AN INVESTIGATION INTO THE DESIGN PROCESS OF THE ENGINEERING GRAPHICS AND DESIGN SYLLABUS IN THE BACHELOR OF EDUCATION DEGREE IN THE UNIVERSITIES OF TECHNOLOGY IN SOUTH AFRICA

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Abstract

In the years before 2004 teacher training was presented through two routes, one, the degree route through the university or two, a diploma route through a teachers training college. Where universities acted as autonomous institutions having control of their administrative and academic activities the colleges of education were administered and controlled by the government through the Department of Education. This included the setting and assessment of the curriculum. The role of the lecturers in the teacher training colleges was simply to present the prescribed syllabus to the students.

Drastic changes were implemented by the government in 2004. In its restructuring programme the government made two major changes to teacher training. Firstly, they closed all the colleges of education and moved the departments into a university or a technikon. The technikons eventually became Universities of Technology. Secondly, they changed the four year teacher's diploma to a four year degree in education.

The impact of this restructuring meant that lecturers were now in an autonomous environment in which they were expected to develop a syllabus for the Bachelor of Education degree course on their own.

This research investigates the process that the lecturers applied in designing a suitable syllabus for the Bachelor of Education (Engineering Graphics and Design) degree and how it relates to the process that the theory advocates should be used.

Declaration

Reference declaration in respect of a Master's Dissertation

I, Edmund Conradie

_____

(full name of student)

and,

_____

(full name of supervisor)

Do hereby declare that in respect of the following dissertation:

An investigation into the design process of the Engineering Graphics and Design syllabus in the Bachelor of Education degree in the Universities of Technology in South Africa.

(1) As far as we know and can ascertain:
   (a) No other similar dissertation exists
   (b) The only similar dissertation(s) that exist(s) is/are referenced in my dissertation as follows

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(2) All references as detailed in the dissertation are complete in terms of all the personal communications engaged in and published works consulted.

_____ Approved for Submission

Signature of student

Date: _____ _____

_____

Signature of supervisor

Date:_____

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Acronyms

BEd	Bachelor of Education
CAD	Computer Aided Drawing
CHE	Council on Higher Education
CoE	Colleges of Education
COTEP	Committee on Teacher Education Policy
EGD	Engineering Graphics & Design
ETDP	Education Training and Development Practitioner
HEDCOM	Heads of Education Departments Committee
HEI	Higher Education Institution
HEQC	Higher Education Qualifications Committee
IPET	Initial Professional Education of Teachers
MCTE	Ministerial Committee on Teacher Education
NCS	National Curriculum Statements
NPFTED	National Policy Framework for Teacher Education and Development
NQF	National Qualifications Framework
OBE	Outcomes Based Education
SAFCERT	South African Certification Authority
SAQA	South African Qualifications Authority
SETA	Sectoral Education and Training Authority
UoT	University of Technology

Chapter 1 Statement of the Problem

1.1 Background

In 1994 a new government was elected in South Africa and very quickly made radical changes in the sphere of education. Major changes were made in the method of learning, the structure of the curriculum, and the content to be learned within the curriculum. These changes were made primarily in the school environment but also had a major influence on the teacher training environment.

1.1.1 The Old Dispensation

Teacher training in the previous government was offered either in the universities or Colleges of Education (CoE). A teacher training qualification through a university involved completing a degree (Bachelor of Arts, Bachelor of Commerce or Bachelor of Science) and then an education diploma thereafter. The curriculum taught was developed and presented at a high level by each university with very little government intervention but within the influences of the prospective business realms eg industry.

Prior to 1995 there were approximately 150 state funded Colleges of Education providing teacher education (Parker, 2004). Colleges of Education were established for the sole purpose of training future teachers and were often referred to as teacher training colleges. The qualification obtained through the CoE was a diploma in education and was aimed at preparing the diplomat to teach in the schools in South Africa. It focused primarily on the subject content that was presented in the schools and on teaching methodology, and was presented in an integrated manner throughout the three or four year duration of the diploma. The Colleges of Education were the responsibility of the state which controlled all domains of its functioning. Significant to this study is that the state controlled the curriculum, what was taught, when it was taught, how it was to be presented, and the assessment thereof. Parker and Adler (2005) claim that, ‘Colleges operated much like high schools, with strong external framing of curricula and in most cases external examinations, full timetables, little space for independent study, and little expectation that the staff engage in research or become disciplinary experts’.

1.1.2 The New Era

Since 1994 the education curriculum, in response to global changes in concepts of knowledge and the role of higher education, has been subjected to a continuing process of restructuring and policy change. Kruss (2008) refers to this as a 'double dynamic' where 'the change in teacher education is driven primarily by two sets of imperatives, related to changes in education, and the other to changes in its new higher education location' (Kruss 2008).

The educational imperatives refer to the 'new education philosophies and curricula, to new teacher education qualifications frameworks, to supply and demand in terms of provincial and national development and to transformation goals for the education system, as set out in the 1999 White Paper on Education' (Kruss 2008). The policy for change in higher education was 'directed by the National Plan for Higher Education aimed to refocus the priorities of the system to be more responsive to socio-economic goals, to become more equitable and to increase its efficiency in terms of graduates, publications outputs and so on' (Kruss 2008).

1.1.3 Changes in Education

The most dramatic change in education policy made through the National Education Act 27 of 1996 and the South African Qualifications Authority Act 58 of 1995 was the introduction and implementation of Outcomes Based Education (OBE). Outcomes Based Education was developed on very different epistemological and pedagogical principles from the previous system. Where the previous system was based on principles of the teachers presenting prescribed content in a teacher-centered environment, OBE methodology is underpinned by the principle that the teacher facilitates the learners progress through a process of achieving outcomes in a learner-centered environment.

This new framework had major implications for teacher education as these principles had to be applied at all levels of education including the Initial Professional Education of Teachers (IPET) programmes. Teacher educators presenting courses in the IPET programmes needed to educate themselves on the new OBE epistemological and pedagogical principles and prepare future teachers within a curriculum developed on these principles.

Whether their own approach was characterized by fundamental pedagogies, critical theory social constructivism, teacher educators were required to reform their programmes in line with the NQF qualifications structure and to register their qualifications with the South African Qualifications Authority (SAQA 2005). In many cases they faced the challenge of

addressing the features of the new school curriculum in their own curricula and pedagogy in their efforts to align teacher education.

1.1.4 Changes in Higher Education

Kruss (2008) identifies four specific periods during the restructuring process in relation to both higher education and educational processes which impacted on the developments of the IPET curriculum.

In the first period from 1994 to 1999 curriculum change was primarily driven by the introduction of South Africa into the global community, and the need to develop new policy frameworks for a democratic future. Two national initiatives impacted strongly on the curriculum restructuring in all disciplinary fields at all the levels. The first was the introduction of the National Qualifications Framework (NQF) in 1996. The second was the shift to the programme-based approach to higher education funding, which has led to the development of national and institutional planning systems. Teacher education after 1994 became a national rather that a provincial competence. It became the prerogative of the minister of education to determine national policy and standards for the professional education of teachers, accreditation and curriculum frameworks.

The second period from 2000 to 2003 was more strongly shaped by national education transformation imperatives, with the incorporation of colleges of education into the higher education system. The legal framework was developed for qualifications and programmes leading to the employment of teachers, culminating with a revised version of the Norms and Standards for Teachers (NSE) (DoE 2000a) and supplemented by Criteria for Recognition and Evaluation of Qualifications for the Employment in Education (DoE 2000b). A four year Bachelor of Education (BEd) was introduced as the preferred IPET route offered in the FET specialization phase. Qualifications were to be developed by the standards-generating bodies (SGBs) and teacher education providers, subject to the new national processes for registration and accreditation set in place through SAQA, the DoE, and the Council on Higher Education. According to Parker (2004) ‘the NSE do not provide specific criteria, but rather a general picture on the basis of which universities and other higher education providers can design their own programmes and qualifications’.

This is a critical feature of the curriculum framework, one that created opportunity and accorded great responsibility to teacher educators. It meant that there was space for multiple

mediations and interpretations of the NSE instrument. The revised NSE adopted an outcomes-based approach centred on the notion of the competent teacher, defining seven roles that the teacher should be able to perform, as well as the knowledge, skills and values that future teachers required in order to perform these roles. Qualified teachers should be able to integrate the applied competences of each of the seven roles of educators. In particular, foundational subject knowledge was emphasized as core, and linked strongly to academic disciplines. In essence the new curriculum framework implied that 'institutions must ensure that teachers can teach and assess their subject content adequately within the contexts in which they teach' (Welch & Gultig 2002).

Essentially, the teacher education institutions were required to develop the new BEd degree for implementation in 2002, which resulted in tension between complying rapidly with administrative requirements on the one hand and developing quality integrated programmes in line with a new paradigm on the other.

The recurriculation and the incorporation of the Colleges of Education (CoE) into the technikons and universities occurred simultaneously. Lewin *et al* (2003) posits that the shift in teacher education to the higher education sector goes beyond simply a cost saving motivation arguing that it 'also signals a belief that what is required in teacher education in South Africa is a strong focus on subject/learning area content knowledge and a culture which universities rather than colleges seem to provide'.

The recurriculation primarily consisted of repackaging existing programmes to comply formally with nomenclature and structure of the new qualifications. The programmes of some of the colleges provided the core concepts for developing the new BEd qualification. This is contrary to the substantial academically driven engagement with the creative challenges of the NSE, which required a commitment to the new OBE conceptual framework.

In the context of the substantial change to the teacher education landscape since 1910, the requirement for individual institutions and academics to redevelop qualifications was greater than could be addressed in the short period given for formal compliance with the NSE. Most colleges, which for decades had been under provincial departmental control, had little autonomy over curriculum. There was strong direct departmental control over curriculum development and assessment, leading to perceptions that colleges were 'glorified high schools'. Soudien (2007) describes college lecturer's lack of autonomy over what they taught, '…lecturers seldom ventured beyond the textbook, which was invariably written by an

apologist for the apartheid system. When they did, they courted trouble and found themselves out of a job'. It is clear that lecturers, especially those from colleges, had never been involved in curriculum design and programme development.

For teacher education, the key shift in this period was the decentralization of control of responsibility over curricula to the university and the challenge to develop curricula in terms of theoretical and epistemological approach that was entirely new to most teacher educators.

The third period, from 2004 to 2005, was once again more strongly shaped by higher education dynamics, as teacher education academics were caught up in mergers and the creation of new institutional landscape. Some colleges were absorbed into the university structures and some into the technikons which later became known as Universities of Technology (UoT). The regulation and decision-making for teacher education had to be aligned and coordinated between multiple statutory bodies viz. the national and provincial education departments, the CHE, SAQA, the South African Council of Educators, the Education Labour Relations Council, and the Education, Training and Development Practioner (ETDP) Sectoral Education and Training Authority (SETA). Effective implementation depended on alignment between these multiple institutions with varying powers at different levels. Summararily, Parker (2004) argued that 'the dispersion of responsibilities and the division of authority has produced a decision-making gridlock exacerbated by a general lack of human resource capacity in the system'. To address this gridlock, reviews of C2005 and NQF were implemented to identify ways to simplify, streamline and enhance the effective implementation and to clarify the responsibilities and roles of the multiple regulatory agencies involved. A similar review of the teacher education framework was initiated in the form of the Ministerial Committee on Teacher Education (MCTE) whose purpose was not to replace the newly developed policies but to identify barriers and develop an 'overarching framework that will enable us to use the policies already in place to develop a coherent teacher education system and to focus sharply on the decisive role of teacher education in the transformation of education' (DoE, 2005). The impact of the institutional restructuring on curriculum development in a new academic program was very diverse as the education faculties tried to align them to the demands of the new policies. As a result there was a reluctance to proceed with the process until the publication of the new National Policy Framework for Teacher Education and Development (NPFTED).

The fourth period from 2006 to the present saw the finalizing of the restructuring process in the universities, and the attention shifted to aligning programmes and developing new curricula. For teacher education the HEQC was initiated to evaluate the quality of the programmes offered, and the NPFTED was published reiterating the core conception of the NSE that the notion of applied and integrated competence, associated with the seven roles for teachers of the Norms and Standards for Educators (DoE, 2000b), provides the basis for designing of new or revised teacher education programmes, (DoE, 2007). All new qualifications, which for teacher education included the 480–credit BEd degree, had to be aligned to the HEQF.

There was once again a demand on teacher educators to interpret the new criteria for the qualification, and to realign their programmes.

I have tried, in this section, to illustrate the complex situation that the lecturers involved in teacher training have found themselves over the last two decades. Those lecturers that have come from the cosy CoE system where programme structure and syllabi were given to them have had to face the new challenge of recurriculating their programmes during the restructuring process within an Education system that was constantly changing.

1.2 Rationale

There are three major developments that have led to the importance of this research.

Firstly, in its' restructuring programme, the state closed all the colleges of education (CoE) and incorporated them into the higher education system. Prior to the restructuring colleges of education were responsible for training teachers and offered Diplomas in Education. The curriculum including the syllabus content for these diplomas was developed, monitored and assessed by the Department of Education (DoE).

From the restructuring programme two significant issues arose.

Firstly, the three year CoE Diploma in Education was changed to a four year University Bachelor of Education degree. The new qualification was now subjected to the new policies that were introduced. They had to be registered with the South African Qualifications Authority (SAQA), comply with the requirements of the National Qualifications Framework (NQF), and be accredited by the Higher Education Qualification Committee (HEQC). Within the schools context the qualification was expected to deliver teachers who could perform

their expected roles as advocated in the Norms and Standards for Teachers (NSE). Guidance for the transformation of teacher education curricula came in the form of a national recurriculation process from 1995 to develop the Norms and Standards for Educators (DoE 2000b) (1996) to replace the old criteria. This process illustrates the complexity of alignment between national educational policy processes in general and teacher education policy specifically. In 1996 COTEP produced a new norms and standards policy document, and the accompanying criteria for the recognition and evaluation of qualifications. These were written in the language of 'outcomes' and were intended primarily to replace the diverse range of college curricula inherited from the apartheid dispensation. Once the NQF itself was operational, by September 1997, the DoE, in collaboration with the Council of Education Ministers, HEDCOM and COTEP, decided to revise the 1996 documents in order to align them with the NQF (Parker et al. 2005).

All providers of teachers' education were to revise their programmes subject to the approval of the Committee on Teacher Education Policy (COTEP) and the Heads of Education Departments Committee (HEDCOM), in line with a national core curriculum.

Secondly, lecturers who were not trained in curriculum design were tasked to develop a new curriculum for the new BEd degree. There does not seem to be much research done on curriculum development in EGD over this transition period but through my own involvement and correspondence it appears that lecturers for this course are expected to develop it themselves.

Thirdly, the subject changed from Technical Drawing to Engineering Graphics and Design (EGD) the details of which are contained in the National Curriculum Statements. Where Technical Drawing focused on the principles of drawing in its application on Mechanical drawing, EGD includes the principles of Civil and Electrical drawing as well as Computer Aided Drawing (CAD).

Lecturers were not only expected to learn the new content but also learn new techniques in planning and presenting the subject according to the newly introduced Outcomes Based Education (OBE) methodology. It is important that lecturers are au fait with these developments because it is the school subject that informs the syllabus in the BEd degree.

These issues are the background for the many frustrations and anxieties which the lecturers have experienced in the development of the universities BEd Engineering Graphics and

Design syllabus. As Carl (2008) states, 'It was inevitable that these policy changes would have an impact on teacher training, since training institutions were now expected to deliver teachers who could function optimally within this new dispensation'.

I feel that this research, through the analysis of the different EGD BEd syllabi and the enquiries made into the decisions that influenced the inclusion of certain content can help other lectures in this field, and perhaps in the official realms of curriculum planning. This fits in with the intentions of the National Plan for Higher Education (DoE 2010) that is to guide the development of higher education qualifications and programmes to ensure articulation between institutions, to see that goals are achieved.

Much research has been done on the challenges faced by academics in the restructuring and recurriculation process. Kruss (2008) indicates that research needs to be done on 'actual changes to the curricula'. This research aims to do that, as well as looking at the processes that have been used in the changes of the curriculum.

I have personally been part of the situation described above and have often felt confused. My personal experiences have helped to identify the issues around which this research is based. Through this research I hope to ascertain if the lecturers offering the same courses as myself are experiencing similar problems and to determine what they have done to overcome them. Hopefully these findings may be used to improve my situation as well as possibly help other lecturers who may find themselves in similar circumstances.

1.3 Research questions

The study is guided by the following questions:

1. What process was used to design the EGD syllabus?
2. What content is included in the EGD syllabus?
3. What has influenced the decisions to include the particular content in the syllabus?

The purpose of the study is to investigate the design process of the EGD syllabus in the BEd degree. Through this study, I will explore the reasons for selecting the planned content and the processes applied in the design. I then plan to relate the findings to the academic theory on curriculum design.

The study will be guided by three key questions. The first question will determine what processes the lecturers used in the designing the course and the content. The questions in the questionnaire aim to expose what research was done, what documents were referred to, if the design was based on a curriculum design theory, was it a creation of a new syllabus or was it adopted or adapted from an existing syllabus? The second question will determine what content has been incorporated in the planned curriculum. The data will be collected from the different lecturers and will be analysed using a simple document analysis process. The third question will determine the lecturer's research, processes followed and reasons for the inclusion of the content in the curriculum. The data will be collected through an open ended questionnaire which will provide the lecturer's own interpretations and experiences of the curriculum process. Further probing into the curriculum development process will be done, if necessary, through individual contact with the lecturer. This qualitative data will be analysed using a constant comparative approach.

1.4 Arrangement of thesis

This thesis is divided into six chapters. Chapter one presents the background to and rationale for the study. This chapter also provides the research questions which inform the research process.

Chapter two deals with the literature review. It presents the literature on how curriculum is perceived, as well as curriculum design and development.

Chapter three outlines the theoretical framework of an eclectic curriculum model based on concepts from Tyler, Taba, Reynolds and Beauchamp (1964) curriculum development models.

Chapter four describes the methodology adopted for the study as well as the methods used in collecting and analysing the data.

Chapter five presents the results and interpretations of the analysis of the data. This chapter is divided into three sections aligned with the three research questions.

Chapter six concludes the thesis and responds to the research questions by bringing together the findings and interpretations that were made in chapter four. It further makes suggestions and recommendations on the results obtained from the study.

Chapter 2 Review of Literature

2.1 Introduction

This chapter firstly reviews the literature on the definitions, paradigms and philosophies of curriculum, and then it explores the concept of curriculum development, in particular the design phase of the process. Secondly, the chapter will then investigate the perceptions of curriculum development in higher education with special focus on the development and changes within the teacher training scenario in South Africa. Lastly, the chapter sheds light on the subject Engineering Graphics and Design (EGD) and on the developments and trends in the subject in the schools and the teacher training environment.

2.2 What is Curriculum?

In Latin the word c*urrere* meant 'to run', and curriculum referred to the running or racing of chariots. The meaning of what constitutes a curriculum has been hotly debated during the last century. Today we refer to curriculum from an academic perspective, an 'agenda for social reconstruction' within a school, university or training environment. Most definitions can be categorized into two main groups' viz. Curriculum as a Plan and Curriculum as Experience.

2.2.1 Curriculum as Plan

The curriculum can be viewed as a plan or 'blue print'. Beauchamp (as cited in and Hunkins, 1998), asserts that only definitions involving a plan, system and field of study represent key or legitimate uses of the word curriculum. 'Curriculum can be defined as a *plan* for action or a written document that includes strategies for achieving desired goals or ends.' Saylor et al (1981) views curriculum, 'as a plan for providing sets of learning opportunities for persons to be educated', while Pratt (1980), advocates that, 'Curriculum is an organized set of formal education or training intentions' and Jon Wiles and Joseph Bondi (2010) posit simply that, 'curriculum as a plan for learning'.

If curriculum is a plan then the question to be asked is 'What is to be planned? Schubert (1986), Ornstein and Hunkins (1998) and Kelly (1989) suggest that curriculum can be viewed as a body of knowledge (subject content or subject matter) that needs to be transmitted to the learners. The contents of this plan are normally contained in a document referred to as the, syllabus or learning program. The syllabus will contain a 'set of tasks to be mastered, and

they are assumed to lead to a prespecified end' (Schubert, 1986). The syllabus is normally an official document presented to teachers by subject syllabus planners which according to Ornstein and Hunkins (1998), Schubert (1986), Tyler (1949) and Taba (1962) provide instructional strategies, sequencing procedures, the scope of the subject, and evaluation instruments. Education in this sense, is the process by which these are transmitted or 'delivered to students by the most effective methods that can be devised (Blenkin et al 1992). Curzon (1985) points out, that those who compile a syllabus tend to follow the traditional textbook approach of an 'order of contents', or a pattern prescribed by a 'logical' approach to the subject.

Curriculum is often defined as more than the syllabus; it includes 'all the planned learning outcomes for which the school is responsible'. Kelly (1989) stresses that a definition for curriculum needs to go beyond the official curriculum. The definition should include the intentions of the planner, the procedure used in implementing the intentions, the actual experiences of the learner which are the results of the teachers' attempts to implement the planners' intention, and the hidden learning that takes place as a result of what the planners have planned. While Beauchamp (1964) proposes the curriculum as a written document of what is intended to be taught, Saylor et al (1981), Stenhouse (1988), Tyler (1949), Grundy (1987), Kelly (1989) all advocate the thinking that the curriculum includes all the experiences that are planned and intended.

Although most definitions of curriculum indicate a plan, there are many opinions as to what the curriculum consists of and how it is presented. Bobbitt (1924) says that the curriculum is 'that series of things which children and youth must do to experience by way of developing abilities to do the things well that make up the affairs of adult life; and to be in all respects what adults should do'. This definition fosters the notion that the curriculum should be primarily about 'abilities to do things' and assumes that there is a consensus of 'what adults should do'. McCutcheon (1997) refers to that which 'constitutes what school people intend that students learn and what teachers say they intend to teach' as the overt curriculum. She also refers to aspects that are purposefully omitted from the curriculum which she terms the null curriculum. Aspects that are intentionally left out of the curriculum could range from the teachers' personal decision in the class to a political agenda.

We have seen that the term curriculum can be referred to by many as the plan of intentions that is used in the school to educate and train the learners, but is this what is really what the learner experiences?

2.2.2 Curriculum as Experience

What actually happens in practice is that the curriculum is not only refined to the intended outcomes. This implies that curriculum is a lot broader than the syllabus and other planned activities. It includes more than just a written statement. It encompasses not only the blueprint but also the experiences of the learners. Kelly (1989) suggested that in dealing with curriculum there is a need to adopt the definition, which goes beyond the official curriculum. The definition should include the intentions of the planner, the procedure used in implementing the intentions, the actual experiences of the learner which are the teachers' attempts to implement the planners' intentions and the hidden learning that takes place as a result of what the planners have planned.

Graham-Jolly (2002), posits that, 'on one hand curriculum can be viewed as a plan, blue print or intentions and is referred to as the official curriculum that is planned and documented (syllabus) and on the other it is viewed as what the learners actually experience as the plan is being implemented'.

Eisner, as cited in Ornstein and Hunkins (1998), says that curriculum is '…an entire range of experiences a child has within the school.' These are experiences the child will have that is not necessarily intended or experienced through everyday activities. McCutcheon (1997) refers to this as the hidden curriculum and may include aspects like manners, work ethic, gender and race equality etc. Kelly (1989) defines the hidden curriculum as 'those things which students learn because of the way in which the work of the school is planned and organized but which are not in themselves overtly included in the planning or even in the consciousness of those responsible for the school arrangements.' Cromley, (as cited in Prevedel, 2003) claims that, 'learners construct their own understanding from what they are exposed to in the classroom and what they experience in the rest of their lives'. The curriculum can be viewed, as Schwab (1973) posits as a construct which is fashioned as teachers and learners interact with the subject in a specific milieu. This view emerges from the original meaning of the word 'currere' and emphasizes the individual's own capacity to reconceptualize his or her own autobiography Schubert (1986). Pinar and Grumet (1976)

posit that the individual seeks greater understanding of themselves, of others and of the world, through his experiences and interactions. The curriculum becomes a reconceiving of one's perspective on life (Grumet 1980) through the interpretation of lived experiences.

To understand how complicated and difficult it is to define what a curriculum is, one must realize that it influenced by the ideological and political beliefs of the people responsible for designing and implementing it. Kliebard (1977) says, 'Curriculum is the ambiguous outcome of a complex interplay between certain social conditions and prevailing conceptions of how schools are supposed to function…affected by social, political, economic and intellectual forces'.

2.3 Approaches to curriculum

We have seen in the previous section how differently the curriculum can be viewed. Cornbleth (1990) posits that, 'How we conceive of curriculum and curriculum making is important because our conception and ways of reasoning about curriculum reflect and shape how we see, think and talk about, study and act on education made available to learners'. Ornstein (1998) agrees with this and indicates that, 'An individual's approach to curriculum reflects that persons view of the world, including what that person perceives as reality, the values he or she deems important, and the amount of knowledge he or she possesses', and then adds that, 'an approach expresses a viewpoint about the development and design of curriculum, the role of the learner, teacher and curriculum specialist in the planning of the curriculum, the goals and objectives of the curriculum and the important issues that need to be examined.'

Eisner (2002) posits that there are five orientations to curriculum that influence the way people think about curriculum. These are: the development of cognitive process, academic rationalism, personal relevance, social adaptation and social reconstruction and curriculum as technology. The *development of cognitive processes* emphasises the role of the curriculum and the teaching in developing the children's cognitive capabilities to learn. This cognitive development relates to Bloom's Taxonomy of educational objectives as it places more emphasis on the ability to reason and solve problems than on learning facts and theories. The *academic rationalisation* suggests that some subjects are more worthy than others. The school should therefore use these subjects to foster intellectual development in these subjects and not to broaden the curriculum with other unworthy subjects. The curriculum should have *personal relevance* to the learners. Children should have a voice as to what they should learn.

The curriculum should emerge from interaction and discussions between the learners and the teachers. According to *social adaptation and reconstruction* the function of the school is to implement a curriculum that will produce learners who can fit into and serve the needs of society. *Curriculum as technology* view curriculum planning essentially as a technical activity. Ornstein and Hunkins (1998) claims that this approach 'Relies on technical and scientific principles, and includes paradigms, models and step-by step strategies for formulating curriculum usually based on the plan, and sometimes called the blue print or document, goals, objectives and specified content and the activities are sequenced to coincide with the objectives, and learning outcomes are evaluated in relation to the goals and objectives'.

Perspectives in curriculum development are associated with the paradigms that 'knowledge is constructed according to three fundamental human interests' (Habermas, 1972). These are (1) 'technical/technocratic' perspective which is related to the positivist paradigm, (2) the 'practical' perspective which is related to the interpretivist's paradigm and (3) the 'emancipatory' perspective that is related to the critical perspective. There are many different types of curriculum models which are influenced by different thoughts and philosophies. McKenna (2003) posits that 'world views can be roughly delineated along similar categories to those of research and that fundamental differences between these three paradigms is a major factor accounting for the different ways in which educators approach the task of curriculum design'.

2.3.1 The Positivist Paradigm

This orientation developed in the modernity period of the world wars, the great depression and the industrial age. There was a need for the development of Fordist skills needed in the factories.

The *positivist paradigm*, as indicated by McKenna (2003), 'identifies a reality that can be discovered, measured and manipulated and this is aligned with the technical interest that is served by the generation of laws allowing for the control of the environment'.

The impact of this view in curriculum design results in a reflection on teaching and learning that is empirical. The nature of knowledge was understood to be a definable universal reality based on what was needed to know in order to work and live their lives.

Knowledge is a set of skills to be transferred from the educated teacher to the uneducated learner. The teaching methodology assumed a behavioural approach born from the concept of efficiency, influenced by business and industry and scientific management. Taylor proposed that jobs be simplified into smaller defined components, more management control over all the elements of the work place and better efficiency.

The works of Bobbitt (1924) and Tyler (1949) dominate theory and practice within this orientation. The central theory is that human life consists in the performance of activities. Education that prepares for life is one that prepares definitely and adequately for these specific activities. These will be the objectives of the curriculum. For Bobbitt (1924) curriculum is then, 'that series of experiences which children and youth must do and experience by way of developing abilities to do things well that make up the affairs of adult life; and to be in all respects what adults should do'.

This approach has a subject-centered orientation in which students gain mastery of subject matter based upon a predetermined course set of experts. It was assumed that what was important to know was the same for everyone, regardless of the context in which one lived. The learner has little input regarding the subject matter that is taught. The curriculum is influenced by the natural and behavioural sciences where the student is given the role of passive receiver of knowledge and the learning environment is controlled by the instructor. The content to be learnt is important and not the process of acquiring that content. The curriculum is a planned event which is organized around content units and the sequence of what is taught follows the logic of the subject matter.

There are three main issues of the technical approach.

Firstly, is that the plan or programme assumes great importance. This aspect is supported by Grundys' more recent definition of curriculum as 'A programme of activities designed so that pupils will attain so far as possible certain educational and other schooling ends or objectives' (1987). The criticism of this is that these programmes invariably exist prior to and outside the learning experiences and is based on the assumption that the same curriculum is appropriate across any number of contexts. Much of what is deemed to be appropriate for one person in a particular environment is actually inappropriate for another who is in a completely different environment.

Secondly, the control of the learning process is out of the hands of the learner. The process of learning is seen as one ‘in which the expert teachers deposit knowledge into the student who lacks knowledge’ (Freire, 1970). The traditional model omits the importance of the learner experience, requiring the learner to accept, rather than challenge, the information being transmitted.

Thirdly, the type of knowledge is grounded in experience and observation, ‘which permit the deduction of law like hypotheses with empirical content.’ (Habermas, 1972) and which is congruent with empirical-analytical sciences. The observations give us predictive powers that potentially enable us to have control over our environment. ‘Within the objectives model of curriculum the interest is in controlling the learning so that by the end of the teaching process, the product will conform to the eidos expressed in the original objectives’ (Grundy 1987).

According to Beuachamp (1964), ‘theory may be defined as the knowledge and statements that give functional meaning to a series of events and take the form of definitions, operational constraints , assumptions, postulates, hypotheses, generalizations law or theorems’.

The curriculum that is developed within this paradigm is typically a planned curriculum. Cornbleth (1990) indicates that the technicist curriculum planner separates curriculum from its context by assuming that curriculum is independent of the educational context in which it is supposed to be practised. The technicist perspective to curriculum development is associated with the behavioural approach and uses step by step strategies in the development of goals and objectives, and specifies content, learning outcomes and activities (Ornstein and Hunkins 1998).

2.3.2 The Interpretivist Paradigm

Reacting to the Technical approach the advocates of the practical orientation emphasize the ‘understanding the environment so that one is able to interact with it’. (Grundy 1987)

The *interpretivist paradigm* seeks to extend human understanding of the environment so that we can exist harmoniously within it. Researchers operating within this paradigm believe that an individuals’ behaviour can only be understood by sharing their frame of reference and by understanding the individuals’ interpretations of what truth and reality is. This paradigm is aligned with the ‘practical’ interest advocated by Habermas (1972) and defines it as ‘a

fundamental interest in understanding the environment through the interaction based on a consensual interpretation of meaning'.

Knowledge is not seen as absolute or objective but as being socially constructed. It is formulated by the creation of one's own meaning through understanding the meaning and interpreting the data based on one's own perceptions and experiences and is viewed holistically within a particular context. Knowledge is seen to be a process of making meaning through interaction. The validity of the interpretation is dependent on the consensual interpretation of what others judge to be reasonable and acceptable. Grundy (1987) says 'It follows from the moral imperative associated with the practical interest that the curriculum informed by such an interest will be concerned, not simply with promoting knowledge in pupils, but also with promoting right action'.

The learning takes place not through a top down approach where the child is a passive acceptor of information but through interaction and engagement. The teacher's role is to facilitate the learning experience so that the learner can develop his own meaning of the situation. As Habermas (1972) indicates, 'access to the facts is provided by the understanding of meaning'. This is done through an inductive process by interpreting social situations through reasoning, reflection and deliberation. This learner-driven approach also draws upon the work of contextual theorists, who believe that effective learning is situated within the social context of real surroundings and situations.

The curriculum design within the interpretivist paradigm as explained by Cornbleth (1990) is 'an on-going activity that is shaped by various contextual influences within and beyond the classroom and is accomplished interactively, primarily by teachers and students'. The curriculum that is developed within this paradigm is not viewed as a linear equation but typically 'as a continual cyclical process'.

2.3.3 The Critical Paradigm

The *critical paradigm* is also an anti-positivist approach but the curriculum developer, according to Guba (1990), is focussed, not with understanding multiple perspectives that makes up the curriculum, but on how the curriculum can be used to challenge and transform the social relations. This paradigm is aligned with the 'emancipatory interest' advocated by Habermas (1972) in which 'a process of self-reflection which generates critical theories about the way in which ideology, coercion and distortion inhibit freedom' (Boughey 1999) is

central. This approach question the authority of the curriculum developers in deciding what should be taught and who is being served by the outcomes selected, and in whose interest the assessment criteria are designed. This perspective encourages the participation of teachers and students in the curriculum design process.

Critical reconceptualists acknowledge that knowledge is socially constructed, but progress beyond the hermeneutic by emphasizing emancipatory political interests. Schubert (1986) argues that 'the search for meaning and virtue is impossible if not accompanied by a social organization that empowers human beings to transcend constraints imposed by socio-economic class and its controlling ideologies….that provides for socioeconomic equity and justice'.

The curriculum is seen as a political tool designed by those in power and attempts to impose its values and ideologies onto society. Jansen (1998) points out that it does so in three ways, by selecting the knowledge that must be formally taught, having an influence on aspects that are not formally taught (hidden curriculum), and what they intentionally exclude from the curriculum (null curriculum). The purpose of the curriculum ought to be emancipatory but is really controlling and preserving of the existing order. So how do we stop those in power from oppressing and disempowering certain individuals and sectors of society? Counts' (1932) believes that this should be done in the schools. Teachers need to use the power that they derive from their positions in the school and society, not in a devious and corrupt way, but with the aim of raising a new generation equipped to self-determination. Friere (1970) advocates the necessity for critical thinking, dialogue and decision making activities that are used to expose knowledge truths. The curriculum is negotiated by both the teacher and the student with the student being central to the process of constructing and interpreting knowledge. The learner takes ownership of his learning destiny.

This approach aims to emancipate the learner by equipping him with critical thinking abilities with the agenda for cultural reconstruction. Grundy (1987) advocates that, 'the fundamental interest in emancipation and empowerment is to engage in autonomous action arising out authentic, critical insights into the social construction of human society'. This emancipation is on two levels. Firstly, at the level of consciousness, where the learners will develop their own understanding of the distortions of the truths. Secondly, at the level of practice, where the learner is involved in some action which attempts to make changes. This is called praxis.

It is clear that there have been many factors that have led to theorists developing their ideas of curriculum. Each orientation has positives and criticisms which should be noted. Pinar (1977) says ‘we are not faced with an exclusive choice: either the traditional wisdom of the field, or conceptual empiricism, or the reconceptualization. Each is reliant upon the other....and [we] must strive for synthesis, for a series of perspectives on curriculum that are at once empirical, interpretive, critical, and emancipatory’.

As indicated earlier, these orientations have influence on the curriculum debates and curriculum making; as such it could be assumed that they can be depicted in the curriculum development and design. The subsequent section examines curriculum development and the curriculum design.

2.4 Curriculum development

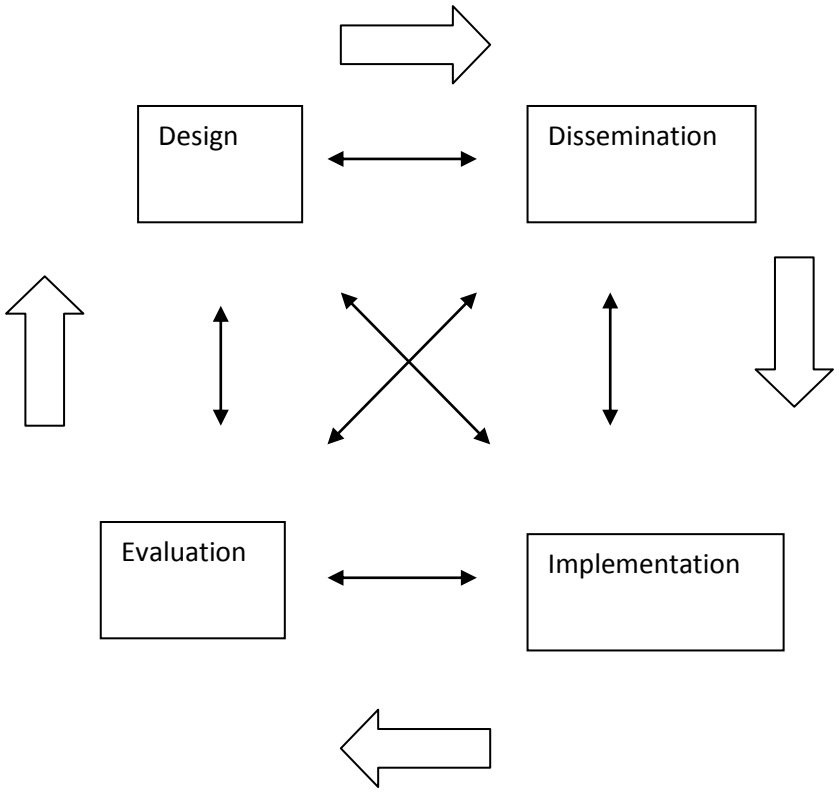
As with the definition of Curriculum the term ‘curriculum development’ lends itself to different interpretations. Posner (2002) states simply that curriculum development ‘is a technical matter, more suitably done by technical experts; the matter of deciding instructional methods, and content suitable for addressing certain objectives. However, curriculum development according to Schubert (1986), ‘refers to the process of deciding what to teach and learn, along with all the other considerations’. The other considerations referred to include historical, philosophical, psychological, and economic. Kliebard (1977), posits that the ‘basic questions of curriculum cover not only epistemological (what should be construed as school knowledge? or simply what should we teach?), political (who should control its selection and distribution, and what group of the population gets taught what?) and technical commitments (how shall curricular knowledge be made accessible to students? or simply how should it be taught); and how should the various components of the curriculum be organized to form a coherent whole? … but also economic (how is knowledge linked to the existing distribution of goods and services?) ideological (whose knowledge is it?) and ethical (how shall we treat others responsibly and justly?)’.

Akhtar (2004) adds that the historical precedents will have an influence on the traditions, cultural patterns and social aims of the society. It is within the framework of the existing structure that the curriculum is developed. He further adds that research brings about new ideas and practices which tend to influence the curriculum developers into experimentation with the intention of improving the quality of education. These points made by Akhtar are endorsed in the National Curriculum Statement (NCS) (DoE 2003). Two of the points made

are, 1. ‘Social transformation in education is aimed at ensuring that the educational imbalances of the past are redressed’ and 2. ‘Indigenous knowledge systems in the South African context refer to a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years’ It can be seen then that curriculum development refers to the curriculum considerations at a macro- level.

Curriculum development as suggested by Carl (2009) can be regarded as an ongoing process which is characterized by certain phases. These include design, dissemination, implementation and evaluation.

Carl briefly describes curriculum design as that phase during which a curriculum is planned. Curriculum dissemination (or implementation) is that phase during which consumers receive the intended curriculum and are prepared for its implementation. The curriculum implementation is the application phase of the intended curriculum. The purpose of the evaluation phase is to determine the effectiveness and success of the process. The following is a clear illustration of this:



Phases of curriculum development (Carl 2009)

It is not the intention of this study to discuss the whole curriculum process in depth but to focus on the curriculum design phase.

2.5 Curriculum Design

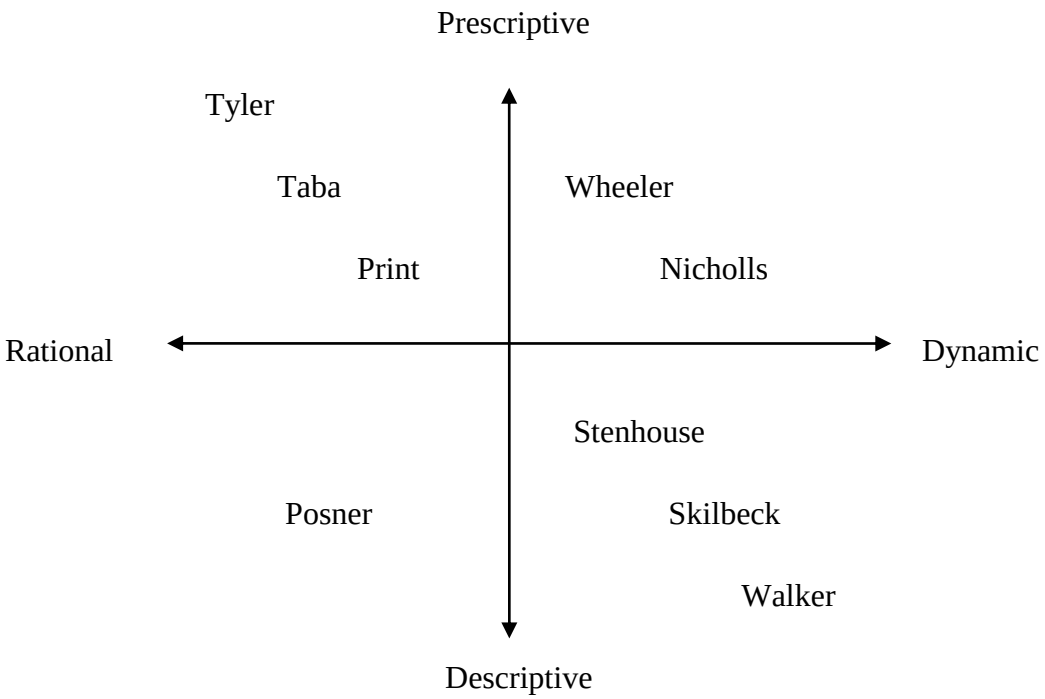
Curriculum design, according to Schubert (1986), is usually more specific and refers to, 'the planning of curriculum guides, the analysis of instructional materials, the development of instructional units, the preparation of learning materials: intent or objectives, content or activities, organization and evaluation' Curriculum design then refers to the curriculum considerations at a micro- level and is a sub-set of the curriculum development. The product of the curriculum design process is commonly referred to as the syllabus or according to the SAQA (DoE 2003), 'the learning programme'.

A facet of nearly all design processes is to create a prototype or model to communicate the essentials of something planned. A model is used to develop a plan to follow, and provides a vehicle for communication and understanding between the writer and the user.

The following section will look more specifically at curriculum design models.

2.5.1 Curriculum Design Models

Curriculum models in general, lead one through a process of thinking about the scope and sequence of what should be taught. Models that are prescriptive require designers to follow a rigid set of procedures or a sequence of steps about how to do something. Models that are descriptive have a more flexible approach and places emphasis on the process of design. The figure by Print (1993) shows the dimensions in which curriculum design models are placed.



Dimension in which curriculum design models are placed. Source: Print (1993)

Curriculum design models, according to Akthar (2004), can be classified into three categories within the dimensions proposed by Print (1993). These are rational, cyclic and dynamic models.

2.5.1.1 Rational models

The rational model suggests a logical and sequential structure method that provides for a useful base for planning and devising curricula. The model provides a straight forward time efficient approach in meeting the curriculum task. It also emphasises the role and value of objectives. Objectives in the context of curriculum are defined by Ntoi (2007) as ‘an aim

which describes learners' behaviour'. Stenhouse (1988) posits that they are sometimes called 'intended learning outcomes'. Ornstein and Hunkins (1998) assert that objectives are written at three different levels. The first level of writing objectives is the program objectives. The second level of objectives addresses the course. The third level of objectives concerns the classroom objectives which can be further divided into lesson plan objectives. They also contend that the first and second levels are usually developed by the curriculum designers while the level three classroom objectives are developed by the teachers.

Ornstein and Hunkins (1998) suggest that objectives are, 'observable behaviours that are expected of the learners after instruction,' and, are stated in terms of outcomes.

Eisner (2002) argues that:

> Curriculum theory as it pertains to educational objectives has four significant limitations. First, it has not sufficiently emphasised the extent to which the prediction of educational outcomes cannot be matched with accuracy. Secondly, it has not discussed the ways in which the subject matter affects precision in stating educational objectives. Third, it has not distinguished between the logical requirements of relating means to ends in curriculum as a product and psychological conditions useful for constructing curriculum.

2.5.1.1.1 The Tyler Rationale

The Tyler Rationale (Tyler 1949) was first introduced in the late 1930s when he developed a process for thinking about the purposes for schools and how to develop the curriculum. The Tyler Rationale is developed through posing four questions which he considers fundamental to curriculum and instruction. These questions are.

1. What educational purposes should the school seek to attain?
2. What educational experiences can be provided that are likely to attain these purposes?
3. How can these educational experiences be effectively organised?
4. How can we determine whether the purposes are being attained? (Tyler 1949)

These questions address the four elements in Tyler's theory, namely, the elements of educational objectives, of selection of curriculum content, of organization of content and of evaluation. Educational objectives are derived out of information about the learner, about the contemporary society and opinions of the subject specialist. The objectives are then stated in

terms of learners' expected behaviour. The selection and organisation of the content not only provides the operational definition but also suggests implementation strategies and procedures. The evaluation advocated in the rationale firstly recognizes the role of the teacher participation in curriculum work, and secondly rejects the assumption that curriculum planning should always begin and progress through a particular sequence.

2.5.1.1.2 Taba's Inverted Model

Taba's Inverted Model of curriculum development is different to most other models because it begins in the classroom with the teacher. Taba (1962) posits that there are eight steps, beginning with research in the community and its schools. Step two will be to analyze the data to inform teachers, enabling them to formulate the specific objectives that would be the basis of the teaching units. Step three involves selecting the content; this must be done considering Piaget's development hierarchy. In step four, the content must then be logically sequenced according to the cognitive level which makes continuous and accumulative learning possible. Steps five and six involve the selection and organization of the activities. Each activity must have a definite function, set at the cognitive level of the learner. The activities must be introduced, discerned by the student and then connected by the student to the previous experiences. In stage seven the unit being taught must be continuously evaluated and revised as needed. The final analysis is done in stage eight to determine how well the content can be implemented, and whether the objectives as determined in stage one will be achieved.

The strength of rational models is its' nature. Its' logical sequential structure provides it with a useful base for planning and devising curricula. The essence of Tyler (1949) and Taba's (1962) models is in emphasizing the role and value of objectives. By conceptualizing and stating the objectives curriculum developers are forced in to thinking and planning in a logically rational and systematic manner. This recipe-type approach using the sequence of developing objectives, formulating content and learning activities, and finally evaluating the extent to which objectives have been achieved, provides direction and purpose to the process and reduces levels of confusion.

The weakness of this rational model to some is perhaps that an over emphasis on the formulation measurable outcomes has sometimes placed an excessive use of time and effort on phrasing and writing particular objectives which reduces the development of other elements within the curriculum. Critics of the rational model (Kliebard, 1977; Skilbeck,

1976; Brady, 1995; Marsh, 1986) argue that its proponents do not adequately explain the sources of their objectives.

2.5.1.2 Cyclical Models

Cyclical models lie along the continuum between the extremes of rational and dynamic models, incorporating elements of both to provide a different approach to designing curriculum. These models are basically an extension of rational models in that they are essentially logical and sequential in approach. However, they see the curriculum process as a continuing activity constantly in a state of change as new information and practices become available.

Cyclical models view elements of the curriculum as interrelated and interdependent, so that the distinctions between the elements, as in the rational model, are less distinct. The model allows for more interaction between the curricula elements. In this way, through some situational analysis the curriculum reflects more accurately the needs of the students for whom it is contended.

The situational analysis is a preliminary stage which makes the curriculum developers cognizant of the factors impinging upon the curriculum they are developing. Nicholls and Nicholls (1972) advocate that the inclusion of the situational analysis phase is a deliberate move to force curriculum developers to be more responsive to the environment and particularly to the needs of the learners. They argue for a much wider and more comprehensive approach to diagnosis and analysis of all the factors which make up the total situation, followed by the use of knowledge and insights derived from this analysis in curriculum planning.

The main strength of the cyclical model is that it is flexible in that changes can be made as the situation changes. The model allows for the revision of the new situation and subsequent changes to the other curriculum elements such as the objectives, content, methods and evaluation.

The weakness of this model may be the ability and time required to undertake an effective situational analysis. Print (1993) posits that in order to be well apprised of the situation, developers must employ numerous techniques to elicit data about the learning situation. They feel that this can become extremely time consuming and developers often prefer upon their experienced intuition rather than on the more systematic collection of the situation based data.

2.5.1.2.1 Wheeler's Model

Wheeler (1976) argued for curriculum developers to employ a cyclical process in which each element is related and interdependent and follows a cyclical pattern. Wheeler (1976) developed and extended the idea of a rational process advocated by Tyler (1949) and Taba (1962). He suggested five interrelated phases in the curriculum process which is presented in a cyclical format. The phases are: 1. the selection of aims, goals and objectives. 2. The selection of learning experiences to help achieve these aims, goals and objectives. 3. The selection of content in which certain types of experiences may be offered. 4. The organization and integration of the teaching and learning experiences and content into an appropriate cognitive development order. 5. Evaluation of each phase, and attainment of goals. To complete the cyclical process, phase 1 would be reinitiated with a reselection of the aims, goals and objectives based on the information from the evaluation.

2.5.1.2.2 Nicholls and Nicholls Model

The Nicholls and Nicholls (1972) model for curriculum development adopted the logical approach as advocated by Tyler (1949), Taba (1962) and the cyclical process by Wheeler (1976), but developed it to include and emphasize the situational analysis. They suggested five stages in the curriculum process viz. 1. The situational analysis. 2. The selection of objectives. 3. The selection and organization of content. 4. The selection and organization of methods. 5. Evaluation. The cyclical model will allow for the process to return to phase 1 where a new situational analysis will be done. The situational analysis allows the developers to be more aware and responsive to the environment and needs of the learners. Nicholls and Nicholls (1972) argue for a more comprehensive approach with an analysis of all the factors which make up the total situation, followed by the use of knowledge and insights derived from this analysis in curriculum planning.

2.5.1.2.3 Beauchamp's Model

Beauchamp (1964) identifies a series of five critical decision-making areas that constitute a model for curriculum development. The first, the *arena for curriculum engineering*, refers to the status of the environment; whether it is a classroom, a school system or a district. While education in South Africa is the responsibility of the state that develops policy and frameworks and evaluates for accreditation, the curriculum development and implementation decisions are left to the universities. The second area is the *selection and involvement of people.* Beauchamp (1964) indicates that there are groups of people involved in curriculum

planning. These are specialized personnel such as curriculum specialists, representative groups composed of specialist personnel and classroom teachers, professionals in the education system, and professionals outside the education system. It is clear that the selection of people is dependent on the arena in which the curriculum is developed. The third area is the *organisation and procedures for curriculum planning.* This area defines the procedures to be followed by those selected to establish curriculum goals and objectives, selecting the content and learning activities, and determining the overall design. The fourth area is the *curriculum implementation*. The point of discussion here is the void between what is planned, how it is interpreted, and eventually what is actually implemented. The fifth area that Beauchamp (1964) identifies is the *curriculum evaluation.* An on-going evaluation process of data collection is used to continually improve the designed curriculum.

2.5.1.3 Dynamic Models

On the other side of the spectrum to the prescriptive models are the descriptive/interactive models. Proponents of these models, Walker (1971) and Skilback (1976), argue that the rational and cyclical models do not reflect the reality of curriculum development. By avoiding having to write objectives, they posit that curriculum development should commence with any curriculum element, be able to retrace their steps and proceed in any order. This enables the curriculum process to be more flexible and the curriculum developers to be more creative.

The proponents of the linear and cyclic models suggest the non-systematic models appear confusing and lacking in direction. They argue that there is a lack of emphasis placed on the construction and use of objectives and the lack of direction through not following a logical sequence in developing the curricula. This results in a significant waste of time and results in an ineffective development process and confusing curriculum.

2.5.1.3.1 Walker's Model

Walker (1971) argued that the objectives and rational models of curriculum development were neither popular nor successful. He contended that curriculum developers do not follow the rational sequencing of curriculum elements of the prescriptive approach. Rather, they proceed through three stages (The Platform, the Deliberation and the Design) in their 'natural' preparation of the curricula.

Stage 1, the ‘Platform Stage’ contains statements that consist of ‘a hotchpotch of ideas, preferences, points of view, beliefs and values that are held about the curriculum. Walker suggests the platform includes an idea of what is and a vision of what ought to be, and these guide the curriculum developer in determining what he should do to realize his vision.

In stage two, the ‘Deliberation Stage’, Walker (1971), contends that curriculum developers clarify their ideas proposed in the platform statements and reach a consensus. Unlike the sequential steps proposed in the objectives model, this phase is a complex, randomized set of interactions that eventually involves an enormous amount of background work before the actual curriculum is designed.

In the final stage, the ‘Design Stage’, curriculum developers make their decisions about the various curriculum elements which are used as the basis for the proposed curriculum.

2.5.1.3.2 Skilbeck’s Model

Skilbeck (1976) developed a dynamic type model by which could be used to develop appropriate curricula. His model consists of five steps viz. 1. A situational analysis. 2. Formulation of goals. 3. Programme building. 4. Interpretation & implementation 5. Monitoring, feedback, assessment and reconstruction.

Skilbeck’s (1976) main contribution to curriculum development during his time was stressing that developers must be aware of the source of their objectives. They need to complete a situational analysis. A situational analysis is defined by Print (1993) as ‘the process of examining the context for which a curriculum is to be developed and the application of that analysis of several factors that relate to that context … for the development of curriculum intent, curriculum content, learning activities and evaluation.’

The model appears to resemble a rational approach, Skilbeck (1976) contends that curriculum developers may begin their planning at any of the five stages and proceed in any order. He states that ‘The model outlined does not presuppose a means – end analysis at all; it simply encourages teams or groups of curriculum developers to take into account different elements and aspects of the curriculum process to see the process as an organic whole and to work in a moderately systematic way’.

2.5.1.3.3 Reynolds Model

Reynolds (2000) proposes a model for researching development and curriculum change

The model evolved from two directions, firstly, through reading policy literature, curriculum, educational history, social science pedagogy, sociology areas, and examining primary documents such as committee minutes, and secondly, from talking to syllabus committee members from the period and reading their survey replies, and examining the syllabuses produced. She argued that there were macro-theories encompassing an examination of the broader social and political context in which policy develops and the role of the state in this; middle-range theories which concentrate on the different stages of policy development and implementation; and micro-theories concerning decision making and decision makers within particular institutions. It is also important to examine the text of syllabus documents/policy documents.

The facets of the environment for syllabus development or syllabus change entail the political, economic, social and cultural factors of the period and the ideology in educational circles that is pre-eminent at the time.

2.5.1.3.4 Friere's Liberation Model

Friere's Liberation Model (1970) was developed in the political struggles of oppressed people in Brazil. His curriculum model is an example of theory emerging from practice as opposed to a model that emerges from practice based on a research experience. 'The model centers on creating structures of thought to empower the oppressed to understand themselves and their circumstances and create their own self, social and cultural knowledge so they can emerge into a world of their own making and control' (Hewitt 2006). Anthropological research is done on the community for the curriculum development and implementation to emancipate the people. It is a distinctive curriculum of the people for the people for special schooling in a specific context.

2.6 Summary

In a summary of the models that exist, Carl (2009) notes that the models developed show correspondence with the models of Tyler (1949) and Taba (1962). However, whatever model is used, it still appears essential to plan any curriculum design systematically and thoroughly. The curriculum design is the phase which gives the curriculum development phase its impetus. It is from this phase that the wheel starts to roll and that the stage is set for further development. Carl (2009) emphasizes that the success of any curriculum depends largely on the quality of its design. If this development phase is of a poor standard, then what is disseminated and implemented will also be of a poor standard.

This section has looked briefly at the phases of the curriculum development and then quite comprehensively at the different models for curriculum design.

2.7 Curriculum discourses in higher education

Chapter one shed some light on the changes that have occurred in higher education especially in South Africa. It was found that there were vast differences in opinion in what the IPET curriculum should entail. The understanding of what is and what constitutes a curriculum suitable for teacher training is dependent on the philosophies of individuals and is therefore subjective.

Traditionally, the curriculum for higher education has been determined by two main curriculum models; the disciplinary model which has been dominant in the academic universities, and the vocational/professional model which has been prevalent in the college sector and undergraduate professional programmes (Karseth 2005). The central aim of the disciplinary discourse implies a strong emphasis on students' acquisition of theoretical knowledge and where academic productivity "derives from an inward focus upon the development of concepts, structures and modes of argument, rather than outwards upon the world' (Ensor 2004). Advocates of the vocational discourse emphasise that education should be an apprenticeship into specific knowledge domains in order to develop specific skills relevant for specific professions. Stark and Lattuca (1997), argue that all professional programmes involve conceptual and technical competences that indicate that students have acquired the knowledge base and the technical skills needed in that chosen field.

The models above are not only indicative of what higher education in most countries in the western world but also in teacher training in South Africa. The teacher training curriculum that was implemented in the academic universities was based on the disciplinary model. Typically the students completed a degree within a subject field and then completed a general teaching diploma. However, the curriculum for teacher training in the colleges of education was based on the vocational/professional model where the student studied the subject content together with its application in the school environment.

Pinar (1978) claims that traditional curriculum writing was aimed at the schools because the, 'curriculists are former school people who…. Tend to be less interested in basic research, in theory development, in related developments in allied fields, than in a set of perceived realities of classrooms and school settings generally'.

The new trends in the western world have seen these divisions being reduced and both forms of institutions adopting a fairly similar approach. The universities have adjusted their programmes to prepare the students more effectively for the work place, while the non-universities have upped the academic rigour of their professional programmes. John Pratt (1999) posits:

> *In the historical context, the unification of higher education in 1992 could be seen as simply the most spectacular example of academic drift in British history; the polytechnics finally succumbed to the long standing hierarchy and became universities. But history is not as simple as that. Indeed, it was less that the polytechnics became universities than that the universities has become polytechnics (s.261).*

Very similar shifts in teacher training are evident in the South African scenario. Firstly, colleges of education were closed down or incorporated either directly into the universities or into Institutes of Technology which eventually became Universities of Technology. This means that all teachers training can only be done through a university.

A debate arose as to the location of where teaching training should be placed in the university. Would it be best located in the subject specialist departments within the university to draw on academic expertise applying the disciplinary model or would it be best to apply the vocational/professional model and locate it in the School of Education and taught by education academics who understand the requirements in the school context. These debates led to many differences of opinion as lecturers from different institutions with different philosophies were brought together through the recurriculation process.

This increase in status had an impact on the expectation of a programme with a higher academic rigour. In general then, the curriculum of the teacher training qualifications have also had to be reassessed and either changed or adapted.

The colleges of education (CoE) teacher training programmes had always been conceived of within a cooperative framework with curricula formulated centrally by the state and then implemented across the whole sector by the departments within individual institutions. After the restructuring programme was completed and the lecturers from the CoE environment had eventually settled in the Universities of Technology, they found that there was no syllabus provided to them.

Lecturers were now expected to design and develop their own curriculum as there was no controlling state body that supplied the curriculum and monitored the assessment. Lecturers were generally in unchartered water. Kruss (2008) points out that 'There was demand on teacher educators to interpret the new criteria for qualifications and to realign their programmes which entailed an academically driven curriculum design to formally comply with the new qualifications structure, before authentic engagement can begin'. What was required according to Kruss (2008) was not what appeared to happen.

In addition to understanding the reasons for selecting the planned content using the three key questions, this study will also look at what the theorists propose should be the process for curriculum development. Generally educators do not use research to guide their teaching. During curriculum change experienced teachers will tend to draw on their experience to adopt new methods without understanding the underlying principles and assumptions of the new methods. Egbert (1984) says, in reference to teachers' planning, 'Teachers ignore research and overestimate the value of personal experience.' Parker and Adler (2005) argue that despite the regulation of control that the state implemented on teacher education, teacher educators 'are now positioned to redefine knowledge and practices for teacher education and to re-insert disciplined and disciplinary inquiry into teacher preparation programmes.

It is assumed through interaction with some lecturers that they have adopted or adapted the given school curriculum to be used in the BEd degree without referring to the latest research.

Research by Cooke (2000) that aimed to determine the extent to which curriculum reform was taking place, showed the following. In the process of institutional policy development, none of the institutions had specifically formulated curriculum development policies. Many conceptions of curriculum remained fairly traditional in practice and the relevance of the curricula, and their capacity to promote the kind of civil values envisaged in the original policy documents, was questioned. The subjects' identity still remains entrenched in terms of the NATED 151 with very few changes to the new NCS. Different interpretations of policy and conceptions of programmes produced differences both within and between institutions. Most interviewees in their research did not identify the NQF or SAQA as providing the primary impetus for curriculum change, but rather the economics of survival. It seemed that curriculum reform often came down to a simple paper exercise in rewriting curricula in SAQA terms (Cooke 2000). In her research done at CPUT, Gordon (date unknown) claims that 'A senior member of staff reported that recurriculation of the technikon National

Diploma in Education to create the BEd FET simply involved adding a fourth year of study to the three year diploma – a 'repackaging' to meet the requirements of the NSE – and the fundamental changes were not made to the content of the programme'. This poses the question. Why are lecturers not designing curriculum as it should be done? Are lecturers educated regarding the process in curriculum design and development? Kruss (2008) posits that;

> *The challenge is to find ways to meet the expectation for teacher educators to be strong academics, conducting research, and at the same time developing research-led curricula to produce competent teachers capable of transforming the schooling system in South Africa.*

2.8 Engineering Graphics and Design

2.8.1 Historical perspectives of Engineering Graphics and Design (EGD)

Technical drawing, also known as drafting, refers to the discipline of producing precise illustrations of things in fields such as architecture and engineering. Generally, the term technical drawing pertains to any kind of drawing fashioned with technical ideas. Technical drawings are a means of graphic communication which aims to clearly and concisely communicate information about transforming technical ideas or concepts into reality. A technical drawing often contains both a graphic representation of its subject, and dimensions, notes and specifications.

Drawing to communicate technical ideas may predate the written language. The oldest drawing instruments known, a drawing board inscripted with a temple plan, date from the 3rd millennium BC from the city of Lagash in Babylon. The ancient Greeks influenced drawing through their work in geometry, and tools such as the compass and triangles used in engineering were then developed.

The beginning of contemporary technical drawing originates from 15th century renaissance artists like the Italian Architect Filippo Brunelleschii, who, in about 1415, demonstrated the geometrical method of perspective. Leonardo da Vinci further developed perspective and technical drawing, using geometric principles from famous Greek mathematicians like Pythagoras of Samos, and Euclid of Alexandria. In the 18th century the mathematician Gaspard Monge developed descriptive geometry when designing a complicated fortress in a star shape using orthographic projection. Early 19th century isometric drawing was introduced by the Englishman William Farish.

Up until the 20th century technical drawings were used mainly within the architectural discipline. They were among the first design discipline to make use of conventions of plan, elevation and section in design and production control. Inventors, engineers and builders made each product one at a time, and each product was unique. Many designs used through the 19th century were accomplished by first completing a hand sketch of the object to build. These were then converted into wooden models, and there was no need to make accurate drawings.

The start of the 20th century brought upon the Industrial Revolution and with it specialized fields of engineering to meet the needs of industry. Prototypes were made and then drawings of these were sent to factories were objects were made en masse. This brought on the need for technical drawings of the objects to be made. The drawings needed to be understood by the factory workers so that they could produce the artifact correctly and accurately. Both engineers and artisans therefore needed to be educated in this new means of communication that often spanned across countries and even languages. After the world wars there was a need for technical skills and many technical schools were established by governments around the world. Although the curriculum in the technical schools included a variety of trade subjects such as plumbing, carpentry, fitting and turning, pottery etc, the core subject was technical drawing. The syllabus for technical drawing developed according to the needs of industry and to links to the other trade subjects. The drawings were done manually by skilled draughtsman with the use of drawing instruments. The basic drawing instruments used since the 15th century had progressed from a square and compass to set squares, drafting machines, stencils and ink pens. The development of the computer has had a major impact on the methods used in design and creating technical drawings. Computer programs used to do technical drawings have been developed called Computer Aided Drawing (CAD). Today most inventors, engineers, architects etc. use one or more of the many CAD programs to complete their drawings. The technical drawing syllabus has therefore had to evolve to include the use of CAD to prepare learners to move into the technical field. CAD is a compulsory subject in higher education in the fields of engineering and architecture. In most countries CAD is being introduced in the schools syllabus whether in Technical Drawing or Technology.

2.8.2 Engineering Graphics and Design as a school subject

This section aims to give the reader some background to the new subject Engineering Graphics and Design (EGD), which is offered in the schools in South Africa.

The content that was taught in the schools in the 20th century was influenced by two main factors. Firstly, there was a need to train more people with technical expertise and technical drawing was introduced to provide this. Technical drawing was linked to all technical or practical subjects from engineering to pottery. Secondly, the subject was still seen as a drawing subject and the syllabus contained the skills used in art. Artistic representation of technical objects through freehand drawing and rendering was emphasised. Technical Drawing was the subject that was used to represent technical drawings in an artistic form. At the turn of the century there was a need to produce technical working drawing which were drawn to certain conventions and symbols and included dimensions. The syllabus that evolved placed less emphasis on the artistic elements and focussed more on orthographic projection, geometrical construction, isometric and oblique projection, assembly drawing and sectional views. These sections were the basic sections needed in the blue print drawings required in the manufacturing fields in which there was a boom.

South Africa, being a colony of the United Kingdom, inherited and presented a similar curriculum. The subject was initially referred to as Geometrical Drawing probably due to the emphasis it placed on geometry. The emphasis on geometry weakened as the subject developed to include more perception and visualisation and the name changed to Technical Drawing. Technical Drawing, as defined by Benade and vd Heever (1985) 'is a graphic language which enables us to describe the exact size and shape physical objects'. The grammar of this language is based on the four universal functions namely perception, sketching, construction and projection.

It must be remembered that this occurred in the apartheid years and that there were several education departments representing different races and provinces. The white education departments were provincialised, whereas non-white education was divided into the Department of Education (Blacks), the House of Delegates (Asian) and the House of Representatives (Coloured), and was nationalised. The syllabus presented to the different Education Departments was controlled by Education Ministry's South African Certification Authority (SAFCERT). The syllabus was however, a 'core syllabus', and acted as a guideline for the subject advisors, teachers and examiners from the different departments to work from. From an analysis done on the exam papers by the researcher it was noted that although all the examining bodies examined the same sections there was a marked difference in the cognitive standard in questions on similar sections. It was clear that the examiners had placed different emphasis on different sections by the breadth and depth of the content examined. The depth

of knowledge that teachers were expected to go into was normally determined by evaluating locally produced books, and by consulting past examination papers. Both of these were the product of more experienced teachers in the subject field.

Several changes were made to the school Technical Drawing syllabus through the eighties and nineties. Some sections were removed while sections like perspective drawing were included. More emphasis was placed on assembly drawings

With the introduction of Curriculum 2005 (C2005), Technical Drawing was replaced with Engineering Graphics and Design with a new definition of the subject. 'Engineering Graphics and Design integrates the cognitive and manipulative skills that are used to design and communicate graphically. The subject combinations lines and symbols to render services and design processes and systems that contribute to economic growth and enhanced quality of life' (DoE 2005).

2.8.3 The subject in teacher training

Some universities may use the name Technical Drawing or Technological Design but they all refer to similar content that is presented in the subject in the BEd (FET) specialisation degree. The structure of the subject in the diploma offered through the Colleges of Education prepared the teacher to teach the subject in the schools. As a result the syllabus that was presented to the colleges basically covered a slightly more advanced school syllabus, and included the teaching methodology of the subject. The following table shows the similarity between the South African schools higher grade syllabus and the Department of Education syllabus for the Secondary Teachers Diploma, presented through the colleges of education. It must be noted firstly, that syllabi presented were to be a guide to teachers, and secondly there were differences in syllabi between the different education bodies of the Department of Education, House of Assembly and the different provincial education departments.

SECTION	Schools (HG)Standard 8-10 1995	DET teachers diploma (1987)
1. Plane Geometry	☑	☑
Lines	☑	☑
Angles		
Polygons	☑	☑

Circles Tangency Blending lines and arcs Construction of geometrical patterns	☑ ☑ ☑ ☑	☑ ☑ ☑ ☑
2. Descriptive Geometry Points, Lines and Laminas True lengths and Shape Inclination of lines and planes to HP, VP and SVP Traces of a line to HP, VP and Lamina Intersecting lines and planes	☑ ☑ ☑ ☑ ☑	☑ ☑ ☑ ☑ ☑
3. Solid Geometry Orthographic projection Sectional views with cutting plane parallel, perpendicular or oblique to the principal planes Auxiliary view and true shapes of sections. Interpenetration of solids with axes intersecting at 30^0, 45^0, 60^0 or 90^0 and offset or co-axial. Surface developments. Solids inclined to one or two planes	☑ ☑ ☑ ☑ ☑	☑ ☑ ☑ ☑ ☑
4. Machine Drawing Assembly drawings Fasteners Dimensioning	☑ ☑ ☑	☑ ☑ ☑

5. Freehand Drawing Basic hand movements Application to all sections	☑ ☑	☑ ☑
6. Loci Involutes Archimedean Spiral Helix Cams Cycloid and Trochoid	☑ ☑ ☑ ☑ ☑	☑ ☑ ☑ ☑ ☑
7. Machine Design Calculation of compressive, tension and shear stress in simple machine designs		☑
8. Didactics		☑

2.8.3.1 Content comparison school syllabus (1995) & DoE (STD) syllabus

It is clear from the table that, apart from Machine Design and Didactics, the syllabi for the Colleges was very similar to that of the schools. The academic rigour was increased in the colleges' syllabi by examining at a more complex level. The assembly drawing in the colleges' examination often involved ten to fifteen components, whereas the schools examination normally had between eight to fifteen.

2.8.4 The new subject in the schools

The new Curriculum 2005 (C2005) was introduced into the schools with the aim '… to replace *A Resume of Instructional Programmes in Schools, Report 550 (2001/08)* as a document that stipulates policy on curriculum and qualifications in grades 10-12 (General).' (DoE 2003). Technical Drawing was changed to Engineering Graphics and Design (EGD). The purpose of EGD is very similar to that of Technical Drawing in that it aims to prepare the learner for the needs of society, enabling him/her to a) read a technical drawing, and b) represent his/her ideas graphically while complying to a set of national and international standards. Where the core content in Technical Drawing was more mechanically biased, EGD provides a broader base preparing the learner in the fields of mechanical as well as civil and

electrical. To prepare the learner for the new technological world Computer Aided Drawing (CAD) has been included as a method of drawing. The following table indicates the comparison between the old Technical Drawing and the new Engineering Graphics & Design syllabus.

Content	T D	EGD
1. Civil Graphics		
Conventions		☑
Scale		☑
Design		☑
Floor plans		☑
Roof construction		☑
Elevations		☑
Sections		☑
Pictorial	☑	☑
Relevant constructions	☑	☑
2. Mechanical Graphics	☑	☑
Conventions	☑	☑
Fasteners	☑	☑
Assemblies	☑	☑
Pictorial	☑	☑
Design		☑
Cams	☑	☑
Developments	☑	☑
Loci	☑	☑
Relevant Geometry	☑	☑

	☑ ☑	☑ ☑
3. Electrical Graphics Circuit symbols Logics Wiring Diagrams Design		☑ ☑ ☑ ☑ ☑
4. Computer Aided Drawing Hardware Software File management Producing Drawings		☑ ☑ ☑ ☑

2.8.4.1 Content comparison between TD and EGD syllabus

The EGD syllabus aimed to prepare the learner to enter any of the main technical fields of civil, mechanical and electrical and not just the mechanical. It aimed also to provide the learner with CAD skills, which has now become the industry norm.

2.8.5 The impact on teacher training

It is evident that the syllabus taught in the CoE reflects very closely that of the school syllabus. This is simply because the qualified teachers will be returning to the schools to teach and not progress to a specialised direction within the industry environment. 'The design of programmes and qualifications … must lead to the competence to teach learning programmes, learning areas, subjects or foci in the school's curriculum' (DoE 2003). The teacher syllabus should therefore be governed by the school syllabus. Any syllabus changes that have been made in the school syllabus should be implemented in the teacher training syllabus. As there is no syllabus provided for teacher education, the onus is left to the lecturer to develop the syllabus for the BEd degree. While it may seem that that teacher education is regulated by the state through the Norms and Standards for Educators (NSE), 'the curriculum for specialised teacher education is not prescribed, it is open to interpretation and generation

by relatively autonomous agents, i.e. teacher educators in the HEIs.' (Parker and Adler 2005). Teacher educators are therefore expected to be experts in their fields, design an appropriate of curricula, and be able to select and produce suitable learning material and present it in a manner that will lead to the production of well qualified teachers. How the teacher trainers have coped with these new demands is the crux of this research.

2.9 Conclusion

This chapter has presented an account of the literature pertinent to this research.

Firstly, we looked at how our world views and philosophies influenced our concept of the intention of a curriculum and the impact on its development. Secondly we looked at several curriculum development models. Lastly we looked at the development of the subject 'Engineering Graphics and Design' to understand the challenges that teacher trainers are faced in developing a new curriculum for the Bachelor of Education degree.

Chapter 3 Theoretical Framework

3.1 Introduction

This chapter outlines the theoretical framework of the study. It presents the Eclectic curriculum design model which is used as the main theoretical framework. The model is used as a guide to advocate what components are recommended for the curriculum design process as well as to investigate what processes the lecturers have actually taken in their curriculum design.

3.2 Curriculum Design in Context

Curriculum design, as explained in chapter two, is a phase within curriculum development and relates both to the creation of a new curriculum as well as the replanning of an existing one. The process entails important decision making, according to Carl (2009), regarding criteria and procedures for curriculum development, educational and teaching objectives, learner and subject knowledge, as well as necessary subject didactic knowledge and skills.

3.2.1 Levels

Curriculum design, as posited by Oliva (1988) and supported by Carl (2009), invariably takes place at different levels viz. the macro (national), the meso (provincial and department), and the micro levels (school). The broad curriculum is designed by national government at the macro level and disseminated to the provincial education departments at the meso level. It is then forwarded to the school teachers at the micro level who are responsible for interpreting it and presenting it to the learners. This is a similar process that was exercised in the colleges of education system. Now that the programmes are developed and administered solely by the universities, lecturers are expected to design the course curriculum themselves. Lecturers are no longer simply interpreters and administrators of the curriculum at the micro level; they are also curriculum designers involved at all the levels.

3.2.2 Criteria

The decision-making process of planning and designing the curriculum, according to Walters (1978), is ‘influenced by criteria which will eventually determine how the product of the design will appear’. Several writers have set out certain criteria for curriculum design (Doll, 1978; Walters, 1978, Carl, 2009) and a general consensus is summarized below.

- Clear, well defined educational objectives are essential
- The subject curricula and other courses must promote the realization of the objectives
- The curriculum must reflect the needs of the community.
- The curriculum must accentuate the cognitive, affective and psychomotor aspects.
- The curriculum must ensure that correlation between subject content exists.

Curriculum design requires thorough planning and decision making and it is desirable to have a comprehensive knowledge of the relevant curriculum models. Oliva (1988) posits that curriculum leaders must take cognisance of available models; they must be able to test them and decide or develop one which is understandable and workable for their groups. An overview of different models was discussed in chapter two. The next section will discuss the Eclectic model which is used as the theoretical framework for the study.

3.3 The Cawood-Carl-Blackenberg Model / Eclectic Model

The Eclectic Curriculum Design model has been based on the components of the Cawood-Carl-Blackenberg (Carl 1995) as well as including the common components from the models discussed in chapter two which are pertinent in the investigation in this study.

Where some models may have a bias of focus in the macro or micro levels, this model consists of the components which are necessary in curriculum design at the macro, meso and also the micro level. As the lecturers in this study have the responsibility of designing the curriculum from the beginning it was felt that this eclectic model, which has many similarities to most of the other models, would be suited.

The Eclectic model consists of the following components: situation analysis, aims and objectives, selection and handling of core and learning contents, choice of teaching media, selection of teaching methods and evaluation. It is against these components that the investigation as to the process of the curriculum design by the lecturers will be analysed.

3.3.1 Situational Analysis

Nicholls and Nicholls (1972) advocate that the inclusion of the situational analysis phase is a deliberate move to force curriculum developers to be more responsive to the environment and particularly to the needs of the learners. Beauchamp (1964) refers to knowing the status of the

environment in which the curriculum is developed. Skilbeck (1976) emphasizes that developers must be aware of the source of their objectives. The process of situational analysis is a method evaluation comprising the collection and interpretation of all information which may influence curriculum development. Reynolds (2000) suggests that the information is obtained, firstly, through reading policy literature, curriculum, educational history, social science pedagogy, sociology areas, and examining primary documents such as committee minutes, and secondly, from talking to syllabus committee members from the period and reading their survey replies, and examining the syllabuses produced.

Carl (2009) indicates that curriculum planners who look at the broad curriculum on a national level, viz. the macro level, will first make an analysis of the needs of the country and the broad school population, and accordingly formulate broad objectives for the school phases.

3.3.1.1 Purpose

The first step in developing or designing anything, whether it is an artefact or a document, is that there is a reason for it. Any activity is futile if there is no purpose. In designing a syllabus Bray (as cited in Carl, 2009) advocates that the first priority in knowing where we are, what we have, and where we hope to be, is the determination of the goal. Oliva (1988) posits that establishing the purpose is often based on the set, broad educational goals and philosophies of life. The purpose of the syllabus must be clearly defined and articulated to assist the designers in providing the parameters in which to work during the research for the syllabus document.

3.3.1.2 Subject research

Selecting the content is done in the situational analysis too, as Reynolds (2000) posits that this is done by ‘talking to syllabus committee members from the period and reading their survey replies, and examining the syllabuses’. Taba (1962) posits that ‘to satisfy the requirements as determined in the research on policy, requirements of industry and expectations from society’ need to be included in the research during the situational analysis.

Research needs to be done on the subject to determine the latest methods or techniques, the requirements from industry (in this case the schools), defining a purpose and formulating aims and objectives for the course, relevance, degree of difficulty, available resources, demands and requirements of the syllabus, depth of study, time scheduling, available text books and other learning matter, and structure of the subject content.

Chapter one highlighted the important changes in the situation that the lecturers in this study faced. These include (1) the change from a diploma to a degree, (2) the change of the narrow Technical Drawing subject to a broad Engineering Graphics & Design one which includes several new sections including CAD, (3) a change of pedagogic methodology to OBE and (4) the change from implementing a curriculum planned and provided by the state to developing one in an autonomous environment.

3.3.1.3 Political

The ruling party of any country will impose its aspiration and authority on state run organisations, including the education system. Reynolds (2000) highlights that political influences have a big impact on the curriculum design. Friere's Liberation model is a typical example of how political issues can have a major influence on the emphasis placed in the design of a curriculum. Anthropological research is done on the community for the curriculum development and implementation to emancipate the people. This was very evident in South Africa with the recent introduction of Curriculum 2005. Jansen (1999) argued that the reason for the introduction of C2005 and the haste with which it was to be implemented was political. This view was supported by the Teacher Development Directorate which admitted that, 'C2005 is a political strategy that is used to drive change. There was no way this couldn't be political' (DoE 2000a). This is not unique to the new government. According to Jansen 'A historical account further suggests that politics remains a primary force in shaping the timing, focus and content of the curriculum policy in democratic states (Jansen 1999).

3.3.1.4 Learners

Carl (2009) posits that no curriculum development process can begin without knowing for whom the syllabus is being planned. The most basic point of departure for any curriculum design is dependent on the learners. Curriculum designers must take into account the learners development. This includes their age, gender, physical growth, intellectual and creative development, personality factors, psychological needs and attitudes in respect of the subject.

The background of the learners considers the home and family environment, the home language, the home culture, the school environment in or from which the learners come, general background to technology and subject matter, financial status

3.3.1.5 Teacher/Lecturer

The curriculum planner needs to have an understanding of the person responsible for presenting the course. He needs to consider the teachers view on education in the broad sense, their views on the learners and the subject, the extent of their curriculum knowledge and skills, subject knowledge, qualifications, teaching experience and teaching ability (Carl 2009). In some courses lecturers are only expected to present specialist sections of the course and in others the lecturer presents the whole course.

3.3.2 Aims and Objectives

It is clear from the models discussed in chapter two that all the models stress the importance of setting and working around aims and objectives. Tyler's (1949) leading question for his rationale asks, 'What educational purposes should the school seek to attain? Carl (2009) stresses that, 'curriculum designers must have a clear understanding of the educational and teaching goals as well as the objectives of the particular subjects'. This is supported by Cawood (as cited in Carl 2009) who advocates that, the manner in which goals guide education, and the quality of instruction, are basic requirements for all instructional learning situations in all subject areas at all levels.

The purpose then of the aims and objectives is that they give direction and that they are determinative in the design process, Carl (2009) posits that aims and objectives are formulated on three educational levels:

- The macro level, which is concerned with the identification of the final destination at national level, within a particular cultural context, within a school phase for a particular group or broad curriculum development for a particular subject.

- The meso level has to do with the identification of aims within a specific school curriculum or more complete subject curriculum development, and

- The micro level, which has to do with the identification of aims within a specific subject module or even a lesson or lesson unit.

Reynolds (2000) argued that there were macro-theories encompassing an examination of the broader social and political context in which policy develops and the role of the state in this; middle-range theories which concentrate on the different stages of policy development and implementation; and micro-theories concerning decision making and decision makers within

particular institutions. It is also important to examine the text of syllabus documents/policy documents.

Walters (1978) proposes a hierarchy of goals from instructional aims in the micro level to the broad educational goals arising from the philosophies of the broad community.

Curriculum planners must also be aware of the differences between aims and objectives. An aim is broadly stated and indicates the total extent of an educational undertaking around subjects or themes within a demarcated terrain. An objective is an exact precise description of the teacher or learners' behaviour or achievement which must be realized at the end of a set time period. Rowntree (1978) posits that well formulated objectives give direction to the determination of method, media and evaluation strategies and therefore offer a frame of reference against which a value determination may be made regarding the success of the curriculum.

Setting aims and objectives are therefore a necessary step in curriculum design as it gives direction to the process and a means by which it can be evaluated.

3.3.3 Content

Tyler's (1949) second question for his rationale asks what educational experiences can be provided that are likely to attain these purposes? Carl (2009) states that, 'When one is considering the curriculum, the content dimension is a core aspect which normally determines the nature and extent of the relevant curriculum. One cannot consider the curriculum without involving the content dimension with it'. When discussing the whole curriculum one will refer to all the experiences that the learner must have to attain the broad as well as the specific aims and objectives. The curriculum planners in the macro level are responsible for selecting the content that will provide the learner these experiences.

Walker (1971) claims that, curriculum developers make their decisions about the various curriculum elements from 'a hotchpotch of ideas, preferences, points of view, beliefs and values held about the curriculum to be used as the basis to realize his vision for the proposed curriculum. It is felt then that the selection and classification of contents cannot take place in a haphazard manner. This of fundamental importance for the curriculum developer, as irrelevant and incorrect contents can by their impact, drastically influence the path of life of the learner.

Selecting the content is done in the situational analysis to, as Reynolds (2000) posits ‘through reading policy literature, curriculum, educational history, social science pedagogy, sociology areas, and examining primary documents such as committee minutes, from talking to syllabus committee members from the period and reading their survey replies, and examining the syllabuses produced’. Taba (1962) includes ‘to satisfy the requirements as determined in the research on policy, requirements of industry and expectations from society’. It is of extreme importance for the planners to know to what purpose the knowledge learnt is going to be used. Rowntree (1978), advocates that the knowledge has its source in three types of objectives viz, life skills (future needs of the community), methodological objectives (analysis of subject by subject specialists, and content objectives (analysis of subject structure). The school curriculum focuses more on providing the learner with broad foundational curriculum content with the aim of preparing them to progress into a more specific vocational education system. In higher education the curriculum planned must build on this general education and develop a curriculum which will prepare the learner for the demands of the workforce in which he will find himself. Selecting the content then will consider the expected knowledge of the incoming learner, the time frame and the expected knowledge that the qualifying learner must have attained.

A synthesis of the criteria for the selection of content proposed by Walters (1978) and Carl (2009) shows that:

- They must serve the realization of the curriculum aims.
- They must be realistic, manageable, accessible and viable.
- They must be relevant.
- They must take learners existing knowledge into account.
- They must be stimulating and motivating.
- They must have balance in the regard to extent and depth of study.
- They must be topical to in regard to needs.
- They must be representative of the relevant subject.

3.3.4 Organising learning experiences

Once the content for a subject or course has been selected at the macro level it is then documented for the purposes of implementation. This document, referred to as the syllabus (or learning programme as in C2005), acts as a reference guide for the teachers who are responsible for presenting it to the learners. Carl (2009) explains that the document does not normally prescribe how and when the syllabus must be presented; it is the responsibility of the teacher, at the micro level. Tyler's (1949) third question for his rationale asks, 'How can these educational experiences be effectively organised?'

As a starting point it is important that the teacher interpret the syllabus to understand the planned aims and objectives. This will help him in the planning and presentation of the learning experiences so that the intentions of the planners are disseminated correctly down the process. The teachers' next step is to focus on selecting and organizing of the teaching and learning activities; this is done by developing a learning programme. In doing this the following should be considered:

- Determine how much content has to be taught and in what time period. A year planner allows for a structured teaching and assessment programme, and so that the appropriate amount of time is allocated for each section.

- Determine how many lessons will be needed to complete each section. Lessons must be planned so that enough time is planned for teaching and practice for learners to acquire sufficient skills.

- Must have knowledge of the learners' general and prior subject content knowledge before planning each section. The activities planned must be connected to the students' previous experiences.

- Must have knowledge of the expected levels the learners need to achieve in the different grades. Taba (1962) advocates that each activity must have a definite function and be set at the cognitive level of the learner.

- Sequencing the lessons within a section, across sections as well as from year to year. The content must be sequenced so that learners can construct knowledge through building on basic principles.

A logical learning programme with appropriate learning activities should lead to effective learning and result in positive grades in the evaluation process.

3.3.4 Evaluation

The previous section emphasized the importance of having objectives in designing a curriculum or course. It is also important then, at the end of the process, to determine whether the objectives have been sufficiently met. An evaluation of the success of the program must be carried out. Carl (2009) proposes six functions of evaluation which are:

- To determine the success of instruction or the quality of the learning outcomes.
- To determine the suitability of the curriculum.
- To direct replanning and adjustments.
- To determine whether grading and advancement are possible.
- To monitor progress.
- To identify defects timeously and correct them.

Wheeler (1976) says, that evaluation 'enables us to compare the actual outcomes with the expected outcome, and to arrive at conclusions about this comparison with a view to future action.'

Carl (2009) posits two orientations in which the evaluation must be done, curriculum and pupil. Curriculum orientated evaluation, done at the macro level by the curriculum developer, seeks to determine how effectively the objectives of the broad curriculum have been achieved. Pupil orientated evaluation, done at the micro level by the teacher, evaluates the effectiveness of the subject or lesson curriculum.

It is often wrongly believed that evaluation should come only at the end of a process of curriculum development. Experience shows however that curriculum design is a continuous, cyclic process; so also is evaluation. Evaluation therefore involves asking such questions as:

(a) Is the new curriculum likely to work?

(b) To what extent are the various choices (of objectives, content, methods, materials), appropriate?

(c) To what extent are the intended objectives being achieved?

(d) To what extent have the various processes worked?

(e) What lessons can be learnt from all activities already carried out for further curriculum development?

An evaluation of whether the objectives have been met is very subjective and there are several models (Kelly (1989), Ornstein & Hunkins (1998), Davis (1980), Stake (2004), Stenhouse (1988)) designed specifically for this purpose.

In this section we have seen then that designing a curriculum or course entails a considerable amount of decision making from a combination of research and experience. In designing the curriculum for the BEd degree it is imperative for the lecturers to consider the situation analysis, the aims and objectives, the content to be learned, the organising of the learning experiences and the evaluation process.

Chapter 4 Research Design

4.1 Introduction

'Research is the process of trying to gain a better understanding of the complexities of human interactions. Through systematic means, the researcher gathers information about those interactions, reflect on their meaning, arrives at and evaluates conclusions, and eventually puts forward an interpretation of those interactions.' Marshall and Rossman (1989).

This study investigated the curriculum development in the BEd degree, in particular, the process used in the design phase of the curriculum development. Spradley (1979) posits that the process of research is not done haphazardly but in a systematic way. This chapter outlines the design used in this study. It begins by presenting the aim and purpose of the research. It then explains the methodological paradigm to which the research falls. It continues with an account of the setting, the procedure for selecting informants, and the methods used in the collection of data. The chapter also includes other information viz. issues on reliability and validity, ethical considerations as well as limitations of the study. It also presents the theoretical framework used as a guide in the analysis of data and which forms the basis for what theory advocates should be happening in the process of curriculum design.

4.2 The Research Aim

As indicated in chapter one, the purpose of the study was to investigate the development of the content for the Engineering Graphics and Design course offered in the BEd degrees. The intention was to understand the processes applied in the curriculum design and the reasons the lecturers had for selecting the planned content. The research began with the formulation of clear and unambiguous research questions that were used to stimulate the line of investigation as discussed in the previous section. I then planned to relate the findings to the academic theory on curriculum design. The study was guided by the following three key questions:

1. What process was used to design the EGD syllabus?
2. What content is included in the EGD syllabus?
3. What has influenced the decisions to include the particular content in the syllabus?

The first question aimed to determine what processes the lecturers used in the designing the course and the content. The questions in the questionnaire aim to reveal what research was done, what documents were referred to, whether the design was based on a curriculum design

theory, and was it a creation of a new syllabus or was it adopted or adapted from an existing syllabus? The aim of the second question was to determine what content has been incorporated in the planned curriculum. The data in the form of course syllabus was obtained by the different lecturers and analysed using a simple document analysis process. The third question aimed to determine the research carried out by the lecturers, the processes administered, and reasons for the inclusion of the content in the curriculum. The data was collected through a questionnaire which gathered the lecturer's own interpretations and experiences of the curriculum process. Further probing into the curriculum development process will be done, if necessary, through individual contact with the lecturer.

4.3 The Research Methodology

The above indicates an interpretive non-positivist approach to the research. Cohen et al. (2008) posits that, 'the central endeavour in the context of the interpretive paradigm is to understand the subjective world of human experience' and 'efforts are made to get inside the person' and 'strives to understand and interpret the meaningful behaviour of the individual'. To undertake this investigation a questionnaire survey and document analysis was used to obtain information from suitably selected participants to try to understand their experiences.

Cohen et al. (2008) claims that a survey can be used to gather data 'with the intention of describing the nature of conditions, or identifying standards against which existing conditions can be compared, or determining the relationships that exist between specific events'. The survey in this study was used to investigate the nature or process of the said curriculum development. Although surveys are generally used for a wide target, Cohen et al. (2008) explains that surveys can be used for smaller detailed studies as in this study.

Morrison (1993) provides several characteristics of surveys which may be pertinent to this study. Surveys are useful in that they usually:

- *Gathers data on a one-shot basis and hence economical and efficient.* Once the participants were contacted the questionnaire was sent to them via e-mail. The participants could simply open the document, complete it on the computer and then e-mail it back. There were no problems as all the participants but this were suitably computer literate and the questionnaires were returned timeously. Some participants had to be contacted more than once to remind them to send the course content document but this had no impact on the progress of the study.

- *Provide descriptive, inferential and explanatory information.* The questionnaire used closed and open ended questions. Once the questionnaire had been collected the data needed to be analysed and the researcher had to interpret the meanings of the situation through the eyes of the participants in their context. There are multiple interpretations, and perspectives of events and situations, and the interpretation of reality is therefore multilayered and complex. This hermeneutic approach, according to Habermas (1972), aims to 'seek to clarify, understand and interpret the communications of 'speaking and acting subjects'. This hermeneutic process of interpreting someone else's interpretation of reality is open to subjectivity.
- *Gathers standardized information*. The benefit of using a survey meant that the same instrument was used for all the participants. The questionnaire could be filled out by the participants at their convenience and in their own environment without the intimidating presence of an interviewer. This hopefully encouraged honesty from the participants in answering the questions. Having a hard copy to work from helps to alleviate the possibility of inaccuracies which could happen during the transcription of information as is often the case when using interviews. The answers to the questions can be interpreted more objectively because the same questions are presented to the participants in the same way.
- *Ascertains correlations and relationships* The interpreted data required a lot of careful sifting, sorting, reviewing and reflecting on, data so that the eventual analysis reflects valid and reliable results. Where the positivist researcher begins with a theory and develops a hypothesis to prove or disprove the theory, the non-positivist develops the theory at the end through the findings of the research. The relationships between variables are not presupposed but emerge as the research progresses and the theory becomes sets of multifaceted meanings which yield insight and understanding of people's behaviour in varied situation and contexts.
- *Generates accurate instruments through their piloting and revision*. Two instruments were generated in this study. A questionnaire which was to be answered by the participants and a document outlining the course content. These are discussed in detail in chapter 3.3

The research methodology for this study is an interpretivist comparative study within the qualitative paradigm. In order to compare them the course content was analysed as well as the

schools NCS programme for the subject as well as to substantiate comments made by the participants in the questionnaire.

4.4 The Research Methods

The study requires the lecturers from the universities to submit, together with the completed questionnaire, a copy of the detailed planned syllabus to the researcher. It is intended that the syllabi will be analysed to determine, the scope, the detail, the sequencing, the levels in each of the phases, and the commonalities and differences that exist between them. A comparison of these syllabi will be made to the National Curriculum Statements for EGD in the FET band.

The study used a questionnaire to determine information regarding the development of the curriculum in use. Closed questions are used to determine the personal details and the experience, training and competence of the individuals responsible for developing the syllabus. Open ended questions are used to obtain information regarding the resources used and the process followed in developing the syllabus. The questions were sequenced, firstly with closed questions to obtain some background information and worded so that the participant did not feel threatened at the start of the questionnaire. Open ended questions where set to seek responses on opinions, attitudes and perceptions used to try and get a deeper meaning into the processes used and to determine strengths and weaknesses of the course design.

A pilot study of the questionnaire was done to check for ambiguities and appropriate interpretations and to determine if there would be any problems with the interpretation by the participants. It was sent to two experienced researchers for an evaluation and comments, and suggestions were implemented. It was also sent to a test participant in a similar situation to the proposed research participants. This situation being that he is lecturing the EGD BEd degree, but not at a UoT.

4.5 Content Analysis Study

Leedy and Ormrod (2001) define this method as ‘a detailed and systematic examination of the contents of a particular body of materials for the purpose of identifying patterns, themes, or biases’. Content analysis review *forms of human communication,* including books, newspapers and films, as well as other forms in order to identify patterns, themes, or biases. The method is designed to identify specific characteristics from the content in human

communications. The researcher is exploring verbal, visual, behavioural patterns, themes, or biases. The procedural process for the content analysis study is designed to achieve the highest objective analysis possible, and involves identifying the body of material to be studied as well as defining the characteristics or qualities to be examined (Leedy & Ormrod, 2001). The collection of data is a two-step process. First, the researcher must analyse the materials and put them in a frequency table as each characteristic or quality is mentioned. Second, the researcher must conduct a statistical analysis so that the results are reported in a quantitative format. The research report has five sections: the description of the materials studied, the characteristics and qualities studied, a description of the methodology, the statistical analysis showing the frequency table, and. drawing conclusions about the patterns, themes, or biases found in the human communications and data collection.

4.6 Data analysis

Document analysis is the systematic examination of instructional documents such as syllabi, assignments, lecture notes, and course evaluation results in order to identify instructional needs and challenges and describe an instructional activity. The focus of the analysis was used as a preliminary study to gain insight into the syllabi so that a critical examination of the reasons for the planned content could be done.

The constant comparative approach, according to Merriam (1998) and Neuman (2003) involves categorising data, developing conceptual definitions and examining the interrelationship between the concepts. The analysis and presentation is done on three levels, namely, a descriptive account, category construction, and analysis making inferences and generating theory. The analysis involves the process of open coding, axial coding and selective coding in the process of categorising data, developing conceptual definitions, and examining interrelationships among the concepts. Open coding involves assigning codes to themes identified, and helps to reduce the amount of data. Axial coding is used to organise the themes and identify key concepts. Neuman (2003) posits that ‘during axial coding the researcher asks about causes and consequences, conditions and interactions, strategies and processes, and looks for categories and concepts that cluster together’. Selective coding is a more abstract analysis to code major themes through looking at specific concepts that illustrate, compare and contrast the identified themes.

4.7 Ethical considerations

According to MacMillan & Schumacher (2001), ethics in research studies involve considerations of informed consent, deception, confidentiality, anonymity, privacy and harm to the subjects. Once the participants for this study were identified they were all individually contacted telephonically by the researcher. The background to and the purpose for the study was highlighted and a verbal invitation to participate was offered. It was also explained to the participants that it would be totally voluntary and if at any time they wanted to withdraw their information from the research their request would be granted. Their personal and university names as well as the data collected would be used solely for this study and not revealed in any other form or document. All of the participants contacted agreed to participate and a covering letter and questionnaire were sent to them. All the aspects that had been discussed telephonically were again made clear in the covering letter. The following is an extract from the covering letter, 'In order to allow honest comments and evaluation I would like to assure you that the results of the survey will be used purely for my master's dissertation and that pseudonyms will be used and persons and institutions names will not be revealed or exposed'. The questionnaire form also included a declaration by the participant as well as by the department/school head in which the participant is located that they understand and consent to participating in the research.

4.8 Validity and reliability

The trustworthiness of any research results is dependent on the extent to which validity and reliability has been accounted for in the study. Validity may be addressed through the honesty, depth richness and scope of the data achieved, the participants approached, the extent of triangulation and the disinterestedness or objectivity of the researcher (Winter, as cited in Cohen, Manion & Morrison, 2008).

Too few participants can render a study invalid. It is felt that because all the participants that could be identified had agreed to participate in this research, the results prove to be an accurate reflection of the particular group, albeit a small one.

The opinions, attitudes and perspectives of the participants as well as the researcher's interpretation of the data all contribute to a subjective interpretation that makes the research impossible to be 100% valid. There are several strategies, summarised by Macmillan &

Schumacher (2001) that are used to enhance validity in a qualitative research. The following are appropriate to this study.

Strategy	Description
Participant language – verbatim accounts	The use of a questionnaire provided literal statements from participants and quotations from documents
Low inference descriptors	Records precise almost literal, and detailed description of people and situations
Member checking	By having personal communication with the participants the possibility existed for the researcher to contact the participants for further probing or clarification if questions had been ambiguous or misinterpreted.
Multi method strategy	A check of what is presented in the specific degree was done by downloading the universities prospectus. This is a, according to Merriman (1998) a form a triangulation used to confirm the data received.

As this study relied specifically on the questionnaire it is pertinent that reference is made to what has been written about validity and reliability specifically when using questionnaires. The validity of the study will depend, firstly, on how accurately and honestly the participants answer the questions. The covering letter which requested the lecturer to participate in the study aimed to motivate them by highlighting the importance of accuracy and honesty to add value to the study, and for its possible benefits to them in the future.

Reliability in qualitative research refers to the credibility, transferability, consistency and trustworthiness of the study. This is achieved if the study is replicated by someone else, the findings should prove to be similar. Denzin and Lincoln (1994) posit that reliability and replicability can be addressed in several ways, (1) Whether the researcher would have obtained the same information at a different time or place, (2) whether the researcher would

have obtained similar information if he had focussed on other phenomena during the observation and (3) whether a different researcher with the same theoretical framework and methodology would obtain similar findings. The advantage of using questionnaires is that participants have time to answer the questions thoughtfully and completely. They are given the opportunity to add comments or other pertinent information. The information is written down by the participant in his own words which reduces the possibility of the researcher misinterpreting the information and then misrepresenting it in the field notes. The disadvantages are (1) that participants need to value the importance of the study and take 'ownership' of their contribution, (2) that answers are limited to the questions presented in the questionnaire and the opportunity to probe for deeper meanings is limited, (3) there is a need to pilot the questionnaire to make sure that the responses are full and aligned with the intentions of the question. To counter possible problems the following actions were put in place. Firstly the covering letter stressed the aim of the study and the benefits that it could have to the participants. The letter also stressed the importance of the participants' honesty in their responses. Secondly, a pilot questionnaire was sent to a lecturer in a similar situation as the participants as well as the supervisor to test for any ambiguities in the questions and to check whether interpretation was in line with the researchers intentions. Note was made of comments in this pilot process and changes were made before the questionnaire was sent to the participants.

4.9 Sampling

The lectures at the different Universities of Technology (UoT) in South Africa that offer the Engineering Graphics and Design elective for the Bachelor of Education degree were identified. These lecturers had been selected as it was presumed that they had originally come from the College of Education structure before the national restructuring program. The research sample was restricted to the ex Colleges of Education lecturers because the curriculum and syllabi had always been planned and provided to the colleges by the State and as a result it was expected that the lecturers had not been involved in the curriculum planning process. Now that teacher training is provided for within the university environment the lecturers were expected to develop the syllabus themselves. The purpose of this study was to investigate how these lecturers had done this. A thorough investigation was done to ascertain which universities in South Africa offered this particular degree to determine how many prospective participants there would be and if this number would be suitable for a research study. It was found that only six UoT's and two 'traditional academic' universities were

identified as offering the particular degree. The lecturer from one of the UoT's could not be used as he is the researcher of this study. The two lecturers from the traditional universities were not included in the research as they had not been part of the restructuring program; however one was used in the pilot study for the questionnaire. Although these are small numbers, all potential participants willingly agreed to participate, giving this a 100% representation of the possible candidates.

4.10 Limitations to the research

As already indicated, there are only a few possible participants suitably identified for this study and participation in this study was voluntary. It was a concern that should anyone reject the invitation to participate the numbers would be too small. This would have an effect on the generalizability of the findings. An attempt to prevent this was made by the researcher contacting each participant telephonically, introducing himself, and explaining the purpose of the research. This seemed to have a positive effect as all the prospective participants agreed to participate.

The universities are situated around South Africa and this makes personal interviews very difficult. The researcher had to rely on the information given in the response to the questionnaire. There were some cases where the interpretation given by the participants were not congruent with the intention of the researcher's questions. Clarifying and probing into deeper meanings of the participants' answers into was not done as contact with the participants was extremely difficult.

4.11 Summary

Miles and Huber (as cited in Cohen, 2008) would classify this study as having a tight research design because of its restricted research questions and predetermined procedures with limited flexibility. They suggest that this design is suitable when the research is 'intended to look at particular specified issues, constructs, groups or individuals, or when the research brief is explicit.

The following table summarizes the research design for this study.

Research questions	**Type of data collected**	**Data collection strategy**	**From who/what was data collected from**	**Valdity and reliability**	**Data analysis**
What process was used to design the EGD syllabus?	Qualitative	Survey	Lecturers Questionnaire	Low inference descriptors Verbatim accounts of participant language	Content analysis
What content is included in the EGD syllabus?	Quantitative	Document analysis	Lecturers Course content	Low inference descriptors Member checking Multi method strategy	Comparative document analysis
What has influenced the decisions to include the particular content in the syllabus?	Qualitative	Survey	Lecturers Questionnaire	Low inference descriptors Verbatim accounts of participant language	Content analysis

4.11.1 Summary of Research Design

Chapter five presents the findings of the study. It outlines the background of the lecturers and their experiences in curriculum design. It further compares the content of the course content with the existing schools course content.

Chapter 5 Findings

5.1 Introduction

This study investigated the curriculum development of Engineering Graphics and Design (EGD) in the BEd degree, offered by selected universities in South Africa. In particular, it focussed on the process used by the particular lecturers in the design phase of the development of their curriculum. Research found that only eight universities in South Africa offered the BEd degree which included the EGD specialization as a major. Out of these eight, only five were identified for this study as explained in chapter 3.

The study requires the lecturers from the universities to submit, together with the completed questionnaire, a copy of the detailed planned syllabus to the researcher. The syllabi was analysed to determine, the scope, the detail, the sequencing, the levels in each of the phases, and the commonalities and differences that exist between them. These syllabi were then compared to the National Curriculum Statements for EGD in the FET band to try and get a deeper meaning into the processes used and to determine strengths and weaknesses of the course design.

The research used an Eclectic Curriculum Design model based on the components of the Cawood-Carl-Blackenberg (Carl 1995) model as well as including pertinent common components from the models discussed in chapter two. The Eclectic model consists of the following components: situation analysis, aims and objectives, selection and handling of core and learning contents, choice of teaching media, selection of teaching methods, and evaluation. It is against these components that the process of the curriculum design by the lecturers has been investigated and analysed.

To undertake this investigation a questionnaire survey and document analysis was used to obtain information. The study required the lecturers from the universities to submit, together with the completed questionnaire, a copy of the detailed planned syllabus to the researcher. A comparison of these syllabi was made to the National Curriculum Statements for EGD in the FET band.

The questionnaire was used to determine data regarding the development of the curriculum in use. It was divided into two sections. Section A determined the personal details and the experience, training and competence of the individuals responsible for developing the

syllabus. Section B aimed at obtaining information regarding the resources used and the process followed in developing the syllabus.

The documents used in this study include 1) the BEd syllabi from the selected universities, 2) the schools NCS documents for EGD and, 3) the syllabi for the Department of Education and Training Secondary Teacher's Diploma for Technical Drawing (STD). The NCS and the STD syllabi were selected so that comparisons can be made, and to determine what influences they may have had in the design of BEd syllabi.

Document analysis according to Leedy and Ormrod (2001) is defined as 'a detailed and systematic examination of the contents of a particular body of materials for the purpose of identifying patterns, themes, or biases'. In this study the syllabi were analysed to determine the scope, the detail, the sequencing, the levels in each of the phases, and the commonalities and differences that exist between them to help ascertain the reasons for including these sections in the syllabus.

The procedural process for the document analysis study is designed to achieve the highest objective analysis possible (Leedy & Ormrod, 2001). The collection of data is a two-step process.

First, the data was put into tables as each characteristic or quality is mentioned. In this research a table was drawn up which included all the questions from the questionnaire. The participant's responses were then entered into the tables under participant's column.

Second, an analysis of the data was conducted using the constant comparative approach so that the results could be reported. According to Merriam (1998), and Neuman (2003), the constant comparative approach is done on three levels. Firstly, a descriptive account is given which involved categorising the data using axial and selective coding. Neuman (2003) posits that 'during axial coding the researcher asks about causes and consequences, conditions and interactions, strategies and processes, and looks for categories and concepts that cluster together'. Selective coding is a more abstract analysis to code major themes through looking at specific concepts that illustrate, compare and contrast between the identified themes. In this research the first step was to group together those questions that probed a particular concept. This created the tables that have been used in the discussion in this chapter. The next step was to cluster and code the data. There were only five participants, which meant that there were not a vast number of categories or themes in which the data could be clustered,

and so a system of colour coding according to similarities and variations was used. Some of the information could simply be quantitatively classified and coded, whereas some required qualitative clustering and coding into themes or concepts. Secondly, an analysis of the data was done which involved making inferences through examining the interrelationship among the concepts. Thirdly, theory was generated by drawing conclusions about the patterns, themes, or biases found in the data analysis. The analysis of the data was based on these three levels to report the findings of the study.

Section 5.2 reports on the findings of the questionnaire and section 5.3 reports on the comparative content analysis of the syllabi submitted and the NCS grade 10 -12 EGD and ex-DoE Senior Teachers Diploma (Technical Drawing).

5.2 Findings of the questionnaire

The questionnaire was divided into two sections, Section A and B. The questions in Section A aimed to reveal the background of the lecturers and determine how suitably qualified they are to design the curriculum. The questions in Section B aimed to reveal the influences and processes which led to the decisions to include the particular content in the syllabus?'

Section A of questionnaire

5.2.1 Qualification to present the subject

The questionnaire was designed with the purpose of determining how qualified the lecturers are that are involved in designing the BEd syllabus. Qualification can be classified in two different ways. In one way one can be academically qualified where one has learnt the theory of the subject and should have the knowledge of the subject. Qualification can also be determined as having the experience to apply the knowledge suitably in a situation. We firstly analyse the qualification in their positions as the presenters of the BEd course. We then determine how qualified the lecturers are in developing the BEd curriculum.

Question	A	B	C	D	E
1. Please indicate your academic qualifications.	B Sec Ed B Ed	FDE: Tech	M Tech	BEd: Tech M Tech	BEd(Hons) NTD HDE FDE

2. What course and level are you presently lecturing?	Graphics Level:1-3	BEd Level: 1-3.	BEd Level:1-3	BEd Level:1-3	BEd Level:3-4
3. How long have you taught this course?	6 months	7 yrs	12 yrs	2 yrs	21 yrs
4. Did you teach the STD Technical Drawing Diploma in a 'College of Education'? No. of years	No	Yes 12 yrs	No	No	Yes 12 yrs
5. Have you taught Technical Drawing or Engineering Graphics and Design at school level? No. of years	Yes 21 yrs	Yes 2 yrs	No	Yes 10 yrs	No
6. What academic position do you currently hold?	Junior Lecturer	Lecturer	Lecturer	Lecturer	Senior Tutor

5.2.1 Qualification to present subject

5.2.1.1 Academic qualification

Question 1 refers to the academic qualifications of the lecturers. All of the lecturers have a higher education qualification which includes engineering drawing or technical drawing. Four of the lecturers have qualifications that are specifically linked to technical drawing in the school situation. Two have a Bachelor in Secondary Education and the other two have a Diploma in Education. The syllabus content in both these qualifications is based on the schools drawing syllabus and also deals with the teaching of the subject in the school situation. One lecturer has qualified through the Bachelor of Technology route. The syllabus in this qualification is more specialised and the drawing component is more specific to the particular industry related discipline. Not all the components of the school syllabus are therefore covered in the BTech syllabus. The BTech also does not include the didactical component in the qualification as the expected route for these graduates is into industry and not education.

As discussed, four of the lecturers have had some didactical training in their academic qualifications. The didactics syllabus invariably contains not only the science and skills of teaching but also aspects like setting tests, drawing up mark memorandums, as well as the interpretation of syllabi content and the preparation of work schedules. These lecturers will have therefore been exposed to and worked with the subject syllabus.

5.2.1.2 Experience

Qualification to do a job is also determined by the applicable experience one has accumulated over time. The experience of the lecturers in teaching the subject varies considerably with one lecturer lecturing the BEd degree or equivalent teachers' diploma for twenty one years, one for nineteen years and the other three for two years or less. They do however have experience in the school and FET technical colleges.

Three lecturers have school teaching experience. One lecturer has twenty one years, another two years and the other ten years. One lecturer has no school teaching experience but eleven years' experience in the FET colleges.

To summarize, all the lecturers are suitably qualified both academically and vocationally to present or teach the subject at the Bachelor of Education level. The next section will determine how qualified the lecturers are in developing a suitable syllabus for the BED degree.

In three of the universities there is only one lecturer presenting the course and in the other two there are two. This indicates that the subject is in a very small and isolated arena. All three of the lecturers that are on their own are also responsible for the development of the syllabus on their own. The two that lecture with someone else also share the responsibility of developing the syllabus either with the other person, or with the rest of the department.

5.2.2 Qualification to design the curriculum

This section tries to determine how qualified the participants are in curriculum design.

Question	A	B	C	D	E
7. How many lecturers	1	1	2	2	1

present your subject in the BEd degree					
8. Who is responsible for designing the course content?	Me	Me	The department (University)	Colleague & I	Me
9. If you have ever been involved in any other curriculum design process please elaborate.	National Education (NCS)	Motor mechanics	Involved in the FET programme review and curriculum dev of technical subjects	None	Yes, all the technical learning programmes in the BEd
10. If you have ever received any curriculum design training please elaborate	Workshops presented by National DoE for FET;	Workshops presented by National DoE for FET; Faculty training done by Teaching Committee.	At FET college level we sat as a province of Gauteng and as graphics and design conveners in a workshop organised by the education provincial government and at university level	None	No

5.2.2 Qualification to design curriculum

5.2.2.1 Academic qualification

Three lecturers have had some curriculum training, and only one of them has had formal training in curriculum studies at university level. This indicates that the lecturers have very

little formal tuition in the aspects of curriculum studies such as definition of curriculum, theories of curriculum, curriculum models, curriculum development, curriculum design, curriculum implementation etc. which need to be drawn on during the curriculum design process.

5.2.2.2 Experience

Only one lecturer has been involved at the curriculum development stage for EGD. This was however, at the FET College level. As indicated previously, there is a difference in the aims of the courses presented in the universities, FET colleges and schools. Although the experience gained was in a FET college environment, the curriculum development principles that are learnt and applied would be applicable to the university BEd degree.

The three lecturers have all indicated that they attended the National Department of Education workshops for training on the implementation of the then newly developed curriculum and syllabi for schools. The curriculum, together with the subject syllabus, had already been developed by certain subject committees who were responsible for deciding what content had to be taught and at what level. The workshops that the lecturers attended were aimed at the school teachers and the lecturers were invited to them because of their association with teacher education. These workshops were presented by trained personal (normally subject advisors) and involved informing teachers of the newly developed curriculum and how the teachers were expected to implement it in the classroom. The teachers and the lecturers were not involved in the development process but only in the implementation process, which does not allow for any input into the what, how and when the content must or can be taught.

To summarize then it is evident that the lecturers have very little if any formal training in curriculum development. Between them they have a vast amount of experience working with and applying a given syllabus. The task of developing a syllabus for the BEd degree then has been to draw on the experience gained with no real curriculum theory applied to it.

Section B of questionnaire

5.2.3 Curriculum Design

As discussed in chapter four, the first step in the development of the syllabus is the process of situational analysis which involves the collection and interpretation of all information which may influence curriculum development.

5.2.3.1 Aims and objectives

All the curriculum models discussed in chapter four stress the importance of setting and working around aims and objectives. Carl (1995) stresses that, 'curriculum designers must have a clear understanding of the educational and teaching goals as well as the objectives of the particular subjects'.

Question	A	B	C	D	E
11. How did you decide on the content chosen for your course?	Used NCS grade 10-12 (EGD).	Used NCS grade 10-12 (EGD) to prepare students to be able to present the subject at school.	Used NCS grade 10-12 (EGD).	Used NCS grade 10-12 (EGD) to meet the requirements of FET schools and FET colleges. Used NSE for roles and standards for teachers.	Used NCS grade 10-12 (EGD) to meet the requirements of FET schools and FET colleges

5.2.3.1 How did you decide on the content?

Although this question refers to the content and seems to be out of context here in the aims and objectives, it is not without reason. The question was placed here to determine whether the content was selected according to a determined course goal or purpose, or whether the content was merely adopted from the NCS document. This is discussed below.

In all cases the lecturers started off the curriculum development process by identifying the main purpose of the course viz. that, as lecturer number two states, his 'point of departure was … that I must prepare the students to be able to present the subject at school using the curriculum prescribed by the National Ministry of Education'. The research shows that the lecturers know that the aim of the programme must prepare the students to return to and teach in the school environment. Although the lecturers have predominantly used the schools NCS document as the basis for their course they have used it to select mainly the content. Only lecturers A and D have included aims into their course documents and both of them have adopted aims from the NCS document. Lecturer A focussed on aims specifically related to the subject and are adopted from the four Learning Outcomes in the NCS Grades 10 – 12 (General) for EGD. Learning Outcome 3 reflects the knowledge and understanding, whilst Learning Outcome 4 deals with the application of this knowledge. These two Learning Outcomes are underpinned by Learning Outcome 1, which reflects the interrelationship of technology, society and the environment, and Learning Outcome 2, which outlines the technological process that is used as the organising concept.

The course offered by lecturer D however aims to develop the student into fulfilling the seven roles of the teacher as advocated in the Norms and Standards for Educators. These being 1) Learning mediator, 2) Interpreter and designer of learning programmes and materials, 3) Leader, administrator and manager, 4) Scholar, researcher and lifelong learner, 5) Community, citizenship and pastoral role, 6) Assessor, and 7) Learning area/subject specialist. Lecturer D focussed more on the aims of the course and states that 'On completion of this course the students should be able to: describe the nature of Engineering Design and Graphics, demonstrate a clear understanding of the FET school Engineering Design and Graphics curriculum, observe lessons in Engineering Design and Graphics with understanding, prepare and deliver lessons for micro-teaching, write assessment standards that are clear, specific, detailed, logically arranged and as complete as possible on each topic, identify and solve problems as well as make decisions using critical and creative thinking, and distinguish between and apply the various types of outcomes - critical, developmental and learning outcomes.

The research done by the lecturers in this level of curriculum planning seems to be restricted to the schools NCS.

It is clear that they identified that the graduates of the BEd degree were going to be working in the FET band of the school sector. Unlike many university degrees that educate students to progress into the business or industrial sector, the BEd degree prepares students to return to the school environment but as the educator.

5.2.3.2 Course structure

A summary of the BEd degrees as analysed from the syllabi presented shows that lecturers A, C, D and E follow a similar structure to each other. At these universities the students specialize in EGD in their first year, which they continue into the third. The course presented by lecturer B, however, starts off with a general course in first year where 'the students are exposed to the following subjects in order to give them some background for EGD: Mechanical (Motor Mechanics, Fitting and Turning, Welding), Civil (Woodworking) and Electrical (Electricians Work). They then specialise in EGD in the second, third and fourth year. The reason for this is because it was felt that the students generally came from a non technical background and this general year would give the students the basics in the technical fields in which EGD is underpinned. Cognisance of this structure could be taken by the other lecturers to alleviate the problems encountered by lecturer C who claims that 'lack of technical background from the students make it difficult for us to achieve what we are attempting to achieve because they are not technically equipped'**.**

5.2.3.3 Subject research

Reynolds (2000) suggests that the information is obtained, firstly, through reading policy literature and curriculum documents, and secondly, from talking to syllabus committee members from the period and reading their survey replies, and examining the syllabuses produced. Question twelve is used to determine to what extent the lecturers have obtained the former, and question thirteen the latter.

5.2.3.3.1 Subject literature

Question	A	B	C	D	E
12. What documents, policies, and guide lines	NCS (EGD), NQF level 4Subject descriptors,	NCS (EGD), Various policy documents, CAD training	NCS (EGD)	NCS (EGD) University policies and relevant	NCS (EGD) Referred to examples in EGD books

did you consult in the design exercise?	NCS (Assessment guidelines), Technikon syllabus	manual, Study material from the FET engineering course.		guidelines	

5.2.3.3.1 What did you consult in the design exercise?

It is clear that there is a very strong influence of the school syllabus in the development of the BEd syllabus. All the lecturers indicated that they used the schools NCS document as the reference for the BEd degree. The lecturers also indicated that they also referred to other related documents. These included the syllabi from the FET for engineering, and ex Technikon, NQF level 4 descriptors for the different facets of the subject, and individual university policies. They also referred to resource materials such as the CAD manual and subject specific books to determine methods and levels at which content should be taught and assessed. The lecturers seem to have adopted the core aspects of the schools syllabus and then used other resources to adapt the syllabus to develop a more appropriate syllabus for the BEd degree. To what extent they adapted the school syllabus will be discussed later.

5.2.3.3.2 Subject expert liaison

Question	A	B	C	D	E
13. Did you consult other lecturers/advisors in your design process? Elaborate.	Yes old Convener Technikon, Lecturers at DUT	Yes, subject advisor, teachers, other lecturers involved in FET technology training and Engineering training. I also used information obtained from teachers and draughtsman to guide me.	At FET college level, no but at university level we did invite other colleagues from other UoT and the process will be repeated early next year.	Yes, through Advisory meetings	No

5.2.3.3.2 Who did you consult in the design exercise?

Lewy (1977) advocates that no one person possesses all the competencies necessary to develop a new curriculum and so many experts may be brought together to develop it. Reynolds (2000) indicates that information must be obtained from talking to syllabus committee members. Four out of the five lecturers consulted with subject specialists within the Higher Education Institution (HEI) academic and training field. One lecturer consulted the previous convenor for Technikons. This is a logical resource to use for this particular lecturer as he comes from a college of education that was absorbed into a Technikon. When this happened a new syllabus was presented for the course by the convenor of Technikons. When the Technikon became a University of Technology the lecturer was expected to develop his own syllabus and he then approached the convenor. Two lecturers consulted lecturers from another University of Technology offering the same course. Two lecturers' contacted other lecturers in the Technology and Engineering departments in the FET colleges. Only one lecturer consulted people from the school sector. This lecturer consulted an EGD subject advisor and numerous EGD teachers.

Taba (1962) posits that 'to satisfy the requirements as determined in the research on policy, requirements of industry and expectations from society' need to be included in the research during the situational analysis.Only one lecturer contacted a drawing specialist from industry. One lecturer did not consult anybody. As can be seen from the two previous questions his approach was to refer only to the different syllabi and books to determine the content and the assessment levels.

5.2.4 Challenges

Question	A	B	C	D	E
14. What were some of the challenges that you encountered in the subject design?	1. I think the biggest challenge is the fact that some of the students have no background of EGD at all. 2. The second challenge is that	The divergence of the subject. New Computer programme for Design, had to	Some of the topics were not relevant to the needs of the technologic ally changing world and	For now there are many challenges. I think that it is not enough for individual University to decide on the content or	Students with no drawing experience entering the course 3D visualizati on.

	you must go through the whole school curriculum to make sure that they know everything and uplift the standard. 3. The fact that CAD is part of the new curriculum to implement CAD and also help the students to make use of the different parts (2D, 3D and animation).	attend training courses to be able to teach it.	we were worried about resources available to carry the plan forward.	subject design. All the relevant stakeholders (doe, FET schools, FET colleges and all Universities within the country) must participate in the design of the content.	

5.2.4 What challenges did you encounter?

This question is aimed at determining what challenges the lecturers encountered in the development of the syllabus. It is clear that all the lecturers felt that they were not free to simply choose their own syllabus but that there was a need to design a syllabus that complied with new requirements as included in the school syllabus. Two main changes were made in the new school syllabus; the inclusion of civil and electrical drawing, as well as computer aided drawing (CAD). One lecturer refers to the former as 'the divergence of the subject' suggesting that there are more sections in the syllabus than in the previous syllabus and three lecturers add the inclusion of CAD. This requires that the lecturer needs to be trained in these sections. Curriculum designers need to be very experienced in their field in order to know what content is required, what assessment levels are needed at the different stages, and then how to structure the syllabus to allow for logical cognitive progression. The question arises as to whether the lecturers are suitably qualified to handle this task. One lecturer did not feel

that confident when he indicates that, ‘It is not enough for individual universities to decide on the content or subject syllabus. All the relevant stakeholders (DoE, FET schools, FET colleges and all universities within the country) must participate in the design of the content.

5.2.5 Teaching Reference Material

Question	A	B	C	D	E
15. Do you provide your own notes or do you prescribe a book? What is the title?	No answer	No answer	Provide own notes	Recommend a series of relevant books.	Notes and Books Engineering Graphics and Design for the senior secondary phase.

5.2.5 What teaching material do you refer to?

Unfortunately only three of the lecturers answered this question. It was noted earlier that the lecturers focussed mainly on the school syllabus in developing their own syllabus. The teaching material used by them seems to indicate that the lecturers did not simply confine themselves to a prescribed syllabus and work program, but that they sought other references to make the course different to the school course. One lecturer produces only his own notes, another uses a combination of notes and books. In this case the book that is used is a book written specifically for EGD senior secondary phase, the phase that the teachers are being trained to teach. The last lecturer recommends a series of relevant books. These may not necessarily be restricted to school books but could also include the books such as the South African Bureau of Standards for the different drawing codes.

5.2.6 Strengths and Weaknesses

Question	A	B	C	D	E
16. Briefly give the strengths of the present syllabus.	It articulates with the school program. All the new content is	The syllabus prepares them enough to enable them	Students are prepared for the school syllabus. They are taught the	The syllabus is underpinned by the three disciplines of Mechanical,	Articulates with the school and college syllabus. Content

	implemented in the new curriculum.	to do the job. Students are prepared with pencil and CAD drawings	theory and the didactics of the subject.	Electrical and Civil drawing.	progresses from basic drawing techniques to advanced applied Mechanical, Electrical and Civil drawings. Includes application of CAD
17. Briefly give the weaknesses of the present syllabus.	Too much time is spent on the school curriculum and not enough on more advanced Graphics.	Lots of practical work involved, due to time constraints sometimes difficult to get enough exposure and practice.	Students entering the course do not have suitable technical background knowledge.	The intended implementation is facing challenges to be attained.	Not enough time to complete the syllabus.

5.2.6 Strengths and weaknesses of the present syllabus

The lecturers seem quite satisfied with the syllabus that they are using. They feel that the syllabus ‘articulates with the school program’ and it prepares them adequately to teach in the School or FET college environment. This is to be expected as the syllabus was developed with the aim of preparing the students to present the subject at school level as indicated in the answers to question 11.

They do however feel that they are not able to extend the students much beyond the school level mainly due to two reasons. Firstly, the students that are accepted in this course do not always have the suitable background knowledge of the subject. It seems that students enrolled for the BEd degree in the specialization of EGD do not have to have taken EGD at school level. This means that the syllabus has to be designed in consideration of the knowledge level of the incoming students. Secondly, the contact time in the BEd degree is far less than that of the contact time that teachers have to present the course at school level. Not only is the academic year at university shorter than the school year, but the BEd degree also requires the students to do practice teaching in the schools. This takes them out of the lecture room and therefore reduces the contact time for theory.

Summary

Section 5.2 has presented the findings of the questionnaire that was completed by the participants. The following issues are raised from the data collected.

- Although the lecturers have a thorough knowledge and vast experience in the subject they lack the theoretical knowledge in curriculum studies needed in the curriculum design process.
- There was a lack of communication/correspondence between lecturers from the different higher education institutions (HEI's) offering the BEd degree.There was very little research done on other BEd degree to determine standards.
- Research is based on school levels and does not include research in programme expectations at HEI levels. Research was mainly done on subject content and there is no evidence of research done on the policy and expectations by the government departments on teacher training. There was no mention of participants adhering to the SAQA and NQF credit levels when considering the content.
- The new student's academic standards and subject knowledge played an important role when deciding on the content.
- The purpose of the stipulated course does not fulfil all the purposes for teacher training. There was no inclusion of subject specific didactics. Is this done as a separate subject?

These issues will be discussed in chapter six.

5.3 Analysis of Content

Section 5.2 dealt with the findings of the questionnaire that the lecturers responded to. This section presents the analysis of the comparison of the different syllabi and aims to answer the research question, 'What content is included in the EGD syllabus?' The syllabi compared are the school syllabus (NCS), the DoE Colleges of Education syllabus used for teacher training, and the syllabi presented by four lecturers. One lecturer answered the questionnaire but did not submit a syllabus. The syllabi for the three year course, viz. grade 10 -12, and BEd years 1-3 have been included together to compare the whole course and not compare them year by year. It is not the intention to analyse the syllabi in as much detail as the questionnaire but to summarize the results into grouped areas of interest.
The first group of questions deals with the setting of the syllabus.

5.3.1 Purpose, aims and objectives and assessment

The syllabus normally contains a general section which will incorporate the purpose, aims and objectives and assessment methods for the course and helps orientate the reader to the syllabus.

The purpose sets the reasons for the course and highlights the broad goals that need to be realised.These are normally formulated on the macro-level and are 'concerned with the identification of the final destination at national level, within a particular cultural context, within a school phase for a particular group or broad curriculum development for a particular subject' Cawood (as cited in Carl 2009).

Aims and objectives relate specifically to the syllabus content of the subject. Although they are formulated in the macro level they are used by the teachers in the micro level. They relate more specifically to the subject content and are used by the teachers/lecturers to guide them in deciding what levels to teach and assess at.

The assessment describes how the student's knowledge will be tested and includes the method and the regularity of the assessment. The method of assessment normally includes formative and summative assessment and also stipulates weightings between assignments, tests and exams

Table 5.3.1 shows in which syllabus documents the orientation sections are included.

	NCS Grade 12	DoE STD	A	B	C	D
Purpose	Yes	Yes	Yes	No	No	Yes 7 roles of a learner
Aims and objectives	Yes	Yes	Yes	No	No	Yes As per schools
Assessment standards Methods of assessment	Yes	Yes	Yes Yes	No No	No No	No No

5.3.1 Orientation of syllabus inclusion in syllabus comparison

The analysis of the presented syllabi shows that the two governmental departmental developed syllabi were comprehensively developed including, in detail, the introduction to the subject and an overview of the syllabus. Both of these syllabi included a detailed account of the purpose, the aims and objectives and the assessment methods. These syllabus documents were obviously set by experienced panels of curriculum and subject specialists. This does not seem to be the case for the BEd degree.

It is clear that there is lack of experience in developing the syllabus by the lecturers. Firstly, only two of the lecturers have included aims and objectives and outcomes in their syllabus, yet all these lecturers indicated that it was important to know what the aim of the course is and to be guided by this aim in developing the content for the course. Secondly, there is the tendency to adopt the aims and objectives stipulated in the school syllabus, as indicated by the two lecturers who included aims and objectives in their syllabus. Not much thought and consideration has been placed in either creating new or even adapting the aims and objectives to make them specific to the course for the training of teachers. Regarding the three lecturers that did not present a complete syllabus, it indicates that they focussed on producing a working document for themselves of what needs to be done in class. This does not present an official document to be used by other lecturers that outlines all the facets of the course syllabus as with the two syllabi that had been developed and presented by the Education departments.

5.3.2 Selection of Content

5.3.2.1 Alignment with school syllabus

As indicated before, the aim of the BEd degree is to prepare the students to present the subject as school level. It is logical then that the content of the BEd syllabus needed to be aligned with the school syllabus. The table below indicates the ratio between the number of sections included in the school syllabus, and the number included in the BEd syllabus. The sections have been grouped, in most cases, according to the way they are presented in the schools NCS, but liberty has been taken to edit the wording and to separate and group some sections through the axial and selective coding process as for analysis purposes as advocated Merriam (1998) and Neuman (2003).

Table 5.3.2.1a presents a summary of the selected syllabi in the research. The main sections of content in the NCS syllabus have been tabled as the reference criteria, and the contents of BEd and STD syllabi have been entered to make alignment comparisons.

NCS Grade 12	DoE STD	A	B	C	D
Introduction to Engineering Graphics and Design.	Yes	Yes	Yes	Yes	Yes
Scope, educational and career opportunities, human rights, gender, and inclusivity and HIV/AIDS issues related to EGD	No	Yes	Yes, not Aids	No	Yes
SANS code of practice as related to basic civil, electrical and mechanical drawing.	Only mechani cal	Yes	Yes	Yes	Yes
Free-hand drawing.	Yes	Yes	Yes	Yes	Yes
Setting up a Drawing Sheet	Yes	Yes	Yes	Yes	Yes
Use and care of Instrument Drawing.	Yes	Yes	Yes	Yes	Yes
Geometrical Constructions	Yes	Yes	Yes	Yes	Yes
Scale drawings.	Yes	Yes	Yes	Yes	Yes
Descriptive geometry.	Yes	Yes	Yes	Yes	Yes

Civil Drawings.	No	Yes	Yes	Yes	Yes
Electrical Drawing.	No	Yes	Yes	Yes	Yes
Sectional views	Yes	Yes	Yes	Yes	Yes
Mechanical Drawing.	Yes	Yes	Yes	Yes	Yes
Dimensioning of Welding symbols and Machining and surface treatment and Tolerances	No	No	Yes	Yes, No welding	Yes, No welding
Interpenetration and Development.	Yes	Yes	Yes	Yes	Yes
Transition pieces and containers.	No	Yes	Yes	Yes	Yes
Pictorial Drawing – Isometric, 1 and 2 point perspective drawings	Yes Axano-, di-& trimetric.	Yes Axano-, di-& trimetric.	Yes	Yes	Yes
Loci – Helix, Cam, Rolling circles, Link mechanisms.	Yes Roulettes Spirals	Yes Roulettes	Yes	Yes	Yes
CAD	No	Yes	Yes	Yes	Yes
The Design process:	No	Yes	Yes	Yes	Yes
Visualisation cognitive and perceptual exercises.	Yes	No	No	Yes	No
Hrs per section & total hrs	Yes	Yes	Yes	No	No

5.3.2.1a Subject content comparison

Table 5.3.2.1b illustrates how closely the participant designed syllabi are aligned to the schools NCS. The NCS stipulates twenty one different sections of content. Out of these twenty one sections, three participants have included twenty, and one participant nineteen.

NCS Grade 12	A	B	C	D
21sections	19	20	20	20

5.3.2.1b Alignment of BEd syllabi to NCS

All the lecturers have covered the school syllabus quite comprehensively. Nearly all the twenty one sections in the NCS have been covered in the BEd syllabi. The only sections which have not been covered by all of them are, 1) The discussion of the scope, educational and career opportunities, human rights, gender, and inclusivity and HIV/AIDS issues related to EGD, 2) The dimensioning technique using welding symbols, machining and surface treatment and tolerances, and 3) visualisation cognitive and perceptual exercises. All of these are sections that have been introduced into the syllabus since the change from Technical Drawing to Engineering Graphics and Design. Reasons for not including these three sections are not stipulated.

It is clear then that lecturers, basically, resisted the challenge of redesigning or adapting the existing school syllabus but simply adopted it to be used for the BEd degree. There are examples, however slight, of the students being extended in some sections beyond the school syllabus viz. lecturer 1 including axano-, di-, and trimetric drawing in the pictorial drawing section.

5.4 Conclusion

Chapter 5 has attempted to reveal the findings of the questionnaire and syllabi presented by the lecturers in the study. The questionnaire was divided into two sections, section A and B. Sections A dealt with the personal details and the experience, training and competence of the lecturers responsible for developing the syllabus. Section B required opinions, attitudes and perceptions and aimed to obtain information regarding the resources used and the process followed in developing the syllabus.

Chapter 6 Discussion and Conclusion

6.1 Introduction

Chapter five presented the data obtained from the questionnaire and the document analyses. Chapter six brings together the findings and interpretations of the data based on curriculum analysis using the Eclectic Curriculum Design Model. It further concludes by reflecting on the answers to the research questions which guided the study.

6.2 Discussion of the findings and the Eclectic Model in the curriculum design process

This report on the findings of the study is based on the structure of the Eclectic Curriculum Design model as discussed in chapter four. The Eclectic model consists of the following components: situation analysis, determination of the aims and objectives, selection and handling of core and learning contents, choice of teaching media, selection of teaching methods and evaluation. It is against these components that the investigation as to the process of the curriculum design by the lecturers was analysed and is reported on. Each section posits the models suggestion as to what procedures should take place, a discussion of what the findings reveal, and suggestions made to help improve the process.

6.2.1 Situational Analysis

The situational analysis is the first phase of the process and includes the following elements; the purpose of the course, the subject, the political issues, the learners/students, the physical environment and the lecturer/presenter.

Curriculum developers can be found working in different levels viz. the macro-, meso- and micro level. Carl (2009) indicates that the macro level is concerned at national level. Curriculum planners working within the macro level who look at the broad curriculum on a national level ‘will first make a thorough analysis of the needs of the country and the broad school population and accordingly formulate broad objectives for the school phases’ (Carl 2009). At university level developing the curriculum is the responsibility of the lecturers. Although the new position of curriculum development for their subject requires the lecturers to identify and set the broad educational goals, the BEd degree still has to be developed in conjunction with the schools NCS. The general approach taken by the lecturers was not to develop new goals but to adopt the educational goals as stipulated in the government

produced NCS. These goals are therefore orientated to learners in the school situation and not developed specifically for the BEd degree.

The meso level requires the lecturers to be involved in the curriculum development at the university level. This involves developing strategies for the implementation of the subject or course at the institution. Aspects such as timetabling, number of periods for offering the course, integration of the course in the program, integration of the course with other courses, and credit values of the course are all issues dealt with by the institution or government. The curriculum planning in this the meso level is left mainly up to the senior staff of the school or faculty at the university. There is no indication from the lecturers in the study that they have been involved at this level.

The duties then of the subject lecturers were basically restricted to the micro level which involved making decisions around the syllabus content and methodology. It was found that, even though the lecturers had indicated that they had contacted other subject specialists from education and industry, they basically adopted the NCS as the content to be taught in the BEd degree. Their efforts in developing a syllabus for the programme included

- Determining the aims and objectives of the programme
- Deciding on the content to be taught,
- The sequencing of the content within each year and over the duration of the programme,
- Deciding on the assessment standards to be achieved for each section.

6.2.1.1 Purpose

Tyler's (1949) leading question for his rationale asks, 'What educational purposes should the school seek to attain? Bray (as cited in Carl, 2009) posits that the first priority in knowing where we are, what we have and where we hope to be, is the determination of the goal. It is of extreme importance for the planners to know to what purpose the knowledge acquired is going to be used.

The lecturers in the study have indicated that they were very aware of the purpose of the degree, to train student teachers to teach Engineering Graphics & Design. Lecturer B stated that, 'My point of departure was the fact that I must prepare the students to be able to present the subject at school'. While this lecturer saw the future destination as the school

environment, lecturers D and E indicated that the students must also be prepared to teach in the FET (vocational) colleges.

Skilbeck (1976) posits that developers must be aware of the source of their objectives. Reynolds (2000) suggests that the information is obtained, 'through reading policy literature, curriculum, educational history, social science pedagogy, sociology areas, and examining primary documents such as committee minutes.'

All but one of the lecturers indicated that they had been in discussions with other parties. Lecturer A had discussions with the ex-convener of Technikons as well as one of the other universities of Technology that offer the same course. Lecturer B had discussions with the EGD schools subject advisor, and other lecturers involved in FET Technology and Engineering training. Lecturer C had discussions with other lecturers from other UoT's and lecturer D had participated in subject advisory meetings.

6.2.1.2 Subject research

Chapter one highlighted the important changes in the situation that the lecturers in this study faced. These include (1) the change from a diploma to a degree, (2) the change of the narrow Technical Drawing subject to a broad Engineering Graphics & Design which includes several new sections including CAD, (3) a change of pedagogic methodology to OBE and (4) the change from implementing a curriculum planned and provided by the state, to developing one in an autonomous environment.

Comprehensive research needs to be done on the subject to determine what has been done in the past and what new developments are expected in the future. There were several changes in the new syllabus from Technical Drawing to EGD. The inclusion of civil and electrical drawing, design and CAD are major new sections to the syllabus which not only required research but for some lecturer's further training. This includes areas such as the latest methods or techniques and regulations for the subject. Further research is needed in the requirements from industry (in this case the schools) in defining a purpose and formulating aims and objectives for the course, relevance, degree of difficulty, available resources, demands and requirements of the syllabus, depth of study, time scheduling, available text books and other learning matter and structure of the subject content.

The lecturers responses indicated that they generally opted for an 'adoption of an existing curriculum' approach as opposed to a 'developing a curriculum from the beginning' one. They based their syllabus on what is being taught at the FET level in the schools or colleges.

The main source of reference amongst the lecturers is the National Curriculum Statement (NCS) for Engineering Graphics & Design. The statements were as follows:

Lecturer A – 'Make use of the NCS '.

Lecturer B – 'Present the subject using the curriculum prescribed by the National Ministry of Education'.

Lecturer C – We were guided by the National Subject Guidelines and by the National Curriculum Statements'.

Lecturer D – 'To ensure that the contents meet the requirements of FET schools'.

Lecturer E – 'Guided by the FET curriculum'.

The lecturers also used other documents and policies to develop their syllabus. These included the NQF Level 4 subject descriptors, EGD Assessment Guidelines, current and old Technikon syllabi, CAD training manuals, the FET colleges drawing subject guidelines, and EGD and Technology text books.

Although the school syllabus was provided at the macro level for the school environment it seemed to be adopted and adapted for the lecturers' courses at the higher education level.

6.2.1.3 Political

Reynolds (2000) highlights that political influences have a big impact on the curriculum design. The political changes in South Africa have resulted in major changes in the country's education system. The restructuring of the teacher training colleges into the HEI's, the introduction of the Outcomes Based Education methodology in all teaching, and the introduction of Curriculum 2005 are examples of political influences.

The political influences are very evident in that the lecturers, including those who had taught the old Technical Drawing syllabus under the previous government, have adopted the new structure and content advocated by the new government's department of education. Aspects which had political grounding such as human rights, gender equality and aids awareness which were never considered important, are now also included in the syllabus. Lecturers also attended the training workshops offered by the department of education's subject training committees and are therefore subjected to the emphasis they have placed on the content and methodology for the subject. .

6.2.1.4 Learners

The situational analysis must also include research into who is going to be taught. Curriculum designers need to know what knowledge the students have as they enter the course. This is important in 1) setting the minimum requirements for entry to the course and 2) knowing at what level the first year level and consecutive years must be set at. Carl (2000), claims that the curriculum design process can only begin by taking into account the physical, psychological and intellectual development of the learners.

To gain entry into the BEd degree a learner must posses a minimum of a National Senior Certificate (with endorsement into Bachelor Studies) (DoE 2010). It is deemed that a learner with this achievement has acquired the necessary skills to cope with the academic rigour of a degree. Added to this, the learner is required to have the appropriate subject combinations and levels of achievement as prescribed by the university offering the programme. This according to lecturers A and E was not enough as they felt that students without any EGD background or three dimensional visualisation experience were enrolled into the programme and posed the biggest challenges. This problem is noted in DoE draft policy for Teacher Education in which it includes the following statement as on of the lessons learnt from the HEQC review of teacher training. It states that 'In many teacher education programmes, there is insufficient professional screening of applicants prior to admission. Institutions are directed to become more selective during admissions processes.' (DoE 2010).

Important in the situational analysis is not that the learners' lack the EGD knowledge but that the lecturers be aware of what general and specific knowledge the learners bring to the learning environment. This will help the curriculum planner in developing a syllabus with appropriate content and progression.

To highlight this point the following scenario has significance. A general feeling amongst the participants is that the incoming students lack basic EGD subject knowledge. Lecturer C claims that a 'lack of technical background from the students make it difficult for us to achieve what we are attempting to achieve because they are not technically equipped'**.** This results in the course been designed for beginners, and consequently impacts on the time to complete the course and the levels to which the standards can be attained. By taking into account the academic level of the student, the course presented by lecturer B is spread over four years with the first year being a general course to give them some general background

for EGD. Cognisance of this structure adaptation could be taken by the other lecturers to alleviate the problems of enrolling unequipped students.

6.2.1.5 Teacher/Lecturer

Curriculum, educational history, social science pedagogy and social areas all suggest specialist and formal training in educational studies which may assist the curriculum planner with theories to be used in developing the syllabus.

The curriculum planner needs to have an understanding of the person responsible for presenting the course. He needs, as Carl (2009) suggests, considering the lecturers expertise, which includes knowledge and skills, subject knowledge, qualifications, teaching experience and teaching ability, in presenting the subject. The lecturers in the BEd degree are responsible for presenting the whole course as well as the didactics of the subject. It is therefore imperative that they are subject experts and that they also have experience in presenting the subject at school level. The findings show that one lecturer has an MTech qualification and has no formal teachers' qualification.

In this research study the syllabus planning is not done by an external person or body in the macro level, but by the individual lecturers presenting the course, the micro level. All the lecturers, bar one, indicated that they are responsible solely for the development of their curriculum. Only one lecturer works within a department where the syllabus is developed as a team.

6.2.2 Aims and Objectives

The next stage in the curriculum design process is the identification and clarification of the aims and objectives of the subject. Carl (2009) adds that, 'curriculum designers must have a clear understanding of the educational and teaching goals as well as the objectives of the particular subjects'.

Aims are broad statements that indicate the general educational undertaking in a subject. Objectives, according to Carl (2009), are exact, precise descriptions of the learner's required behaviour or achievement which must be realised at the end of a certain time. Rowntree (1978) posits that 'well formulated objectives give direction to the determination of method, media and evaluation strategies, and therefore offer a frame of reference against which a value determination may be made regarding the success of the curriculum'

The research done in the situational analysis shows that the lecturers know, that the aim of the programme is to prepare the students to return to and teach in the school environment. Although the lecturers have predominantly used the schools NCS document as the basis for their course, they have used it to select mainly the content. Only lecturers A and D have included aims into their course documents, and both of them have adopted aims from the NCS document. Lecturer A has adopted the 12 critical outcomes as documented in the EGD NCS document. The course offered by lecturer D however, aims to develop the student into fulfilling the seven roles of the teacher as advocated in the Norms and Standards for Educators. These being, 1) a learning mediator, 2) interpreter and designer of learning programmes and materials, 3) a leader, administrator and manager, 4) a scholar, researcher and lifelong learner, 5) community, citizenship and pastoral role, 6) Assessor, and 7) learning area/subject specialist. It is clear that not much research and emphasis has been placed by the lecturers in this macro level of curriculum planning. The planning at this level, according to Carl (2009), 'is concerned with the identification of the final destination at national level, within a particular cultural context, within a school phase for a particular group or broad curriculum development for a particular subject'. It is this level of curriculum planning that was previously done by specialist curriculum planners for the colleges of education. The lecturers lack training in this new task required of them and it has prompted lecturer D to suggest that 'it is not enough for individual universities to decide on the content or subject design. All the relevant stakeholders (DoE, FET schools, FET colleges and all universities within the country) must participate in the design of the content'.

Carl (2009) explains that the meso level of curriculum planning 'has to do with the identification of aims within a specific school curriculum or more complete subject curriculum development.' At this level the structure of the course is developed from the information obtained in the situational analysis in an attempt to achieve the desired aims and objectives. A summary of the BEd degree in the research shows that lecturers A, C, D and E follow a similar structure to each other. At these universities the students specialise in EGD in their first year, which they continue into the third. The course presented by lecturer B, however, starts off with a general course in first year where 'the students are exposed to the following subjects in order to give them some background for EGD: Mechanical (motor mechanics, fitting and turning, welding), Civil (woodworking) and Electrical (electricians work). The reason for this was not determined, but cognisance of this structure could be taken to alleviate the problems encountered by lecturer C, who claims that 'lack of technical

background from the students make it difficult for us to achieve what we are attempting to achieve because they are not technically equipped.'

Carl (2009), states that 'the micro level has to do with the identification of aims within a specific subject module or even a lesson or lesson unit'. This is where the lecturers find themselves in charge and responsible for the first time. It is at this level that the lecturers have been given freedom to design their course using their knowledge and experience. It is expected that the role of the lecturer (educator) be that of a 'designer of learning programmes' as advocated in the Norms and Standards for Educators, which requires the setting of aims for the program. Again only two lecturers included aims in their program.

Lecturer A focussed on aims specifically related to the subject which are adopted from the four learning outcomes in the NCS Grades 10 – 12 (General) for EGD. Learning outcome 3 reflects knowledge and understanding, whilst learning outcome 4 deals with the application of this knowledge. These two learning outcomes are underpinned by learning outcome 1, which reflects the interrelationship of technology, society and the environment, and learning outcome 2, which outlines the technological process that is used as the organising concept.

Lecturer D focussed more on the aims of the course and states the following

> 'On completion of this course the students should be able to: describe the nature of Engineering Design and Graphics, demonstrate a clear understanding of the FET school Engineering Design and Graphics curriculum, observe lessons in Engineering Design and Graphics with understanding, prepare and deliver lessons for micro-teaching, write assessment standards that are clear, specific, detailed, logically arranged and as complete as possible on each topic, identify and solve problems as well as make decisions using critical and creative thinking and distinguish between and apply the various types of outcomes: critical, developmental and learning outcomes'.

Carl (2009) posits that one may distinguish between process and product aims. Process aims are those goals aimed at developing cognitive processes and strategies which may be served through a particular subject. These processes include; working in a team, organizing and managing oneself, critical evaluation, effective communication, reflection and exploring different strategies. Product aims are those goals 'orientated to the mere introduction and control of the body of knowledge and the proficiencies and skills of a particular subject' (Carl 2009).

Rowntree (1979), advocates that knowledge has its source in three types of objectives viz, life skills (future needs of the community), methodological objectives (analysis of subject by subject specialists, and content objectives (analysis of subject structure). Carl (2009) states that, 'When one is considering the curriculum, the content dimension is a core aspect which normally determines the nature and extent of the relevant curriculum. One can not consider the curriculum without involving the content dimension with it'.

The life skills objectives in the school curriculum focuses on providing the learner with broad foundational curriculum content with the aim of preparing them to progress into a more specific vocational education system. In higher education the curriculum planned must build on this general education and develop a curriculum model which will prepare the learner for the demands of the workforce in which he will find himself.

The methodological objectives are developed through the analysis of the subject by subject specialists. Selecting the content will consider the expected knowledge of the incoming learner, the time frame and the expected knowledge that the qualifying learner must have attained. The workshops that the lecturers attended not only provided them with the content to be covered, but also provided discussion on the methodology of how it is expected to be taught, and how it will be assessed in the school environment.

The content objectives are developed from the analysis of the subject structure. Tyler's (1949) second question for his rationale asks, 'what educational experiences can be provided that are likely to attain these purposes?' Walker (1971) claims that curriculum developers make their decisions about the various curriculum elements from 'a hotchpotch of ideas, preferences, points of view, beliefs and values held about the curriculum to be used as the basis to realize his vision'. Kruger (as cited in Carl, 2009), however argues that the selection and classification of contents cannot take place in a haphazard manner. He posits, and is supported by (Cawood, 1982, Reynolds 2000, Rowntree 1978) as discussed previously, that it is of extreme importance for the planners to know to what purpose the knowledge learnt is going to be used, as irrelevant and incorrect contents can negatively influence the path of life of the learner.

Lecturer A uses the same terminology as used in the NCS document and does not refer to this information as objectives but as assessment standards. Assessment standards are defined in the NCS document as 'criteria that collectively describe what a learner should know and be able to demonstrate at a specific level. They embody the skills, knowledge, values and

attitudes required to achieve the learning outcomes. Assessment Standards within each learning outcome collectively show conceptual progression occurs from grade to grade.

Lecturer B's course outline is stated simply as follows (translated)

After the unit is completed, you will be able

- To complete the following constructions and write down the steps to the solution
  - Bisect a straight line
  - Bisect an angle
  - Construct a perpendicular from a point on the line
  - Construct a perpendicular from a point outside the line.

These objectives or assessment standards indicate the content of the course, and leads us to the second research question for this study. What content is included in the EGD syllabus?

6.2.3 Content

A synthesis of the criteria for the selection of content proposed by Walters (1978), and Carl (2009) is given.

- They must serve the realization of the curriculum aims.
- They must be realistic, manageable, accessible and viable.
- They must be relevant.
- They must take learners existing knowledge into account.
- They must be stimulating and motivating.
- They must have balance in the regard to extent and depth of study.
- They must be topical to in regard to needs.
- They must be representative of the relevant subject.

An analysis of the data shows that the lecturers used the NCS EGD syllabus to select the content for the BEd degree. It was shown that in most cases, twenty out of the twenty one sections stated in the NCS were included in the BEd degree syllabi. This congruency with the school syllabus is to be expected as the content selected must be guided by the purpose of the

course, being ‘to prepare the students to teach the subject in the schools.’ Selecting the school syllabus indicates that the course is simply a school syllabus presented at the university. This is not the case as most of the sections are repeated from one year to the next progressing in a level of cognitive difficulty. The levels achieved by the universities were not evaluated in this study as it would involve an in depth analysis of the examination papers.

6.2.4 Organising learning experiences

The content syllabus, selected and documented in the macro level, does not normally prescribe how and when it must be presented. Carl (2009) explains that this is the responsibility of the course presenter, at the micro level. Tyler (1949) in his rationale asks, ‘How these educational experiences are to be effectively organised’.

Once the course presenter interprets and understands the planned aims and objectives he/she must select and organize the teaching and learning activities into a learning programme. In doing this the following should be considered:

- Determine a year planner. The analysis of the lecturers’ syllabi indicates that the sections of work have been suitably divided into the three years of study. The time allocated for each section is not stipulated, but the different year syllabi accommodate a suitable number of sections to be completed appropriately.
- Determine how many lessons will be needed to complete each section. Although a detailed breakdown of the years content into each lesson was not submitted, the lecturers seem to have brought their years of experience in teaching the subject to plan syllabi suitably for learners to adequately acquire the necessary skills. The lecturers did however; feel that they were pushed for time to get the students to acquire the necessary skills within the time constraints allowed.
- Must have knowledge of the learners’ general and prior subject content knowledge before planning each section. It is evident that all the lecturers were aware that many of the students were entering the course having never done the subject before. This was articulated as one of the challenges they experienced in presenting the course. To accommodate these students they all began the first year syllabus with the similar introduction topics that are presented in the NCS (grade 10), which is the first year for EGD at school level. The activities planned must be connected to the students’ previous experiences.
- Must have knowledge of the expected assessment levels the learners need to achieve in the different grades. Taba (1962) advocates that each activity must have a definite

function and set at the cognitive level of the learner. The analysis of the syllabi shows that the lecturers have not aligned themselves totally with the NCS (EGD) expected assessment levels. Although they have covered the NCS syllabus, it was found that the lecturers opted to complete some sections in one year instead of spreading it over the three years as in the NCS. This, therefore, takes the students to an advanced cognitive level in the early years.

- Sequencing the lessons within a section, across sections, as well as from year to year. It is to be presumed that the content would be covered in the same sequence that was articulated in the syllabi submitted. Apart from the sections mentioned in the previous point, the content seemed to be logically sequenced throughout the year as well as the degree. Generally, the content has been planned in such a way so that learners can construct knowledge through building on basic principles. A typical example of this is the section of solid geometry. The first year syllabus covers the basic projection and auxiliary views of prisms and pyramids and the second year introduces the interpenetration of prisms and pyramids. In order to solve these problems the students will need to have acquired the concepts learned from their first year.

A logical learning programme with appropriate learning activities that leads to an effective learning process requires a vast amount of experience and is not simply an accumulation of a hotch- potch of ideas.

The effectiveness of the curriculum design process is finally assessed in the final step, the evaluation.

6.2.5 Evaluation

The previous section emphasized the importance of having objectives in designing a curriculum or course. It is also important then, at the end of the process, to determine whether the objectives have been sufficiently met. Carl (2009) proposes six functions of evaluation. It is to:

- To determine the success of instruction or the quality of the learning outcomes.
- To determine the suitability of the curriculum.
- To direct replanning and adjustments.
- To determine whether grading and advancement are possible.
- To monitor progress.

- To identify defects timeously and correct them.

It was not the objective of this study to evaluate the success of the implementation of the program. From the findings one can however, conclude that the syllabi presented by the lecturers are indeed suitable for the BEd degree.

The above discussion reveals that the lecturers did attend to the components advocated in the Eclectic model, but not always very well. An overview of these findings is elaborated below to answer the research questions of this study.

6.3 Answers to research questions

6.3.1 What process was used to design the EGD syllabus?

Apart from one lecturer, the syllabus design was left up to the individual lecturers. Generally, the first step was to identify the aims and purpose of the course. After this, they did some subject research, which included consulting the NCS and subject specialists as well as attending schools in service training workshops. Lastly, the lecturers generally adapted the schools NCS for EGD for their syllabus.

6.3.2 What has influenced the decisions to include the particular content in the syllabus?

Lecturers identified that the aim of the course that they were presenting is to train student teachers who would be returning to the school environment. Some of the lecturers attended the schools in service training where they acquired the knowledge in what the new school syllabus contained in both content and methodology. The lecturers also drew on their experience from teaching at schools, FET colleges, as well as colleges of education. Lecturers also consulted subject specialists from education and industry, although this did not seem to play a significant role. The main influence on what content was included lay in what was included in the schools NCS.

Lecturers were very conscious of the subject knowledge the students possess entering the course. In doing EGD for the first time, it was felt that they lacked the suitable background to begin an advanced level course. The course therefore needed to be designed to accommodate these students.

6.3.3 What content is included in the EGD syllabus?

The content used was based on the schools EGD syllabus. All lecturers indicated that they had used the NCS for grades 10- 12 as the content for the BEd degree. The analysis shows that approximately 95% of the school NCS is included in the BEd syllabi.

This raises the following issues.

- Although the lecturers have a thorough knowledge and experience in the subject, they did not have the theoretical knowledge in curriculum development needed to apply any particular process.
- There was a lack of communication/correspondence between lecturers from the different higher education institutions (HEI's) offering the BEd degree. What research has been done on other BEd degrees to determine standards?
- Research is based on school levels and does not include research in programme expectations at HEI levels. Research was mainly done on subject content, and there is no evidence of research done on the policy and expectations by the government departments on teacher training. Have the SAQA credit levels been adhered to when considering the content?
- The new student's academic standards need to be considered when deciding on the content
- The purpose of the course stipulated does not fulfil all the purposes for teacher training. There was no inclusion of subject specific didactics. Is this done as a separate subject?

6.4 Discussion on the significant issues

6.4.1 Are the lecturers suitably qualified to develop a curriculum/syllabus?

The research shows that only three of the lecturers have had formal training in education, either obtaining a Diploma in Education, a Bachelor of Education or a Bachelor of Education (Honours). The curriculum in these qualifications normally include some training in the necessary areas, such as, curriculum theory, pedagogy, and sociology, which according to Reynolds (2000), are all important in curriculum design. The other two lecturers have both obtained Masters degrees, but these are in the technical specialist direction. The training in the specialist technical direction does not provide the training suggested by Reynolds.

Although the lecturers appear to have very little formal training in these areas, four of them have attended workshops presented by the DoE subject committees for EGD. It is appropriate that the lecturers attend the workshops presented by these committees.

In suggesting that information should be obtained through educational history and examining committee meetings, Reynolds (2000) implies that cognizance of what has been done in the past must be made. The lecturers bring with them a wealth of experience as they have all had more than 10 years experience in teaching or lecturing EGD in a school, CoE or FET college. It is not enough though to rely on past experience. Chapter 2.7 discusses the curriculum discourse in higher education in South Africa and highlights the point that lecturers overestimated the value of personal experience (Egbert 1984) in designing the curriculum, and they have not engaged in research and 'disciplinary inquiry into teacher preparation programmes' (Parker and Adler 2005).

Recommendation: Lecturers need to become formally trained in curriculum design. They need to have the theoretical knowledge on curriculum models which they can apply, together with their subject knowledge, in developing 'research-led curricula' Kruss (2008).

6.4.2 Has the BEd degree been set at a suitable level?

It is evident that the research done to decide on the content for the BEd degree was basically limited to the school environment. There is hardly any evidence that shows that lecturers have researched the levels expected at university level. Even though lecturers have the autonomy and responsibility for designing the course syllabus, the programmes still need to be registered and accredited through several government organizations as discussed in chapter 1. The SAQA credit level at grade 12 is pitched at level 4, and the credit level for a BEd degree is pitched at level 7. This means that the exit level for the BEd degree needs to be set at a much higher level than that for grade 12. The data obtained clearly indicates what content is to be taught. It does not indicate to what levels the content must be taught. There is no mention of the lecturers referring to any consultation or research regarding pitching the levels to level 7. It is clear that the lecturers have not had enough in-depth interaction and discussion regarding expected exit levels as indicated by one of the lecturers who states that, 'there was a lack of communication/correspondence between lecturers from the different higher education institutions (HEI's) offering the BEd degree'.

Recommendation: Lecturers need to make their research much broader. The research must not only include an investigation into what is advocated in the NCS but must also comply with standards and expectations set by SAQA, the NQF and the DoE for teacher education. It is also recommended that the lecturers from the different universities offering similar programmes establish a working committee in helping to establish a common syllabus and define standards at which the content must be set.

6.4.3 The relevance of the purpose of the syllabus.

The lecturers in general identified the need to prepare the students to return back into the school environment to teach the subject. To this end they focussed on the school syllabus as the theoretical content to be covered. Lecturer A focussed on aims specifically related to the subject and are adopted from the four learning outcomes in the NCS Grades 10 – 12 (General) for EGD. Only lecturer D includes theoretical content as well as didactics in the form of preparing and delivering lessons for micro-teaching and writing assessment standards.

Cognisance of the required competences required of newly qualified teachers as proposed in the Draft Policy on Minimum Requirements for Teacher Education Qualifications could be made to formulate program aims at this level.

1. Newly qualified teachers must have sound subject knowledge.
2. Knowledge of how to teach their subject, and how to select, sequence and pace content according to both the subject and learner needs.
3. Newly qualified teachers must have knowledge of their learners and how they learn, understand their individual needs, and tailor their teaching accordingly.
4. Newly qualified teachers must know how to communicate effectively, in general and in relation to their subjects, in order to mediate learning.
5. Newly qualified teachers must have highly developed literacy, numeracy and IT skills.
6. Newly qualified teachers must have knowledge of the school curriculum and be able to unpack its specialised contents, and be able to use available resources appropriately, so as to plan and design suitable learning programmes.

7. Newly qualified teachers must understand diversity in the South African context, in order to teach in a manner that includes all learners, and must be able to identify learning or social problems and work in partnership with professional services to address them.
8. Newly qualified teachers must be able to manage classrooms effectively across diverse contexts in order to ensure a conducive learning environment.
9. Newly qualified teachers must be able to assess learners in reliable and varied ways, and to use the results of assessment to improve teaching and learning.
10. Newly qualified teachers must have a positive work ethic, display appropriate values, and conduct themselves in a manner which befits, enhances and develops the teaching profession.
11. Newly qualified teachers must be able to reflect critically in theoretically informed ways on their own practice. Together with their professional community of colleagues seek to constantly improve it and adapt it to evolving circumstances.

Recommendation: Lecturers need to expand the purpose of the course to not only contain one of the roles of the teacher as advocated by the Norms and Standards for Teachers (NSE) viz. educating and training the students to becoming more than a subject specialist. The purpose also needs to include the other six roles viz. learning mediator; interpreter, and designer of learning programmes and materials; leader, administrator and manager; scholar, researcher and lifelong learner; community, citizenship and pastoral role and assessor.

6.5 Concluding remarks

The change in government in South Africa in 1994 brought many changes and these were especially felt in the education system. Although these changes were initially made in the school sector, changes were eventually made in the higher education system. The teacher training section, because of its position of being in the HEI sector and preparing the students for the school sector was therefore affected by the changes in both sectors. The significant change in the school sector was that the subject content of Engineering Graphics and Design changed by more than 50%, meaning that lecturers needed to be retrained. There was no program for any retraining and lecturers were expected to do this on their own. The major change that took place in the HEI sector was in changing the Senior Teachers' Diploma (STD) to a Bachelor of Education degree (BEd) due to the restructuring process. The impact

of this was that the lecturers, who were used to working off a given governmental syllabus for the subject, now had to design the curriculum on their own.

Curriculum design is a complex exercise with many interconnected facets. It is also dependant on different role players advocating regulation and policies. It is a major task for anyone to undertake this exercise without any formal training. It is important that the lecturers need to be formally trained on the theory and intricacies of curriculum design before embarking on this task.

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Appendixes

1. Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL

02 October 2009

Faculty Research Committee
Faculty of Education
Edgewood Campus
University of KwaZulu-Natal

Dear Dr M Combrinck,

Consideration of Ethical Clearance for student:

Conradie, Edmund - 201512246

Your student's ethical clearance application has met with approval in terms of the **internal review process** of the Faculty of Education.

Approval has been obtained from the Faculty Research Committee, and the application will be forwarded for ratification (MEd) or recommended in the case of PhD and Staff applications, to the Ethics Sub-Committee of the University of KwaZulu-Natal. All Masters applications approved by Faculty Research Committe may commence with research.

Both you and the student will be advised as to whether ethical clearance has been granted for the research thesis (PhD), once the Ethics Sub-Committee has reviewed the application. An ethical clearance certificate will be issued which you should retain with your records. The student should include the ethical clearance certificate in the final dissertation (appendixes).

Should you have any queries please contact Rishandhani Govender the Faculty Research Officer on (031) 260 3440 or on the email govender3@ukzn.ac.za

Yours faithfully

UNIVERSITY OF KWAZULU-NATAL
EDUCATION
2009 -10- 2
FACULTY RESEARCH OFFICE

Professor D. Bhana
Deputy Dean Postgraduate Studies and Research

2. Invitation and questionnaire to participate in research programme

Dear Sir/Madam

REQUEST TO PARTICIPATE IN RESEARCH STUDY

I am presently registered for an M.Ed at the University of KZN and would like you to participate in the study. The thesis topic is 'An Investigation into the design process of the Engineering Graphic and Design Syllabus of the Bachelor of Education Degree in South Africa'. The focus of this study is the design process used in the development of the Engineering Graphic and Design (EG&D) Syllabus of the Bachelor of Education Degree in the South African Universities of Technology (UoT). The purpose of the study is to investigate the design process of the EG&D syllabus in the degree. Through this study, I intend to understand the reasons for selecting the planned content and the processes applied in the design. I then plan to relate the findings to the academic theory on curriculum design. I hope that the results of the study may one day help all of the lecturers that are presenting the Engineering Graphics and Design in the B.Ed degree.

You have been asked to participate due to your position as lecturer in this degree offered at your university. Your participation is voluntary without remuneration and you will be required to sign the informed consent declaration as well as have the consent of your school/institution. (Please complete the declaration below). The consent form is not binding and should you wish to withdraw from participating in the study, you may do so at any stage without any consequences to yourself.

In order to allow honest comments and evaluation I would like to assure you that the results of the survey will be used purely for my master's dissertation and that pseudonyms will be used and persons and institutions names will not be revealed or exposed.

I will require from you:

- A copy (electronic format) of the syllabus that you are using to present your course.
- To complete the questionnaire enclosed

Please contact me if you require any further information

As there are so few potential participants I would appreciate your to participation

Many thanks

Eddie Conradie

Questionnaire for Engineering Graphics and Design B.Ed Lecturers

DECLARATION OF PARTICIPANT

I…… (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

……

DATE

DECLARATION OF HEAD OF SCHOOL/FACULTY

I…… (full names of head) in my capacity as ……..hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to

…… participating in the research project.

……..

DATE

Format of Questionnaire

Section A is designed to obtain the background and position of the respondent.

Section B is questions related to the respondents experience and involvement regarding the curriculum design.

Please complete the questions as informatively as possible.

Section A

1. Please indicate your academic qualifications. _____

2. What course and level are you presently lecturing? _____

_____

3. How long have you been lecturing in this course? _____

_____

4. Did you teach the STD Technical Drawing Diploma in a 'College of Education'?

_____No. of years_____

5. Have you taught Technical Drawing or Engineering Graphics and Design at school level? _____No. of years _____

6. What academic position do you currently hold? _____

Section B

4. How many lecturers present your subject in the B.Ed degree? _____

5. Who is responsible for designing the course content? _____

_____

6. If you have ever been involved in any other curriculum design process please elaborate.
_____

_____

_____

7. If you have ever received any curriculum design training please elaborate._____

_____

_____

8. How did you decide on the content chosen for your course? _____

_____

_____

_____

9. What were some of the challenges that you encountered in the subject design?
_____

_____

_____

10. What documents, policies, and guide lines did you consult in the design exercise?
_____

_____

11. Did you consult other lecturers/advisors in your design process? Elaborate. _____

_____

12. When did you first implement the current syllabus? _____

13. Do you provide your own notes or do you prescribe a book? _____

What is the title? _____

14. Briefly give the strengths and weaknesses of the present syllabus.

Strengths _____

_____

_____

_____

_____

Weaknesses _____

_____

_____

_____

_____

I would like to thank you for taking the time and showing the interest in participating in my study.

Please feel free to provide suggestions which may add to the value of this questionnaire and research.

Thank you

Eddie Conradie

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