving involves a search for relationships between various aspects of the problem situation. During a search, a problem-solver will realise how all parts in a problem fit together to reach a solution. This search involves reorganising various aspects of the problem until it can be solved. According to Blandow and Dyrenfurth (1994:159), "much of the Gestalt perspective on problem-solving is based upon the principle on insight. Insight is thought to occur during the problem-solving state of incubation and illumination". During the former stage, the person solving the problem does not consciously think about the problem, while the latter stage occurs when the problem-solver suddenly realises how to solve the problem (Blandow & Dyrenfurth, 1994:158).

Blandow and Dyrenfurth (1994:159) also provide another model called *cognitive aspects* of problem-solving. This model depicts human problem-solving as an information processing system. The information-processing model consists of three structures: sensory memory, short-term memory and long-term memory. These structures perform input, encoding, storage and transformations within the mind. The human information processing system can be developed by creating computer programmes that stimulate cognitive processes. This model depicts problem-solving as a search for solutions through a "problem space" which consists of a "mental representation of initial problem conditions, the final goal, the intermediate states that could occur between the initial conditions and the solution, and the operators for moving from one state to the next" (Blandow & Dyrenfurth, 1994:159).

b. Learning activities

Learning activities, including technological processes, are organised into tasks. These tasks which have to be central to any educator training for TE, are case studies, resource tasks and capability tasks. Technological processes need not be discussed in this section as they are covered in section 3.4.2.1. In Curriculum 2005, educators use

specific outcomes, phase organisers and performance indicators to plan the following tasks (DoE, 1997e:10-26):

- **Case study tasks**: These tasks are investigations which attempt to link learning that takes place at schools with technological experience in a wider community. These tasks should also examine indigenous technology and that of other times. They should also act as a means for examining the ethical, social and environmental issues related to the development of technology and its practical use. These are some of the aspects which make TE relevant to the real situation (HEDCOM, 1998:7).

- **Resource tasks**: These are short, practical tasks geared towards teaching a particular piece of technical knowledge, design strategy and making skills. Resource tasks also examine the existing technology (HEDCOM, 1998:7).

- **Capability tasks:** Unlike shorter resource tasks, these activities are longer, more open tasks requiring designing skills, making skills and evaluating skills. Capability tasks are sometimes called projects. The main aim of these activities is to bring to the surface the hidden capabilities of the learners. During these activities, learners are required to use the knowledge, skills and understanding learned through resource tasks (HEDCOM, 1998:7).

Activities such as applying the technological process, skills training, verification (where practical experimentation is done to verify principles and concepts in knowledge content), and using technology are carried out by organising them into one of the above categories of tasks. It is important that all these activities be integrated with theoretical content or what can be called the didactics of technology. Learners at schools and educators involved in INSET courses should visit local industries to observe how industrial activity is related to specific learning content. Therefore, it is important to note that each task should be well planned and selected so that it leads to enquiry in a particular content area.

c. Methods of teaching problem-solving

There is still confusion as to whether problem-solving in TE is a pedagogic device or something to be taught (Williams & Williams, 1996:63). Williams and Williams (1996:63) characterise this confusion as "problem-based learning versus learning problem-solving". Many advocate the teaching of problem-solving, not how to solve problems. It is believed that problem-solving is a useful pedagogic and motivating device, which is also able to motivate. Although this approach has important implications for learning, it is less important in TE. According to Williams and Williams (1996:63), the main concern should be with the process of problem-solving itself as the subject of teaching. However, learning to solve problems assumes that there are particular methods of solving problems that can be taught and learnt (Williams & Williams, 1996:63).

Teaching methods establish the climate for developing problem-solving skills. According to DeLuca (1992:27) a survey showed that educators use a variety of teaching methods when implementing problem-solving activities. Williams and Williams (1996:47) provide the following list of instructional approaches studied by educational researchers: anchored instruction, cognitive apprenticeship, communities of learning, discovery learning, experiential learning, peer and cross-age tutoring, paired problem-solving, reciprocal teaching, reflective learning, situated learning, thematic instruction and work-based learning. DeLuca (1992:29) cites discussion and demonstration, lecture, individual instruction, media, competency-based instruction, simulation, game structure competition, experimentation and discovery as teaching methods that can be used in TE. Eisenberg (1996:37) mentions technological process, systems approach, spiral approach, integrated approach and tactical-theoretical balance. The latter "emphasises the interdisciplinary characteristic of TE as it relates to many other disciplines. The system approach on the other hand, emphasises that people should "work from the system to its components, from the general to the specific, and from the known to the unknown" (Eisenberg, 1996:37).

It is not necessary for this study to single out some methods as the best since the use of several teaching methods is common when implementing problem-solving activities. Most of the teaching methods listed above and in section 3.4.2 can give

educators direction for adopting problem-solving activities (DeLuca, 1992:29). The choice of methods to be used will depend on the type and nature of the problem to be solved and the type of knowledge to be used. It is important that each of the above methods include the problem-solving process as an integral part.

4.8.3 Context

Context demands that any TE programme should be relevant to the learner's life. Environmental issues, social and cultural considerations and economic constraints should be taken into account in all TE projects (Eisenberg, 1996:37). The progression from short-term activities to major projects (see figure 4) should be in keeping with the familiar social circle of the learner such as the home, school, community, as well as the national and global context (Eisenberg, 1996:37). One should not forget that the majority of South Africans still live in rural areas. It is therefore important for prospective TE projects to be relevant to such rural circumstances (Eisenberg, 1996:37).

4.9 CONCLUSION

In conclusion, this section aims at indicating the relevance of the essential characteristics of a TE curriculum as discussed above and the close link between OBE, classroom practice, co-operative and constructive learning.

The curriculum of Technology Learning Area in South Africa is in line with the essential characteristics of a curriculum discussed in section 3.4. These essential characteristics are linked to all 7 Specific Outcomes (SO) (see section 3.3) and the rationale for TE in Curriculum 2005 (DoE, 1997d:6). The content dimension includes technological knowledge, skills, attitude and values. The content is covered by SO2, SO3 and SO6. The attitudes and values are covered by SO5 and SO7. The specific outcomes also support the rationale for including TE in Curriculum 2005. The rationale and the specific outcomes emphasise that the object of the Technology Learning Area is to develop a fundamental understanding of and ability to apply technological knowledge, skills and values, as well as working as individuals and as

group members in a range of technological contexts (see figure 4). The knowledge and skills learners acquire from TE will assist them to demonstrate an understanding of the impact of technology in their lives (SO6) and of how technology could reflect different biases (SO7).

Methodology is covered by SO1 maintaining that learners have to be able to understand and apply the technological process to solve problems and satisfy human needs and wants. The understanding of this technological process is important as it assists learners and educators to conduct research successfully. In addition, every activity in the TLA is directed at solving a particular problem in real life to satisfy needs and wants. SO1 still emphasises problem-solving approach in all technology activities.

Context is also important in the TE curriculum. One rationale for including the TLA in Curriculum 2005 is that it seeks to develop a critical understanding of the interrelationship between technology, society, the economy and the environment, all of which fall under context (see figure5). In addition, educators are provided with learning programmes, phase organisers, learning programme organisers, specific outcomes and assessment criteria to plan their own unique learning activities. These enable educators to organise learning activities, which are relevant to that particular environment and society with its economic and social problems.

As indicated in the above pictures, especially 2 and 3, OBE as an approach in Curriculum 2005 emphasises co-operative and constructive learning. Learners remain active and creative during their classroom activities. Learners are encouraged to solve problems together as a groups and should come up with concrete objects which may assist in solving problems they will be discussing.

The next chapter provides an INSET model that can be used to train educators for TE.

CHAPTER FIVE
INSET MODEL FOR TECHNOLOGY EDUCATION

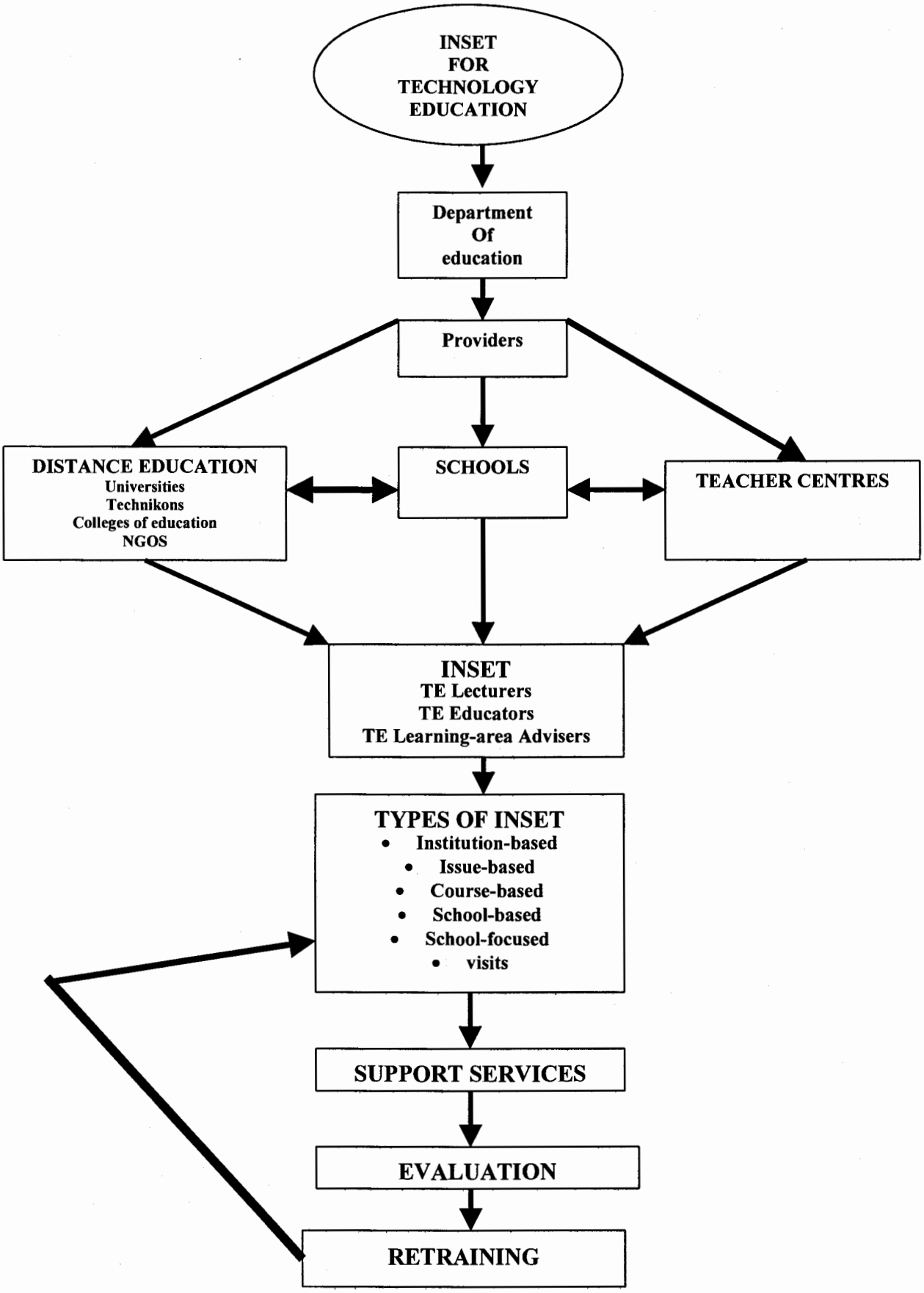
5.1 INTRODUCTION

The new norms and standards for educators assume rapid changes in knowledge, particularly in key areas such as science and technology, which makes the ongoing education of educators a priority. The implication of these changes in knowledge is that the percentage of educators involved in INSET will increase in relation to the number in PRESET. As a result courses will need to be delivered in a manner that allows educators to study while working (DoE, 1998b:115). Unfortunately, DoE (1996:51) reveals in its annual report on the progress of the educational transformation in South Africa that the quality of the present INSET is poor.

In addition, training for educators has suffered a setback due to the division between INSET and PRESET. INSET has been regarded as a form of *practical training* while PRESET is characterised as *theoretical education*. The practical training of INSET aims at upgrading skills and qualifications of unqualified or under-qualified educators. The theoretical education of PRESET leads to a nationally recognised qualification. This division led to different and competing educational constituencies such as non-governmental organisations (NGOs) – major providers of INSET - and formal providers of PRESET. An integration of theory and practice is a necessity to make sure that INSET is an ongoing professional development. This chapter develops a model that will integrate INSET and PRESET (DoE, 1998:128-131). An INSET model is necessary to make sure that there is a PRESET-INSET continuum, and that INSET is formalised and institutionalised.

5.2 THE DRAMATICAL REPRESENTATION OF AN INSET MODEL FOR TECHNOLOGY EDUCATION

Figure 8: An INSET model for Technology Education



The discussion of this INSET model has been spread into four chapters. The second chapter deals with *Technology Education* which is top at the INSET model. Below TE, the model indicates the *providers of INSET* (Distance education, schools and teacher centres) which are discussed in chapter 3. *Categories of INSETS* are discussed in chapter 4, while chapter 5 deal with the last part of the INSET model which include *evaluation, support services* and *retraining*.

The following section deals with the evaluation of all INSET activities.

5.3 Evaluation as part of the INSET model for Technology Education

5.3.1 Introduction

There is always evaluation of one kind or another taking place during INSET. This is because of the need to assess the facilities; what the INSET is doing or what it is not doing or what it should be doing (Hering, 1979:81) It is also important for INSET providers to ensure that the programmes and courses they offer meet acceptable standards. This is possible if INSET programmes and courses are assessed in terms of accepted criteria. The two most important criteria in the context of INSET are academic standards and professional relevance (Morant, 1981:20). INSET providers need to plan a more thorough and focused evaluation, especially to satisfy the questions of outsiders (Hering, 1979:87). In addition, Morant (1981:20) states that evaluation should not only serve consumers' interests, but should ensure that the INSET programmes provided are generally accepted by society. Evaluation of INSET programmes helps to guarantee the integrity and credibility of the educator centre or any other institutions such as universities and colleges. The awards, degrees and diplomas conferred by these institutions will be respected (Morant, 1981:21).

5.3.2 General aspects of evaluation of the INSET programmes for Technology Education

Assessment is integral to the learning and teaching process as it is a measurement of the achievement of outcomes (DoE, 1998b:153). Hering (1979:81) advises that all institutions offering INSET programmes (Distance Education, school and Teacher Centres) should set evaluating questions even before they start with training. This assists institutions in focusing and clarifying what trainers should attend to during their training. In the same way, the institution will be deciding what to evaluate, what questions they want answered and how to answer questions form the sponsors. The institutions should, however, guard against evaluation at the beginning and at the end of the programme alone. Continuous evaluation is important. Evaluation used to improve the course while it is still in progress contributes more to improving education than evaluation to appraise a product already on the market (Hering, 1979:82).

People should not think that only educators – who are students at training institutions – should be subjected to evaluation. The trainers must also be the beneficiaries of assessment. They are likely to become better trainers in TE, if they receive good coaching from informed and insightful people who are experts in the use of different instructional strategies (Sturdivant, 1989:34).

Establishing a real and meaningful evaluation is probably the toughest challenge for anyone who presents training programmes. It is easy to present training programmes to educators who are sometimes so eager for training that they tend to be fairly uncritical. They can attach too much significance to only certain aspects of the training (Sturdivant, 1989:31). This emphasises the importance of continuous evaluation. A standard evaluation form must be used at all times to enable value judgements to be made about the effectiveness of different sessions. Follow-up visits to classrooms often provide trainers with valuable insights that may be missed even when competency-based assessment is used in their courses (Sturdivant, 1989:32).

According to Baker and Sharpe (1992:5) there are two kinds of evaluation activities which may be used in TE training. These are:

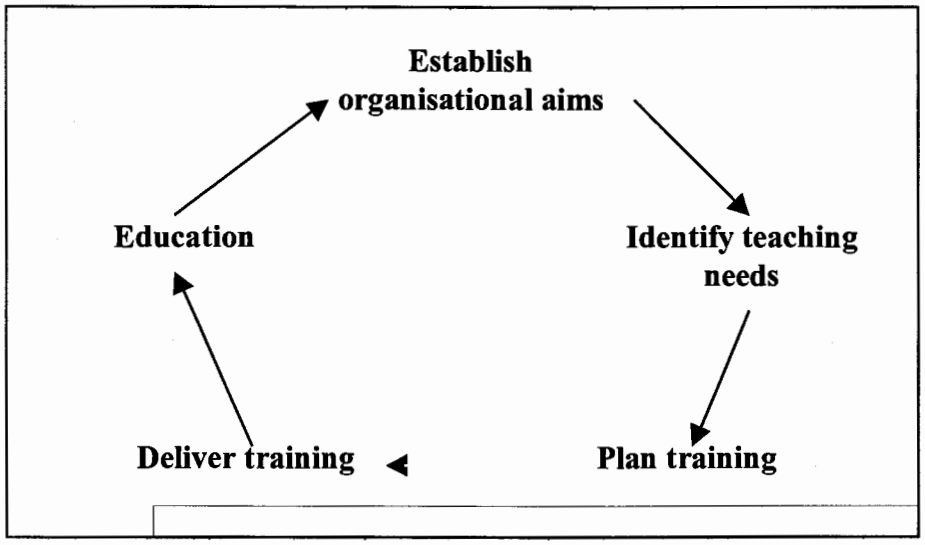
- **Summative evaluation**: A statement about what was accomplished over time. This type of evaluation is often used to justify the continued existence of a centre or a particular programme within a centre.
- **Formative evaluation**: This type is used as a source of information for policy makers and staff members of a centre. It also provides clues about how well they are accomplishing their goals and suggests areas for improvement.

It is also important to note that in the evaluation of an educator centre of any other institution concerned with educator training, many different perspectives on the centre or institution and many different notions of the good that is anticipated will produce differing goals or evaluation criteria. For some, a goal or criterion may be stated in terms of numbers. For others, a goal may be stated in the perspective of organisational development. For still others a goal may be stated in financial terms. The goal may include whether the centre can accomplish the objective of improving staff performance or skills at a lower cost than the alternative INSET programme. Some people's goals are highly individualistic. From this number of goals, it would be difficult, though possible, to construct one single evaluation which would satisfy all the goal-setters (Hering, 1979:82).

Still demonstrating how important evaluation is, Parry (1991:62) includes it as one of the steps to be implemented in educator training. The process of training - INSET in this case - is cyclical in nature. The length of the cycle differs. It may take a week, a month, year or more. Although the cycle indicates evaluation as one step that takes place at the end of the cycle, it should happen throughout the training cycle. For example, training needs may be identified through evaluating the existing conditions before training. The results of such evaluation, which reveal the training aims and needs, will be helpful during the planning and delivery of subsequent training. The last evaluation which leads to a reward at the end of the session should be based on the aims and needs of the training programme (Parry, 1991:62). In the case of a

shorter INSET session evaluation should also be done in the form of follow-up visits mentioned previously in this section.

Figure 9: The training cycle



5.3.3 Evaluation processes for INSET in the Technology Learning Area

5.3.3.1 Identification and analysis of training needs

- Identifying and analysing needs for educator training is important as it will build confidence among staff and will also encourage them to engage in self-evaluation.

- Needs analysis will lead to two outcomes:
  - an understanding of the training expectations of both the school and the individual; and
  - an ability to create a training plan which includes objectives, methods and approaches.

- Needs analysis also complements the need for educators to feel valued, listened to and influential.

- Needs analysis is a continuing process which assists a training organiser to prioritise how training resources are allocated given the needs of all people concerned and the school to which they belong.

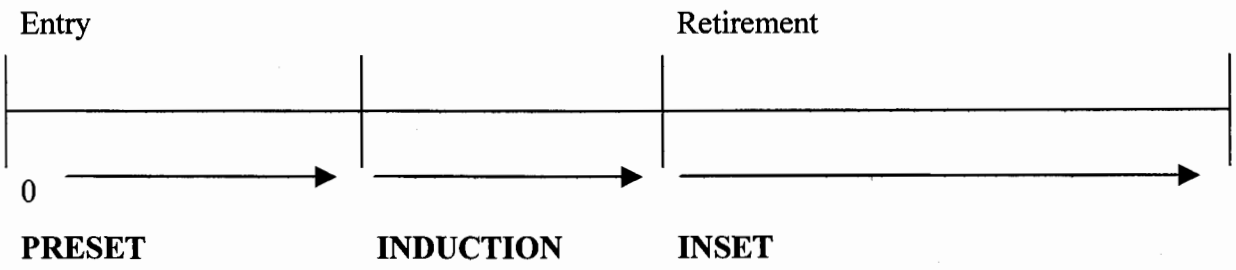
5.3.3.2 Evaluation methods for the INSET programmes in the Technology Learning Area

The methods of evaluation discussed below, excluding appraisal, can also be used in the assessment of learners (DoE, 1996b:153). Besides the educator, there are other parties involved in the assessment of learners. For example, there might be self-evaluation, peer-evaluation, and assessment by other educators or employers.

a. Teacher appraisal as a form of evaluation

Teacher appraisal warrants a detailed discussion as it seems the government is emphasising it more than other forms of INSET (DoE, 1998a:131). Teacher appraisal is part of INSET (Hewton, 1988:6) as illustrated by the following discussion of the career timeline.

Figure 10: Career timeline



(DoE, 1998a:2)

According to this career timeline, all educators have to attend PRESET before they can be treated as qualified. Before entering the teaching field educators have to be introduced to this field by induction courses. After the induction courses, educators

will be continuously exposed to INSET in different forms, including educator appraisal. Teacher appraisal can also assist in the evaluation of INSET. TE educators also need to be fully trained by way of PRESET and induction courses, but the urgent demand for educators in this learning area does not give educational authorities a chance to appoint only PRESET - qualified TE educators. INSET is therefore taken as alternative.

Appraisal schemes are designed to assist in planning the INSET and professional development of educators individually and collectively. They should also be designed to identify the potential of educators for career development, with the intention of helping them through INSET (Jones, 1993:3). For this reason, all educators should be trained to play their part in appraisal. The government has to make funding available through grants for education support and training initiatives to support INSET in the area of appraisal. In this period of intense and rapid change that the government has initiated, an appraisal is urgently needed. If educators are to develop their skills and knowledge in this new direction they ought to be able to sit down once a year at least and review their work and agree on achievable goals for the following year (Jones, 1993:28).

i. Aims of appraisal

According to DoE (1998a:3) and SADTU (1999:2) the aims of appraisal are as follows:

- To facilitate the personal and professional development of educators
- To facilitate the personal development of educators. This will enhance the quality of the education system as a whole
- To serve as a starting point from which the development of educators can be done
- To upgrade the teaching ability of educators by means of support and development programmes
- To promote the competency of educators for the purposes of optimum usage, promotion and corrective measures

- To determine the success of educator training and development programmes and to make recommendations where necessary
- To maintain maximum accountability to all stakeholders
- To establish a nationally recognised appraisal system.

ii. The nature of the new educator appraisal system

According to DoE (1998a:55) there are mainly two types of appraisal. These are the judgmental and the developmental approaches. The judgmental approach, which includes concepts such as inspection, assessment and evaluation, has failed to bear fruit in South African education because of its tendency towards fault finding, to be negative in reports that are written and not to acknowledge the positive things done by educators. Usually this type of staff development does not include the person judged and he or she does not have a say in the evaluation (DoE, 1998a:55).

TE does not have to be part of INSET that is judgmental in its approach. A fault-finding and negative evaluation is not part of TE's mission. A judgmental approach is clearly a way of inspecting and one could also argue that it is policing educators' performances. Summative forms of evaluation tend to use the judgmental approach.

The notion of appraisal is not compatible with a judgmental approach. The notion of appraisal aims at an acknowledgement of the positive aspects of educators' performances in the belief that nobody has only faults to offer. Thus, the notion of appraisal is tied to a more developmental approach as opposed to a more judgmental one. Unlike summative forms of evaluation, a formative form of evaluation - which is qualitatively framed - emphasises process rather than products (DoE, 1998a:55). The developmental approach and TE share the same vision, as they are both concerned with a process rather than a product. The fact that the developmental approach is not judgmental does not mean that it is blind to negative aspects that may exist in educators' performance. Ways are found to remedy such negative aspects. Both TE and the developmental approach (used during INSET or appraisal) acknowledge that teaching and learning are complex processes. Thus, if a desired result is not achieved, it is accepted that it is attributable to a variety of reasons. When observing an

educator's performance, the appraiser using the formative form of evaluation, will look at how the work is done. The focus will be on the quality of the pedagogical processes (DoE, 1998a:55).

iii. Guiding principles of the new development appraisal system to be used in Technology Education

DoE (1998a:60) provides several guiding principles for the new developmental appraisal system:

- The process of appraisal should be open, transparent and developmental.
- The process of appraisal should always involve relevant academic and management staff.
- The appraisal should include stakeholders, and its members should be trained to conduct the appraisal process.
- Educators should be informed of all aspects of the appraisal process so that they can take the initiative to conduct the appraisal process.
- Educator appraisal should give feedback by way of discussions and written communication to those appraised.
- Educators appraised must have the right to have access to and respond to the appraisal report.
- The instruments for the appraisal should have appropriate criteria to appraise the nature and level of the work performed.

These guiding principles of the new developmental appraisal system have been negotiated over many years of discussion and consultation. According to the DoE (1998a:59) these are the finally agreed principles that determine the basic nature of the developmental appraisal system and are essential to its operation. An understanding of these principles is crucial. According to the DoE (1998a:60) there are "three basic philosophical understandings that inform these guiding principles", namely democracy, transparency and a developmental orientation.

iv. Educator appraisal and the new South Africa

As indicated previously in this work, transformation from apartheid to democracy in South Africa affected all spheres of South African society. This process of change also motivated educational change in South Africa. It also follows that if the whole of South African society is changing towards democracy, the educational sector must also be democratised. Changes that come as a result of transformation in education also affect educators and their learners. Therefore, there is a need to train educators to face this transformation with confidence. Educator appraisal, as another form of INSET, will play an important part in the process of democratisation and transformation. Educator appraisal should attempt to achieve this by engaging processes that are democratic, transparent and non-judgemental (DoE, 1998:66).

v. Setting up the appraisal panel to assist Technology Education educators

The appraisal panel used to assist educators for Technology Education should be made up of the appraisee, a nominated peer, a senior management person, a union representative and a person from outside the institution, for example a person from a district office, an NGO or a college or university. The panel should consists of the appraisee and at least three others from the list above, depending on what may be possible in each context. In small schools, it should be acceptable for the panel to be composed of the appraisee and two outsiders. In general, the appraisal panel should be made up of four people, some of which must have knowledge of TE. Maximally, it is made up of five people and minimally of three people (DoE, 1998a: 79).

Let us look at a practical example of the constitution of the panel. Let us assume that in one school five educators become part of the appraisal process in that school. Let us also assume that these five educators are the principal (A), a head of department (B), two educators in the human sciences (C and D) and one educator from the natural sciences (E). If this is the case then appraisal panels may be arranged in the following pattern:

- C and D may act as peers for each other.

- C may also act as a peer for E.
- Each of them, C, D, and E, may choose a single union representative to join the panels.
- A and B can still choose the same union representative to serve in their appraisal panels.
- B may need another head of department to act as his/her peer.
- A, who is the principal, may need somebody from outside, perhaps some one from the district office or a principal from another school, to serve on the panel.

vi. The educator appraisal instrument and conducting appraisals for Technology Education educators

The educator appraisal instrument is the actual tool that can be used in the appraisal of Technology Education educators. The form entails the following:

- Personal details to be filled in by the appraisee him/herself.
- Learner questionnaire which is optional at the discretion of the appraisee.
- The needs identification and prioritisation form to be completed by the appraisal panel. This form provides so-called core criteria only, but it also allows for optional and additional criteria to be added on if they are found to be necessary. For level 1 educators the core criteria cover classroom expertise, professional development and leadership, and communication skills. The core criteria for heads of departments are the same as those for level 1 educators. The core criteria for principals and deputy principals emphasise leadership, management and administration skills (DoE, 1998a: 86-87).
- The appraisee must complete professional growth plan, mainly to allow him/her to formulate objectives, which will be based on the criteria prioritised.
- The discussion paper which is first completed by the appraisee and then by the panel, reports whether the appraisal objectives were reached or not.

The successful appraisal for Technology Education educators should consists mainly of the three following stages:

- The *pre-appraisal stage* includes setting up the panel, clarifying the roles of members of the panel, the filling in of personal details and professional development.
- The *appraisal stage* is the actual appraisal of the educator in practice.
- The *post-appraisal stage* includes compiling the discussion paper and the appraisal report. The appraisal report must clearly stipulate what kind of developmental programmes can be used to further improve the educator's performance. These programmes may include INSET programmes (DoE, 1998a:91-92).

b. Self-evaluation in Technology Education

It seems that self-evaluation is the most positive and helpful evaluation that can be used in TE. Self-evaluation forms should be used to help TE to obtain some idea of the progress they are making and where they may need help (Kent, 1987:29). With needs analysis, the training process for TE and self-evaluation will be an important step to start with. TE teachers need to be encouraged to practice self-evaluation. Something could be done before a training activity to help prepare teachers for what lies ahead.

How does evaluation connect with staff development or INSET? Evaluation can provide a means to initiate, monitor and manage growth at an individual and organisational level. The main aim in educator training (INSET) is to bring about change. This change may come as a result of:

- **Internal/self-motivation** which is generated by experience, confidence, responsibilities, appraisal and a personal-development plan.

- **External motivation** which emanates from government legislation; expert reports and advice; appraisal; a school-development plan; community and parental pressure; and school culture.

For both kinds of motivation processes and systems are required to bring about substantial changes. Therefore, it is staff development or the INSET and evaluation

process that may assist in mapping of needs, progress and outcomes. Evaluation also helps people to feel more fully a part of the process of INSET. When all participants are fully integrated into the cycle, it potentially brings about the desired change.

The integration of staff development and the evaluation process is depicted in figure 11.

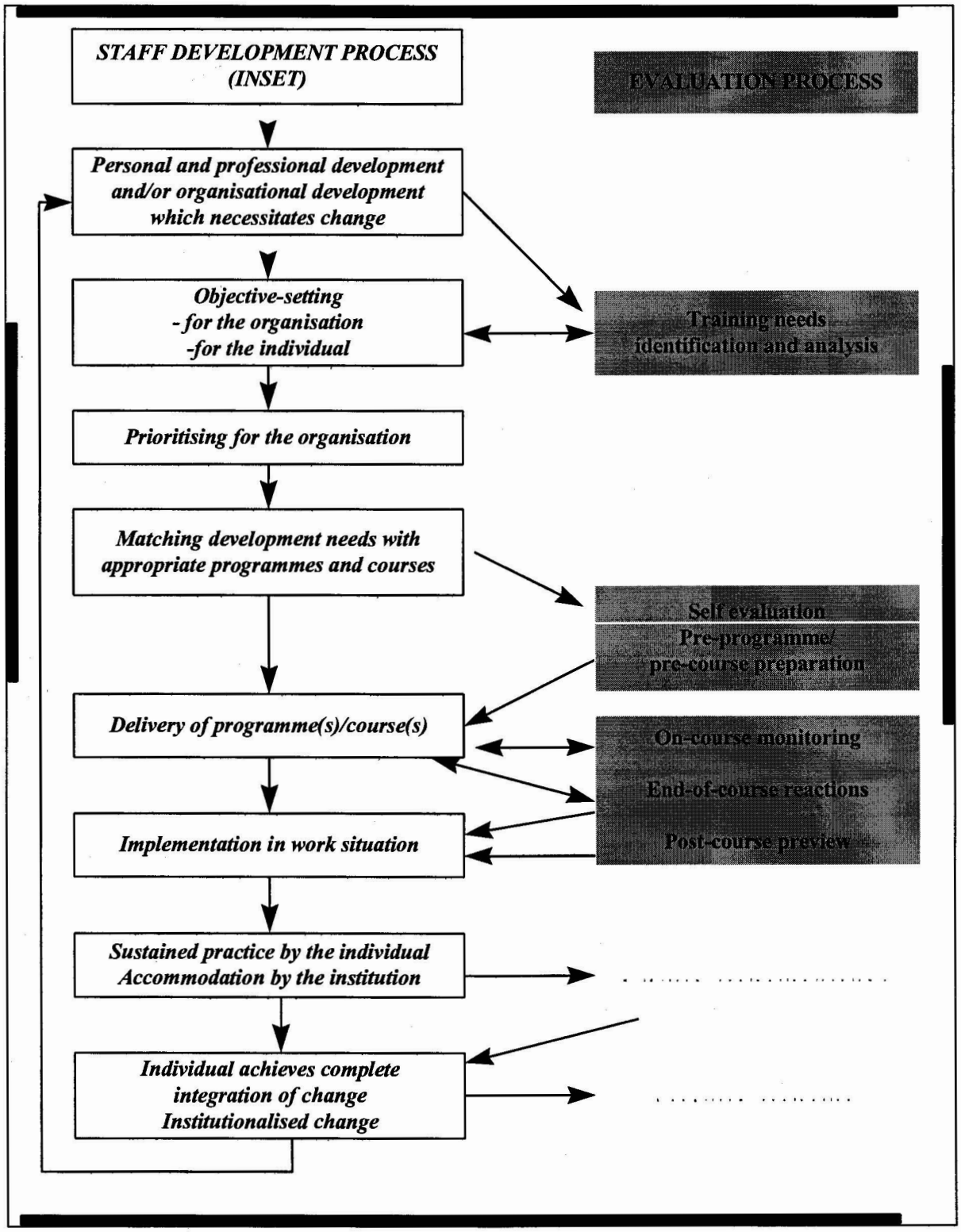
The questionnaire and feedback from colleagues can be a powerful and informative way of conducting self-evaluation, but it needs to be handled within an environment of trust and willingness to improve (Baker & Sharpe, 1992:30).

According to Baker and Sharpe (1992:27) the following are some of the popular methods to help prepare the hearts and minds of participating teachers

c. Pre-course preparation discussion in Technology Education

Pre-course preparation discussion is important as it helps to resolve misunderstandings and uncertainties, which may prevent TE educators' full contribution to the training activities. This discussion will also give educators the chance to explore and express their attitudes towards the course before it starts. The aim of this discussion is to assist TE educators in developing a positive view of the training and TE as a new learning area. Through this discussion, TE educators can reveal their concerns about and expectations of their training. Issues revealed can be tackled constructively before and during the training activity (Baker & Sharpe, 1992:29).

Figure 11: The integration of staff development and evaluation processes



(Baker & Sharpe, 1992:7)

d. Pre-course tasks in Technology Education

Pre-course tasks are used to set the scene for some of the most important themes. It is important that pre-event activity is built on during the event itself. Otherwise educators may wonder why they invested so much time in irrelevant pre-course tasks (Baker & Sharpe, 1992:30). There should be a close relationship between the course and pre-course task. INSET for TE needs to be productive as this learning area has to be improved to the level of other learning areas. Pre-course tasks relevant to TE have to be attractive and stimulating to educators to cope with the implementation of new learning areas.

e. Training responsibility contracts in Technology Education

These are another important step that can be used to create an environment conducive to productive training activity for TE. Prospective educators should be asked to acknowledge their individual responsibilities. Thus, each educator knows what is expected of him/her. The contract is between the trainees and the trainer. It establishes the standard against which to evaluate the outcomes of the activity (Baker & Sharpe, 1992:30).

In addition to the above methods of assessment, Potgieter (1999:12) proposes the following methods: self-assessment, individual peer assessment, group peer assessment, educator assessment and portfolio assessment. Although these methods are meant for learners it can also be used for educators who are training for TE.

5.4 RETRAINING AND SUPPORT OF EDUCATORS AS PART OF INSET MODEL FOR TECHNOLOGY EDUCATION

The INSET model in Chapter 4 indicates that educators must receive continuous training and support if we want the implementation of TE to succeed. This support may come from the institutions responsible for the training of educators. In the case of national training of trainers workshop was concern, a tender was given to a Teachers Trust, a training consortium under the leadership of Mr M Kibi (Vinjevold & Roberts: 1999). This Teacher Trust must assists in retraining and support of educators.

After each evaluation process, the results will indicate if a retraining is needed or not. If training is needed, an INSET model in this study indicates that retraining should be conducted by using the various types of INSETS reflected in the model. The evaluation study conducted by Technology 2005 Project states that most of the educators reported that the `cascade` peer-training model did not work effectively in their schools (Mouton; Tapp; Luthuli & Rogan, 1999:19). The evaluation team also shows that many of the problems experienced by educators in implementing TE could have been addressed through the provision of more training and follow-up. Educators who received extra assistance respond positively, both with respect to their attitude towards TE and their skills in facilitating learning (Mouton; Tapp; Luthuli & Rogan, 1999:19).

In addition to retraining, support can also include the provision of learning support materials such as print materials and equipments. Equipments for TE have been delivered even for grade 7, but only at pilot schools. Many of these pilot schools attempt to use the equipments provided, although with problems. Some educators indicated that they were afraid of using some dangerous items with learners. Lack of training and support in regard to the use of equipments were said to be the cause of difficulties. This is the reason why the model suggested in chapter 4 indicates that even if initial training has been done as soon the evaluation shows that the training was insufficient retraining must be conducted until educators understand what is expected of them.

While one indicates that the educators at pilot schools are experiencing problems in using the equipments provided, then we must expect more problems from educators who teach at ordinary schools. More than eighty percent of the principals indicated that they had received no direct support from the Department of Education except for the support provided by Provincial Task Team (Mouton; Tapp; Luthuli & Rogan, 1999:74).

5.5 Conclusion

It has indicated in this study that the previous INSET models have not delivered desired results to educators. The demand for training educators in TE, need new initiatives in planning INSET programmes. This chapter provides an INSET model which may be used in training educators for TE (figure 8).

One can without doubt say that evaluation as part of INSET model is important for training since it seems that lack of proper evaluation has undermined the effectiveness of INSET. Types of evaluation indicated in section .3.5.3.2 (appraisal, self-evaluation, pre-course preparation discussion, pre-course tasks and training responsibility contracts) are necessary for the success of training, because they will help to determine the needs for further training or support. There should be a means to evaluate educators through their training session and during activities in the classroom. Teacher appraisal is the relevant form of evaluation that can assist as it is run at school level. The INSET providers discussed in chapter 3 should provide the criteria that will assist the schools to evaluate by means of appraisal. In this way, educators will be encouraged to apply knowledge, skills and methods acquired during the training. The criteria used should take note of specific outcomes (SO) of the learning area. In all instances, evaluation should be descriptive and analytical rather than purely numerical (DoE, 1998b: 153).

Evaluation should lead to more support or retraining. Retraining must include all types of INSETs discussed in chapter 4

The chapter that follows provides findings, conclusions and recommendations towards INSET for Technology Education.

CHAPTER SIX
FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The problem that initiated this research can be summed up as being the introduction of Curriculum 2005 and TE (Technology Learning Area). The discussion of these two new concepts in South Africa is based on the following considerations:

- The feasibility of TE as a new learning area in Curriculum 2005
- The possible providers of INSET for TE
- Types of INSET to be used in training educators for TE
- The lack of an INSET model for TE

The following section deals with the findings and conclusions relevant to the above considerations.

6.2 FINDINGS AND CONCLUSIONS

6.2.1 Findings and conclusions concerning the feasibility of Technology Education in Curriculum 2005

The findings arrived at from the study of Curriculum 2005 and Technology Education is that there is disagreement about the acceptance of these concepts. There are those who feel that the education system of the previous government should be adopted by the new education system (Curriculum 2005). Another school of thought is that the present education system be replaced by a new system of education. Like Curriculum 2005, Technology Education as a learning area is also controversial. There are those who believe that TE should not be a field on its own on the grounds that this is too restrictive since it involves a wide spectrum of activities and professions. Despite the differing views on whether to adopt or replace the

present education system, one can conclude that there are aspects of the previous education system that can be included in Curriculum 2005 (see paragraph 2.5.2).

It has been found ~~out~~ from the literature that there are differences between the previous education system and Curriculum 2005 (see paragraph 2.2.1). In addition, it has been realised that the core method in Curriculum 2005 is Outcome-based education (see paragraphs 2.2.2 and 3.4.2) and that some people confuse TE with other learning areas (see paragraph 2.3.2). It can be concluded that it is necessary for educators to become aware of the differences discussed in paragraph 2.2.1, OBE as an approach and know the differences between TE and other learning areas. Teacher training should be a platform to be used to make educators aware of the above-mentioned aspects.

The rationale for the inclusion of TE provided in chapter 2 (see paragraph 2.4) shows how important TE is in our education system for our economy and for society as a whole. According to this rationale, TE can be seen as a means of empowering learners to develop innovative skills and critical thinking which can make them effective citizens. TE provides learners with skills relevant to problem-solving, working as an individual, as a group member and in different technological contexts. TE, therefore, has a rightful place in Curriculum 2005. This ensures that every learner who leaves the GET band will be equipped with technological knowledge and skills that will enable him/her to understand technology and its impacts. For this reason, educators should be made to understand the importance of TE so that they can take it serious with their learners at school.

6.2.2 Findings and conclusions on providers of INSET for Technology Education

Literature indicates that the national Department of Education shows some interest in using NGOs as providers of INSET for Technology Education. A Teacher Trust, a training consortium under the leadership of Mr Kibi, was given a tender to conduct training for provincial officials (see section 4.2). Provincially, the interest of using NGOs in training educators for TE has been demonstrated when the Gauteng Provincial Task Team (PTT)

granted ORT-STEP Institution an opportunity to train educators from pilot schools (see section 4.2).

6.2.3 Findings and conclusions concerning the present INSET for Technology Education

A report on the programme of implementing Curriculum 2005 shows that the quality of the previous INSET was poor, although it was provided on a large scale. Literature has shown that national training of trainers was conducted by a Teacher Trust. This effort was followed by a cascading process of ~~or~~ peer-training in the provinces during which selected provincial officials were trained to be able to take the responsibility of training pilot schools and other officials who would train other educators (see paragraph 4.2). Literature also indicates that most of the educators reported that the cascading process of peer-training model did not work satisfactorily in their schools. In addition, educators who were supposed to train others educators complained that they were overloaded and were not given time to train their peers. A recent report by a committee set up by the present minister of education has also confirmed that training of educators for Curriculum 2005 was rushed (see paragraph 4.2).

In conclusion, although one admits that the new cascading process of peer-training model was ~~is~~ not particularly successful in the pilot school phase of Technology 2005, realistically it is probably the best option that South Africa has for training the large numbers of educators that need it (see paragraph 4.2).

The document on norms and standards for teacher education shows that there is a dichotomy between PRESET and INSET and this prevents a PRESET-INSET continuum as well as a contact-distance education continuum from being formed. The literature states that INSET is always informal and ad hoc. There should be ways of providing training that will ensure the continuity between PRESET and INSET. There should be a link between PRESET and INSET (see paragraph 5.1). A link between INSET and PRESET can possibly be provided if all providers of educator training work together.

In addition, findings from educators indicate that much has been said on paper but in practice less has been done (see paragraph 4.2). The chain of training to be followed as stipulated by the cascade model became weaker as it goes down to the ordinary educators. Efforts of teacher training already done are mainly directed to Outcomes-based Education (OBE). Despite this training, TE educators still feel that they needed more training for OBE. This information indicates that training already conducted is not enough to assist in the implementation of TE. Addition efforts need to be taken to boast the implementation of TE educator training (see paragraph 4.2).

Educators from both ordinary and pilot schools see the following as their main problems:

- **Inadequate educator training**

The training that educators received is inadequate to assist them to implement TE and OBE as a method to be used in teaching. Both TE and OBE are new concepts. A training session of one or two weeks is not enough. Literature indicates that several principals reported that the inadequate training of Technology 2005 educators has been a major obstacle to the successful implementation of TE. Since the educators who were trained for TE did not have time to train others according to the cascading process, many are teaching TE without training (see section 4.2).

- **Shortage of resources**

The Department of Education provided the schools with print materials such as illustrative learning p~~P~~rogrammes, learner handbooks, teacher training manuals and a number of promotional low quality copies of textbooks per learning area (see paragraph 4.2). Equipment s was ~~ere~~ also delivered to schools throughout the country to support learning and teaching in ~~the~~ learning areas such as the Technology Learning Area. Although the Technology 2005 Project claims that the National Task Team (NTT) and Provincial Task Teams (PTT) have worked collaboratively in the course of 1997 and 1998 to develop teaching and learning materials, educators still claim that they do not have enough resources (see paragraph 4.2). Almost all pilot schools struggled with a shortage of resources. In many

cases resources were delivered late. One may ask why information on resources is included in this study dealing with educator training. The cascading process of peer-training which is extended down to school level where educators train one another - school-based INSET (see paragraphs 4.2 and 4.6) should, however, include the provision of resources at that level. Without quality resources educators cannot be able to run their school-based INSET as effectively as is expected of them.

In conclusion, even though the Department of Education may claim that support materials were delivered throughout the country, sufficient training in the use of such materials still remains the problem to be solved. The Department of Education focussed on supplying only the very basic material and equipment. The Department of Education should rather aim at supplying the necessary material and equipment to teach TE effectively to as many schools as possible.

While it is true that the government should provide teaching materials, on the other hand educators must learn to improvise. For example, in TE waste materials from homes, businesses and industry can be useful in a classroom. Models can, for instance, be made from waste material such as paper, cardboard boxes, plastic containers and tins, to name but a few. As far as incentives are concerned, educators show that, except for remuneration, there should be proof that they trained or assisted in training other educators. This demand is genuine, as it will give educators credits, which may lead to promotions.

- **Lack of incentives from educational authorities for educators who assisted in training other educators**

  Pilot school educators who were involved with the training of other educators complain about a lack of incentives from the authorities. Lack of interest from these educators may hamper the extension of training down to school level. Educators indicate that incentives in this case do not refer to salary increases but to words of recognition and praise such as "work well done". Educators also maintain that even letters to indicate that they participated in training other educators could serve as an encouragement for further

efforts and also promotions. In addition, educators should benefit from having incentives for implementing and teaching well.

- **Too much information in a short space of time during training**

Educators state that they attended a one-week session once in 1998. A one-week session for Curriculum 2005 and its eight learning areas as well as OBE is not enough. This is the reason why educators complain that they were provided with too much information in a short space of time. For example, a national five-day training for Curriculum 2005 (which includes eight learning areas) was structured as follows:

- first day was for the introduction of Curriculum 2005,
- second day was for the introduction of various learning-areas,
- during the third and fourth days participants were divided into groups according to learning-area specialisation and
- the last day was set aside for assessment. It is not possible that educators can understand TE contents and methodology within two days (see paragraph 4.2).

The literature also shows that assessment is an essential feature of the teaching and learning process. Assessment is an integral to learning and teaching strategies and includes formative as well as summative processes. Assessment can be used as a measurement of the achievement of outcomes, either during the training of educators or in a classroom with learners. Assessment should fulfil the requirements of the NQF and its results should be relevant to the needs of the government. For this reason, assessment should be made part of teacher training. It reflects back to the type of training educators had. It is true that the government cannot afford longer INSET courses as it will mean more money and loss of time for learners, but all avenues have to be exploited to make sure that educators receive proper training and learners receive full measure in terms of time. This is not a problem as educators are willing to attend courses after school hours, as has been done in the N4 district of Gauteng, provided that there is consultation between government and educators.

The previous sections of this chapter (findings and conclusions) have shown that TE has been implemented in South Africa. What is still lagging behind is training for TE. For this reason the following guidelines and recommendations will be directed at training by means of INSET for TE.

6.3 GUIDELINES AND RECOMMENDATIONS

An attempt will be made in this section to give some guidelines and recommendations concerning training for TE. Guidelines and recommendations are necessary since the present form of training shows that it is still insufficient and cannot be applied or used in its present form without looking at its shortcomings and expect good results (see paragraph 4.2). An ad hoc way of providing INSET will not work well for TE. One of the reasons for this is that TE is new in South Africa. A constructive and continuous training effort should be a priority for all stakeholders.

In the light of the above information, an attempt is made to give some guidelines and recommendations which emanate from the study, and which can possibly be of value for the future development of a relevant INSET for the training of educators.

6.3.1 Guidelines and recommendations on the feasibility of Technology Education in Curriculum 2005

The debate on whether to accept the Curriculum 2005 or to continue with the old curriculum may seem to favour those who argued for status quo. The fact that the committee set up by minister of education to investigate Curriculum 2005 suggested that it should be replaced by Curriculum 21 may be taken as an evidence that those who favoured a status quo are wining a debate. It can therefore be recommended that the suggested Curriculum 21 be introduced and should be specific to learning areas since the proposed changes do not affect OBE (see paragraph 4.2). Although writers differ also on whether TE should be a learning area on its own or be incorporated into other learning areas such as science this study may recommend that it should be treated as a learning area (see paragraph 2.3.1). TE should be a field on its

own but it has to be clustered with other learning areas in foundation and intermediate phase and made a separate learning area in senior phase (see paragraph 2.5.2).

The rationale for including TE in Curriculum 2005 indicate that no developing country could afford to ignore it an expect to develop economically (see paragraph 2.4).It is therefore recommended that these rationale be well communicated to educators. Content to be delivered during educator training should include the rationale for incorporating TE in a curriculum (see paragraph 2.4).

6.3.2 Guidelines and recommendations on providers of INSET for Technology Education

In as far as providers of INSET are concern, one may acknowledge that there is nothing wrong in using NGOs, but the Department of Education should avoid using these institution alone. An INSET model (see figure 8) include distance education, school and teacher centres as providers of INSET for TE. All these institutions can be used profitable with the government, in addition to financial responsibilities, acting on an advisory capacity. In this way the government will be in a position of making sure that all these institution provide equal training to all educators (see paragraph 3.2).

6.3.3 Guidelines and recommendations concerning the present INSET for Technology Education

The fact that educators claim that the cascade peer-training did not bring the desired results to their school indicate that a well planned long-term INSET programme is necessary to the successful implementation of TE. All stakeholders must realise that a change to long-term INSET will not occur overnight. The INSET should contain learning-area knowledge. Subject pedagogical knowledge and OBE methodology. A great deal of attention should be

placed on the content of TE. Training must address the needs of the different phases GET such as foundation, intermediate and senior phases.

The Gauteng Department of Education policy for training emphasis that no training will be conducted during school hours (see section 4.2). This means that educators will use the limited free time they have for training. Unfortunately, educators may be reluctant to give up weekend days. A training plan for the year might assist in addressing problems of scheduling for educators and schools.

Schools should be encouraged to use school-based INSET (in-school training) as another type of peer training. This will help educators from a particular school to help each other. After each training session, Learning-area advisers should ask the headmasters of schools under their jurisdiction for reports on the school-based INSET activities. This will encourage educators to work as a team. In addition, local groups should be established among educators from nearby schools for Technology-related training. These local groups may use school-focused INSET to train educators from different school. Educators should be encouraged to ask assistance through school-focused INSET (see figure 8).

Institutions of higher education should volunteer to run INSET for TE, particularly as distance education to avoid taking educators from their classes for a longer period. This will assist in reducing ad hoc types of INSET. The Department of Education, nationally and provincially, should encourage educators to attend workshops, conferences and subject association meetings; and involve themselves in curriculum development relevant to TE or OBE.

To make sure that there is a contact-distance education continuum, extensive courses during semesters should be presented by selected institutions and the courses should include contact hours and self-study hours. This will also make sure that there is in an INSET-PRESET continuum, which can be secured through short, intensive courses during a vacation. Contact hours in both INSET-PRESET and contact distance education continuums should include lecturing, tutorials, case studies, reading and other activities not specified in these sections. Self-study hours should include learning materials and trainees should be supported

remotely. According to the suggested INSET model (see chapter 5), extensive courses delivered during semesters may include school-focused INSET while short vacation courses should end up with school-based activities. Both extensive courses and short courses of teacher training (INSET) should enjoy the same number of hours. It is important that these courses be built up to a particular qualification.

Some courses should earn qualifications and others should not. To specify, there should be courses shorter than 120 student study hours that are not qualification-earning and short courses of 120 or more student study hours that are qualification earning. Shorter, award-bearing courses should be offered by means of either school-focused or course-based INSET. Other shorter courses that are not award-bearing can be offered by means of school-based INSET. In addition to the short courses indicated, long INSET courses should be offered by means of course-based INSET and should be qualification earning. These courses should be the responsibility of the Department of Education.
Educators need to be given a chance to provide their own views on Curriculum 2005, OBE and TE. They should decide the type of training they wish to undergo. Training through INSET should be provided after school hours or during weekends and holidays. Denying educators the right to choose would be imposing Curriculum 2005, OBE and TE on them, with the result that they might be reluctant to participate. At times, it is not advisable to use teacher unions to express educators' views. Individual educators can be given a chance to air their own views. This could be done by means of a questionnaire. This does not suggest that trade unions should be regarded as useless because they can play an important part in the planning of workshops and the drafting of questionnaires (see paragraph 4.5)

Experts in the field of OBE and TE must be invited from within and outside South Africa to assist in providing information. Countries that have introduced OBE and TE should be visited. These educational authorities should also include Learning Area Advisers and educators if it meets on holidays. Successful countries will provide hints on how South Africa can go about improving this situation. Unsuccessful countries will warn us of any problems that may befall us.

Due to the claim from educators, a cascade or peer-training model should be re-examined and restructured if it is to be adopted on a national basis. Research should be conducted to correct what ever is wrong with the peer-training.

An INSET model, which can assist in training educators, has been recommended in chapter 5. The model also cited a school as one of the place were training should take place. This simply means that the cascade or peer-training is accommodated in the suggested model. In addition to a school, the model depicted in figure 8 indicates distance education and teacher centres as providers of INSET programmes. Distance education providers should include universities, technikons, colleges of education and NGOs providing higher education. Some of the closed colleges of education should be used as teacher centres from which all Learning Area Advisers can operate. Universities offering distance education may also use these colleges as venues were their INSET are run.

There should be close collaboration between distance education, school and teacher centres as providers of INSET. The providers should share programmes of action and courses. The personnel (Learning Area Advisers, lecturers and educators) charged with the task of training teachers for TE should maintain a close relationship with each other. For example, distance education lecturers could be invited by Learning Area Advisers to offer short courses at teacher centres and vice versa. This type of collaboration is important, as the three types of providers will know what is happening in each other's situation.

Distance education has to provide short and long qualification-earning INSET courses. Short courses should also be used as a support service. According to the suggested INSET model, the supportive service should be coupled with evaluations, which in turn have to lead to retraining. Although teacher centres will be in close contact with institutions offering distance education they may only provide short courses that are not qualification earning. Short courses delivered by teacher centres can be qualification earning if they work together with an accredited higher education institution (see paragraph 3.2.2).

The responsibility of the government should be to administer the teacher centres through the district and circuit managers. Where distance education is concerned the government should

act in an advisory capacity and provide financial assistance. In return distance education and teacher centres must help the government by soliciting financial assistance from the private sector.

6.4 CONCLUDING REMARKS

On the basis of the insight required throughout the study of the TE with respect to educator training in South Africa, various guidelines and recommendations are given. In the formulation of these guidelines and recommendations, no claim is made of completeness or comprehensive strategy. The guidelines provided are suggested steps that could be taken should INSET for TE become a priority to the South African government.

A retrospective view on the efforts concerning the implementation of TE as a new learning area in Curriculum 2005 brings the realisation that training poses tremendous challenges. Much more research, renewed thinking and hard work is required in this area of education. This study has been undertaken as an attempt to disclose the shortcomings of the previous and present INSET in South Africa for the sole purpose of seeking solutions for them and to determine a model or strategy that should be followed in order to train educators for TE.

6.5 SHORTCOMINGS OF THIS STUDY

The following can be sided as the shortcoming of this study:

- The research did not include the whole of South Africa since M.Ed study is of limited scope.
- Some educators from the black school of the N4 districts were reluctant to speak to strangers may be as a result of redeployment or lack of information concerning TE
- Lack of sufficient local literature that deals with the topic of study. Most of the literature were either written by the government or HEDCOM.

The following research still need to be done:

- The contribution that Technology Education can make to the South African economy. Although the economy of South Africa may be said to be better than most of the African states, she can still be counted as one of the African states that need attention as it still lagged behind compared to European countries.

- The relevance of Technology Education to the rural South African black society. Some of these societies are still without electricity even after the efforts of new government of electrifying every home in South Africa. Many schools in these rural areas are still operating without electricity.

- The relationship between Technology Education and other learning areas. Literature and interviews conducted has indicated a need for a research which will highlight further why Technology Education should be treated as a learning area on its own.

- The interest of educators and learners towards Technology Education and Curriculum 2005.It cannot be taken for granted that educators and learners will be interest to Technology Education. Research that could to more literature on Technology Education in South Africa will assist in attracting the attention and interest of educators and learners.

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ON-SITE OBSERVATION

Visits were paid to the following schools during which various impact of TE and TE INSET were observed:

- ORT-STEP Institute
- St Album's College